

# Office of Energy Efficiency and Renewable Energy

## Energy Conservation

### Executive Summary

#### Mission

The Mission of the Office of Energy Efficiency and Renewable Energy (EERE) is to strengthen America's energy security, environmental quality, and economic vitality through public-private partnerships that:

- promote energy efficiency and productivity;
- bring clean, reliable, and affordable energy technologies to the marketplace; and
- make a difference in the everyday lives of Americans by enhancing their energy choices and quality of life.

The energy efficiency and renewable energy initiatives in this budget impact both energy supply and demand markets, all sectors of the U.S. economy, and all regions of the country. These efforts directly support the conservation, environmental, critical infrastructure, and security goals and recommendations in the National Energy Policy (NEP). This budget also directly supports the Secretary's mission of enhancing the Nation's energy security, and the President's Hydrogen fuel, weatherization, and climate change goals and initiatives. Specifically, EERE's portfolio helps achieve the Department of Energy's Energy Resources business-line goal to:

*Increase global energy security, maintain energy affordability and reduce adverse environmental impacts associated with energy production, distribution, and use by developing and promoting advanced energy technologies, policies, and practices that efficiently increase domestic energy supply, diversity, productivity, and reliability.*

#### Goals and Objectives

EERE fulfills its mission through the pursuit of 3 objectives, directly tied to implementation of the National Energy Policy:

- P** *Modernize conservation.* EERE energy efficiency programs constitute the majority of Federal efforts to improve the energy performance of the American economy by improving the productivity with which we use energy in our homes, vehicles, factories, and energy production and delivery systems.

Objective: Through public-private partnerships:

- Reduce U.S. energy intensity by 29 percent in 2020, compared to expected reductions of 26 percent without EERE Conservation programs (Interior).

- Complete the weatherization of 753,000 low-income households from 2003 through 2008.

**P** ***Increase energy supplies.*** Accounting for some 9 percent of domestic energy production (including hydropower), America's vast domestic renewable energy resource base provides substantial opportunity for increasing and diversifying domestic production. EERE focuses on promoting technological improvements necessary to allow the private sector to develop these domestic resources.

Objective: Through public-private partnerships, increase renewable energy production by 70 percent in 2020, compared to an increase of 28 percent without EERE programs, including provision of about 22 percent of the expected 240 GW of additional electricity capacity installed between 2005 and 2020 with the EERE portfolio.<sup>a</sup> (EWD)

**P** ***Modernize our critical energy infrastructure.*** EERE's portfolio employs an integrated supply and demand systems approach to reducing the stress on our Nation's energy infrastructure by reducing peak demand for energy, developing on-site energy resources, and improving the efficiency with which energy is provided and distributed.

Objective: Through public-private partnerships, help ensure the adequacy of our electricity generation and transmission system through the development by 2020 of:

- 56 GW of distributed generation (compared to 38 GW without EERE programs)<sup>b</sup> and technologies facilitating an improvement in the operating efficiency of existing transmission capacity. (EWD)
- Demand and load management techniques and practices which allow an approximately 9 percent reduction in the expected 949 GW projected peak electricity demand, and provide the opportunity to reduce peak loads on an emergency basis. (Interior)

## **Expected Benefits**

EERE's three objectives directly support three types of energy benefits for the United States: increased energy security, improvements in environmental quality, and economic gains. Pursuant to GPRA, EERE annually estimates the expected energy and oil savings, and related reductions in carbon emissions and energy expenditures, associated with market adoption of EERE program technologies under expected energy market conditions. Although these estimates clearly do not cover the full range of resulting benefits (*e.g.*, security and reliability benefits are not quantified), and reflect only one set of assumptions about future energy prices and markets, they do provide a sense of the level of short- and mid-term benefits associated with these programs.

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<sup>a</sup> This amount is smaller than the Base due to efficiency improvements; these calculations were performed for the years 2015-2020.

<sup>b</sup> This difference is smaller than the reported capacity increase for the DEER Program, due to integration effects with the other programs.

A summary of the methods and models used in developing these benefit estimates is provided below. For further details about the models used to calculate the EERE benefits estimates, as well as information on the technology and market assumptions relevant to particular EERE programs, visit [www.eren.doe.gov/eere/budget.html](http://www.eren.doe.gov/eere/budget.html).

**P** *Increased energy security.* The efficiency, renewable, and infrastructure improvements described above would enhance both fuel and infrastructure security for the United States:

- U.S. oil consumption would be about 1.8 million barrels per day (b/d) lower in 2020 than otherwise expected, resulting in reductions in oil imports of about 1.5 million b/d, depending upon the response of international oil markets. Reductions in the energy intensity of the U.S. economy, combined with the development of more diverse domestic energy resources, would reduce the vulnerability of our economy to volatility in fuels prices.
- The development of distributed generation, load control options, and improved transmission operating flexibility would reduce the vulnerability of our electricity infrastructure to natural or man-made events, and increase the ability to cope with, and recover from, electricity emergencies.

**P** *Accelerated protection and improvement of the environment.* The energy efficiency and renewable energy technology improvements supported by this budget provide the U.S. with additional, longer-term flexibility in responding to current and potential future environmental needs. The efficiency, renewable, and infrastructure improvements described above would reduce a variety of emissions associated with energy production and use:

- EERE programs will contribute to the President's Clear Skies Initiative by reducing expected emissions of nitrogen oxide (NO<sub>x</sub>) and mercury (Hg) from electricity generation in 2020 by 3.7 percent and 1.5 percent, respectively, while contributing to reductions in particulate matter (PM) as well.
- EERE programs will reduce 2020 carbon dioxide emissions by 151 million metric tonnes of carbon equivalent (MMTCE). This contributes to realizing the President's goal of an 18 percent reduction in greenhouse gas (GHG) emissions intensity by 2012.

