Fiscal Year 2007
Budget-in-Brief

U.S. Department of Energy

Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

www.eere.energy.gov

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Preface

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 enhance energy efficiency; help bring clean, reliable and affordable energy technologies to the market; and make a difference in the everyday lives of Americans. Advanced energy efficient technologies and practices that use less energy, as well as renewable energy technologies that cleanly produce fuel and power, will be critical in addressing the Nation's energy and environmental challenges.

The Fiscal Year 2007 budget request is a bold and focused approach for advancing clean energy technologies. Given rising energy prices and increasing global competition for the world's available resources, EERE's mission is critical to the Nation's economic well-being and energy security.

In his 2006 State of the Union address, President Bush stated "we have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world." The President emphasized that "the best way to break this addiction is through technology," and he proposed to increase "research in better batteries for hybrid and electric cars…pollution free cars that run on hydrogen…and cutting-edge methods of producing ethanol, not just from corn, but from wood chips and stalks, or switch grass." He also spoke about "the need to change how we power our homes and offices" and pledged to invest more in "revolutionary solar and wind technologies." EERE's Fiscal Year 2007 request includes increased funding for research in these areas.

EERE's overall budget request limits spending growth in a time of severe budget constraints throughout the Federal Government and focuses on high-priority, high-risk, and high-payoff research and development (R&D). Consequently, the Fiscal Year 2007 budget request proposes reduced funding for the Industrial Technologies Program, the Federal Energy Management Program, and the Weatherization Assistance Program and close-out of the Geothermal Technology Program.

Highlights

The EERE Fiscal Year 2007 budget request supports the President's Advanced Energy Initiative (AEI), as announced in his 2006 State of the Union address:

- *The President's Biofuels Initiative.* According to Energy Information Administration (EIA) data, the United States relies upon imported petroleum to meet approximately 60 percent of its oil demand. Biomass is the only clean, renewable energy source which can make an immediate impact on diversifying our liquid transportation fuels, thereby reducing our dependency on imported oil. To advance the Administration's priority for displacing imported oil, the President's *Biofuels Initiative* will focus on the production of biofuels equivalent to 30 percent of today's gasoline consumption. This aggressive target will be accomplished through the ability to convert a wider variety of regionally available biomass feedstocks and agricultural waste and the validation of those technologies and their related economics. In his State of the Union Address, President Bush set forth the goal "to make this new kind of ethanol practical and competitive within six years." As a result of the initiative, future biorefineries will contribute to the Nation's energy security through the sustainable conversion of biomass to fuels and chemicals.

The President's Hydrogen Fuel Initiative. The Fiscal Year 2007 request is consistent with the President's commitment of $1.2 billion for the first five years of the *Hydrogen Fuel Initiative*. Under this initiative, the first car driven by today's pre-school children could be powered by hydrogen fuel cells. The President's Fiscal Year 2007 budget request increases EERE funding for hydrogen technology research by more than $40 million over current levels. Increased funding is requested to expand research in several areas including: hydrogen production from renewables, materials for hydrogen storage, fuel cell stack components, and a new R&D effort on cost-effective manufacturing technologies to build a competitive, domestic hydrogen and fuel cell supplier capability.

- *FreedomCAR*. This year's request places an emphasis on plug-in hybrid technologies that offer the potential to make significant additional improvements in petroleum reduction beyond that achievable with standard hybrid configurations. By utilizing energy drawn from the Nation's electricity grid at off-peak times to charge high energy batteries, these technologies will be able to operate in an electric vehicle mode for expanded distances, potentially meeting most drivers' needs for commuting and short distance driving.

- *The President's Solar America Initiative.* This new and major initiative is designed to achieve market competitiveness for photovoltaic (PV) solar electricity by 2015 to power our homes and businesses through Federal partnerships with industry, universities, National Laboratories, States, and/or other government entities. Continued R&D work on PV technologies has the potential for dramatic cost reductions and performance and reliability improvements. Key PV technologies that have the greatest potential for cost competitiveness in this accelerated timeframe will be pursued for aggressive research and development. This initiative also includes funding for R&D activities associated with Concentrating Solar Power.

The Fiscal Year 2007 budget request also supports renewable energy and energy efficiency R&D that will help reduce the overall demand for natural gas and lower energy costs in the electricity sector:

- *Wind Energy*. The 2007 budget request includes $44 million for wind energy research - a $5 million increase over Fiscal Year 2006 levels. The R&D will help improve the efficiency and lower the costs of new wind technologies for use in low-speed wind environments. The Fiscal Year 2007 request also funds R&D to develop offshore wind power systems, thereby enhancing the competitiveness of wind energy in densely populated electricity markets.

- *Solid State Lighting*. This year's budget request accelerates development of Solid State Lighting technologies that can reduce commercial building lighting electricity consumption by at least 50 percent. These technologies promise to revolutionize the energy efficiency, appearance, visual comfort, and quality of lighting.

- *Equipment Standards and Analysis*. The Department is committed to clearing the backlog of rulemakings and meeting all of its new Energy Policy Act (EPACT) of 2005 requirements. This budget request supports the Department's planned schedules which are firm and achievable and will enable the Department to produce at least one new or amended standard for all products in the backlog no later than mid-2011, while also meeting EPACT 2005 requirements.

Benefits continue to be realized from the implementation of EERE's "one-way of doing business model" that integrated EERE's programs and streamlined its business administration functions. In Fiscal Year 2007, EERE's Project Management Center (PMC) will be fully operational and will

continue to provide the core services to State and local governments that previously were the responsibility of the Regional Offices.

In developing this request, EERE continues to be guided by the Research and Development Investment Criteria (RDIC) called for in the President's Management Agenda, as well as the Office of Management and Budget's (OMB) Program Assessment Rating Tool (PART) to evaluate its portfolio and to focus its R&D dollars.

This Budget-in-Brief summarizes the key activities and changes in each of the 13 program areas. A chart summarizing the Fiscal Year 2007 budget request is on page 42. More detailed information, including the EERE Fiscal Year 2007 budget request, can be found at www.eere.energy.gov.

Biomass and Biorefinery Systems R&D Program

The mission of the Biomass and Biorefinery Systems R&D Program ("Biomass Program")[1] is to foster research and development on advanced technologies that will transform the Nation's domestic biomass resources into affordable biofuels, biopower, and high-value bioproducts. Biomass is the only clean, renewable energy source which can make an immediate impact in diversifying our liquid transportation fuels, thereby reducing our dependency on imported oil. The program's research focus is in three areas: Feedstock Infrastructure, for reducing the cost of collecting and preparing raw biomass, and for the sustainable production and delivery of future energy crops; Platforms R&D, for reducing the cost of outputs and byproducts from biochemical and thermochemical processes; and Utilization of Platform Outputs, for developing technologies and processes that utilize intermediates such as sugars and syngas to co-produce fuels, value-added chemicals and materials, and heat and power. The program's strategy is to integrate those technologies and processes in biorefinery configurations that industry will help to validate at an industrial scale. The next-generation biorefinery will produce transportation fuels along with value-added chemicals and materials, and/or power from non-conventional, lower cost feedstock such as agricultural and forest residues and other biomass.

The additional impetus created by the President's *Biofuels Initiative* will enable program R&D to accelerate the development of cost-competitive, bio-based liquid transportation fuels. The program has outlined a strategy for reaching the objectives of the initiative which assumes funding at the requested level, exclusive of congressionally directed activities.

FY 2007 Budget Request
Biomass and Biorefinery Systems R&D

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Feedstock Infrastructure	1,984	479	9,967
Platforms R&D	29,288	15,140	50,530
Utilization of Platform Outputs R&D	20,473	23,322	89,190
Congressionally Directed Activities	35,332	51,777	0
Technical/Program Management	394	0	0
TOTAL	**87,471**	**90,718**	**149,687**

In Fiscal Year 2007, the Department is requesting $149.7 million for the Biomass Program, an increase of $59.0 million from the Fiscal Year 2006 Appropriation. The Fiscal Year 2006 biomass appropriation included $51.8 million in congressionally directed activities.

[1] Biomass includes agricultural crops and trees, wood and wood wastes and residues, plants, grasses, residues, fibers, animal wastes, municipal solid wastes, and other waste materials. Biorefineries are processing facilities that extract carbohydrates, oils, lignin, and other materials from biomass, and convert them into multiple products such as transportation fuel, chemicals, and materials.

Feedstock Infrastructure

In Fiscal Year 2007, Feedstock Infrastructure systems work will be accelerated for single-pass harvester development for wheat straw and corn stover collection and supporting infrastructure and supply analysis. In addition, DOE will initiate partnerships on regional feedstock development in collaboration with USDA, land grant universities, and regional consortia to ensure that the biorefineries will have access to plentiful feedstock supplies (including energy crops) at reasonable prices, in diverse regions and climates. ($10.0 million)

Platforms R&D

- Thermochemical Platform conducts research, testing, integration, and feasibility studies on thermochemical conversion of biomass to provide the foundation for advanced and integrated systems that focus on syngas and pyrolysis oils. In Fiscal Year 2007, the program will focus on residues (off-spec feedstock, low quality biomass, and lignin-rich residues) from biochemical biorefineries to provide clean syngas. ($16.9 million)

- Bioconversion Platform R&D for Sugars will accelerate research on bioconversion technologies with improved process integration capabilities to enable industrial biorefineries. The program will expand partnerships to further improve the integration of pretreatment and enzyme operations leading to cheaper biomass-based sugars. This effort is required to support future biorefinery validation projects. ($33.6 million)

Utilization of Platform Outputs

- Integration of Biorefinery Technologies will initiate industrial cost-shared projects to validate integrated biorefinery designs that will focus on the near-term pathways with feedstocks such as corn fiber, corn stover and oilseeds for converting biomass to fuels, chemicals and/or materials. The increased resources will accelerate the validation of industrial-scale projects, an essential step in reducing technical risks associated with first-of-a-kind biorefineries. This acceleration will result in up to three industrial scale demonstrations. Efforts will continue to integrate and test handling, pre-treatment, hydrolysis, and fermentation operations to evaluate performance and costs of converting biomass to fuels and co-products. ($54.4 million)

- Products Development will focus on technologies for processing intermediate biorefinery product streams into ethanol and value-added products such as chemicals and materials, and their integration into both existing and future biorefineries. These value-added products will be key to the long-term economic viability of biorefineries and will have the added advantage of reducing U.S. demand for petroleum-based chemicals and materials. The program will collaborate with partners on advanced fermentation yeasts to reduce ethanol costs further. Additional work with industry, universities and the National Laboratories will focus on improvements to increase the efficiency of individual process steps, e.g., catalysis and separations, and the development of processes to produce the building-block chemicals identified in the program's Top Ten Chemicals report. ($34.8 million)

Building Technologies Program

The mission of the Building Technologies Program is to develop technologies, techniques, and tools for making residential and commercial buildings more energy efficient, productive, and affordable. Energy use by residential and commercial buildings accounts for over one-third of the Nation's total energy consumption, including two-thirds of the electricity generated in the United States. This level of energy use costs the Nation about $240 billion annually. Improving the energy efficiency of buildings and equipment reduces energy consumption—especially during critical peak demand periods—which also reduces America's vulnerability to energy supply disruptions, energy price spikes and constraints on the Nation's electricity infrastructure. The funding supports a portfolio of activities that includes solid-state lighting, improved energy efficiency of other building components and equipment, and their effective integration using whole-building-system-design techniques. The program also includes the development of codes and standards and successful education and market introduction programs, including ENERGY STAR® and Rebuild America.

