Energy Efficiency Policy: Budget, Electricity Conservation, and Fuel Conservation Issues

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Summary

Energy efficiency issues include research and development (R&D) priorities, funding for climate-related efficiency programs, implementation of equipment efficiency standards, regulation of vehicle fuel efficiency, and electricity industry ratemaking for energy efficiency profitability. The Bush Administration has proposed an Advanced Energy Initiative (AEI) to accelerate hydrogen programs. For the Department of Energy's (DOE's) energy efficiency R&D programs, the Administration seeks $484.7 million, with increases for Hydrogen and Hybrid/Electric Propulsion. The request would cut $74.8 million from the Weatherization Program and eliminate controversial funding earmarks. The House-passed version of the FY2007 Energy and Water Appropriations Bill (H.R. 5427) would fund AEI and cut earmarks. The Senate Appropriations Committee has also approved AEI funding and would cut earmarks even further than the House.

Energy efficiency programs have long been justified for the ability to reduce petroleum use and curb environmental impacts such as air pollution. This made it economically and administratively convenient to have them also serve as part of a low cost "no regrets" policy to reduce greenhouse gas (especially CO_2) emissions. In addition to DOE funding, H.R. 5386 would provide about $100 million for the Environmental Protection Agency's energy efficiency program, and the Senate Appropriations Committee's version of H.R. 5522 would provide about $200 million for energy efficiency-related programs in developing countries.

DOE's implementation of equipment efficiency standards has been a subject of some congressional criticism. The Energy Policy Act of 2005 (EPACT, P.L. 109-58) directed DOE to report to Congress on actions taken to address the concern. In response, DOE issued a schedule for rulemakings on 30 products. EPACT also raised the goals for energy efficiency in federal agencies and provided modest tax incentives for efficiency in certain vehicles and buildings.

Automobile fuel efficiency regulation has been one of the most controversial aspects of energy efficiency policy. The Corporate Average Fuel Economy (CAFE) program for new cars and light trucks achieved significant energy savings through 1985 but has remained relatively flat since then. Critics say that recent CAFE increases for light trucks are too small, given concerns about high gasoline prices, air pollution, and CO_2 emissions. Proponents counter that larger CAFE increases would compromise safety and cause hardship for manufacturers.

The *National Action Plan for Energy Efficiency* aims to defer the need for 20,000 megawatts of new electric power plant capacity. Its success will depend mainly on the ability of state regulators to make energy efficiency profitable for electricity companies, by addressing the link between profits and sales.

This report will be updated as events warrant.

Contents

Tables

Contacts

Most Recent Developments

On June 29, 2006, the Senate Committee on Appropriations reported H.R. 5427, the Energy and Water Appropriations bill for FY2007 (S.Rept. 109-274). This bill includes funding for the DOE Energy Efficiency Program, which is conducted by the Office of Energy Efficiency and Renewable Energy (EERE). Compared with House-passed funding for FY2007, the Senate Committee approved an increase of $66.1 million (5%) for all EERE programs. **Table 3** shows other differences, most notably increases for Buildings and Clean Cities programs; and decreases for Weatherization, Fuel Cells, FEMP, Program Management, and Industry programs.

Compared with FY2006 funding, the Committee recommends an increase of $211.7 million (18%) for EERE R&D and deployment programs. This reflects support for the Advanced Energy Initiative, including an increase for the Hydrogen program ($34.2 million). The main cuts include the Weatherization program (-$42.6 million), Industrial programs (-$9.3 million), and Program Management (-$9.9 million).[1] Regarding earmarks, both the House ($26.1 million) and Senate ($15.8 million) figures are much lower than the $76.4 million enacted for FY2006.[2]

For the Environmental Protection Agency's Climate Protection (energy efficiency) Programs (H.R. 5386), the Senate Appropriations Committee approved $105.8 million.[3] Also, appropriations bills for the Department of Agriculture (H.R. 5384) and the Department of State (H.R. 5522) fund energy efficiency programs.[4]

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 the "Energy Efficiency in the 109th Congress" and "Legislation" sections below.[5]

Background

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 (e.g., attic insulation), components (e.g., insulated windows), and design aspects (e.g., solar orientation and shade tree landscaping). Further, the energy efficiency of communities and cities can be improved through architectural

[1] For more details, see "DOE Budget, FY2007" and **Table 3**. Also, the DOE FY2007 budget request document is online at http://www.cfo.doe.gov/budget/index.htm.

[2] More details about earmarks for DOE's energy efficiency programs can be found in CRS Report RL33294, *DOE Budget Earmarks: A Selective Look at Energy Efficiency and Renewable Energy R&D Programs*, by (name redacted).

[3] For more details, see "EPA Budget, FY2007" and **Table 2**, below.

[4] For more details, see the "Legislation" and "Climate Change" sections below.

[5] A list of all energy efficiency bills introduced in the 109th Congress is provided in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by (name redacted).

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. An important aspect of energy efficiency policy is to weigh such benefits against the cost of energy efficiency investments.

Energy Efficiency Drivers

Various concerns and national interests drive energy efficiency policymaking. Recently, high energy prices and concerns about energy security have renewed an emphasis on energy efficiency and energy conservation to dampen electricity, natural gas, and oil demand. Energy efficiency is also driven by the potential benefits of avoiding environmental costs that would otherwise result from growth in energy supply facilities, with the attendant impacts of their effluents and emissions on land, water, air, and global climate. Further, energy efficiency is often driven by the potential to reduce consumer energy costs, but this potential can be compromised by several barriers, including perceived threats to the profitability of energy supply companies, the complexity of energy consumer decision-making, and the "rebound effect," wherein expected savings are reduced by increased consumption elsewhere.[6]

Measuring Energy Efficiency and Energy Savings

Measurement Challenge

In the processes of extracting and producing energy, energy supplies are physically tangible and easily measured. In contrast, measuring energy savings and energy efficiency is more challenging. In effect, one is attempting to measure something that never happens; namely, that consumption falls below a projected level and the difference is attributed to the installation of more energy efficient equipment.[7]

Measuring Energy Savings by Individuals and Programs

The scientific approach to measuring the impact of an energy efficiency program is known as evaluation research.[8] This technique employs surveys of actions taken by many of the individuals

[6] Also referred to as the "take-back" effect, the rebound effect is discussed in the following section, "Measuring the Rebound Effect."

[7] This equipment is selected and installed by millions of consumers and companies, which calls for a different approach to measurement than that for energy supplies.

[8] Evaluation research is an empirical social science discipline that originated in the 1960s with a focus on the use of (continued...)

that receive benefits from an energy efficiency or energy conservation program. Due to the large scale of national programs and the associated cost to mount a large evaluation effort, only a few major evaluations of DOE programs have been conducted, mostly during the 1980s and early 1990s.[9] These studies focused on assessing the energy savings from grant programs.[10] Evaluating impacts from R&D programs is conceptually, and mechanically, much more difficult than evaluating grant programs.[11]

NAS Study of Barriers to Action by Individuals

More than 20 years ago, the National Academy of Sciences (NAS) prepared a landmark study of the decision-making behavior of energy users. The report reviewed several studies that found energy users often avoid making substantial investments in energy efficiency measures that would have been cost-effective. In particular, NAS observed that some major studies found that only 30% to 80% of economically justified investment would be induced by energy price signals. Further, it found that a belief in market effectiveness persists, despite evidence that institutional barriers to investment in energy efficiency tend to blunt the effect of market signals. The report identifies several technical, market, and information barriers to consumer investment in cost-effective energy efficiency. In particular, NAS focused on the non-rational "folk" model of consumer energy decision-making:

> People who try to make rational calculations based on their own assumptions [folk model] about energy would be led to make fewer energy-saving investments than an expert analyst would recommend ... they [would] interpret their investments as less effective than would an expert....[12]

In addition, NAS points out that non-technical and non-economic factors have a major impact on energy use:

> More fundamentally, there is a problem with the very notion of users as investors. People do not see their purchases of energy and energy-using equipment only as investment; they have

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control and treatment groups to measure the effects of education, health, and other social programs. As broad-based energy programs emerged in the late 1970s and early 1980s, these techniques began to be applied to many energy programs.