**P** *Improved economic performance and energy affordability.* The efficiency, renewable, and infrastructure improvements developed by EERE provide economic benefits to individual families and businesses, and to our economy as a whole:

- EERE programs have the potential to reduce energy bills by \$102 billion in 2020, a reduction of 11 percent of the expected total U.S. energy expenditures in 2020 under business-as-usual market and policy conditions,
- Reductions in the demand for conventional energy resources reduce natural gas prices by about \$0.50/thousand cubic feet (mcf) in 2020.

EERE's programs are designed to provide the Nation with more energy efficient technologies and greater availability of domestic renewable energy resources. Taken together, these new technologies and energy sources provide the U.S. with unprecedented opportunities to respond to our future energy-related, economic, environmental, and security challenges.

The development of substantially more efficient vehicles, capable of operating on domestically-produced hydrogen, affords the Nation an important opportunity to reduce, and potentially eliminate, its dependence on imported oil. The development of more reliable, high-quality electricity supports our increasingly information-based economy. The development of substantially more efficient buildings and factories, combined with new means of producing electricity on-site, often from locally available renewable resources, will help the Nation address growing electricity infrastructure and reliability problems. The development of locally-available sources of electricity that can provide emergency services even in the event of power or fuel losses can improve our homeland security.

Energy efficient technologies and renewable energy resources also provide important tools and flexibility in responding to environmental issues, from local air quality to global climate change. On the economic front, new energy efficiency and renewable energy technologies can increase the competitiveness of U.S. companies in the global marketplace, as well as creating new domestic job opportunities.

The extent to which these technologies and resources are adopted depend in large part on the extent to which future economic, environmental, and security needs warrant their adoption. Although the largest benefits of efficient technologies and domestic renewable resources may come in response to energy, security, or environmental issues, significant benefits also occur in a business-as-usual future scenario.

## GPRA04 Benefits Estimates

	Primary Non-Renewable Energy Savings (Quads)		Oil Savings (Quads)		Consumer Energy Expenditure Savings (Billion \$2000)		Carbon Emission Reductions (MMT)	
	2010	2020	2010	2020	2010	2020	2010	2020
Biomass Program .....	0.1	0.33	0.07	0.33	0.6	1.9	0.8	3.6
Building Technologies Program .....	0.41	1.33	0.05	0.13	5.5	16.3	6.9	22.7
Distributed Energy & Electricity Reliability Program .....	0.19	0.46	0.01	0.02	3.1	9	3.4	8.5
FEMP .....	0.03	0.07	0	0.01	0.4	0.8	0.6	1.3
FreedomCAR & Vehicle Technologies Program .....	0.32	1.58	0.34	1.51	9.4	25.5	6.4	29.8
Geothermal Technologies Program .....	0.1	0.4	0.01	0.02	0.6	1.8	1.7	7.5
Hydrogen, Fuel Cells & Infrastructure Technologies Program .....	0	0.10-0.24	0	0.23	0.1	3.9	0	4.6
Industrial Technologies Program .....	0.56	2.13	0.13	0.46	4.4	20.2	9.9	36.3
Solar Energy Technology Program .....	0.07	0.12	0	0.01	0.5	1.4	1.3	2.4
Weatherization & Intergovernmental Program .....	0.68	1.42	0.14	0.6	6	14.7	8.9	26.3
Wind & Hydropower Technologies Program .....	0.2	1.15	0.01	0.08	1.4	5.4	3.2	20.9
<b>Total, Individual Sums .....</b>	<b>2.66</b>	<b>9.09</b>	<b>0.76</b>	<b>3.4</b>	<b>32.0</b>	<b>100.9</b>	<b>43.1</b>	<b>163.9</b>
<b>Total, Integrated .....</b>	<b>2.27</b>	<b>8.66</b>	<b>0.7</b>	<b>3.29</b>	<b>31.2</b>	<b>101.8</b>	<b>38.9</b>	<b>151</b>

<sup>a</sup> EERE's portfolio approach to RD&D impacts benefits and the way they are calculated. The total benefits reported for EERE's entire portfolio are usually less than the sum of the individual programs due to competition between these technologies and the resulting tradeoffs. For instance, efficiency improvements reduce the future need for new electricity generating capacity, including the potential size of the renewable electric market. In addition, a research failure in one area will not necessarily reduce the technology's overall benefits, as the lack of market penetration by the failed technology may create a market opportunity elsewhere in the EERE portfolio. An integrated benefit total may be higher than the individual sums because of the additive impact of multiple EERE programs.

This budget reports the levels of savings for 2005 (short-term), 2010, and 2020 (mid-term), covering about 15 years of budget impacts.<sup>a</sup> EERE is completing analysis of impacts through 2050 (long-term), which will provide a more complete picture of EERE program benefits, especially for programs such as the Hydrogen, Fuel Cells & Infrastructure Technologies Program, which will require both significant R&D and market infrastructure changes to fully realize.

The estimates reported are based on the mid-term program goals identified in this budget, along with some longer-term goals identified in program roadmaps, where necessary to capture longer research time horizons. Technologies are often introduced into the models over time, since R&D tends to produce a series of price or performance improvements which gradually expand the available market for the technology.

In order to help standardize analysis across EERE's portfolio, roughly level FY 2004 funding amounts are presumed for future years, unless otherwise noted in individual program chapters. This analysis is undertaken pursuant to guidelines developed for EERE which specify common assumptions, methodologies, and approaches for use in estimating resulting benefits, although there remain to date some variations, sometimes substantial, in how the guidelines are implemented within and between specific areas. The guidelines are updated annually to reflect changes in the Energy Information Administration's (EIA) expectations about future energy markets, including energy prices and improvements in conventional technologies against which EERE technologies would compete in the marketplace. EERE's reorganization during FY 2002 consolidates analytical efforts and will facilitate improved consistency in the application of these guidelines to program benefit estimates in the future.