The Fiscal Year 2007 request for the Building Technologies Program is $77.3 million, an increase of $8 million from the Fiscal Year 2006 Appropriation.

FY 2007 Budget Request
Building Technologies

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Residential Buildings Integration	16,787	15,168	19,700
Commercial Buildings Integration	5,125	3,069	4,699
Emerging Technologies	31,124	33,055	32,756
Equipment Standards and Analysis	10,147	10,153	11,925
Technology Validation and Market Introduction	0	0	8,249
Oil Heat Research for Residential Buildings	493	990	0
Technical/Program Management Support	1,479	1,485	0
Congressionally Directed Activities	0	5,346	0
TOTAL	**65,155**	**69,266**	**77,329**

Residential Buildings Integration

The long-term goal of Residential Buildings Integration is to develop cost-effective technologies and building practices that will enable the design and construction of net Zero Energy Buildings (ZEB) — houses that produce as much energy as they use on an annual basis — by 2020.

- Research and Development: Building America. This program will focus on reducing total energy use in a new home by 60 to 70 percent. During Fiscal Year 2007, research for production-ready new residential buildings that are 30 percent more efficient for all five climates will be completed and research will continue at the 40 percent efficiency level for three climate zones, with one climate zone completed. Activities will be carried out in partnership with designers, builders and component manufacturers. ($19.2 million)

- Residential Building Energy Codes. In Fiscal Year 2007, DOE will provide determinations as required on new ASHRAE, IECC or IRC building codes and update REScheck code compliance software to efficiency levels in the current residential codes. ($0.5 million)

Commercial Buildings Integration

The long-term goal of the Commercial Buildings Integration subprogram is to develop cost-effective technologies and building practices that will enable the design and construction of net Zero Energy Buildings — commercial buildings that produce as much energy as they use on an annual basis — by 2025.

- Research and Development. In Fiscal Year 2007, we will demonstrate the first package of cost-effective technologies for small to medium-sized (less than 25,000 square feet) commercial buildings to reach 30 percent energy savings over ASHRAE 90.1-2004 and begin development on a design package for medium sized commercial buildings, also focusing on 30 percent improvement over ASHRAE 90.1-2004. This commercial building energy efficiency improvement package will describe the technologies, quantify the energy savings and costs, and provide design, construction, and commissioning guidelines for implementation in several climate regions of the United States. ($4.2 million)

- Commercial Building Energy Codes. In Fiscal Year 2007, DOE will provide determinations as required on new ASHRAE, IECC or IRC building codes, and update COMcheck code compliance software to efficiency levels in the current commercial codes. ($0.5 million)

Emerging Technologies

The Emerging Technologies subprogram seeks to develop cost-effective technologies (e.g., lighting, windows, and space heating and cooling) for residential and commercial buildings that can reduce the total energy use in buildings by 60 to 70 percent. The improvement in component and system energy efficiency, when coupled with research to integrate onsite renewable energy supply systems into the commercial building, can result in marketable net zero energy designs.

- Solid State Lighting will develop technologies that can reduce commercial building lighting electricity consumption by at least 50 percent. Projects will be continued (from the Fiscal Years 2004 and 2005 solicitations) to develop general illumination technologies that achieve energy efficiencies of up to 72 lumens per watt, through creation of a technical foundation to revolutionize the energy efficiency, appearance, visual comfort, and quality of lighting. These projects will include LED core topics (UV emissions, power conversion efficiency, and phosphors), LED product development topics (luminaire design and materials, and electronics), OLED core topics (materials, light extraction, and novel device structures), and OLED product development (luminaire design and materials). ($19.8 million)

- Space Conditioning and Refrigeration R&D will demonstrate through laboratory or field testing, two to three design concepts (selected from initial prototypes in Fiscal Year 2006) that have the long-term potential to reduce annual HVAC energy consumption by 50 percent in new residential buildings, relative to Building America Benchmarks, with an estimated simple payback period of three years or less. The design concepts must also address other critical Building America needs such as humidity control, uniform comfort, and indoor air quality. The R&D projects will emphasize modest cost premiums, since very high efficiency equipment already exists, but has low market penetration due to high first cost. ($2.9 million)

- Building Envelope R&D will develop new envelope materials in response to needs identified in the Residential and Commercial Integration activities. Specifically, this research will include phase change materials and thermochromic surfaces that adjust to optimize building performance. The integration of these new materials has the technical potential to transform the performance of our Nation's predominant light weight wall construction building market to function with the equivalence of greater thermal mass and high R-values, delivering greater energy savings and curtailing peak demand. In addition, DOE will continue competitive fundamental science research to develop the second generation of materials, chemical engineering applications, and advanced manufacturing processes that can offer "leap frog" reductions in cost for dynamic windows while maintaining a high level of reliability and durability with a broad range of optical properties. A second generation highly insulating, dynamic window with improved durability will also be developed. ($7.3 million)

- Analysis Tools and Design Strategies will focus its research on developing, improving, verifying and maintaining software packages for engineers, architects, and builders who design or retrofit buildings to be more energy efficient and comfortable. Activities will focus on research and additions to the EnergyPlus whole-building energy simulation software that enables building designers, operators, owners, and researchers to evaluate technologies for improving the energy efficiency and comfort of buildings while reducing operating costs. ($2.8 million)

Equipment Standards and Analysis

The Equipment Standards and Analysis subprogram seeks to develop minimum energy efficiency standards that are technologically feasible and economically justified. During Fiscal Year 2005 and Fiscal Year 2006, the Department has identified and implemented significant enhancements to implementation of rulemaking activities. The Department has made a commitment to clear the backlog of delayed actions that accumulated during prior years, while simultaneously implementing all new requirements of the Energy Policy Act of 2005. Activities were initiated in Fiscal Year 2006 on thirteen products that will continue in Fiscal Year 2007. The Department will continue to implement

productivity enhancements that will allow multiple rulemaking activities to proceed simultaneously while maintaining the rigorous technical and economic analysis required by statute. ($11.9 million)

Technology Validation and Market Introduction

The Technology Validation and Market Introduction subprogram funds activities that accelerate the adoption of clean, efficient, and domestic energy technologies. The two major activities are: ENERGY STAR® and Rebuild America. Both have been transferred to Building Technologies in Fiscal Year 2007 from Weatherization and Intergovernmental Activities. ENERGY STAR® is a joint Department of Energy/Environmental Protection Agency activity designed to identify and promote energy efficient products.

- ENERGY STAR® will continue to update criteria on selected products in accordance with EPAct 2005. In Fiscal Year 2007, DOE will focus on raising efficiency targets to increase energy efficiency of the current appliance portfolio (e.g., clothes washers, dishwashers, room air conditioners and compact fluorescent light bulbs [CFLs]) to insure the label connotes top-level performance of managed products, and introduce new ENERGY STAR® products, as appropriate (e.g., photovoltaics, solid state lighting, and water heaters). ($5.8 million)

- Rebuild America will be redesigned and aligned with the Commercial Building Integration research and development activity to accelerate the adoption of advances in commercial building integrated design, software tools, practices and advanced controls, equipment and lighting. The redesigned activity will target decision-makers with national and regional market scope, such as multi-brand corporations in the retail, lodging, and restaurant market segments, as well as commercial property developers, owners and operators. ($2.5 million)

Distributed Energy Resources Program

As directed in the Fiscal Year 2006 Energy and Water Development Appropriation language, the Distributed Energy Resources (DER) Program has been transferred to the Office of Electricity Delivery and Energy Reliability (OE). Therefore, the DER Program activities and funding can now be found in the OE Fiscal Year 2007 budget request.

FY 2007 Budget Request within EERE Distributed Energy Resources			
	Funding ($ in thousands)		
Activity	FY 2005 Approp	FY 2006 Approp[2]	FY 2007 Request[2]
Distributed Generation Technology Development	38,410	0	0
End-Use System Integration and Interface	20,136	0	0
Technical/Program Management Support	523	0	0
TOTAL	**59,069**	**0**	**0**

[2] The Distributed Energy Resources activities continue within the Office of Electricity Distribution and Energy Reliability.

Federal Energy Management Program

Federal Energy Management Program (FEMP) assists Federal agencies, including the Department of Energy, in increasing their use of energy efficiency and renewable energy technologies through alternative financing contract support and technical assistance and reporting and evaluating agency progress each year. FEMP facilitates the award of alternative financing contracts between Federal agencies and the private sector to fund energy efficiency improvements through the use of dollar savings on Federal energy bills. FEMP provides technical assistance to Federal energy managers so they can identify, design, and implement energy efficient and renewable energy technologies and practices. In addition, FEMP publishes an Annual Report to Congress on Federal energy efficiency and renewable energy use, and conducts an awards program to recognize individuals and groups within Federal agencies who achieve excellence in energy management. Direct funding for energy retrofit projects is provided to DOE facilities. The focus of FEMP in Fiscal Year 2007 is to reduce the energy costs and environmental impacts of government by promoting energy efficiency, water conservation and renewable energy at Federal sites.

FY 2007 Budget Request
Federal Energy Management Program

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Project Financing	7,133	6,759	5,935
Technical Guidance and Assistance	8,160	7,642	6,519
Planning, Reporting and Evaluation	2,638	2,574	2,473
Departmental Energy Management	1,951	1,999	1,979
TOTAL	**19,882**	**18,974**	**16,906**

The Fiscal Year 2007 request is $16.9 million, $2.1 million less than the Fiscal Year 2006 Appropriations, to continue meeting the goals of reducing Federal energy consumption. As FEMP's core activities have evolved, efficiencies have increased, enabling a reduced funding level in Fiscal Year 2007. More efficient use of resources in meetings, awards, publications and funding technical projects will allow FEMP to maintain its historically high level of achievement.