[9] Evaluations of energy efficiency and energy conservation programs have continued, but they are focused mostly on effects at the state or local level. The International Energy Program Evaluation Conference is at the center of this continuing effort. See abstracts of evaluation papers from its 2005 conference at http://www.iepec.org/.

[10] Prominent examples are U.S. DOE, Oak Ridge National Laboratory (ORNL), *Past Efforts and Future Directions for Evaluating State Energy Conservation Programs* (ORNL-6113), 1985; Office of State and Local Assistance Programs, *Institutional Conservation Program Evaluation Project*, 1986; and ORNL, *National Impacts of the Weatherization Assistance Program in Single-Family and Small Multifamily Dwellings* (ORNL/CON-326), 1993.

[11] This is true for virtually all R&D programs, not just for energy efficiency R&D programs. The Bush Administration has launched an effort under the President's Management Agenda to develop methods for assessing the impacts of applied R&D programs, including the Energy Efficiency Program at DOE. The National Academy of Sciences has published reports in this area, including *Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000*, 2001, at http://darwin.nap.edu/books/0309074487/html/9.html, and *Prospective Evaluation of Applied Energy Research and Development at DOE (Phase One): A First Look Forward*, 2005, at http://darwin.nap.edu/books/0309096049/html/70.html.

[12] National Academy of Sciences, *Energy Use: The Human Dimension*, Chapter 4, "Individuals and Households as Energy Users," 1984, p. 60.

> meanings unrelated to the cost of fuel. Car purchasers, for example, do not look solely at fuel efficiency. They are also concerned with performance, safety, styling, status considerations, and other factors.[13]

The report finds similar aspects are factored into decisions about home improvements that have major implications for household energy use.

Measuring the Rebound Effect

One important behavioral aspect of energy efficiency is the "rebound effect." This effect may reduce the measured level of energy (and cost) savings from an energy efficiency action well below the expected level. The rebound can take the form of a direct effect, where resource use is increased (e.g., drive an efficient car more miles); an indirect effect, where additional goods are purchased that use the same resource (e.g., buy a new electrical appliance for the home); or a market effect, where a lower resource price makes new uses affordable (e.g., provide electric heating for a hot tub). Studies have shown that the rebound for automobiles ranges from 10% to 30% and the rebound for home water heating ranges from 10% to 40%. However, in each case, the losses in expected energy savings are generally associated with gains in equipment service (e.g., more hours of use) or increased comfort (e.g., a more desirable temperature setting).[14]

DOE's Efforts To Measure Energy Efficiency in the Economy

In 1989,[15] and again in 1995, DOE prepared a report that attempted to estimate the energy savings from its energy efficiency and energy conservation programs.[16] From 1985 to 2005, national energy use climbed about 20 Q (quads),[17] reaching a record high of 99.9 Q in 2005. 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, DOE said this was saving the economy about $150 billion annually in total U.S. energy expenditures.

These two studies used an economic modeling approach to estimate past energy savings trends, distinguish program savings from price-induced savings, and energy savings for each end-use sector. The 1995 report concluded with four basic "lessons" that provide guidance for policy development: (1) energy prices strongly affect trends in energy savings, (2) growth and structural change make energy conservation a moving target subject to continued reevaluation, (3) trends in energy savings reflect a diversity of responses among and within each sector of the economy, and (4) several areas of rising demand are diminishing or detracting from the gains in energy savings,[18] and they present targets of opportunity for further policy attention.[19]

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[13] NAS, *Energy Use*, p. 61.

[14] For more information, see Lee Schipper, "On the Rebound: The Interaction of Energy Efficiency, Energy Use and Economic Activity: An Introduction," *Energy Policy*, vol. 28, 2000, p. 351-353. Also see CRS Report RS20981, *Energy Efficiency and the Rebound Effect: Does Increasing Efficiency Decrease Demand?*, by (name redacted).

[15] DOE, *Energy Conservation Trends: Understanding the Factors That Affect Conservation Gains in the U.S. Economy* (DOE/PE-0092), September 1989.

[16] DOE, *Energy Conservation Trends: Understanding the Factors Affecting Conservation Gains and Their Implications for Policy Development* (DOE/PO-0034), April 1995, 50 p.

[17] A quad is a quadrillion Btus (British thermal units).

[18] DOE noted that the areas of rising demand included increased use of air conditioning in the residential sector, greater (continued...)

EIA's Approach: Measure Energy Intensity of the Economy

In 1995, EIA issued a report that attempted to address difficulties in measuring energy efficiency.[20] The report declares that the ability to define and measure energy efficiency is essential to the DOE objective of promoting energy efficiency to help the nation manage its energy resources:

> In the absence of defensible energy efficiency measures, any change in consumption might be equated with a change in energy efficiency even if such fluctuations are caused by structural or behavioral effects.[21]

To contribute to the goal of accurately measuring energy efficiency, EIA developed an approach based on energy intensity.

EIA notes that the task of defining and measuring energy efficiency and creating statistical measures as descriptors is a "daunting one." Specifically, it explains that

> [c]hange in energy use over time is driven by a combination of efficiency, weather, behavioral, and structural effects that may be only partially separable and may differ among energy services.... As a practical matter, it is virtually impossible to remove, or even to consider, all of the behavioral or structural factors that would be necessary to obtain a pure measurement of energy efficiency, however broadly energy efficiency may be defined.[22]

Thus, in this view, because energy efficiency is tied to energy use and demand, it must somehow be separated from other factors that affect demand, especially structural (economy), weather, and behavioral effects.[23]

EIA suggested that one way to achieve this separation was to focus on energy intensity as a measurement indicator of energy efficiency. The energy intensity indicator was obtained from an equation in which energy consumption is set equal to the product of energy intensity (energy use rate per unit of service) times the total amount of service provided.[24] EIA says it adopted a comprehensive approach that starts the measurement process with the broadest available measures of energy use and demand indicators. Over time, changes in such measures reflect changes in behavior, weather, structure, and energy efficiency. Further, structures of energy measures are needed that make it possible to separate the effects unrelated to energy efficiency.[25]

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use of air conditioning and office equipment (e.g., computers, printers, and copiers) in the commercial sector, a decline in the ratio of load-to-vehicle weight for heavy trucks in the transportation sector, and a shift from cars to light trucks in consumer vehicle choices.

[19] DOE, *Energy Conservation Trends*, 1995, p. 33-35.

[20] EIA, *Measuring Energy Efficiency In The United States' Economy: A Beginning*, October 1995, 91 p., at http://www.eia.doe.gov/emeu/efficiency/ee_report_html.htm.

[21] EIA, p.71.

[22] EIA, *Measuring Energy Efficiency*, pp. vii and 4.

[23] In discussing the behavioral aspect as an intervening variable in measuring energy efficiency, EIA notes that a consumer may decide to reallocate the energy savings to an increased level of service, such as a higher heating temperature in winter. This behavioral phenomena is know as the "rebound effect," as previously discussed.

[24] EIA notes that for any given service, energy intensity is inversely related to energy efficiency; pp. 3-4.

[25] EIA, pp. 5-6.

EIA observes that some of the obstacles to measuring energy efficiency on an economy-wide basis are lack of consistent data, difficulties in establishing demand indicators, and absence of clarity in identifying structural and behavioral influences on efficiency.[26]

EIA's report concluded that further work is needed to forge a consensus on the definition of energy efficiency and the development of energy-intensity indicators that are precise, valid, reproducible, and as robust as possible. EIA offered its report as a focus point for further discussion and debate to improve energy efficiency measures.[27]

EIA's discussion of energy efficiency measurement was continued with an article on its website.[28] The article noted that there are data access and processing barriers to developing energy efficiency indicators. Further, the effort to create international comparative indicators is made more difficult due to structural, behavioral, and economic differences between nations. Even a measure of energy intensity, such as energy use per unit of gross domestic product (GDP), is difficult because of differing measures of energy, currencies, and income accounts.