The NEMS-GPRA04 model is currently used to estimate benefits through the year 2020 (to be extended to 2025 starting with next year's analysis) and is the basis of the benefit estimates reported here. The EERE-2050 model (EERE's version of MARKAL, calibrated to NEMS) estimates benefits through 2050, with analyses available as completed. The models compare technologies against one another, resulting in projected market penetration estimates for each technology and associated levels of energy consumption and production, energy expenditures, and emissions. One requirement of this competition is that program technologies must provide additional value to consumers, or be available at lower costs, in order to produce benefits.

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<sup>a</sup> Benefits for 2005 are only presented at the program level in individual program chapters, not as integrated across the EERE portfolio.

Not all programs could be modeled individually this year. The FreedomCAR & Vehicle Technologies Program and the Hydrogen, Fuel Cells & Infrastructure Program were modeled jointly, as were the Wind and Hydropower Technologies Program; the Geothermal Technologies Program; the Solar Energy Technology Program; and the biopower portion of the Biomass Program. The benefit estimates for these individual programs would likely be somewhat higher if it were possible to model them without the program interactions.

In order to ensure that reported benefits do not include energy savings and other results that would have occurred without the EERE programs, the models are run twice – once with and once without the results of the EERE programs included. The net benefits of EERE programs reported in the above table are the differences between the “EERE Case” and the “No-EERE Case”. The No-EERE Case is developed by removing explicit representation of EERE program effects from EIA’s *Annual Energy Outlook 2002* Reference Case.

In the EERE Case, program outputs are represented using EERE’s versions of two widely-used energy-economic models. The goals or outputs of R&D programs are typically represented in these models as improvements in technology cost and performance, while outputs of market transformation programs are represented by enhanced market penetration of energy technologies or practices. In some cases where the technology or intended market is not well represented in NEMS, benefit levels must be initially estimated off-line based on available market analysis to develop realistic estimates of market adoption. Assumptions currently used reflect the results of reviews by A.D. Little, Inc. over the last five years of the market adoption assumptions utilized in EERE benefit analyses (no review was undertaken in FY 2002). Off-line analyses are currently reduced across the board by 30 percent as a way of conservatively accounting for likely economic interactions within markets that often cannot be specifically identified without fuller modeling. Identifying a better approach for taking these effects into account is a high priority for future analyses. The results are then included in NEMS in order to account for feedback effects with other markets.

The models also keep track of changes in prices when new technologies change the level of demand for fuels. Efficiency and renewable technologies tend to place downward pressure on energy prices, resulting in part in an increase in uses of energy services such as lighting or travel. These price effects are accounted for in the benefit estimates reported. More difficult to assess is the extent to which improved technology characteristics will increase the sale of new technologies. Consumers often place a value on the cleaner, more reliable, higher quality, and more controllable nature of many of EERE’s technologies that are not reflected in model comparisons with conventional technologies. In only a few cases, such as green power markets, was the market information available to take these technology attributes into account. In other cases, the positive impact of preferential consumer choice on EERE technologies are likely understated, especially with regard to the value of distributed generation and building efficiency improvements. Finally, and perhaps most importantly, the societal value of energy technologies that improve national security or reduce environmental impacts are not reflected in the modeled market choices. While excluding these factors provides a truer picture of the extent to which these technologies will be purchased in current markets, it understates the potential value of the products to society as a whole.

## Management Strategies

**Managing for Results – EERE’s New Business Model.** Excellence in business management is essential to accomplishing EERE’s mission and objectives. In March 2002, EERE initiated a complete reorganization of its programmatic and business functions, implementing the President’s Management Agenda and lessons learned from EERE’s Strategic Program Review. The new EERE business model is based on using 11 programs to accomplish its mission and; centralizing business administration functions into a single EERE organization focused on supporting the 11 programs—this eliminated many inefficient overlapping functions and reduced layers between Program Managers and “top management,” thereby increasing the authority and accountability of the Program Managers. The new business model replaced the old organizations with the following:

- P A DAS for Technology Development responsible for managing 11 Headquarters Program Management Offices and the 6 EERE Regional Offices.
- P A DAS for Business Administration responsible for managing three Headquarters offices (Program Execution Support; Planning, Budget Formulation and Analysis; and Information and Business Management Systems) and the Golden Field Office.
- P A Board of Directors (chaired by the Assistant Secretary for EERE) to provide expert advice and counsel with respect to the full range of EERE issues and activities.
- P An Office of Communication and Outreach.

*The Focus on Program Management.* The DAS for Technology Development institutes program management standards and represents the Program Managers’ interests to the Assistant Secretary and EERE Board of Directors. Each Program Manager is now much more prominent, accessible, accountable, responsible, and empowered. In addition, the Program Manager now has full use of—but does not have to manage—a “one-stop shop” Program Execution Support team dedicated to the program. This allows the Program Manager to focus primarily on program management rather than internal business management. EERE’s previous 31 programs were restructured into 11 programs that address eight of nine EERE priorities that are based on EERE’s mission and the energy policy goals and objectives (described below). The ninth priority -- “change the way we do business” -- is fulfilled by adopting and implementing the new business model.

*Centralized Business Administration.* Building on the Strategic Management System (SMS) adopted by EERE in January 2000, the creation of a single business office provides EERE with the opportunity to further integrate its planning, budget formulation, budget execution, and program analysis and evaluation functions. This new structure will allow EERE to “change the way we do business” by streamlining administrative functions, implementing consistent means of getting our work done, and improving the performance basis of our portfolio and management decisions.