Project Financing

FEMP alternative financing programs help agencies access private sector financing to fund needed energy improvements. FEMP helps Federal agencies use Energy Savings Performance Contracts (ESPC) and Utility Energy Service Contracts (UESC) to finance energy saving improvements without the use of current appropriations. These funds pay for energy improvements at Federal facilities that are in need of significant energy system retrofits. Projects include all types of energy improvements such as lighting upgrades, new heating and ventilation systems, and improved control systems. ($5.9 million)

Technical Guidance and Assistance

This effort helps Federal energy managers identify, design, and implement new construction and facility improvement projects that incorporate energy efficiency and renewable energy. FEMP provides unbiased, expert technical assistance through audits for buildings and industrial facilities. FEMP also helps Federal facilities manage peak load and deploy new technologies, including combined heat and power and distributed energy and renewable technologies. In addition, FEMP helps agencies acquire the most energy efficient products through procurement training, product efficiency recommendations, communications and outreach, and assistance in amending agency guide specifications to incorporate requirements for energy efficient products. FEMP provides training for Federal agency energy managers and issues publications on energy technologies and best practices. ($6.5 million)

Planning Reporting and Evaluation

The Energy Policy Act of 2005 and Executive Order 13123 require the Department of Energy (DOE) to collect, verify and report to Congress on the progress by the Federal agencies, including DOE, toward the Federal energy management goals of reducing energy intensity in buildings, reducing petroleum usage, and conserving water. Data collection, verification and reporting are centralized for the Federal agencies at FEMP, which will publish its Annual Report to Congress. In addition, FEMP will continue to recognize excellence through the Presidential and Federal awards program, and provide support for the Federal Energy Management Advisory Committee and other interagency committees. Technical analysis will be conducted as required to respond to analytical reporting requirements involved with the Government Performance and Results Act (GPRA), multi-year planning, and other efforts. ($2.5 million)

Departmental Energy Management Program (DEMP)

DEMP provides direct financial assistance for a small sample of energy projects at DOE facilities to promote increased energy efficiency and reduce future utility and maintenance costs. Funding will be provided to multiple projects that are selected through competition to both maximize return on investment and demonstrate leadership in implementing emerging energy savings technologies. DEMP will fund projects that will provide a rate of return of at least 20 percent per dollar invested. ($2.0 million)

Geothermal Technology Program

The Geothermal Technology Program has worked in partnership with industry to establish geothermal energy as an economically competitive contributor to the U.S. energy supply. Geothermal energy production, a $1.3 billion a year industry, generates electricity or provides heat for direct applications, including aquaculture, crop drying, and district heating, or for use in heat pumps to heat and cool buildings. The technologies developed by this program are providing the Nation with new sources of electricity that are highly reliable and cost competitive and do not add to America's air pollution or the emission of greenhouse gases. Geothermal electricity generation is not subject to fuel price volatility and supply disruptions from changes in global energy markets.

While geothermal energy remains an important regional contributor to the Nation's energy needs, current EERE priorities are focused on technology development with broadly applicable and more readily accelerated public benefits. Therefore, the Department plans to close out the Geothermal Technologies Program in Fiscal Year 2007. This closeout decision was based upon a review of EERE program funding priorities – which include a broad spectrum of considerations.

FY 2007 Budget Request
Geothermal Technology

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Technology Development	15,390	15,164	0
Technology Application.....	6,186	4,190	0
Congressionally Directed Activities ..	3,680	3,712	0
TOTAL.....	**25,256**	**23,066**	**0**

Hydrogen Technology Program

The Hydrogen Technology Program is a major portion of the President's 5-year, $1.2-billion *Hydrogen Fuel Initiative*, and includes activities formerly listed under the Fuel Cell Technologies Program. Hydrogen Technology research focuses on the critical path technologies to the hydrogen economy including: hydrogen production using renewables and distributed natural gas, storage that enables greater than 300 mile driving range for vehicles, and low-cost and durable polymer fuel cell components. Fiscal Year 2007 marks the launch of the program's new manufacturing research effort in support of the President's *Manufacturing Initiative*. This effort supports research on cost-effective manufacturing processes to build a domestic hydrogen and fuel cell supplier base. Additional key activities include technology validation under "real world" conditions to help refocus research efforts; underlying safety research to support the development of codes and standards; systems analyses of hydrogen pathways and transition scenarios to assess energy, environmental and economic impacts of hydrogen and fuel cell technologies; and education activities to support the training of target audiences with a role in the transition to a hydrogen economy.

The Fiscal Year 2007 Budget Request for Hydrogen Technology in EERE is $195.8 million, a $40.2 million increase over the Fiscal Year 2006 Appropriation. Consistent with the program's plan, additional resources are primarily for hydrogen production from renewables. Note that the Fiscal Year 2006 appropriation was $25 million less than the budget request and included more than $42 million for congressionally directed activities, many of which do not support program goals. Continued funding for these activities is not requested, and the total of $42.5 million is also applied as an increase to the program's key activities.

FY 2007 Budget Request
Hydrogen Technology

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Hydrogen Production and Delivery R&D	13,303	8,512	36,844
Hydrogen Storage R&D	22,418	26,600	34,620
Fuel Cell Stack Component R&D	31,702	31,595	38,082
Technology Validation	26,098	33,594	39,566
Transportation Fuel Cell Systems	7,300	1,080	7,518
Distributed Energy Fuel Cell Systems	6,753	962	7,419
Fuel Processor R&D	9,469	617	4,056
Safety and Codes and Standards	5,801	4,727	13,848
Education	0	495	1,978
Systems Analysis	3,157	4,925	9,892
Manufacturing R&D	0	0	1,978
Technical/Program Management Support	535	0	0
Congressionally Directed Activities	40,236	42,520	0
TOTAL	**166,772**	**155,627**	**195,801**

Production and Delivery R&D

Hydrogen Production and Delivery research will strengthen R&D of advanced technologies for producing hydrogen using diverse, domestic resources such as renewables (solar, biomass, and wind) and domestic feedstocks such as distributed natural gas. Significantly increased efforts include research and development of cost-competitive, safe, and efficient hydrogen delivery technologies. The majority of EERE funding for hydrogen production focuses on renewable resources, while work involving other feedstocks is largely funded by, and coordinated with, other DOE offices (i.e. Fossil Energy and Nuclear Energy). Note that natural gas is viewed only as a transitional feedstock (using the existing distribution system) because of long-term energy security issues and demands in other sectors. Technology areas include fuel-flexible reformers (natural gas/renewable liquids), catalysis, purifiers, electrolyzers, highly efficient compressors, and membranes for separations. ($36.8 million)

Storage R&D

Hydrogen Storage, a critical enabling technology for the hydrogen economy, will ramp up to focus on novel materials and breakthrough concepts for on-board vehicular hydrogen storage. The overarching goal is lightweight, low-cost, and efficient on-board vehicular hydrogen storage systems to achieve a driving range of greater than 300 miles, without impacting vehicular cargo or passenger space. This activity emphasizes research and development of materials-based technologies, both solids and liquids, which are either reversible on-board or may be regenerated off-board the vehicle. Concerted, collaborative efforts with multiple university, industry, and national laboratory partners are coordinated through "Centers of Excellence" focused on three promising areas: metal hydrides, carbon-based materials, and chemical hydrogen storage. Independent projects by industry and universities will also explore new materials and concepts, as well as off-board storage and analyses of system performance, cost and life cycle efficiency. ($34.6 million)

Fuel Cell Stack Component R&D

This sustained effort focuses on developing components for the fuel cell stack, overcoming critical technical hurdles at the component level to improve overall fuel cell performance and durability while lowering cost. Addressing technical hurdles at the component level supports the industrial effort to integrate fuel cell systems and develop full-scale fuel cell stacks. In Fiscal Year 2007, the Department will initiate new projects in the following areas: improved fuel cell membranes; water transport within the stack, including cold-weather start-up and operation; advanced cathode catalysts and supports; cell hardware, including gas diffusion media and bipolar plates; innovative fuel cell concepts; and effects of fuel impurities on fuel cell performance and durability. DOE seeks to secure participation by the country's leading scientists and engineers from universities and National Laboratories, along with strong involvement from leading developers from the private sector, in conducting this important research. The Department will continue its effort to enhance and improve global fuel cell testing protocols through participation in the International Partnership for the Hydrogen Economy (IPHE). Component research and development activities for transportation and stationary polymer fuel cell applications are interrelated and interconnected. Transportation fuel cell components will benefit from the early market success of stationary fuel cells to ensure establishment of component manufacturing facilities, while stationary fuel cells can benefit from the investment of the automotive manufacturers, which are motivated by large transportation markets. ($38.1 million)

Technology Validation

A critical component of the program is validation of hydrogen infrastructure and fuel cell technologies under 'real world' operating conditions to help refocus research activities where needed. This effort provides critical statistical data on the status of vehicle and infrastructure technology in meeting targets in the areas of fuel cell efficiency and durability, vehicle system range, and fuel cost. Technology Validation also provides information needed for the standards activity and feedback on vehicle and infrastructure safety. Through "50-50" cost-shared partnerships with the automotive and energy industries, Fiscal Year 2007 activities include operating over 100 hydrogen fuel cell vehicles and opening several advanced technology hydrogen fueling stations. These activities are integrated within the research efforts to ensure important data is captured and fed back into research and development activities in the areas of hydrogen production, delivery, storage, and fuel cells. ($39.6 million)

Transportation Systems

This area focuses on research, development and analysis that address key barriers to the commercialization of fuel cell systems for transportation applications, including cost and durability. The activity supports development of individual component technologies critical to systems integration as well as systems-level modeling activities that serve to guide research, development and integration activities, benchmark systems progress, and explore alternate systems configurations. Other activities include studies to assess the status of critical performance measures (such as cost) and assess important materials issues (such as catalyst usage). Transportation Systems also supports the development of Auxiliary Power Units (APUs) for heavy vehicle applications and the demonstration of the feasibility of fuel cells for portable power applications. Systems components developed under Transportation Systems include compressor/expanders, sensors, and thermal and water management devices. ($7.5 million)

Distributed Energy Systems

This effort develops high-efficiency polymer electrolyte membrane (PEM) fuel cell power systems as an alternative power source to grid-based electricity for buildings and other stationary applications. The Distributed Energy Systems activity focuses on overcoming the barriers to stationary fuel cell systems, including cost, durability, heat utilization, start-up time, and managing power transients and load-following requirements. Improved heat usage and recovery are addressed for combined heat and power generation to maximize overall efficiency of thermal and electrical systems. In Fiscal Year 2007, a stationary fuel cell demonstration project, involving international and intergovernmental partnerships, will begin in support of the IPHE and the Hydrogen Interagency Task Force. Distributed energy fuel cell systems benefit from transportation fuel cell R&D, particularly in the areas of developing improved materials for high temperature membranes, improving fuel cell component durability, and water and thermal management. ($7.4 million)