EIA suggests that different policy contexts call for the use of different energy intensity indicators. For example, a focus on climate change policy might call for an indicator that shows carbon emissions in absolute terms or expressed per unit of energy use. In contrast, a focus on economic productivity policy might call for an indicator that shows energy expenditures per dollar of GDP. EIA said that intensity may only be a "rough surrogate" for energy efficiency, because it may mask structural and behavioral changes that do not represent "true" efficiency improvements. Nevertheless, as with its 1995 report, EIA again found that energy intensity may be the best indicator of energy efficiency that can be developed with available data:

> Energy intensity is defined as the ratio of energy consumption to some measure of demand for energy services. The choice of measure of demand for energy services (a "demand indicator") in efficiency analysis is critical. As examples, in the transportation sector, intensity measures could include gallons per passenger mile or gallons per vehicle mile. Passenger mile and vehicle are the demand indicators in these two examples.[29]

EIA reported that there are four frequently used approaches to developing energy intensity indicators and indexes to measure relative changes,[30] each with its own strengths and weaknesses.[31]

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[26] EIA, p. 71.

[27] EIA, p. 71.

[28] EIA's *Energy Efficiency Measurement Discussion* was last updated in February 2003 and is available online at http://www.eia.doe.gov/emeu/efficiency/measure_discussion.htm.

[29] EIA, *Energy Efficiency Measurement Discussion*, section on "Energy Intensity as a Common Surrogate for Energy Efficiency."

[30] EIA also notes that there is a "best practice approach" that can be used for comparing the efficiency of a current or average production activity with the "best practice" that could be used. This approach is most appropriately applied to single production process or single company.

[31] The "market-basket (of energy services) approach" is a bottom-up approach, in which each category of service is controlled relative to its share in the index. The "comprehensive approach" works from the top-down, starting with the broadest measures of energy use and then removing effects from behavior, weather, and structure. The "factorial decomposition approach" takes energy use and separates it into activity, structural, and intensity effects, measuring each by holding the other two constant. This technique is used by the International Energy Agency in its publication *Indicators of Energy Use and Efficiency.* The "Divisia index approach" separates time trends into different factors, such as structure and intensity.

EIA noted that the measurement of energy efficiency and energy intensity can also be affected by the choice between primary energy and site energy as the indicator of energy use. Primary energy is defined as the amount of energy delivered to an end user (e.g., residential housing unit) adjusted to account for losses in generation, transmission, and distribution.[32] Site energy is defined as the amount of energy delivered to an end user without adjusting for these losses.[33] EIA said primary energy is better for constructing aggregate indicators (e.g., energy use/GDP) and for showing ultimate resource or environmental impact; for example, attributing CO_2 emissions to residential electricity use. When the focus is finding differences in end-use efficiency, for example residential air conditioning compared over time, using a simple measure of site energy would be sufficient and may avoid distortions from changes in "upstream" efficiency. EIA asserted that from an economist's viewpoint, using cost expenditures instead of primary or site energy may be preferable.[34]

DOE Program 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. Energy efficiency is also viewed 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 an important 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.[35]

From FY1978 through FY2005, DOE spent about $12.4 billion in 2005 constant (real) dollars for energy efficiency R&D, which amounts to about 15% of the total DOE spending for energy R&D during that period. In 2005 constant 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, a combined total of $467 million was appropriated for the Hydrogen, Fuel Cells,

[32] This is particularly important for electricity, where large amounts of heat are lost in the combustion of fossil fuels to generate power. However, it is also true for a fuel refinery, where certain amounts of energy are used to operate the machinery that drives the chemical processes. Primary energy use is related to the concept of "full fuel cycle" energy use.

[33] This is usually the easiest measure of use, shown on home electricity and natural gas meters.

[34] With an economic measure, EIA said it does not matter if there is a shift from electricity to natural gas or vice versa because a decrease in the cost of one fuel is likely to be counter-balanced by an increase in the other. Thus, in this view, although site energy use may decline relative to primary energy use, the expenditures would remain relatively level.

[35] Detailed descriptions of DOE programs appear in DOE's *FY2007 Congressional Budget Request*, DOE/CF-004, vol. 3, February 2006, available at http://www.mbe.doe.gov/budget/07budget/Content/Volumes/vol_3_ES.pdf.

Vehicles, Buildings, and Industrial Technologies Programs.[36] Also, in 2005 constant dollars, from FY1978 through FY2005, DOE 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 2005 constant dollars, the federal government spent about $42.6 billion for nuclear (fission and fusion) R&D and about $14.1 billion for fossil energy R&D.[37] From FY1978 through FY2005, the federal government spent $33.9 billion for nuclear (fission and fusion), $21.1 billion for fossil, $13.4 billion for renewables, and $12.4 billion for energy efficiency.[38] Thus, total energy R&D spending from FY1948 to FY2005, in 2005 constant dollars, reached $140.0 billion, including $76.3 billion, or 55%, for nuclear; $35.2 billion, or 25%, for fossil; $13.4 billion, or 10%, for renewables; and $12.4 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%).

DOE's Strategic and Performance Goals

In 2004, a National Academy of Public Administration (NAPA) study[39] found dramatic improvement in the Office of Energy Efficiency and Renewable Energy (EERE) after a major reorganization that included two new offices: FreedomCAR and Vehicle Technologies, and Hydrogen, Fuel Cells, and Infrastructure. DOE completed a major office reorganization in 2005.[40]

A 2001 report by the National Research Council (NRC) found that the net economic benefits associated with DOE energy efficiency programs were more than four times larger than the investment in RD&D over a 22-year period.[41] Further, the report found that DOE did not use a consistent method for evaluating project benefits, and recommended that DOE adopt NRC's

[36] In FY2006, as part of a restructuring of the appropriations committees, Congress merged appropriations accounts for the DOE Energy Efficiency Program, which had previously been under the Department of the Interior and Related Agencies Appropriations Bill, with the appropriations accounts for the DOE Renewable Energy Program under the Energy and Water Development Appropriations Bill. As a result, appropriations for some subprograms, such as Hydrogen and Program Management, of the Renewable Energy Program are commingled with those for the Energy Efficiency Program and are no longer reported separately. In place of the former totals for the Energy Efficiency Program, this report (see **Table 3**) now shows a subtotal of appropriations for all of the energy efficiency technology subprograms, namely Hydrogen, Fuel Cells, Vehicles, Buildings, and Industrial Technologies.

[37] DOE, Pacific Northwest Laboratory, *An Analysis of Federal Incentives Used to Stimulate Energy Production* (PNL-2410 REV II, UC-59), February 1980, 374 p. See also selected publications by Warren Donnelly, CRS.

[38] DOE, Office of the Chief Financial Officer, *Budget Authority History Table by Appropriation, FY1978 through FY2006 Request* (table), June 7, 2005.

[39] The study is available on the NAPA website at http://www.napawash.org/Pubs/EERE%20NAPA%20Rpt%20Sept%2004.htm.

[40] Information about the new management structure and other aspects of EERE are available on the DOE website at http://www1.eere.energy.gov/office_eere/.

[41] The report says that most of the estimated benefits were attributed to three relatively modest building sector projects conducted from the late 1970s into the 1990s. National Research Council. *Energy Research at DOE: Was It Worth It?* (Energy Efficiency and Fossil Energy Research 1978 to 2000), Executive Summary, p. 6., at http://darwin.nap.edu/execsumm_pdf/10165.pdf

framework to assess R&D costs and benefits and to prepare reports to Congress required by the Government Performance and Results Act (GPRA).[42] Areas found short of expected benefits were found to have lacked incentives needed for private sector adoption.[43] Further, DOE noted that from 2001 through 2004, EERE was awarded 33 "R&D 100" awards.[44]

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.[45]

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 FY2007*, 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 petroleum use and greenhouse gas emissions." PG 4.04 says that the Buildings Program will allow buildings to become "capable of generating as much energy as they consume." PG 4.06 says that the Industrial Technologies Program aims to save feedstock and process energy, improve environmental performance, and improve economic competitiveness. PG 4.13 says that the Federal Energy Management Program (FEMP) will support federal agency efforts to achieve life cycle energy savings of 17 trillion Btus each year from FY2007 through FY2011.[46] DOE estimates that the EERE programs will curb energy demand growth by 8 Q per year in 2025 and by 30 Q in 2050,[47] a savings approximately double that which would otherwise be expected by 2050.[48]

[42] NRC, *Energy Research at DOE*, p. 7.