**The President’s Management Agenda** provides a blueprint for more efficient and effective government operations. EERE has pursued this agenda internally through its reorganization and with its participation and application of the OMB R&D Investment Criteria (R&DIC) and participation in the OMB Program Assessment Rating Tool (PART) process.



EERE is implementing the President's Management Agenda by:

- P Management of Human Capital. EERE's reorganization reduces supervisory levels from eight to four, reduces five DAS-level positions to two, eliminates five ADAS-level positions, reduces the number of offices from 19 to 14 (including consolidation of 31 programs to 11) emphasizes core programs and management and facilitates workforce analysis.
- P Expanded E-Government. The consolidation of business systems into a single office facilitates development of an EERE corporate procurement request and authorization system; a single EERE program/project management system; improved inter- and intranet services, data sharing, and streamlined IT policies and procedures to ensure alignment with DOE information systems. These efforts complement and support the Departmental-wide I-Manage system.
- P Budget and Performance Integration. EERE included the Administration's R&D Investment Criteria (R&DIC) in its FY 2004 budget planning and will continue to integrate these criteria and those of the PART into program and corporate level planning, management and evaluation efforts. EERE is applying criteria from R&DIC and PART to its multi-year planning process currently underway. All of the EERE programs participated in the R&DIC and six of the programs/subprograms (Buildings, Geothermal, Hydrogen [subprogram], Solar, Weatherization [subprogram] and Wind [subprogram]) participated in the PART review as well. Individual programs are planning and acting upon the review findings that are programmatic in nature. On a corporate level in DOE and EERE, OMB's review recognized the difficulty of applying some of the original PART criteria to R&D programs, and EERE is working with OMB and others in the R&D community to make that process and EERE programs more able to achieve the intent of budget and performance review and integration in FY 2005. EERE is using the experience gained from the application of the R&DIC and PART in FY 2004 to work with OMB to develop an integrated and more effective review process for the FY 2005 budget from its inception. EERE is integrating the performance measures and benefits estimates to facilitate the performance based budgeting as described in the expected benefits section above and in the individual programs sections.
- P Improved Financial Performance. EERE is working to improve program planning and implementation to more effectively obligate and cost appropriated funds. These improvements will reduce EERE's end-of-year uncOSTed obligations by \$100 million within one year of final appropriations compared to fiscal year 2002 balance of \$725 million. By more effectively implementing our programs, results are achieved sooner to the benefit of the American public.
- P Competitive Sourcing. EERE is participating in a Departmental effort to competitively outsource 15 percent of all commercial activities.

*Expected Near- and Long-Term Results:* EERE's flattened structure will make it more responsive; increase its focus on results, not processes; directly link its budget to performance; end overlapping functions and resulting inefficiencies; and make the most of its people, and their knowledge, skills, and abilities.

*Applied R&D Investment Criteria.* All EERE applied R&D efforts were reviewed for FY 2004 using the OMB R&DIC developed in accordance with the President's Management Agenda by the Office of Management and Budget (OMB). The programs conducted internal reviews using the questionnaires, which

were then reviewed and ultimately screened by OMB. The Department continues to work with OMB to improve consistency and accuracy in reporting.

**Strategic Program Review.** EERE's Strategic Program Review (SPR), developed at the direction of the President's National Energy Policy and released in March 2002, found that EERE research, in the aggregate, generates significant public benefits and generally exhibits technical excellence. These findings have significant independent external support. For example, the National Academy of Sciences/National Research Council's recent review of \$1.6 billion worth of EERE R&D identified \$30 billion (approximately 20% of historic EERE funding) in net realized economic benefits and an additional \$3-\$20 billion in environmental benefits.<sup>a</sup> EERE-supported R&D is also a top recipient of the coveted "R&D 100" awards. The SPR further concluded, however, that there are significant areas needing improvement. This budget request seeks to implement these improvements. EERE utilized preliminary findings in helping to shape its FY 2003 budget request. With the final report in hand, EERE is moving forward on the specific recommendations for the closure, redirection, expansion, or provision for further review ('watch list') of specific efforts, along with the EERE-wide adoption of identified best-practices. In this regard, EERE is conducting oversight and evaluation through technical program management and support of individual programs' strategic and operating plans, feasibility studies, trade-off analyses and evaluation of program performance. These efforts support EERE management's overall objectives of increasing program efficiency and targeting future resources to the most productive program efforts.

**2002 Strategic Plan.** EERE's FY 2004 budget request reflects the energy policy needs and opportunities identified in its 2002 Strategic Plan. This plan, which considers the potential for efficiency, renewable, and infrastructure benefits under expected future market and policy conditions also considers options in which energy markets or policy needs do not evolve as expected. The Strategic Plan recognizes the need to prioritize investments to make the largest possible contribution to DOE's energy resources goal along with our mission and objectives. Based on the NEP, the Secretary's Departmental mission, and recent analyses of potential future energy markets, EERE has identified nine priorities, eight of which are programmatic and used to identify needed programmatic shifts:

1. Dramatically reduce or even end dependence on foreign oil.
2. Reduce the burden of energy prices on the disadvantaged.
3. Increase the viability and deployment of renewable energy.
4. Increase the reliability and efficiency of electricity generation, delivery and use.
5. Increase the efficiency of buildings and appliances.
6. Increase the efficiency/reduce the energy intensity of industry.
7. Create the new domestic bioindustry.
8. Lead by example through the government's own actions.
9. Change the way we do business.