Fuel Processor R&D

The focus of this activity is to develop fuel processors for stationary applications and to develop fundamental catalysts suitable for a variety of fuel processing applications such as fuel processing for auxiliary power applications. Processing fuels such as natural gas, propane, methanol, ethanol, biomass-derived liquids, or diesel will enable environmental and efficiency advantages of hydrogen fuel cell technologies to be realized in an integrated stationary fuel cell system. The option of using a diversity of fuels to produce hydrogen to power stationary fuel cells will be a significant contributor to energy independence. Synergies exist between distributed hydrogen production and integrated fuel flexible stationary fuel cell systems. ($4.1 million)

Safety and Codes and Standards

This activity focuses on the underlying hydrogen safety research required to accelerate the development of codes and standards for hydrogen and fuel cell technologies. Codes and standards for the commercial use of hydrogen generally do not exist. Successful commercialization of hydrogen technologies requires a comprehensive and defensible database on component reliability and safety, published performance-based domestic standards, and international standards or regulations that will allow the technologies to compete in a global market. Research will be conducted to determine flammability and reactive and dispersion properties of hydrogen under various conditions. Through such efforts, critical data will be generated to help write and adopt standards and to develop the safety criteria and systems that meet or exceed current technologies. In Fiscal Year 2007, additional research efforts include developing hydrogen sensors, identifying critical failure modes, and component testing. ($13.8 million)

Education

The Energy Policy Act of 2005 calls for enhanced education relating to hydrogen and fuel cells, including activities in conjunction with hydrogen demonstrations to raise awareness among the public, information exchange to facilitate the development and adoption of codes and standards, and support for institutes of higher education. Education activities are designed to increase understanding of the benefits and challenges to achieving a hydrogen economy, the facts about hydrogen safety, and the role that target audiences can play in the transition to a hydrogen economy. Target audiences, identified by key government and industry stakeholders in the National Hydrogen Energy Roadmap, include state and local governments, safety and code officials, potential end-users, and the public. Activities include development and distribution of educational materials and training to serve the specific needs of target audiences that can facilitate the transition to a hydrogen economy. ($2.0 million)

Systems Analysis

Systems Analysis enables an understanding and assessment of technology needs and progress, the potential environmental impacts, and the energy-related economic benefits of the various hydrogen supply and demand pathways. This analysis is done to directly support program decision-making, planning and budgeting, and interactions with other energy domains. Systems Analysis includes independent analysis and evaluation functions consistent with the recommendations of the National Research Council (NRC). One of the findings of the NRC's report on hydrogen states, "The effective management of the Department of Energy Hydrogen Program will be far more challenging than any activity previously undertaken on the civilian energy side of the DOE."[3] Aligned with the NRC's recommendations, Systems Analysis activities identify the impacts of various hydrogen technology pathways, assess associated cost elements and drivers, identify key costs and technological gaps, evaluate the significance of actual research results, and assist in the prioritization of research and development directions. ($9.9 million)

[3] National Research Council and National Academy of Engineering, Committee on Alternatives and Strategies for Future Hydrogen Production and Use, *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs* (Washington, DC: National Academies Press, 2004).

Manufacturing R&D

In support of the President's *Manufacturing Initiative*, this new activity focuses on R&D to design innovative and cost-effective manufacturing processes and technologies for PEM fuel cells, and hydrogen production, delivery, and storage systems. Government, academic, and industry experts identified research priorities in the *Roadmap on Manufacturing R&D for the Hydrogen Economy* during a workshop held in Washington, DC, on July 13-14, 2005. Near-term research and development will encompass manufacturing processes and technologies essential to transition to the hydrogen economy: 1) membrane-electrode assemblies and bipolar plates for fuel cells; 2) distributed reforming and electrolysis systems and components for producing hydrogen; and 3) vessels, valves, and regulators for hydrogen storage and dispensing. These research activities will cultivate a robust domestic manufacturing capability in evolving hydrogen infrastructure and fuel cell technologies, vital to establishing U.S. economic leadership in the hydrogen economy. ($2.0 million)

Hydropower Program

The Hydropower Program effectively transitioned remaining program activities and information to industry and the public sector and was closed out in Fiscal Year 2006. No funding is requested in Fiscal Year 2007.

FY 2007 Budget Request
Hydropower

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Technology Viability	3,353	149	0
Technology Application.....	1,527	346	0
TOTAL.....	**4,880**	**495**	**0**

The Fiscal Year 2007 Budget Request for Hydropower Technologies is $0.

Industrial Technologies Program

The Industrial Technologies Program seeks to reduce the energy intensity (energy demand per unit of industrial output) of the U.S. industrial sector through coordinated research and development, validation, and dissemination of energy-efficiency technologies and operating practices. Industry energy consumption accounts for about one-third of all U.S. energy use, and improved industrial energy intensity will reduce the need for new power plants, reduce the need to import petroleum from foreign sources, and lower environmental emissions. In addition, more energy efficient production processes and technologies will accelerate industrial modernization and enable U.S. companies to compete more successfully in global markets. Newly-developed technologies from the Industrial Technologies Program R&D activities are now being presented in 200 industrial energy assessments being performed across the country as part of the Secretary of Energy's "Easy Ways to Save Energy" campaign.

The Fiscal Year 2007 budget request for Industrial Technologies is $45.6 million, an $11.3 million reduction from the Fiscal Year 2006 Appropriation. This funding level reflects a shift away from activities that industry can perform on its own behalf, given that energy-intensive companies have significant economic incentives to reduce energy consumption.

FY 2007 Budget Request
Industrial Technologies

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Industries of the Future (Specific).....	37,369	24,245	17,001
Industries of the Future (Crosscutting).....	32,262	28,855	28,562
Technical/Program Management Support.....	3,740	3,755	0
TOTAL.....	**73,371**	**56,855**	**45,563**

Industries of the Future (Specific)

Working with industrial partners, Industries of the Future (Specific) supports cost-shared research, development, and demonstration of advanced technologies to reduce the energy intensity while improving the environmental performance of America's energy-intensive and waste-intensive industries. To provide the best value and optimum use of public investments, Industrial Technology activities will focus on a few basic materials processing industries that can achieve the highest returns on Federal investments. In the process of shifting toward higher priority R&D areas, the glass, mining, and supporting industries activities will be closed out, with less productive activities terminated first. Close out of these activities in Fiscal Year 2006 will include the transfer of research and development results and findings to industry and the public sector.

- Forest and Paper Products. The goal of the Forest and Paper Products activity is to develop high efficiency pulping technologies, advanced water removal technologies for papermaking,

innovative wood drying and curing concepts, and methods for improving fiber recycling. Fiscal Year 2007 activities will include mechanical and process tests for technologies that will reduce water and energy usage in the pulp and papermaking process. Collaborative activities with the American Forest and Paper Association and other industry organizations will include cost-shared R&D as well as the utilization of new improved energy technologies, industrial energy efficiency tools, and energy management best practices. ($3.0 million)

- Steel Industry. In partnership with industry, the objective of the Steel activity is to make a substantial reduction in energy intensity in steelmaking. Emphasis will be placed on activities that reduce the use of natural gas and coke and could also transform the industry. The program will continue to support the American Iron and Steel Institute, Steel Manufacturer's Association and other industry organizations to improve member companies' energy efficiency. The collaborative activities will include the continuation of cost-shared R&D as well as the utilization of new improved energy technologies, industrial energy efficiency tools, and energy management best practices. ($3.7 million)

- Aluminum Industry. The Aluminum Industry activity aims to develop advanced melting and forming technologies that would result in significant energy savings in secondary aluminum production and applications. Fiscal Year 2007 activities include the continuing development of immersion heating systems for melting, and technology in hot rolling defect reduction. ($2.3 million)

- Metal Casting Industry. The Metal Casting Industry activity enables major technical advances in the industry that implement new design techniques and processing technologies to increase yield, and reduce energy use and scraps. Fiscal Year 2007 activities will focus on computer modeling of lost foam patterns, and the simulation and prevention of hot tear for defect and scrap reduction in steel castings. ($1.0 million)

- Glass. Close out of this activity in Fiscal Year 2006 included the transfer of research and development results and findings to the industry and the public sector. ($0 million)

- Chemicals. The goal of the Chemicals activity is to develop reaction, separation, new chemical process chemistry, and alternative feedstock technologies that will increase energy efficiency by up to 20 percent by 2020, compared to 1998 technologies. In Fiscal Year 2007, research will include the completion of demonstration testing of In-Situ Sensors, Low Cost Chemical Feedstocks Using Natural Gas Liquid (NGL) Removal Process, and Production and Separation of Fermentation-Derived Acetic Acid. The program will continue work to develop transformational technologies for hybrid distillation and micro-reactor technologies and investigate research avenues for the reduction of natural gas use through transformational technologies. ($7.0 million)

- Mining. Close out of this activity in Fiscal Year 2006 included the transfer of research and development results and findings to the industry and the public sector. ($0 million)

- Supporting Industries. Close out of this activity in Fiscal Year 2006 included the transfer of research and development results and findings to the industry and the public sector. ($0 million)

The Industries of the Future (IOF) (Crosscutting)

Industries of the Future (Crosscutting) focuses on technologies that have potential applications across many partner industries and bring the potential of significant national economic, energy and environmental benefits.