[43] The NRC report is available at http://darwin.nap.edu/books/0309074487/html/79.html. NRC, *Energy Research at DOE* (Overall Findings and Recommendations), p. 67.

[44] DOE says these awards are known as the "Oscars of Innovation." DOE, FY2006 *Congressional Budget Request* (Interior and Related Agencies), February 2005, vol. 7, p. 217.

[45] The full report is available on the RFF website at http://www.rff.org/Documents/RFF-DP-04-19REV.pdf.

[46] DOE, *FY2007 Congressional Budget Request* (Energy Supply and Conservation), vol. 3, p. 17-18.

[47] DOE, *FY2007 Budget Request*, p. 19.

[48] DOE, *FY2006 Congressional Budget Request* (Interior and Related Agencies), February 2005, vol. 7, p. 217.

Energy Efficiency in the 109th Congress

Action in the Second Session

DOE Budget, FY2007

President Bush issued the Administration's FY2007 budget request on February 6, 2006. 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 increased funding for the Advanced Energy Initiative and elimination (or reprogramming) of congressional earmarks.

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.[49] A key component of the ACI is the Advanced Energy Initiative,[50] which DOE says also "aims to reduce America's dependence on imported energy sources."[51] 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."[52] To support this initiative, the DOE FY2007 request for energy efficiency programs proposes major funding increases for hydrogen and fuel cell technology programs. Also, the ACI and the FY2007 federal budget reflect strong concern about the "rapidly growing" amount of legislative earmarks for R&D programs,[53] including the Hydrogen program.[54]

The House Appropriations Committee report on the FY2007 Energy and Water Development Appropriations Bill includes several policy directives to EERE.[55] First, the report directs EERE to report by January 31, 2007, on the progress of implementing the Inspector General's

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[49] The White House, *State of the Union: American Competitiveness Initiative*, January 31, 2006, at http://www.whitehouse.gov/news/releases/2006/01/20060131-5.html.

[50] The White House, *State of the Union: the Advanced Energy Initiative*, January 31, 2006, at http://www.whitehouse.gov/news/releases/2006/01/20060131-6.html.

[51] DOE, *Department of Energy Requests $23.6 million for FY2007*, press release, February 6, 2006, at http://www.doe.gov/news/3150.htm.

[52] U.S. Executive Office of the President, *Budget of the United States Government, Fiscal Year 2007*, Appendix, p. 390. Also see DOE, *FY2007 Congressional Budget Request: Budget Highlights*, p. 41.

[53] U.S. Executive Office of the President, Office of Science and Technology Policy, Domestic Policy Council, *American Competitiveness Initiative Leading the World in Innovation*, February 2006, p. 13, at http://www.house.gov/science/hot/Competitiveness/aci06-booklet.pdf.

[54] U.S. Congress, House, Committee on Science, *Hearing on Fiscal Year 2007 Federal R&D Budget*, Testimony of John Marburger III (Director of the Office of Science and Technology Policy), Feb. 15, 2006, p. 1-2. His statement also covered the ACI initiative; see http://www.house.gov/science/hearings/full06/Feb15/marburger.pdf. For additional information on Energy Conservation Programs, see http://www.eere.energy.gov/.

[55] U.S. Congress, House, Committee on Appropriations, *Energy and Water Appropriations Bill, 2007*, H.Rept. 109-474, May 19, 2006, p. 74-81, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:hr474.109.pdf

recommendations (IG audit report DOE/IG-0689) to improve the management of cooperative agreements.[56] Second, it directs EERE to strengthen recruiting from Historically Black Colleges and Universities.[57] Also, one DOE-wide directive that would directly affect EERE involves funding for the Asia Pacific Partnership (APP), which would support clean, energy-efficient technologies. The report directs DOE to submit a reprogramming request if it intends to support APP with FY2006 funds and to submit a detailed budget justification (which would be considered by the conference committee) if it proposes to use FY2007 funds.[58]

The Senate Appropriations Committee report includes several policy directives to EERE, of which two apply to energy efficiency programs.[59] First, it directs DOE to study possible impacts of plug-in hybrid-vehicles on electricity supply and distribution networks, including urban areas, and to study environmental aspects of fuel-switching.[60] Second, it directs DOE to provide a strategy to accelerate the development of zero energy buildings by five to seven years.[61]

EPA Budget, FY2007

The FY2007 request for EPA's Climate Protection Programs (CPP), which focus mainly on voluntary energy efficiency activities, is $104.3 million, which is $5.1 million less than the 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.[62] The House approved $111.2 million, and the Senate Appropriations Committee approved $105.8 million.

EPA conducts its CPP programs under the Office of Atmospheric Programs, with funding from appropriations accounts for EPM and S&T. EPM programs cover the areas of buildings (Energy Star), industry, state and local government, international, and sequestration. S&T programs cover mainly transportation. 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.

[56] H.Rept. 109-474, p. 73.

[57] H.Rept. 109-474, pp. 74-75.

[58] H.Rept. 109-474, pp. 67-68.

[59] U.S. Congress, Senate, Committee on Appropriations, *Energy and Water Appropriations Bill, 2007*, S.Rept. 109-274, June 29, 2006, pp. 114-122, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:sr274.109.pdf.

[60] S.Rept. 109-274, pp. 118-119.

[61] S.Rept. 109-274, p. 119.

[62] U.S. Environmental Protection Agency (EPA), *2007 Annual Performance Plan and Congressional Justification*, Climate Protection Program, S&T-23 to S&T-25, EPM-2, and EPM-35 to EPM-40.

Table 1. EPA Funding for Climate Protection Energy Efficiency Programs (CPP)

($ millions current)

	FY2004 Enacted	FY2005 Enacted	FY2006 Appn.	FY2007 Request	FY2007 House	FY2007 Senate	Senate-House
Environ. Programs & Management	88.5	92.5	90.8	91.8	92.6	93.2	0.6
Science & Technology	21.8	20.4	18.6	12.6	18.6	12.6	-6.0
Total	**110.3**	**112.9**	**109.4**	**104.3**	**111.2**	**105.8**	**-5.4**

Sources: S.Rept. 109-275; H.Rept. 109-465; EPA FY2007 Annual Performance Plan and Congressional Justification, February 2006, http://www.epa.gov/ocfopage/budget/2007/2007cj.htm.

Energy Policy Act of 2005 (EPACT, P.L. 109-58)

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 **Table 2** 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 act.

Table 2. EPACT Energy Efficiency Standards

Standard set:	P.L. 109-58 (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.

During deliberations over H.R. 6, concern had been raised about delays in the implementation of previously enacted laws that had directed DOE to establish energy efficiency standards for certain equipment. As a result, the final law contains a section (§141) requiring DOE to report regularly to Congress when efficiency standard rulemakings are behind schedule, and to include steps being taken to get back on schedule.[63]

On January 31, 2006, DOE released a report to Congress with a schedule for setting new appliance efficiency standards.[64] The report identifies 19 products (in the categories of heating,

[63] **Table 2** shows that standards for three products would be set by DOE rulemaking.

[64] DOE, *Energy Conservation Standards Activities: Submitted Pursuant to Section 141 of the Energy Policy Act of 2005 and to the Conference Report (109-275) to the FY 2006 Energy and Water Development Appropriations Act*, January 2006, 85 p. The schedule is posted on the DOE website at http://www.eere.energy.gov/buildings/ (continued...)

transformers and motors, lighting, home appliances, and space cooling) for which DOE has missed the deadlines established prior to EPACT.[65] In addition, the report lists 11 products (in the categories of lighting, home appliances, commercial refrigeration, battery chargers, and external power supplies) for which standards are required by EPACT. Since the report, DOE has issued standards for commercial refrigerator and refrigerator freezers (April 25) and for small industrial electric motors (July 10).