This budget reflects a large number of programmatic shifts since EERE reorganized the elements of 31

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<sup>a</sup> National Academy of Sciences / National Research Council. Energy Research at DOE: Was it Worth It? 2001.

programs into 11 new programs that directly support the eight strategic programmatic priorities:

STRATEGIC PRIORITY	PROGRAM
1. Dramatically reduce or even end dependence on foreign oil	Hydrogen, Fuel Cells & Infrastructure Technologies Program
	FreedomCAR & Vehicle Technologies Program
	Biomass Program
	Industrial Technologies Program
	Building Technologies Program
2. Reduce the burden of energy prices on disadvantaged	Weatherization and Intergovernmental Program
	Building Technologies Program
3. Increase the viability and deployment of renewable energy	Solar Energy Technologies Program
	Wind Energy and Hydropower Technologies Program
	Geothermal Technology Program
4. Increase the reliability and efficiency of electricity generation, delivery and use	Distributed Energy & Electricity Reliability Program
5. Increase the efficiency of buildings and appliances	Building Technologies Program
6. Increase the efficiency/reduce the energy intensity of industry	Industrial Technologies Program
7. Create the new domestic bioindustry	Biomass Program
8. Lead by example through government's own actions	Federal Energy Management Program

## Complementary Appropriations

EERE's budget is appropriated in bills managed by two Congressional Appropriation Subcommittees. The Energy and Water Development (EWD) Appropriations Subcommittee supports EERE's work on renewable energy under the Energy Supply appropriation account. In FY 2004, the request in the EWD account totals \$444,207,000, or 34 percent of EERE's budget. In addition, the Interior and Related Agencies (Interior) Appropriations Subcommittee supports EERE's energy efficiency efforts under the Energy Conservation appropriation account. The FY 2004 request in the Interior account totals \$875,793,000 or 66 percent of EERE's budget. Six programs are jointly funded: Hydrogen, Fuel Cells, and Infrastructure Technologies Program; Weatherization and Intergovernmental Program; Distributed Energy and Electricity Reliability Program; Building Technologies Program; Biomass Program; and Federal Energy Management Program.

The complementary nature of these appropriations jointly facilitate making America more energy productive. In our modern economy, distinctions between energy supply increases and energy efficiency improvements increasingly are blurred. For example:

- P Fuel cells increase energy efficiency while simultaneously providing a new way to power automobiles on fuels other than petroleum (Hydrogen, Fuel Cells, and Infrastructure Technologies Program).
- P Technical assistance, consumer information, and other market enhancement efforts can be more effective when consumers can obtain a range of efficiency and renewable information in “one stop” (Weatherization and Intergovernmental Program).
- P Distributed generation systems provide a new way to produce electricity supplies, while also affording improvements in efficiency by reducing transmission line losses and capturing and using otherwise wasted heat produced when electricity is generated (Distributed Energy and Electricity Reliability Program).
- P Buildings designed to include both advanced efficiency and renewable energy features can achieve greater overall energy savings and even potentially produce as much or more energy on-site than they use on average over the course of a year (Building Technologies Program).
- P Federal procurement can “lead by example” in purchasing cost-effective energy efficient products and renewable energy power supplies (Federal Energy Management Program).

Combined, both funding sources contribute to meeting our Nation’s energy challenges and goals and to providing enhanced public benefits that could not otherwise be realized in this time frame.

## Major External Influences

The following legislative requirements are major drivers of EERE activities:

P.L. 93-275	Federal Energy Administration Act of 1974
P.L. 93-409	Solar Heating and Cooling Demonstration Act (1974)
P.L. 93-410	Geothermal Energy Research, Development and Demonstration Act (1974)
P.L. 93-577	Federal Non-nuclear Energy Research and Development Act of 1974
P.L. 94-163	Energy Policy and Conservation Act (EPCA) (1975)
P.L. 94-385	Energy Conservation and Product Act (ECPA) (1976)
P.L. 94-413	Electric and Hybrid Vehicle Research, Development and Demonstration Act of 1980
P.L. 95-238	Automotive Propulsion Research and Development Act of 1978
P.L. 95-618	Energy Tax Act of 1978
P.L. 95-619	National Energy Conservation Policy Act (NECPA) (1978)
P.L. 95-620	Powerplant and Industrial Fuel Use Act of 1978
P.L. 95-91	Department of Energy Organization Act (1977)
P.L. 96-294	Energy Security Act (1980)
P.L. 96-512	Methane Transportation Research, Development and Demonstration Act of 1980
P.L. 100-12	National Appliance Energy Conservation Act of 1987
P.L. 100-494	Alternative Motor Fuels Act of 1988
P.L. 100-615	Federal Energy Management Improvement Act of 1988
P.L. 100-697	Superconductivity and Competitiveness Act of 1988
P.L. 101-218	Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989
P.L. 101-549	Clean Air Act Amendments of 1990
P.L. 101-566	Hydrogen Research, Development, and Demonstration Act of 1990
P.L. 101-575	Solar, Wind, Waste, and Geothermal Power Production Incentives Act of 1990
P.L. 102-486	Energy Policy Act of 1992 (EPACT)

## Major Program Changes

EERE achieves its energy efficiency, renewable energy, and infrastructure objectives through a mix of research, development, demonstration, and deployment (RD3) efforts. EERE's research is increasingly undertaken in the field with private sector partners in order to facilitate more rapid market adoption than is typical of the traditional, linear approach to RD3. EERE's research and development efforts are also increasingly focused on realizing the cost savings and improved energy performance achievable with an overall systems approach to designing energy efficient and renewable energy use into homes, factories, vehicles, and transmission systems. This systems approach generates greater energy savings and use of renewable energy than is possible by improving the individual components alone.