- Industrial Materials of the Future. Research and development focus on new materials to reduce industrial energy use by more than 200 trillion Btu in 2020. Fiscal Year 2007 activities will include the completion of software development for the prediction of localized corrosion, and completion of development of ultrananocrystalline diamond coatings for rotating pump and seal surfaces. Work will continue on the development of transformational advanced materials solutions such as thermoelectric materials for energy loss recovery, refractories for industrial systems, and materials solutions for corrosion and wear. Research activities on national priorities such as nano-manufacturing will be increased. Funding will be ended for the M-PLUS program to allow for funding of higher priority activities in accordance with the RDIC guidelines ($10.1 million)
- Combustion. The goal is to develop by 2010 boilers that will be commercially available with thermal efficiencies 10-12 percent higher than conventional technology and single digit ppm NO_x emissions. Fiscal Year 2007 activities will include initiation of development of a Computational Fluid Dynamics-based design tool, and the continuation of work initiated in Fiscal Year 2005 for a transformational superboiler. ($2.4 million)
- Robotics. Research efforts are combined with the activities in the Sensors and Automation area.
- Sensors and Automation. This program seeks to develop systems that ultimately will enable a level of productivity and product quality currently unattainable under human or machine control and produce a gain of at least five percent in energy efficiency. Fiscal Year 2007 activities will include evaluation of networked industrial wireless sensor systems in industrial environments, and development and host site testing of a machine-vision based steel quality sensor. ($3.1 million)
- Industrial Assessment Centers. This program seeks by 2020 to have completed more than 20,300 Industrial Assessment Audits. Since its inception in 1976 as the Energy Analysis and Diagnostic Center Program, the program has trained more than 3,550 engineering students. In Fiscal Year 2007, the program will perform 350 days of industrial assessments while providing energy, waste, and productivity training to another 120 engineering students at 14 newly selected universities to help provide a nationwide cadre of experienced and trained engineering alumni. The student certification program will provide these students with credentials important in their further graduate studies and/or in their careers in saving energy in industry. ($4.0 million)
- Best Practices. This program will continue technical assistance to plant sites, enabling their use of industrial process application tools relevant to energy feedstock selection and switching, motor, pump, process heating, steam and compressed air systems emphasizing system-level improvements. The program partners with trade and technical associations to develop new software tools and update existing tools, as necessary. In Fiscal Year 2007, the program will continue efforts to replicate plant-wide assessment results from prior awards in industrial facilities with similar process lines. Allied Partnerships will be used to facilitate delivery and replication of the entire Best Practices portfolio. The program will conduct "Save Energy Now" energy savings assessments to reduce manufacturing plant natural gas consumption in support of the Secretary of Energy's "Easy Ways to Save Energy" campaign. ($8.8 million)

Solar Energy Program

The mission of the Solar Energy Program (Solar Program) is to accelerate widespread commercialization of clean solar energy technologies across America by 2015, diversifying the Nation's electricity supply options, while increasing national security and improving the environment. The Solar Program focuses its research and development activities in two technology areas, photovoltaics and concentrating solar power, to improve their performance and reliability while reducing their cost. To achieve its mission, the Solar Program is launching the *President's Solar America Initiative* (SAI) in Fiscal Year 2007, a major new photovoltaics effort featuring Federal partnerships with industry, universities, National Laboratories, States, and/or other governmental entities. Through advances in photovoltaic technologies, SAI is designed to achieve the President's goal of reducing our overall demand for natural gas and lowering our energy costs. SAI currently includes funding for concentrating solar power activities.

FY 2007 Budget Request
Solar Energy

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Photovoltaic Energy Systems.....	65,844	59,967	139,472
Concentrating Solar Power.....	5,873	7,425	8,900
Solar Heating and Lighting	2,418	1,465	0
Congressionally Directed Activities..	10,120	14,256	0
TOTAL.....	**84,255**	**83,113**	**148,372**

The Fiscal Year 2007 Budget Request for Solar Technologies is $148.4 million, a $65.3 million increase from the Fiscal Year 2006 Appropriation.

Photovoltaic Energy Systems (PV)

The Solar Program focuses on achieving the Department's goal of making solar energy an important part of the national energy supply portfolio through the development of highly-reliable PV systems with user lifetime energy costs competitive with electricity from conventional resources. The PV subprogram attempts to achieve this goal by: 1) increasing their sunlight-to-electricity conversion efficiency (performance); 2) increasing system operating lifetime and reliability; and 3) reducing the manufacturing cost of cells, modules, and systems.

The basic building block of a PV system is a power module, which is typically one square meter in size and produces 120 Watts of power. The power module comprises 50-60 percent of the cost of an installed system and presents the greatest opportunity for cost savings. Current (2005) crystalline silicon (c-Si) power modules produced in the United States are approximately 13.5 percent efficient

and produce electricity at 18 to 23 cents/kWh (lifetime system user cost over 30 years). Crystalline silicon is the most mature technology and comprises 94 percent of the market, but competing PV technologies with the potential to achieve low costs, such as thin film and multi-junction cell technologies, have begun to achieve increased market share.

To lower costs more rapidly and improve performance, the Department is launching the *President's Solar America Initiative* (SAI) to focus on PV technology pathways that have the greatest potential to reach cost competitiveness by 2015. New industry-led partnerships, known as "Technology Pathway Partnerships," will be funded to aggressively address the issues of cost, performance, and reliability associated with each pathway. Under SAI, the Solar Program anticipates substantial work on PV modules, the heart of PV systems, as well as other "balance-of-system" (BOS) components and engineering practices. In addition to PV industry members, potential partners within the Technology Pathway Partnerships include universities, National Laboratories, States, and/or other governmental entities. Aggressive milestones and metrics will be used in a stage-gate process to monitor and accelerate progress, including periodic down-selects to focus only on pathways with the best outlook for success. The Solar Program will work with the Office of Science, the Building Technologies Program (EERE), and the Federal Energy Management Program (EERE) on SAI activities.

- Fundamental Research. In Fiscal Year 2007, this activity will be reduced in scope and realigned to devote more resources to the Advanced Materials and Devices activity to support the SAI Technology Pathway Partnerships. Work under the *University Research Project*, the *High Performance Initiative* and the *Collaborative Crystalline Silicon Initiative* will be reduced in scope in Fiscal Year 2007. Meanwhile, work under *Module Reliability R&D* is being transferred to Fundamental Research from Advanced Materials and Devices. The Solar Program is working closely with the Office of Science to coordinate and accomplish basic solar research needs. ($30.0 million)

- Advanced Materials and Devices. The Advanced Materials and Devices (AM&D) activity has traditionally had three focus areas: the *Thin Film Partnership*, *Advanced Manufacturing R&D*, and *Module Reliability R&D*. Starting in Fiscal Year 2007, these activities will be realigned to support the new SAI. The SAI "Technology Pathway Partnerships" will aggressively address the technical issues associated with key PV technologies. A detailed plan for implementing the work and accomplishing the goals of SAI is under development and will be completed during Fiscal Year 2006. Under SAI, Technology Pathway Partnerships will undergo a rigorous evaluation with the objective of down-selecting in future years so that only the most successful pathways receive further funding. The *Thin Film Partnership* has maintained strong research teams to focus R&D on promising thin-film technologies. Current work under this activity will be concluded in Fiscal Year 2007 and all future work in this area will be performed under the competitive solicitation for Technology Pathway Partnerships. *Advanced Manufacturing R&D* features strong partnerships with the domestic PV industry to meet program goals. Current work under this activity will be concluded in Fiscal Year 2007 and all future work in this area will be performed under the competitive solicitation for Technology Pathway Partnerships. In *Module Reliability R&D*, researchers have been working to solve reliability issues such as degradation mechanisms and intrinsic instabilities of pre-commercial thin film modules. This important activity is being transferred to Fundamental Research where it will be continued. ($94.5 million)

- Technology Development. All activities under Technology Development will be adjusted toward achieving the accelerated cost goals under SAI. *Systems Engineering and Reliability* focuses on the critical need to improve reliability of the entire PV system, including balance-of-system components such as DC-to-AC power inverters and battery charge controllers. *Building Integrated Photovoltaics* is a promising solar application in which PV modules serve the dual purpose of replacing conventional building materials and generating electricity. *Solar Powers America* replaces the former Million Solar Roofs activity as the new deployment arm of SAI. *Solar Powers America* will identify and fund cost-shared opportunities to promote the deployment of current PV technologies and build relationships to assist in the eventual deployment of advanced PV technologies developed under SAI. ($15.0 million)

Concentrating Solar Power (CSP)

Concentrating solar power (CSP) systems utilize the heat generated by concentrating and absorbing the sun's energy to drive a heat engine/generator to produce electric power. Concentrating sunlight produces thermal energy at temperatures ranging from 600° F to over 1500° F, which can be used to run heat engines or steam turbines for generating power or producing clean fuels such as hydrogen. There are currently three types of solar thermal systems – parabolic trough, power tower and dish-engine systems – that are capable of producing power using the sun's heat. Trough systems use linear parabolic concentrators to focus sunlight along the focal lines of the receivers. In a power tower system, a field of two-axis tracking mirrors, called heliostats, reflects sunlight onto a receiver that is mounted on top of a centrally located tower. Dish-engine systems are well suited for distributed mini-grid applications ranging in size from 2 to 25 kilowatts (kW), but can also be configured for large power applications as illustrated by power purchase agreements signed in 2005 for dish projects of 300 megawatts (MW) and 500 MW.

In Fiscal Year 2007, the development of advanced thermal energy storage technologies will be expanded. This will include a field experiment. The development of parabolic trough concentrators and receivers will continue and field validation will be conducted on new collector technology. For distributed applications, research in Fiscal Year 2007 will focus on improving the reliability of dish systems through the operation and testing of multiple units at Sandia National Laboratory test facilities. Construction will be completed of a 1 MW dish demonstration project. Technical support will also be provided to the Western Governors' Association to assist its CSP deployment activities. ($8.9 million)

Vehicle Technologies Program

Activities in the Vehicle Technologies Program contribute to two cooperative government/ industry activities: the *FreedomCAR and Fuel Partnership* (where CAR stands for Cooperative Automotive Research) and the *21st Century Truck Partnership*. The *FreedomCAR and Fuel Partnership* is a collaborative effort among three domestic automobile manufacturers, five energy suppliers, and DOE for cooperative, pre-competitive research on advanced automotive technologies having significant potential to reduce oil consumption. Vehicle Technologies Program activities in the *FreedomCAR and Fuel Partnership* focus on advanced, high-efficiency vehicle technologies such as advanced combustion engines and enabling fuels, hybrid vehicle systems (including plug-in hybrids), high-power and high-energy batteries, materials, and power electronics. These critical technologies can lead to near-term oil savings when used in advanced combustion hybrid electric vehicles; they are also the foundation for the hydrogen fuel cell hybrid vehicles of tomorrow. A new emphasis in Fiscal Year 2007 is R&D on technologies such as high energy batteries needed for plug-in hybrid electric vehicles that have promise for even greater oil savings.

The *21st Century Truck Partnership* has similar objectives but is focused on commercial vehicles. The partnership involves key members of the commercial vehicle industry, (truck equipment manufacturers and engine manufacturers) along with three other Federal agencies. The R&D centers on improving advanced combustion engine systems and fuels and reducing parasitic losses.