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 with 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.[66] 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, some tax incentives have been enacted 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 that apply to commercial property, new home construction, existing home improvements, appliances, residential fuel cells, and business fuel cells.

Energy Efficiency Tax Revenue Effect

Table 3, below, compares the estimated 11-year revenue effect of energy efficiency and conservation tax provisions in the House, Senate, and Conference versions of H.R. 6.

(...continued)

appliance_standards/2006_schedule_setting.html.

[65] The report describes the reasons for each delay and DOE's plan for issuing new or amended standards.

[66] For more information on this topic, see CRS Report RS20935, *Energy Efficiency in Congressional Buildings*, by (name redacted).

Table 3. 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 Cut Provisions	$8.090	$18.421	$14.553
Energy Efficiency and Conservation Share of Total	4.9%	29.4%	8.7%

Sources: 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.

Efficiency's Role in Energy Security, By Fuel

By curbing the demand for petroleum fuels, energy efficiency measures may contribute to energy security by reducing oil import dependence and the risk of oil shortages, energy price shocks, and their attendant impacts on the national economy. By cutting demand for natural gas, energy efficiency may dampen natural gas prices and reduce the need for liquefied natural gas (LNG) imports. Also, by curbing the demand for electricity, energy efficiency may reduce the risk of brownouts, blackouts, and other reliability problems.

Electricity Demand-Side Management (DSM) To Improve Reliability

In the early 1990s, 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 62 billion kilowatt-hours (equivalent to the output from 12 one-gigawatt powerplants).[67] After California

[67] EIA, *Electric Utility Demand Side Management 1997, Executive Summary*, at http://www.eia.doe.gov/cneaf/electricity/dsm/dsm_sum.html.

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, and estimated annual energy savings fell to a low of 49 billion kwh.[68] Savings from energy efficiency in the electricity sector climbed slowly thereafter, reaching 55 billion kwh in 2004.[69]

Electricity problems in California in 2001 raised the issue of whether a federal role is needed to encourage demand-side energy efficiency and load management measures. A 2002 report for DOE by the Lawrence Berkeley National Laboratory found that conservation and efficiency measures reduced summer 2001 peak demand in California by 10%, increased system reliability, avoided some wholesale power purchases, and avoided $2 billion to $20 billion in potential losses from rolling blackouts.[70]

The August 2003 electric power blackout that affected several states and Canadian provinces rekindled interest in energy efficiency, demand response (demand-side management), 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.

In late July 2006, a group of more than 50 organizations including the Edison Electric Institute, more than 20 electric and gas utilities, the president of the National Association of Regulatory Commissioners (NARUC), and 16 state regulatory agencies issued a *National Action Plan for Energy Efficiency*, calling on the electric power industry to pursue a major effort to improve energy efficiency.[71] The *Plan* was developed with assistance from DOE (Office of Electricity) and EPA (Office of Air and Radiation, Climate Protection Partnerships Division) and is supported by the American Council for an Energy-Efficient Economy, the Alliance to Save Energy, and the American Council on Renewable Energy. The report projects that implementation of the *Plan* could defer the need for 40 new 500-megawatt power plants, avoid a substantial amount of greenhouse gases, lower the costs of air pollution controls, and reduce prices for natural gas.

The *Plan* aims to help states and utilities address policy, regulatory, and other barriers that limit energy efficiency investment in more efficient homes, buildings, and industries that would provide energy savings that would cost less than new energy supplies and would reduce energy bills. The five recommendations are (1) recognize energy efficiency as a high-priority energy resource; (2) make a strong, long-term commitment to implementing cost-effective energy efficiency measures; (3) educate the public and policymakers on the benefits of and opportunities for energy efficiency; (4) promote sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective; and (5) modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.

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[68] 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.

[69] EIA, *Electric Power Annual 2004*, November 2005, Table 9.6, p. 57.

[70] U.S. DOE, Lawrence Berkeley National Laboratory, *California Consumers Kept Lights on During Electricity Crisis by Conserving and Investing in Efficient Equipment* (Report #49733), May 2002, at http://www.lbl.gov/Science-Articles/Archive/EETD-Goldman-electricity.html.

[71] EPA has posted the *Plan* at http://www.epa.gov/cleanenergy/actionplan/report.htm.

The fifth recommendation may be the most important one. It marks a return to the "energy efficiency profitability" issue of the early 1990s, when it was recognized that energy efficiency faced a major economic barrier because, without establishing appropriately compensating policy changes, the reduction in demand would hurt electric industry sales and profitability. One objective of the *Plan* is to encourage state regulators to modify ratemaking practices so that energy efficiency is cost-effective to a company's bottom line.

Natural Gas Conservation Through Energy Efficiency in Buildings and Equipment

In 2003, 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*,[72] 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) applauded the NPC recommendations but stressed 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. Further, the 2005 report by ACEEE, *Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets: Updated and Expanded Analysis*, says that in a single year, a massive energy efficiency effort could be put in place that would reduce gas use by 1% and cut prices by 37%.[73]

In January 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.[74] Further, some statements refer to a DOE study, *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency.*[75]

Petroleum Conservation Through Energy Efficiency In Vehicles

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 and climate change.

The regulation of automobile fuel efficiency to curb petroleum use has been one of the most controversial aspects of energy efficiency policy. The Corporate Average Fuel Economy (CAFE)

[72] NPC has posted the report at http://www.npc.org/.

[73] The ACEEE report is available at http://www.aceee.org/energy/efnatgas-study.htm.

[74] See http://energy.senate.gov/conference/conference.cfm.

[75] The report is available at http://eetd.lbl.gov/ea/ems/reports/56756.pdf.

program for new cars and light trucks achieved significant energy savings through 1985 but has remained relatively flat since then. Critics say that recent CAFE increases for light trucks are too small, given concerns about high gasoline prices, air pollution, and CO_2 emissions. Proponents contend that larger CAFE increases would compromise safety and cause hardship for manufacturers.

Specifically, CAFE required a gradual ramp-up of fuel efficiency for newly manufactured cars and light trucks from 1978 through 1985.[76] The CAFE standard for new cars has remained at 27.5 mpg from model year (MY) 1986 through MY2007. In 2003, the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued new light truck (two-wheel drive) standards, setting a standard of 21.0 mpg for MY 2005, 21.6 mpg for MY 2006, and 22.2 mpg for MY 2007. In March 2006, NHTSA raised the light truck standard further to 22.5 mpg for MY 2008, 23.1 mpg for MY 2009, and 23.5 mpg for MY 2010.[77] NHTSA estimates that the new standard will save 700,000 barrels of fuel per day by 2010.[78]

The rollover of new, more efficient cars into the national fleet has gradually raised the overall fleet fuel economy. EIA says 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.[79]

The Energy Policy Act of 2005 (P.L. 109-58, §774) requires EPA to revise its adjustment factors to increase the accuracy of automobile fuel economy labels. In deliberations over H.R. 6 (P.L. 109-58), the Senate version of the bill included a provision to save 1 million barrels of oil per day by 2010, but the provision did not survive conference.

A 2003 report by the Congressional Budget Office (CBO), *The Economic Costs of Fuel Economy Standards Versus a Gasoline Tax*,[80] 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.

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.

[76] In 1975, Congress enacted the Energy Policy and Conservation Act (P.L. 94-163), in which Title V required that automotive manufacturers selling cars in the United States increase the corporate average fuel economy (CAFE) of their new-car fleet annually, from 18.0 miles per gallon (mpg) in model year (MY) 1978 until reaching 27.5 mpg in model year (MY) 1985. A parallel standard for light trucks started at 17.2 mpg in MY1979, rising to 20.7 mpg by MY1991.