The following specific programmatic shifts in this budget request allow EERE's portfolio to better address strategic priorities and implement the results of EERE's Strategic Program Review:

**Closures and reduced funding levels:** Funding is not requested for several efforts, including natural gas vehicle engines and residential refrigerator research. These efforts were identified as completed or unable to continue to provide high levels of public benefits. For example, the NAS identified some \$7 billion in non-economic benefits already realized from just part of DOE's refrigeration R&D activities, but gains have been so large that the activities are reaching the point of diminishing returns for conventional refrigeration cycles. In addition, reduced funding is requested for phasing out specific projects or areas of research, which include:

- P Close-out of roughly 38 industrial program projects that either are expected to conclude in FY 2003 and face major go/no-go decision points in FY 2003. For example, over \$500,000 in NICE3 projects will be completed in FY 2003.
- P Reduce funding for fuels processor R&D in the Hydrogen, Fuel Cells, and Infrastructure Technologies Program, reflecting the decreased emphasis on on-board fuel processing technologies (\$5.1 million decrease).
- P Decrease funding for Regional Field Verification activities for wind power, since this part of the Wind and Hydropower Technologies Program nears completion (\$2.2 million decrease).
- P Phase-out research on high speed (Class 6) wind technologies.
- P Near-term geothermal technology development efforts will not be continued in FY 2004, following a planned 3-year phase-out. Similarly, geothermal systems field verification will be phased out in FY 2004, and advanced heat power systems research will begin a planned 3-year phase out to enable the program to focus on higher priorities.
- P With Building Technologies Program roadmaps set to be completed in FY 2003, no FY 2004 funding is requested for these efforts.

**Redirections:** The transition from PNGV to FreedomCAR is complete with the development of a FreedomCAR multi-year research plan as the basis for this budget request. This budget request reflects several other key redirections being implemented through the EERE reorganization, including:

- P Integration of EERE's intergovernmental efforts into a single program provides improved means for EERE to strengthen and improve the coordination of its deployment efforts, as recommended in the SPR. This coordination will be further improved by the more integrated use of EERE's Regional Offices as the "gateway" for services.
- P Integration of solar building technologies into the new Building Technologies Program, facilitating the incorporation of photovoltaic and solar thermal technologies into improved integrated building designs.
- P Integration of vehicle and stationary fuel cell efforts into the Hydrogen, Fuel Cells and Infrastructure Technologies Program which is designed to "leap frog" current incremental approaches and accelerate progress towards a hydrogen economy.
- P Integration of biopower, biofuel, and bioproducts efforts into a single Biomass Program designed to help develop the technologies needed for an integrated biorefinery industry.

**Expansions:** The expansions that are in the President's budget request variously reflect the National Energy Policy, DOE's mission, EERE's priorities, and the SPR recommendations.

- P **Solid State Lighting (SSL).** Focusing the lighting R&D budget on solid state lighting to advance the technology and lower the cost of organic and inorganic light emitting diodes (LEDs) will lead to more efficient, flexible and functional lighting technology in the future. SSL will build on other Building Technologies Program research that aims to improve the energy efficiency of buildings materials, designs, and associated heating, cooling, and lighting equipment and other appliances.
- P **Hydrogen, Fuel Cells & Infrastructure Technologies Program.** Expanding R&D on hydrogen and fuel cell technologies will accelerate our understanding of the applications of these technologies for both vehicle and stationary uses. New program efforts will help EERE make progress toward assessing and developing a hydrogen-based energy system. The program has been redesigned and bolstered to conduct cutting-edge R&D in hydrogen production, storage, delivery, and conversion technologies as well as fuel cell technologies that would use the hydrogen. Known as the Hydrogen fuel initiative, this work complements activities under the FreedomCAR initiative. This initiative will also enable the program to conduct field evaluations of fuel cell technologies and validate technology advancements including hydrogen infrastructure development.
- P **National Climate Change Technology Initiative (NCCTI).** This Presidential initiative will help the United States develop advanced technology options for reducing the carbon intensity of our economy. This program will allow climate change-related technology ideas to compete on the basis of their potential to reduce, avoid, or sequester greenhouse gas emissions. [Note: The combined funding request for this program from the Energy Supply, Energy Conservation, and Fossil Energy accounts is \$40 million.]

## Funding and Federal Staffing Requirements

### Funding Summary

	FY 2002 Comparable Appropriation	FY 2003 Amended Request	FY 2004 Request	\$ Change	% Change
<b>FreedomCAR and Vehicle Technologies</b>					
Vehicle Systems .....	14,869	14,414	14,514	+100	+0.7%
Innovative Concepts .....	600	1,600	500	-1,100	-68.8%
Hybrid and Electric Propulsion .....	47,121	41,973	49,563	+7,590	+18.1%
Advanced Combustion Engine R&D .....	47,160	40,156	37,085	-3,071	-7.6%
Materials Technology .....	39,158	29,400	39,640	+10,240	+34.8%
Fuels Technology .....	24,650	17,999	6,800	-11,199	-62.2%
Technology Introduction .....	3,450	5,900	5,900	0	0.0%
Energy Efficiency Science Initiative .....	3,959	0	0	0	0.0%
Transferred to Fossil .....	-2,000	0	0	0	0.0%
Technical/Program Management Support .....	2,385	2,121	2,121	0	0.0%
Biennial FreedomCAR Peer Review .....	0	0	1,500	+1,500	NA
<b>Total, FreedomCAR and Vehicle Technologies .....</b>	<b>181,352</b>	<b>153,563</b>	<b>157,623</b>	<b>+4,060</b>	<b>+2.6%</b>
<b>Fuel Cell Technology</b>					
Transportation Systems .....	7,466	7,600	7,600	0	0.0%
Distributed Energy Systems .....	5,500	7,500	7,500	0	0.0%
Stack Component R&D .....	12,595	14,900	28,000	+13,100	+87.9%
Fuel Processor R&D .....	20,921	25,300	19,000	-6,300	-24.9%
Technology Validation .....	0	1,800	15,000	+13,200	+733.3%
Technical/Program Management Support .....	200	400	400	0	0.0%
<b>Total, Fuel Cell Technology .....</b>	<b>46,682</b>	<b>57,500</b>	<b>77,500</b>	<b>+20,000</b>	<b>+34.8%</b>
<b>Weatherization and Intergovernmental Program</b>					
Weatherization Assistance .....	230,000	277,100	288,200	+11,100	+4.0%
State Energy Program .....	45,000	38,798	38,798	0	0.0%
Other State Energy Activities .....	8,230	2,353	2,353	0	0.0%
Gateway Deployment .....	40,951	41,195	27,609	-13,586	-33.0%