FY 2007 Budget Request
Vehicle Technologies

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Vehicle Systems	13,004	13,056	13,315
Innovative Concepts	494	495	500
Hybrid and Electric Propulsion	44,066	43,977	50,841
Advanced Combustion Engine R&D	48,480	45,588	46,706
Materials Technology	36,042	35,269	29,786
Fuels Technology	12,419	13,709	13,845
Technology Introduction	4,944	6,250	11,031
Technical/Program Management Support	1,877	2,475	0
Congressionally Directed Activities	0	20,295	0
Biennial Peer Reviews	0	990	0
TOTAL	**161,326**	**182,104**	**166,024**

In Fiscal Year 2007, the Department is requesting $166.0 million for the Vehicle Technologies Program, $16.1 million less than the Fiscal Year 2006 Appropriation. The Fiscal Year 2007 request fully supports the *FreedomCAR* goals for hybrid and internal combustion powertrain systems. In addition, Vehicle Technologies is devoting $14 million to plug-in (also known as plug-compatible) hybrid electric vehicle (PHEV) R&D where the potential benefits could be significant.

Vehicle Systems

The Vehicle Systems subprogram funds R&D on advanced vehicle technologies and auxiliary equipment that could achieve significant improvements in fuel economy for passenger and commercial vehicles without sacrificing safety, the environment, performance, and affordability. This subprogram's funding contributes to both *FreedomCAR* and *21st Century Truck* activities. ($13.3 million)

- Heavy Vehicle (HV) Systems R&D works with commercial vehicle manufacturers and their suppliers to develop technologies that will reduce non-engine parasitic energy losses from aerodynamic drag, tire rolling resistance, friction and wear, under-hood thermal conditions, and accessory loads, as well as ensure that integration of advanced powertrain and truck systems will increase overall system energy efficiency. In Fiscal Year 2007, the program will compare vehicle energy efficiency results from wind tunnel tests, on-road testing, and theoretical calculations. A primary effort will be to enhance the capabilities of a heavy vehicle systems model by incorporating on-road data from the Truck Manufacturers Association tests and by integrating computational fluid dynamics models. ($6.1 million)
- Ancillary Systems will perform laboratory evaluation of hardware, conduct advanced simulations and modeling to determine the impact of improvements on efficiency, and prepare a final report. These efforts will all help in the transfer of the R&D results to industry. The activity is to conclude in Fiscal Year 2007. ($0.3 million)
- Simulation and Validation develops and validates models and simulations to predict the fuel economy and emissions of advanced vehicles. The simulations will be used to predict and optimize vehicle systems performance, evaluate technical targets, and link the Vehicle Technologies Program objectives of reduced fuel consumption with technology-specific component goals. With industry input, these models are used to develop performance targets for the complete range of vehicle platforms and their components to facilitate prioritization of technology research and development activities. In Fiscal Year 2007, the models and simulation tools will also be extended to allow characterization and exploration of design alternatives for hybrid vehicles, including plug-in hybrids. ($6.9 million)

Innovative Concepts

- Graduate Automotive Technology Education (GATE) activities aid in the development of interdisciplinary curricula to train the future workforce of automotive engineers. In Fiscal Year 2007, the program will fund GATE Centers of Excellence (competitively selected) to develop new university curricula and provide research fellowships for approximately 25 students for research in advanced automotive technologies, including hybrid fuel cell vehicles. ($0.5 million)

Hybrid and Electric Propulsion

This subprogram funds R&D for both passenger and commercial vehicles. Efforts include research in energy storage systems, advanced power electronics and electric motors, and hybrid system development and integration. A key objective of the Hybrid and Electric Propulsion R&D subprogram is to reduce the volume production cost of a high-power 25kW battery for use in passenger vehicles from $3,000 in 1998 to $500 by 2010. ($50.8 million)

- Energy Storage supports long-term research, applied research, and technology development for both passenger and commercial vehicles. Long-term research is focused on developing advanced energy storage technologies for hybrid and electric vehicle applications. Applied research is focused on the development and validation of low-cost and long-life batteries for hybrid vehicle applications. Technology research and development for all passenger vehicle energy storage is conducted with industry through the United States Advanced Battery Consortium (USABC). Federal advanced battery development is coordinated through the Interagency Advanced Power Group (DOE, NASA, Army, Navy, and the Air Force). ($32.0 million)
    - *High Power Energy Storage*. Fiscal Year 2007 activities will include further development of full-sized lithium-ion cells using low-cost, stable, high-performance cathode materials based on abundant, low-toxicity manganese oxide. Low-cost separator technology will be transferred to developers and suppliers for validation and incorporation into full-size prototype cells, modules, and batteries. Early-stage development of an advanced battery for use in fuel cell hybrid vehicles will continue. Benchmark testing and assessments of non-battery energy storage devices, such as ultracapacitors, with applicability to hybrid vehicle systems, will be conducted. ($17.7 million)
    - *Advanced Battery Development*. Fiscal Year 2007 activities will accelerate the benchmarking of candidate technologies for electric vehicle and plug-in hybrid applications. Possible candidates include advanced high-energy lithium-ion systems with gel and/or polymer electrolytes. Data from these studies will be combined with similar data from other development contracts to identify areas for additional R&D, particularly addressing the needs of plug-in hybrid vehicles. Based on positive assessment results, the program will competitively select one or more manufacturers or teams of manufacturers and researchers to develop and begin production of cost-effective batteries suitable for either plug-in hybrid or electric vehicle application. ($7.8 million)
    - *Exploratory Technology Research.* Innovative energy storage systems offering the potential for significant improvements over existing technologies for use in hybrid vehicles, including fuel cell hybrid vehicles, will be examined. Novel anode and cathode materials and electrolytes that have higher energy capability, longer and more stable cycling characteristics, and are lower in cost, will be developed and characterized. Investigations will include the development of diagnostics and the development/application of models to evaluate failure mechanisms. Novel electrochemical energy storage technologies, specifically non-lithium battery technologies such as Mg-based and Al-based chemistries, will be explored. ($6.5 million)
- Advanced Power Electronics develops low-cost converters and motor controllers, and motors needed for fuel cell and combustion hybrid electric vehicles. In Fiscal Year 2007, key efforts will be focused on developing integrated inverters, advanced permanent magnet motors, DC/DC converters, SiC components, low-cost permanent magnet materials, capacitors, advanced thermal systems, and motor control systems to meet passenger vehicle requirements. Existing work in these areas will be expanded to address the different demands created by plug-in hybrid systems. Preliminary deliverables will be tested at National Laboratories for conformance to specifications. ($14.1 million)

- Subsystem Integration and Development validates achievement of technical targets for components and subsystems by emulating a vehicle-operating environment. Data gathered are used to validate simulation models, which are used to predict fuel economy and emissions for hybrid vehicles. ($4.7 million)

    - *Light Vehicle Propulsion and Ancillary Subsystems.* Activities will include use of hardware-in-the-loop techniques to emulate fuel cell propulsion and advanced hybrid electric systems and determine energy storage requirements for different advanced vehicle subsystem technologies and configurations. The Advanced Powertrain Research Facility will be used to benchmark cutting edge hybrid, hydrogen internal combustion engine, and other advanced automotive technologies. Engine emission models will analyze the impact of emissions control on fuel economy. Performance targets will be validated in a systems environment for deliverables from the power electronics and energy storage technology research and development activities. ($4.7 million)

    - *Heavy Vehicle Propulsion and Ancillary Subsystems*. In Fiscal Year 2007, this sub-activity has been terminated to focus efforts on R&D with a greater potential to reduce oil consumption. ($0.0 million)

Advanced Combustion R&D

This subprogram focuses on removing critical technical barriers to commercialization of higher efficiency, advanced internal combustion engines for passenger and commercial vehicle application. The goals are to improve the engine efficiency for passenger vehicles to 45 percent by 2010 and for commercial vehicles to 55 percent by 2013, while meeting cost, durability, and emissions objectives. ($46.7 million)

- Combustion and Emission Control supports the goal of energy-efficient, clean vehicles powered by advanced internal combustion engines using clean, hydrocarbon- and non-petroleum-based, and hydrogen fuels. In Fiscal Year 2007, there will be a continued emphasis on research in advanced combustion regimes (Homogeneous Charge Compression Ignition and other modes of low temperature combustion) that have the potential to achieve the efficiency goals for cars and trucks while maintaining cost and high durability with near-zero emissions. ($24.6 million)

- Heavy Truck Engine develops technologies for diesel engines, such as optimized combustion, fuel injection, emissions control, and waste heat recovery systems, along with reduced friction and pumping losses, with the goal of improving the thermal efficiency to 55 percent by 2013 while meeting Federal emissions standards. In Fiscal Year 2007, a continued emphasis will be placed on improving engine efficiency up to 50 percent through the utilization of advanced combustion regimes capable of reducing engine-out emissions of NO_x and PM to near-zero levels. ($14.9 million)

- Waste Heat Recovery develops technologies to convert waste heat from engines directly to electrical energy to improve overall thermal efficiency and reduce emissions. In Fiscal Year 2007, cost-shared cooperative agreements to develop devices, such as thermoelectric generators and electric turbo-compounding units, to recover energy from waste heat will continue. ($4.7 million)

- Health Impacts evaluates the relative toxicity of emissions from new vehicle technologies developed to meet energy efficiency goals. In Fiscal Year 2007, the sample collection phase of the Advanced Collaborative Emissions study of toxic compounds for emissions from 2007 compliant commercial vehicles will be completed and any observed acute toxicity response will be reported. ($2.6 million)

Materials Technology

This subprogram supports the development of cost-effective materials and materials manufacturing processes that can contribute to fuel-efficient cars and trucks. Better, cost-effective materials make lighter vehicle structures (that provide comparable safety) and more efficient power systems possible. Lighter vehicles require less energy to operate and thus reduce the consumption of fuel. Likewise, better propulsion materials can make more efficient power systems possible, reducing a vehicle's energy consumption. ($29.8 million)

- Propulsion Materials Technology focuses on research that is critical to removing barriers to improved electric drive, advanced combustion, and emissions control technologies. ($6.0 million)
    - *Automotive Propulsion Materials* will evaluate sensitivity, response time, and stability of a prototype NO_x sensor and collaborate with industrial partners to test prototype units. ($2.0 million)
    - *Heavy Vehicle Propulsion Materials* will initiate characterization of new surface modification techniques to reduce friction/wear in engine component materials. The viability of current concepts to enhance fracture toughness and/or to ductilize ceramics for advanced engine applications will be assessed. New analytic and simulation methods that characterize, formulate, and stabilize nano-size atomic clusters to achieve high-potency, durable, cost-effective catalysts for controlling exhaust gas emissions will be examined. High-strength, lightweight, wear-resistant metal and ceramic matrix composites for applications in components of advanced high-performance, efficient engines will be characterized. ($4.0 million)
- Lightweight Materials Technology develops metal processing technologies, composite materials, recycling systems, and technical data to reduce vehicle weight while maintaining safety, performance, and reducing cost. ($19.3 million)
    - *Automotive Lightweight Materials.* In Fiscal Year 2007, emphasis will be placed on manufacturing lightweight components made from the various materials researched and developed in previous years. The purpose will be to lower the costs even further toward the Fiscal Year 2010 goal of cost neutrality. Research, development and validation of the manufacturing of automotive-grade structural carbon fiber and carbon-fiber-reinforced polymer-matrix composite (PMC) structures will be the dominant activities. Development of predictive modeling capability for polymer-matrix composites will continue with National Science Foundation collaboration. Exploration of low cost titanium alloys from inexpensive, plentiful ores will be investigated. Investigations into advanced nondestructive evaluation and rapid recycling of new automotive materials will be emphasized. ($19.3 million)