[77] NHTSA, *New Light Truck Fuel Standards to Save 10.7 Billion Gallons of Fuel*, Mar. 29, 2006, at http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.d0b5a45b55bfbe582f57529cdba046a0/.

[78] For more on CAFE standards, see CRS Report RL33413, *Automobile and Light Truck Fuel Economy: The CAFE Standards*, by Brent Yacobucci and (name redacted).

[79] EIA, *Monthly Energy Review (June 2006)*, Table 1.9, p. 17, at http://www.eia.doe.gov/emeu/mer/overview.html

[80] The CBO report is available at http://www.cbo.gov/showdoc.cfm?index=4917&sequence=0.

Energy Efficiency Programs Targeted at Climate Change

Energy efficiency is seen as a key means to reduce fossil fuel-induced carbon dioxide (CO_2) emissions that may contribute to global climate change. Federal efforts to curb emissions through increased energy efficiency may be affected by debates over program appropriations, by the extent to which EPACT's energy efficiency tax incentives are used, and by the rate at which DOE implements EPACT's equipment efficiency standards.

Energy Efficiency and Carbon Dioxide Emissions Projections

DOE's 2000 report *Scenarios for a Clean Energy Future* projected the potential for advanced energy efficiency and other measures to cut the projected U.S. carbon emissions growth to the 1990 level by 2020.[81] The report assumed a 1990 baseline of 1,346 million metric tons of carbon (MMTC), growing to 1,922 MMTC in a 2020 "business-as-usual" (BAU) estimate of emissions, based on the reference case in EIA's *Annual Energy Outlook 1999*.[82] Assuming a 50% increase in federal R&D spending on energy efficiency and clean energy, and several sector-specific policy changes, the report develops a Moderate Scenario where 2020 emissions would be constrained to about 1,735 MMTC. Further, the report develops an Advanced Scenario where federal R&D spending doubles for energy efficiency and clean energy, carbon trading is instituted with a permit price at $50 per ton, and several sector-specific policies are enacted, yielding a 2020 emissions level approximately equal to that for 1990. In addition, both scenarios showed net energy cost savings, air pollution reductions, improved balance of payments, and reduced vulnerability to oil supply disruptions. However, the report also found significant adverse impacts on the coal industry, and estimated a reduction in Gross Domestic Product (GDP) that ranged from $4 billion to $66 billion by 2010.

Assuming no major future policy actions, the reference case scenario in the EIA's *Annual Energy Outlook 2006* projects 2020 emissions will be 1,942 MMTC, 42% more than that for 1990.[83]

[81] The report is online at http://www.ornl.gov/sci/eere/cef/.

[82] The BAU case for 2020 is somewhat lower than that for the EIA Reference Case, because it assumes some technological improvements that EIA does not include.

[83] EIA's projection appears under the Reference Case, Table A18. Carbon Dioxide Emissions. Also, the factor of 3.67 was used to convert tons of CO_2 to tons of carbon.

International Context and the "No Regrets" Policy

United Nations

With ratification of the U.N. Framework Convention on Climate Change (FCCC) in 1992,[84] U.S. policy toward global climate change evolved from a "study only" to a more "study and action" orientation.[85] During the FCCC deliberations, the National Academy of Sciences (NAS) released a report stating that "[t]he United States could reduce or offset its greenhouse gas emissions by between 10 and 40 percent of 1990 levels at low cost, or at some net savings, if proper policies are implemented."[86] The NAS's energy policy recommendations included a focus on increasing energy conservation and efficiency.[87]

The Energy Policy Act of 1992 (EPACT92, P.L. 102-486) has been the principal statutory basis for programs making up the U.S. response to the FCCC. The above-noted NAS recommendations were embodied in several sections of EPACT92. These sections included provisions to extend and expand energy efficiency standards, promote dissemination of energy-saving information, extend and expand research and development programs related to deployment of energy efficiency technologies, and authorize the Department of Energy (DOE) to evaluate cost-effective energy efficiency technologies.[88]

In December 1992, in response to the FCCC, the George H.W. Bush Administration issued the first U.S. climate action plan,[89] which called for an inventory of emissions and identified then-existing programs and activities that affect greenhouse gas emissions (GHG) as the core of the strategy for reducing emissions. These activities were dominated by research initiatives proposed in the 1991 National Energy Strategy, the Environmental Protection Agency's (EPA's) various pollution prevention, "green" initiatives begun in 1991, or were anticipated to result from the then recently-passed EPACT92.[90] Taken together, these programs and initiatives were consistent with guidance provided by the Intergovernmental Panel on Climate Change (IPCC) and formed the

[84] In 1991, the Intergovernmental Panel on Climate Change (IPCC) issued a report providing guidance to nations considering action on global climate change. It recommended actions that were beneficial for reasons other than climate change and justifiable in their own right (e.g., energy efficiency), economically efficient and cost-effective (especially those focused on market-mechanisms), and able to serve multiple social, economic, and environmental purposes.

[85] For more information about U.S. climate change policy, see CRS Report RL30024, *U.S. Global Climate Change Policy: Evolving Views on Cost, Competitiveness, and Comprehensiveness*, by (name redacted) and (name redacted).

[86] National Academy of Sciences, *Policy Implications of Greenhouse Warming*, (Washington, DC: National Academy Press, 1991), p. 73.

[87] NAS also called for incorporating greenhouse warming as a factor in future energy planning, and studying and eventually implementing "full social cost pricing" of energy.

[88] It should be noted, however, that typically the programs are relatively specific, not broad authorizations; that for many the benefit of reducing greenhouse gases is a "bonus" in achieving other goals (e.g., "substantially reduce environmental pollutants, including greenhouse gases..." [EPACT92, sec. 1608])

[89] U.S. Department of State, *National Action Plan for Global Climate Change* (Publication 10026), December 1992.

[90] The primary reasons for the DOE and EPA programs were to conserve energy and to reduce air pollution—any global climate change benefits would be a bonus. Thus exemplifying "no regrets"—the action is one that is justified for other reasons. As codified by the 1992 *National Action Plan*, the combination of DOE and EPA programs were projected to hold U.S. greenhouse gas emissions at near their 1990 levels in the year 2000. Those programs were not able to fulfill that objective.

core of the George H. W. Bush Administration's "No Regrets" policy.[91] Underlying this approach, it appeared, was the presumption that uncertainties about global climate change were too great to justify actions beyond research except for so-called "no-regrets" initiatives justifiable on other grounds, such as selected energy efficiency and conservation measures.

The idea that the United States could meet modest CO_2 emission reduction goals at little or no cost underlies many of the global climate change initiatives during the George H. W. Bush and Clinton Administrations, including the George H. W. Bush Administration's "No Regrets" policy and 1992 *Climate Action Plan*, and the Clinton Administration's 1994 and 1997 Climate Action Plans.[92]

In fulfilling reporting requirements under FCCC, the Department of State issued the third U.S. climate report to the United Nations, entitled *Climate Action Report 2002*.[93] In it, the Bush Administration called for reducing GHG without interfering with economic growth and set out other general principles for a U.S. climate policy.[94] Taken together, these principles are consistent with the "no regrets" policy previously established by the George H.W. Bush Administration and expanded by the Clinton Administration.

In the *Climate Action Report 2002*, the Bush Administration committed 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 was projected to attain a 4.5% reduction from forecast emissions in 2012. The Administration 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.

Also, the Energy Policy Act of 2005 (P.L. 109-58) contained several provisions to extend or expand energy efficiency standards programs. This includes energy efficiency standards for several types of equipment that were not previously covered, a variety of tax incentives, R&D program reauthorizations, and several other measures.[95] The American Council for an Energy Efficient Economy (ACEEE) estimates that by 2020, the energy efficiency provisions in EPACT would yield annual energy savings of about 2.6 Q per year and emission reductions of about 50 MMTC of carbon.[96] Relative to EIA projections, these figures would represent modest impacts of about 2% of total energy use and about 2.5% of total CO_2 emissions.[97]

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[91] On the "no regrets" policy of the George H.W. Bush Administration, see C. Boyden Gray and David B. Rivkin, Jr., "A 'No Regrets' Environmental Policy," *Foreign Policy*, summer 1991, pp. 47-65.