**Energy Conservation**

**Executive Summary**

**FY 2004 Congressional Budget**

	FY 2002 Comparable Appropriation	FY 2003 Amended Request	FY 2004 Request	\$ Change	% Change
Total, Weatherization and Intergovernmental Program .....	324,181	359,446	356,960	-2,486	-0.7%
Distributed Energy & Electricity Reliability (DEER)					
Distributed Generation Technology Development .....	48,657	34,916	31,916	-3,000	-8.6%
End-Use System Integration and Interface .....	5,950	19,338	19,338	0	0.0%
Technical/Program Management Support .....	530	530	530	0	0.0%
Total, Distributed Energy & Electricity Reliability (DEER) .....	55,137	54,784	51,784	-3,000	-5.5%
Buildings Technologies					
Residential Buildings .....	12,179	13,433	15,230	+1,797	+13.4%
Commercial Building Integration .....	4,403	4,995	4,995	0	0.0%
Emerging Technologies .....	34,970	22,618	21,821	-797	-3.5%
Equipment Standards and Analysis .....	8,251	9,197	9,017	-180	-2.0%
Technical/Program Management Support .....	1,320	2,320	1,500	-820	-35.3%
Energy Efficiency Science Initiative .....	3,959	0	0	0	0.0%
Transferred to Fossil .....	-2,000	0	0	0	0.0%
Total, Buildings Technologies .....	63,082	52,563	52,563	0	0.0%
Industrial Technologies					
Industries of the Future (Specific) .....	61,809	52,285	24,037	-28,248	-54.0%
Industries of the Future (Crosscutting) .....	33,571	34,401	34,401	0	0.0%
Energy Efficiency Science Initiative .....	3,959	0	0	0	0.0%
Transferred to Fossil .....	-2,000	0	0	0	0.0%
Technical / Program Management .....	3,570	4,791	5,991	+1,200	+25.0%
Total, Industrial Technologies .....	100,909	91,477	64,429	-27,048	-29.6%
Biomass and Biorefinery Systems					
Advanced Biomass Technologies R&D .....	7,109	8,259	8,408	+149	+1.8%
Systems Integration and Production .....	17,140	14,680	0	-14,680	-100.0%
Technical Program Management Support .....	530	1,000	400	-600	-60.0%



	FY 2002 Comparable Appropriation	FY 2003 Amended Request	FY 2004 Request	\$ Change	% Change
Total, Biomass .....	24,779	23,939	8,808	-15,131	-63.2%
Federal Energy Management Program					
Project Financing .....	8,700	8,690	8,227	-463	-5.3%
Technical Guidance and Assistance .....	7,000	11,042	8,242	-2,800	-25.4%
Planning, Reporting and Evaluation .....	2,340	2,803	2,603	-200	-7.1%
Technical/Program Management Support .....	860	890	890	0	0.0%
Total, Federal Energy Management Program .....	18,900	23,425	19,962	-3,463	-14.8%
Program Management					
Program Direction .....	74,965	68,399	70,109	+1,710	+2.5%
Planning, Evaluation, & Analysis .....	4,927	5,005	5,005	0	0.0%
Communications and Outreach .....	1,550	1,550	1,550	0	0.0%
Total, Program Management .....	81,442	74,954	76,664	+1,710	+2.3%
NCCTI					
EE Share of NCCTI .....	0	10,000	9,500	-500	-5.0%
Transferred From Fossil Energy .....	0	10,000	0	-10,000	-100.0%
Total, NCCTI .....	0	20,000	9,500	-10,500	-52.5%
Total, Energy Conservation .....	896,464	911,651	875,793	-35,858	-3.9%
Additional net budget authority to cover the cost of fully accruing retirement (non-add)					
	(2,665)	(2,653)	(2,632)	(0)	(0.0%)
Staffing (FTE)					
Headquarters .....	274	274	270	-4	-1.5%
Golden Field Office .....	37	37	50	+13	+35.1%
Operations Offices				0	0.0%
Chicago Operations Office .....	4	5	0	-5	-100.0%
Idaho Operations Office .....	6	7	0	-7	-100.0%
Oak Ridge Operations Office .....	1	1	0	-1	-100.0%
Total, Operation Offices .....	11	13	0	-13	-100.0%