- *Heavy Vehicle High Strength Weight Reduction Materials.* In Fiscal Year 2007, this sub-activity has been terminated to focus efforts on R&D with a greater potential to reduce oil consumption. ($0.0 million)

- The High Temperature Materials Laboratory is an advanced materials R&D industrial user center at the Oak Ridge National Laboratory that develops cutting-edge analytical techniques to identify innovative materials for use in surface transportation applications. Projects include investigation of compositional crystallographic conditions of metals, alloys, ceramics, and novel materials under development for vehicle applications. The Nation's first Aberration Corrected Electron Microscope (ACEM) that has both sub-angstrom level clear imaging and chemical analysis capabilities is being used to study complex material structures such as various formulations of lean NO_x and NO_x adsorber emissions-control catalytic materials identified as promising candidates by the FreedomCAR and Fuel and 21st Century Truck partnerships. ($4.5 million)

Fuels Technology

Advanced fuel formulations will enable the development of advanced power systems operating at significantly higher efficiencies. ($13.8 million)

- Advanced Petroleum Based Fuels will initiate activity involving vertically integrated teams, including passenger vehicle manufacturers and energy companies, to identify fuel-property requirements of post-2010 passenger vehicle advanced internal combustion engines. This activity is crosscutting with the Advanced Combustion Engine subprogram. Utilizing in-house National Laboratory expertise through multi-partner cooperative research and development agreements (CRADA), the activity will continue development of predictive tools that relate molecular structure to ignition behavior and heat release of fuels in advanced internal combustion engines. This effort is conducted through experimentation and modeling, utilizing Government provided specialized equipment and scientists. Through the combined industry/Government effort, base fuel properties that affect advanced combustion regime engine operation will be identified and optimization of a base fuel will be initiated. ($6.7 million)

- Non-Petroleum Based Fuels and Lubricants formulates and evaluates biomass-based and synthetic fuels for their effects on petroleum-based fuels when used as blending agents. Specific areas being investigated include molecular make-up, effect on bulk fuel properties, and effect on engine performance, storage, handling, toxicity, and volatility. ($7.1 million)

    - *Renewable and Synthetic Fuels Utilization*. Fiscal Year 2007 activities continue development of baseline data on the relationships between molecular structure and bulk fuel properties, ignition behavior, and heat release for renewable and synthetic fuels in advanced combustion regime engines, along with work on a predictive model based on these data. The program will continue development of an index to describe and compare the suitability of renewable and synthetic fuels for use in advanced combustion regime engines. ($7.1 million)

Technology Introduction

This subprogram accelerates the adoption and use of alternative fuel and advanced technology vehicles to help meet national energy and environmental goals. The primary functions of Technology

Introduction include: regulatory and rulemaking support for the Energy Policy Acts of 1992 and 2005 alternative fuel and fleet activities; testing and evaluation of advanced technology vehicles; and advanced vehicle competitions. Clean Cities works with public-private partnerships to promote the deployment of vehicle technologies that can reduce petroleum consumption. Advanced Vehicle Competitions provide educational opportunities for university students to learn and use real-world engineering skills while demonstrating the performance of critical vehicle technologies identified by the Department of Energy and industry. In Fiscal Year 2007, the controlled, closed-track baseline testing and real-world monitored fleet evaluations will be expanded to include advanced plug-in hybrid electric vehicles. The program will identify component and system performance and reliability weaknesses to be addressed through future technology R&D activities; continue testing of first generation hydrogen-fueled internal combustion engine hybrid electric vehicles and initiate testing of second generation advanced hybrid electric vehicles, including hydraulic and ultra-capacitor equipped hybrids; and initiate fleet evaluation of passenger fuel cell vehicles. ($11.0 million)

Biennial Peer Reviews

In Fiscal Year 2007 there will not be a biennial review of either the FreedomCAR or the 21st Century Truck activities as these were performed in FY 2006. When held, these reviews are conducted by an independent party to evaluate progress and program direction. The biennial review activity, which supports the President's Management Agenda, includes an evaluation of progress toward achieving the technical and program goals of each respective partnership. Based on the evaluation, resource availability, and other factors, the partners of each effort then consider new opportunities, make adjustments to program targets, and set goals as appropriate. ($0.0 million)

Weatherization and Intergovernmental Activities Program

The Weatherization and Intergovernmental Activities Program develops, promotes and accelerates the adoption of energy efficiency, renewable energy and oil displacement technologies and practices by a wide range of stakeholders. These include State and local governments, weatherization agencies, communities, companies, fleet managers, building code officials, Native American Tribal Governments, and international partners.

FY 2007 Budget Request
Weatherization and Intergovernmental Activities

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Weatherization Assistance Program Grants	228,160	242,550	164,198
State Energy Program Grants	44,176	35,640	49,457
State Energy Activities	2,320	495	0
Gateway Deployment	33,930	25,400	0
International Renewable Energy Program	6,449	3,871	2,473
Tribal Energy Activities	5,457	3,960	3,957
Renewable Energy Production Incentive	4,960	4,950	4,946
TOTAL	**325,452**	**316,866**	**225,031**

The Fiscal Year 2007 request for Weatherization and Intergovernmental Activities is $225.0 million, $91.8 million less than the Fiscal Year 2006 Appropriation.

The reduction is due in part to activities transferred, discontinued, or scheduled to be phased-out in the Gateway Subprogram, State Energy Assistance, and a reduction in the request for Weatherization Assistance Program Grants. Additionally, the reduced Weatherization funding request enables greater investments in advanced R&D within the EERE portfolio that can address critical national priorities: reducing dependence on foreign oil, accelerating the development of clean electricity supply options, and developing highly efficient new technologies and products for our homes and buildings. A number of these advances are expected to increase the effectiveness of Weatherization efforts in the outyears.

Weatherization Assistance Grants

Weatherization Assistance provides technical assistance and formula grants to state and local weatherization agencies throughout the United States. A network of approximately 970 local agencies provides trained crews and contractors to perform weatherization services for eligible low-income households in single-family homes, multifamily dwellings, and mobile homes. Of the homes weatherized annually, 49 percent are occupied by an elderly person with special needs or a person with

disabilities. Other priorities are given to families with children, and households that spend a disproportionate amount of their income on energy bills. All homes receive a comprehensive energy audit, which is a computerized assessment of a home's energy use and an analysis of which energy conservation measures are best for the home. A combination of those energy-saving measures is then installed. ($164.2 million)

- Weatherization Assistance will provide State formula grants to enable the weatherization of 64,084 low-income homes, saving $1.53 in energy costs for every dollar invested over the life of the measures. Ninety percent of the total funding will be allocated to the States as operating funds for this purpose, i.e., for labor, materials, equipment, administrative systems, etc. Ten percent of the total program funding will be allocated for training and technical assistance to maintain a high standard of technology application, effectiveness, and results. Most training and technical assistance will be performed at state and local levels. ($159.6 million)
- Training and Technical Assistance supports effective program operations by the network of state and local weatherization agencies. DOE will conduct the second year of multi-year national evaluation to ensure that its objectives are being met and that estimates of energy savings, bill reductions, program costs, and program benefits are valid. ($4.6 million)

State Energy Program Grants (SEP)

The SEP provides financial assistance to States, enabling State governments to target their own high priority energy needs and expand clean energy choices for their citizens and businesses. With these funds and the resources leveraged by them, the State and Territory Energy Offices develop and manage a variety of programs geared to increase energy efficiency, reduce energy use and costs, develop alternative energy and renewable energy sources, promote environmentally conscious economic development, and reduce reliance on imported oil. In Fiscal Year 2007, the increased funding request supports the expansion of state and local financial and technical assistance to improve emergency preparedness and reduce the impact of energy market volatility, and may also be used to support provisions in the 2005 Energy Policy Act**.** ($49.5 million)

Intergovernmental Activities

These activities promote the market transfer of clean energy innovations for sustainable development, trade, security, environment and climate. ($11.4 million)

- International Renewable Energy Program (IREP) promotes market transformation in international energy markets to increase the installation of U.S. developed technologies. ($2.5 million)
- Tribal Energy Activities builds partnerships with Tribal governments to help assess Native American energy needs for residential, commercial, and industrial uses. Additionally, it provides technical and financial assistance in energy efficiency and renewable energy project development. Energy projects are competitively awarded on a cost-shared basis for Native American Tribes to implement comprehensive energy plans. ($4.0 million)
- Renewable Energy Production Initiative encourages the acquisition of renewable generation systems that use solar, wind, geothermal or biomass technologies by public and Tribal utilities and not-for-profit electric cooperatives by providing financial incentive payments. ($4.9 million)

Wind Energy Program

The Wind Energy Program conducts research and development in support of the Nation's fastest growing renewable energy resource. The Program addresses national energy, environmental, and security priorities through research, development and outreach to support wind technologies. Wind energy is increasingly cost-effective, domestically generated, produces no air pollution or long-term environmental damage, and provides a growing contribution to meeting America's increasing need for affordable, clean, and domestic sources of electricity.

From 1998 through 2005, the annual growth rate of wind power in the United States averaged 22 percent, faster than any other form of power generation. The rapid growth of wind power has been driven in large part by the tremendous reductions in cost that have resulted in part from wind energy research. That research has reduced the cost of electricity generation by a factor of twenty since 1982, to four cents or less per kilowatt-hour in areas with excellent winds. Although in many areas it is a low-cost solution, wind-generated power provides less than 1 percent of the Nation's electricity. Federal research and outreach are needed to allow wind energy to become a fully competitive option for significantly contributing to the Nation's energy and environmental needs.

The Fiscal Year 2007 budget request for Wind Energy is $43.8 million, a nearly $5 million increase over the Fiscal Year 2006 Appropriation.

FY 2007 Budget Request
Wind Energy

Activity	Funding ($ in thousands) FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Technology Viability	25,961	18,353	35,905
Technology Application	10,111	7,634	7,914
Congressionally Directed Activities	4,559	12,870	0
TOTAL	**40,631**	**38,857**	**43,819**

Wind Energy Technologies

The mission of the Wind Energy Program is to lead the Nation's research and development efforts to enhance the commercial viability of wind energy technology, and to address barriers to the use of wind energy in the United States in coordination with stakeholders.