[92] See CRS Report RL30024, *U.S. Global Climate Change Policy: Evolving Views on Cost, Competitiveness, and Comprehensiveness*, by (name redacted) and (name redacted).

[93] U.S. Department of State, *U.S. Climate Action Report: The United States of America's Third National Communication Under the United Nations Framework Convention on Climate Change*, May 2002, at http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport.html.

[94] The other principles are establish a goal to stabilize emissions, create flexibility to allow for new findings, provide market-based incentives, incorporate technological advances, and promote global participation.

[95] These provisions are described in the above section on the Energy Policy Act of 2005.

[96] ACEEE's estimate of savings is available at http://www.aceee.org/energy/0510confsvg.pdf.

[97] For 2020, EIA's *Annual Energy Outlook 2006* reference case estimates are 120.6 quads of energy use and 7,119 MMTC of CO_2 (or 1,942 MMTC of carbon).

Group of Eight (G8) Industrialized Nations

In its role as a member of the G8,[98] the United States has also expressed support for energy efficiency as a means to address greenhouse gas (GHG) emissions. In July 2005, the G8 issued *The Gleneagles Communique*, which included a *Plan of Action on Climate Change, Clean Energy, and Sustainable Development*.[99] The White House reported that President Bush and the G8 leaders agreed to speed the development and deployment of energy efficiency and other clean energy technologies to address climate change, air pollution, and energy security.

At its July 2006 Summit, the G8 issued the Saint Petersburg *Plan of Action on Global Energy Security*.[100] In the *Plan*, G8 commits to several goals, including "enhancing energy efficiency" and "addressing climate change." Specifically, Section III on "Enhancing Energy Efficiency and Energy Saving" indicates that the key goals are to reduce stress on energy infrastructure and decrease GHG emissions. To achieve those goals, the *Plan* calls for increased sharing of best practices, including practices for data collection and reporting, efficiency labeling, and efficiency standards.[101] Also, it encourages financial and tax incentives, governmental leadership by example, and actions at multilateral banks and GEF. This section of the *Plan* sets a focus on reducing losses in the transportation and energy production sectors. Further, it encourages incentives for energy efficiency in vehicles, biofuels, fuel cells, and air transportation. Overall, this section of the *Plan* encourages incentives for energy efficiency and energy conservation broadly.

U.S. Climate-Focused Energy Efficiency Programs

Domestic Programs

The U.S. Climate Change Technology Program (CCTP) encompasses an existing array of energy efficiency and other programs that support goals of the FCCC. Title XVI of EPACT expanded the statutory basis of CCTP.[102] Virtually all federal energy efficiency programs, including those at DOE, are treated as part of CCTP.[103]

DOE's August 2005 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

[98] The G8 includes the United States, four members of the European Union (France, Germany, Italy, and United Kingdom), Canada, Japan, and the Russian Federation. Together, these nations represent two-thirds of the world economy. The G8 convenes an annual economic and political summit meeting with the heads of the respective governments.

[99] After its annual summit each year, the G8 issues a policy document that may include energy-related provisions. The G8 Summit in 2005 did include such a document with energy policy-related provisions. The Gleneagles documents can be obtained at http://www.g8.gov.uk/servlet/Front?pagename=OpenMarket/Xcelerate/ShowPage&c=Page&cid=1119518698846.

[100] The G8 Saint Petersburg *Plan* is available at http://en.g8russia.ru/docs/11-print.html.

[101] This includes the International Energy Agency's initiative to promote efficiency standards for standby power devices.

[102] A summary of the provisions in Title XVI is available in CRS Report RL33302, *Energy Policy Act of 2005: Summary and Analysis of Enacted Provisions*, by (name redacted) et al.

[103] At least four appropriation programs—for DOE, EPA, USDA, and the Department of State—provide funding for energy efficiency programs that contribute to the reduction of greenhouse gas emissions.

technologies.[104] For these end-use energy efficiency and energy 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 done.

Foreign Assistance Programs

The Department of State, Foreign Operations, and Related Programs Appropriations Bill, 2006, provided $100 million for "energy conservation, energy efficiency, and clean energy" to reduce greenhouse gas (GHG) emissions in developing countries.[105] This funding continues support for this activity that has been provided for several consecutive years.

Appropriations Action in the Second Session

The action on the DOE Energy Efficiency Program and the EPA Climate Protection Program are described in detail above.[106] In addition, the Senate Appropriations Committee version of the Department of State, Foreign Operations, and Related Programs Appropriations Bill, 2007 (H.R. 5522; S.Rept. 109-277), would provide $180 million for energy efficiency and clean energy deployment activities to reduce GHG emissions in developing countries.

In January 2006, the Bush Administration announced its commitment to support the Asia Pacific Partnership (APP) for Clean Development and Climate to accelerate deployment of clean, energy efficient technologies.[107] Because of the lack of justification in the DOE FY2007 budget request, both the House and Senate appropriations committees declined to provide funding for APP in the FY2007 Energy and Water Development Appropriations bill (H.R. 5427).[108] However, both committees called on DOE to provide a justification for APP funds, so that they could take action in conference.[109] Further, the report of the Senate Appropriations Committee on the Department of State, Foreign Operations, and Related Programs Appropriations Bill, 2007, recommends $26 million for APP.[110]

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[104] The report is available at http://www.climatetechnology.gov/library/2005/tech-options/index.htm.

[105] This funding provision is in Section 585(a) of P.L. 109-102 (H.R. 3057).

[106] USDA also has a program for energy efficiency and renewable energy, but its funding is on a much smaller scale, ranging from $10 million to $20 million per year. For more about the USDA program, see CRS Report RL33588, *Renewable Energy Policy: Tax Credit, Budget, and Regulatory Issues*, by (name redacted).

[107] APP participants include Australia, China, India, Japan, Korea, and the United States. The APP initiative appears to be a followup to the U.S. commitments under *The Gleneagles Communique.*

[108] For the same reason, the House Committee on Appropriations recommended zero funding at EPA for APP (H.R. 5386, H.Rept. 109-465).

[109] H.Rept. 109-474, p. 69. S.Rept. 109-274, pp. 111-112. In its report, the Senate Appropriations Committee further directed DOE to fund APP from within available funds, with one-third from the Office of Policy and International Affairs, one-third from the Office of Science (Climate Change Account), and one-third from the Office of Energy Efficiency and Renewable Energy. The Senate report also directed APP to work with the Clean Energy Technology Exports Program.

[110] The recommendation appears under "Other Bilateral Economic Assistance," and the reference to exports appears on p. 73. Also, the report specifies that APP be coordinated with clean energy export and market development initiatives.

California's Regulatory Action on Automobile CO_2 Emissions Could Promote Energy Efficiency

The State of California has launched a broad program to reduce greenhouse gas emissions (GHG), including a major focus on policies to encourage energy efficiency and renewable energy. As part of that effort, in September 2004, the California Air Resources Board (CARB) approved final rules (pursuant to AB1493) that would require car manufacturers to cut automobile carbon dioxide and other GHG emissions 22% by 2012. This could force automakers to increase vehicle fuel efficiency sharply. Although the rules take effect in 2006, new cars would not have to meet new standards until model year 2009. However, an industry challenge to the California law and regulations was filed in U.S. District Court in Fresno, California.[111] The Alliance of Automobile Manufacturers joined several California car dealers in the law suit. The parties to the suit contend that an effort to regulate automobile CO_2 emissions is equivalent to regulating automobile fuel economy, but statutory authority to regulate fuel economy rests solely with the Department of Transportation's National Highway Traffic Safety Administration.[112]

Since the time that the lawsuit was filed, Oregon, Washington, and seven northeastern states have adopted automobile CO_2 emission regulations that parallel those in California.[113] Also, 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

In the 109th Congress, more than 260 bills with provisions for energy efficiency or renewable energy have been introduced. A general description of the energy efficiency provisions in these bills, including those enacted into law, is available in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by (name redacted). The report also groups the bills by policy and issue areas, provides a table that identifies recent action on the bills, and discusses recent action on a month-by-month basis.