	FY 2002 Comparable Appropriation	FY 2003 Amended Request	FY 2004 Request	\$ Change	% Change
<b>Regional Offices</b>					
Atlanta Regional Office .....	25	23	23	0	0.0%
Boston Regional Office .....	17	16	16	0	0.0%
Chicago Regional Office .....	18	18	18	0	0.0%
Denver Regional Office .....	24	25	25	0	0.0%
Philadelphia Regional Office .....	14	17	17	0	0.0%
Seattle Regional Office .....	22	20	20	0	0.0%
<b>Total, Regional Offices .....</b>	<b>120</b>	<b>119</b>	<b>119</b>	<b>0</b>	<b>0.0%</b>
<hr/>					
<b>Total Staffing, Energy Conservation Program .....</b>	<b>442</b>	<b>443</b>	<b>439</b>	<b>-4</b>	<b>-0.9%</b>

## Congressional Items of Interest

(dollars in thousands)

	FY 2002	FY 2003	FY 2004	\$ Change	% Change
<b>Industrial Technologies</b>					
Thermo-Mechanical Processing Project .....	2,000	0	0	0	0.0%
<b>Total, Industrial Technologies</b>	<b>2,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0%</b>
<b>FreedomCAR &amp; Vehicle Technologies</b>					
Northwest Alliance for Transportation Technologies .....	4,050	3,225	0	0	-100.0%
<b>Total, FreedomCAR &amp; Vehicle Technologies</b>	<b>4,050</b>	<b>3,225</b>	<b>0</b>	<b>0</b>	<b>-100.0%</b>
<b>Total, Congressional Items of Interest</b> .....	<b>6,050</b>	<b>3,225</b>	<b>0</b>	<b>0</b>	<b>-100.0%</b>

## Office of Energy Efficiency and Renewable Energy Funding Summary by Program

(dollars in thousands)

	FY 2002 Comp Approp	FY 2003 Amended Request	FY 2004 Request to Congress	FY 2004 vs. FY 2003	
				\$ change	% change
<b>Hydrogen, Fuel Cells &amp; Infrastructure Technologies</b>					
Hydrogen Technology .....	28,892	39,881	87,982	+48,101	+120.6%
Fuel Cell Technologies .....	46,682	57,500	77,500	+20,000	+34.8%
<b>Total, Hydrogen, Fuel Cells &amp; Infrastructure .....</b>	<b>75,574</b>	<b>97,381</b>	<b>165,482</b>	<b>+68,101</b>	<b>+69.9%</b>
FreedomCAR and Vehicle Technologies .....	181,352	153,563	157,623	+4,060	+2.6%
<b>Weatherization and Intergovernmental</b>					
Intergovernmental Activities .....	5,680	14,807	12,500	-2,307	-15.6%
Weatherization Assistance Grants .....	230,000	277,100	288,200	+11,100	+4.0%
State Energy Program Grants .....	45,000	38,798	38,798	—	—
State Energy Activities .....	8,230	2,353	2,353	—	—
Gateway Deployment .....	40,951	41,195	27,609	-13,586	-33.0%
<b>Total, Weatherization and Intergovernmental .....</b>	<b>329,861</b>	<b>374,253</b>	<b>369,460</b>	<b>-4,793</b>	<b>-1.3%</b>
Solar Energy Technology .....	87,107	79,625	79,693	+68	+0.1%
<b>Wind and Hydropower Technologies</b>					
Wind Energy .....	38,211	44,000	41,600	-2,400	-5.5%
Hydropower .....	4,986	7,489	7,489	—	—
<b>Total, Wind and Hydropower .....</b>	<b>43,197</b>	<b>51,489</b>	<b>49,089</b>	<b>-2,400</b>	<b>-4.7%</b>
Geothermal Technologies .....	27,035	26,500	25,500	-1,000	-3.8%
<b>Distributed Energy &amp; Electricity Reliability</b>					
Electricity Reliability .....	76,764	76,506	76,866	+360	+0.5%
Distributed Energy Resources .....	55,137	54,784	51,784	-3,000	-5.5%
<b>Total, Distributed Energy &amp; Electricity Reliability</b>	<b>131,901</b>	<b>131,290</b>	<b>128,650</b>	<b>-2,640</b>	<b>-2.0%</b>

Building Technologies					
Zero Energy Buildings .....	1,367	8,000	4,000	-4,000	-50.0%
Building Technologies .....	63,082	52,563	52,563	—	—
Total, Building Technologies .....	64,449	60,563	56,563	-4,000	-6.6%
Industrial Technologies .....	100,909	91,477	64,429	-27,048	-29.6%
Biomass					
Biomass & Biorefinery Systems R&D (EWD) .....	87683	86,005	69,750	-16,255	-18.9%
Biomass & Biorefinery Systems R&D (INT) .....	24779	23939	8,808	-15131	-63.2%
Total, Biomass .....	112,462	109,944	78,558	-31,386	-28.5%
Federal Energy Management					
Departmental Energy Management Program .....	1,421	3,000	2,300	-700	-23.3%
Federal Energy Management Program .....	18900	23425	19,962	-3463	-14.8%
Total, Federal Energy Management .....	20,321	26,425	22,262	-4,163	-15.8%
National Climate Change Technology Initiative (NCCTI) Competitive Solicitation					
NCCTI (EWD) .....	—	—	15000	+15,000	N/A
NCCTI (INT) .....	—	20000	9,500	-10500	-52.5%
Total, NCCTI Competitive Solicitation .....	—	20,000	24,500	+4,500	+22.5%
Facilities and Infrastructure .....	4,870	5,000	4,950	-50	-1.0%
Program Direction					
Program Direction (EWD) .....	18,673	16,187	16,577	+390	+2.4%
Program Management (INT) .....	81442	74954	76664	+1,710	+2.3%
Total, Program Direction .....	100,115	91,141	93,241	+2,100	+2.3%
<b>Total, Energy Efficiency and Renewable Energy .....</b>	<b>1279153</b>	<b>1318651</b>	<b>1320000</b>	<b>+1,349</b>	<b>0.1%</b>