The Wind Energy Program has successfully graduated its land-based, high-speed wind R&D effort, meeting its cost of energy goal of 3 cents per kilowatt hour in Class 6 winds in 2004. Since 2002, the Program has focused most of its efforts on low wind speed technology R&D, and through its public/private partnerships, has reduced the cost of energy for large systems in Class 4 onshore winds from 5.5 cents in 2002 to 4.3 cents in 2005, based on 2002 constant dollar cost of energy calculations. Based on recent emergence of U.S. offshore wind power development prospects and assessment of potential national benefits, the program is also supporting R&D for reducing the cost of offshore systems.

Achieving the Wind Program's mission will enhance the competitiveness of wind energy in conventional electricity markets and higher population density electricity markets, growing the domestic energy supply resource in areas of highest need. In addition to yielding environmental benefits by avoiding pollutant emissions, expanding affordable wind energy will benefit the Nation's infrastructure posture by reducing economic effects of fuel price or supply disruptions while increasing system reliability.

Technology Viability

This effort focuses on developing new, cost-effective technologies through research and development, using competitively-selected public/private partnerships closely coordinated with Supporting Research and Testing, which is conducted by National Laboratories. ($35.9 million)

- Low Wind Speed Technology (LWST) supports public/private partnerships for multiple large wind system technology pathways (turbines over 100 kilowatts) to achieve the goals of 3.6 cents per kilowatt-hour for onshore systems in Class 4 winds by 2012; 5.0 cents per kilowatt-hour for shallow water (depths up to 30 meters) offshore systems in Class 6 winds by 2014; and 5.0 cents per kilowatt-hour for transitional (depths up to 60 meters) offshore systems in Class 6 winds by 2016. New partnerships to catalyze industry adoption of component technology developments and emerging innovation are supported through a phased series of three competitive solicitations. These concentrate on three technical areas: conceptual design studies; component development and testing; and full turbine prototype development and testing. Fiscal Year 2007 activities will focus on fabricating a new sweep-twist adaptive blade for rotor applications; completing conceptual design studies for an optimized (shallow) offshore prototype turbine; and completing laboratory and industry tradeoff studies to identify preferred wind turbine and support structure pathways and infrastructure requirements for transitional wind applications. ($19.7 million)

- Distributed Wind Technology (DWT) supports multiple small wind system (less than 100 kilowatts) pathways for achieving the program goal of 10-15 cents per kilowatt-hour in Class 3 resources by 2007. The DWT strategy is patterned after the LWST project in its low wind speed focus and project structures. This activity is expected to be largely completed in Fiscal Year 2006, and Fiscal Year 2007 activities will focus on completion and final documentation of DWT partnership projects. ($0.5 million)

- Supporting Research and Testing (SR&T) provides technical support essential to the LWST and DWT public/private partnerships by engaging the capabilities of the National Labs, universities and other technical support available in private industry. It is composed of three key programs. *Design Review and Analysis* ensures that improved products resulting from advances in R&D are developed in a logical and safe manner and in compliance with the applicable international certification standards. *Enabling Research* provides a foundation of research activities to support development in the areas of advanced rotor development, drive train and power systems, inflow and site characterization, and systems and controls that provide the technical improvements in components and integrated systems needed to support LWST and DWT projects. Characterization of the design environment, improved computer simulation codes, advanced components, and integrated systems and controls are the main product outputs. *Testing Support* includes both facility and field tests of all newly developed LWST and DWT components and systems to ensure design and performance compliance. ($15.7 million)

Technology Application

This effort addresses opportunities and barriers, other than turbine cost of energy, concerning use of wind energy systems. ($7.9 million)

- Systems Integration efforts enhance the compatibility of wind energy technologies with the electric power system, and develop information and outreach to assure fair treatment of wind energy by power system operators, transmission owners and regulators. The scope of the activity includes research and analysis to facilitate integration of large wind farms in utility grid systems, small wind turbines in stand-alone applications such as hybrid diesel systems, and wind turbines in distributed applications, often close to customers. Technical assistance is provided to electric utilities, regulators, and other stakeholders to address issues such as system impacts from wind plant power variations, and appropriate treatment for an intermittent source such as wind power to allow such plants to participate in the competitive marketplace. Systems Integration also includes coordinated assessment and analysis of integration of wind with hydropower, other renewable energy systems, and emerging energy-related needs, such as production of hydrogen, and desalination, purification and delivery of water. ($4.0 million)

- Technology Acceptance works with stakeholders to move wind power technology into the power generation market. Wind Powering America ($3.1 million) addresses barriers to wind development at the national, State, and local levels to facilitate deployment of wind technology to bring economic benefits to the country; enhancing the use of domestic energy resources, including offshore wind resources; and stimulating sustainable Tribal and rural-based energy sectors. Technology Acceptance also supports cooperative activities with utility-based and other key stakeholder organizations to expand access to wind resource information and to provide data on technical and institutional barriers to wind power development and other topical issues. ($3.9 million)

- Supporting Engineering and Analysis has provided a number of crosscutting functions for supporting the achievement of the program's goals. These include systems analysis to track improvements in wind technology in diverse applications; assessment of future improvements in cost performance of wind technology; investigation of technical, environmental, and institutional issues to address near-term barriers for industry; participation in development of domestic and international design standards for wind turbine design and testing; and operation and management of the National Wind Technology Center. Some of these activities have been completed. In Fiscal Year 2007, remaining activities are being allocated to other parts of the program to allow appropriate tracking with program goals. ($0.0 million)

Program Direction

The Program Direction budget request provides resources for executive and technical direction and oversight required for the implementation of EERE programs. The budget request covers Federal staff, as well as associated properties, equipment, supplies, and materials required to support management and oversight of programs. Areas funded by this request include: Federal staff, information systems and technology equipment; travel; and support service contractors.

The Fiscal Year 2007 budget request for Program Direction totals $91.0 million, representing a $7.5 million decrease from the Fiscal Year 2006 Appropriation. The decrease primarily reflects consolidation of the EERE Regional Office activities at the EERE Project Management Center (PMC).

Program Direction supports staff in both Headquarters and the Field. Headquarters staff is responsible for program management, while Field staff is responsible for project management. The Project Management Center, created by EERE in Fiscal Year 2004, includes the Golden Field Office (GO), and staff at the National Energy Technology Laboratory (NETL). The Project Management Center is responsible for the field project management of R&D partnerships, laboratory contract administration, and a variety of professional, technical, and administrative functions, including administering the management and operating contract for the National Renewable Energy Laboratory and providing procurement, legal, business management, and information resource management.

Staff at the PMC will continue to work with States and communities to promote EERE programs, identify and engage community and State partners, and help integrate EERE programs with public and private sector activities. The PMC administers nearly $0.4 billion in program funding to States, localities, and regional organizations. It continues to play a key role in administering grants and implementing deployment and outreach programs. Major activities include:

- administering EERE's principal technology deployment grant programs, including the Weatherization Assistance and the State Energy Programs;
- delivering EERE's principal technical assistance programs, including Clean Cities, Rebuild America, and the Federal Energy Management Programs;
- serving as EERE's liaison to State Energy Offices, other State agencies, regional organizations, and other stakeholders involved in energy and environmental quality issues; and
- providing EERE's national program managers with customer feedback on how to make EERE programs more efficient and effective.

Program Support

The Program Support budget request provides resources for crosscutting performance evaluation, analysis and planning for EERE programs, and for technical advancement and outreach activities. The Fiscal Year 2007 budget request for Program Support activities totals $10.9 million, representing a $2.4 million decrease from the Fiscal Year 2006 Appropriation. The decrease primarily reflects ending support for a prior fiscal year congressionally directed activity.

The Planning, Analysis and Evaluation activity funded within Program Support is requesting $7.4 million in Fiscal Year 2007 and collects economic, market, and technology data in support of EERE's programs. It also develops cross-cutting analytical tools and models for forecasting future energy and technology markets, estimating the possible impacts of energy-efficiency technologies and the potential energy, economic, environmental and social benefits of those impacts. These analyses are essential for program planning, prioritization, and management of robust program pathways that can achieve EERE goals in the most cost-effective manner.

The Technology Advancement and Outreach activity within Program Support is requesting $3.5 million in Fiscal Year 2007 and communicates the EERE mission, program plans, accomplishments, and technology capabilities to a variety of stakeholder audiences including Congress, the general public, educational institutions, industry, and other government and non-government organizations. The funding requested in this budget line is focused on two EERE public information activities: managing the EERE public websites and a central Information Center which provides a toll-free information "hotline." Use of EERE's websites has expanded rapidly, and continues to grow at 1.5 million additional "page views" per year. The Information Center annually fields around 18,000 inquiries and delivers roughly 225,000 publications to consumers, businesses, and schools.

EERE Funding Summary by Program

(dollars in 1,000s)

Energy Efficiency and Renewable Energy

(dollars in thousands)

	FY 2005 Current Approp.	FY 2006 Current Approp.	FY 2007 Request to Congress	FY 2007 Request vs. 2006 Current Approp.	
Energy Supply and Conservation					
Biomass and Biorefinery Systems R&D	87,471	90,718	149,687	+ 58,969	+ 65.0%
Building Technologies	65,155	69,266	77,329	+ 8,063	+ 11.6%
Distributed Energy Resources	59,069	0	0	0	0.0%
Federal Energy Management Program	19,882	18,974	16,906	- 2,068	- 10.9%
Geothermal Technologies	25,256	23,066	0	- 23,066	- 100.0%
Hydrogen Technology	166,772	155,627	195,801	+ 40,174	+ 25.8%
Hydropower	4,880	495	0	- 495	- 100.0%
Industrial Technologies	73,371	56,855	45,563	- 11,292	- 19.9%
Solar Energy	84,255	83,113	148,372	+ 65,259	+ 78.5%
Vehicle Technologies	161,326	182,104	166,024	- 16,080	- 8.8%
Weatherization and Intergovernmental Activities	325,452	316,866	225,031	- 91,835	- 29.0%
Wind Energy	40,631	38,857	43,819	+ 4,962	+ 12.8 %
All Other					
Program Direction	98,215	98,529	91,024	- 7,505	- 7.6%
Facilities and Infrastructure	11,389	26,052	5,935	- 20,117	- 77.2%
Program Support	16,837	13,321	10,930	- 2,391	- 17.9%
Use of Prior Year Balances	- 5,648	0	0	0	0.0%
Total, Energy Supply and Conservation	**1,234,313**	**1,173,843**	**1,176,421**	**+ 2,578**	**+ 0.2%**