Appropriations Bills in the Second Session

H.R. 5384 (Bonilla)

Agriculture, Rural Development, Food and Drug, Administration, and Related Agencies Appropriations Bill, 2007. Under Title III, Rural Development Programs, the bill would provide funding for the USDA Renewable Energy Program. The House approved $20 million and the Senate Appropriations Committee recommends $25 million. The Senate report language (p. 113) includes earmark recommendations. House Committee on Appropriations reported (H.Rept. 109-463) May 12, 2006, and reported Part II on May 16. Passed House, amended, May 23. Senate Committee on Appropriations reported (S.Rept. 109-266) June 22.

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[111] Alliance of Automobile Manufacturers, *Automakers and Dealers Cite Federal Law, Marketplace Principles, in Challenging Carbon Dioxide Law*, press release, Dec. 7, 2004, at http://www.autoalliance.org/archives/000163.html.

[112] Also, on December 21, 2005, CARB sent a letter to EPA requesting a waiver of federal preemption of state regulation of GHG; see http://www.arb.ca.gov/cc/docs/waiver.pdf.

[113] The seven states are Connecticut, Maine, Massachusetts, New Jersey, New York, Rhode Island, and Vermont.

H.R. 5386 (C. Taylor)

Department of the Interior, Environment, and Related Agencies Appropriations Act, 2007. The House Committee on Appropriations reported (H.Rept. 109-465) May 15, 2006; recommending zero funding for EPA to support the Asia Pacific Partnership and $109.4 million for the EPA Climate Protection Program (CPP).[114] In House floor action, H.Amdt. 840 was adopted, adding $1.8 million to the CPP Energy Star Program. Also, H.Amdt. 849 was adopted, prohibiting use of the bill's appropriations in contravention of building energy efficiency performance requirements set by Executive Order 13123. Passed House, amended, May 18. The Senate Committee on Appropriations reported (S.Rept. 109-275) June 29, 2006; recommending $105.8 million.

H.R. 5427 (Hobson)

Energy and Water Development Appropriations Act, 2007. Provides funding for the DOE Energy Efficiency Program. The details of House and Senate action are shown in **Table 3**. House Committee on Appropriations reported (H.Rept. 109-474) May 17, 2006, with amendments. Passed House, amended, May 24. Senate Committee on Appropriations ordered reported (S.Rept. 109-274) June 29.

H.R. 5522 (Kolbe)

Department of State, Foreign Operations, and Related Programs Appropriations Bill, 2007. In the Senate version of the bill, under Title III, Bilateral Economic Assistance, the program for Development Assistance would include three types of support for renewable energy. First, the program for Energy, Biodiversity, and the Environment would, according to the Committee report (p. 65), provide $180 million "to support policies and programs in developing countries that promote energy efficiency, renewable energy, and cleaner energy technologies...." Also, $3 million would be provided for the U.S. Agency for International Development (USAID) partnership with DOE for the hydropower Clean Energy Technology Exports Initiative (CETEI). Second, under the USAID Development Assistance program, about $160 million would be provided (pp. 59-60) for Energy, Biodiversity, and Other Environment programs for Africa ($73 million), East Asia/Pacific ($28 million), Near East ($2 million), South Asia ($18 million), and Western Hemisphere ($52 million). Third, under Other Bilateral Economic Assistance, the bill would provide $26 million for the Asia Pacific Partnership, and further specifies (p. 73) that the "... Partnership activities will be coordinated with existing efforts to promote clean energy export and market development initiatives." House Committee on Appropriations reported (H.Rept. 109-486) June 5, 2006, with amendments. Passed House, amended, June 9. Senate Committee on Appropriations reported (S.Rept. 109-277) July 10.

Energy Policy Act of 2005 (EPACT, P.L. 109-58)

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

[114] CPP primarily supports energy efficiency deployment in transportation, buildings, and industry sectors.

and a broader range of legislated equipment efficiency standards. Conference reported (H.Rept. 109-190) July 27, 2005. Signed into law August 8.

Other Public Laws of the 109th Congress

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.

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.[115]

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.

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,

[115] 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 (name redacted).

2005; referred to Committee on Transportation and Infrastructure. Conference reported (H.Rept. 109-203) July 28, 2005. Signed into law August 10.

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For Additional Reading

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Table 4. DOE Energy Efficiency Budget for FY2005-FY2007

(selected programs, $ millions)

	FY2005 Appn.	FY2006 Appn.	FY2006 Request	FY2006 House	FY2007 Senate Cmte	Senate-House Percent Change
HYDROGEN TECH.	166.8	155.6	195.8	195.8	189.9	-3.0%
Fuel Cell Tech.	81.9	67.8	96.6	96.6	85.4	-11.6%
VEHICLE TECH.	161.3	182.1	166.0	172.5	180.0	4.4%
Hybrid and Electric	44.1	44.0	50.8	50.8	——[a]	——
Advanced Combustion	48.5	45.6	46.7	53.2	——	——
Materials Technology	36.0	35.3	29.8	29.8	——	——
Fuels Technology	12.4	13.7	13.8	13.8	——	——
Technology Introduction	4.9	6.3	11.0	11.0	15.0	36.0%
Clean Cities	10.6	7.9	4.4	5.0	6.4	27.9%
BUILDING TECH.	65.2	69.3	77.3	80.0	95.3	19.1%
Res. & Commercial Bldgs	21.9	18.3	24.4	24.4	——	——
Emerging Technologies	31.1	33.1	32.8	32.8	——	——
Tech. Valid. & Mkt. Intro.	0.0	0.0	8.2	8.2	——	——
Rebuild America	8.6	3.8	2.5	2.5	——	——
Energy Star	3.7	5.9	5.8	5.8	——	——
INDUSTRIAL TECH.	73.4	56.9	45.6	51.6	47.6	-7.8%
Ind. of the Future, Specific	37.4	24.2	17.0	21.0	——	——
Ind. of the Future, Cross.	32.3	28.9	28.6	28.6	——	——
Combustion, Robotics, Sensors	4.5	3.1	5.4	5.4	——	——

	FY2005 Appn.	FY2006 Appn.	FY2006 Request	FY2006 House	FY2007 Senate Cmte	Senate-House Percent Change
Industrial Tech. Assist.	15.1	14.4	12.9	12.9	——	——
DISTRIB. ENERGY RES.[b]	59.1	0.0	0.0	0.0	——	——
FED. ENERGY MGMT	19.9	19.2	16.9	18.9	16.9	-10.6%
WEATHERIZATION	325.5	316.9	225.0	335.4	266.4	-20.6%
Weatherization Program	228.2	242.6	164.2	268.0	200.0	-25.4%
State Energy Grants	44.2	35.6	49.5	49.5	49.5	0.0%
State Energy Activities	2.3	0.5	0.0	0.0	——	——
Gateway Deployment[c]	33.9	25.4	0.0	0.0	——	——
Inventions	3.9	3.0	0.0	2.0	——	——
PROGRAM MGMT	115.1	111.9	102.0	102.0	101.9	-8.8%
Prior Year Balances	-5.3	——	——	——	——	——
EERE, TOTAL[a]	1,234.3	1,173.8	1,176.4	1,319.4	1,385.5	5.0%
EFFICIENCY R&D, SUB.[d]	466.6	463.9	484.7	499.9	512.8	2.6%
GRANTS, SUBTOTAL	272.3	278.2	213.7	317.5	249.5	-21.4%
EE EARMARKS, SUB.	34.0	76.4	0.0	26.1	15.8	-39.6%

Sources: DOE FY2007 Budget Request, vol. 3, February 2006; H.Rept. 109-474; S.Rept. 109-274.

a. Information about many subprograms was not available in the Senate report.

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

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

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

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