



U.S. Department of Energy
Energy Efficiency and Renewable Energy

The FY 2007 Budget Request

On the Threshold of Incredible Advances

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Office of Energy Efficiency and Renewable Energy

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President's State of the Union Address

*Keeping America competitive requires **affordable energy**. And here we have a serious problem: America is **addicted to oil**, which is often imported from unstable parts of the world.*

*The best way to break this addiction is through **technology....** and we are **on the threshold of incredible advances...***

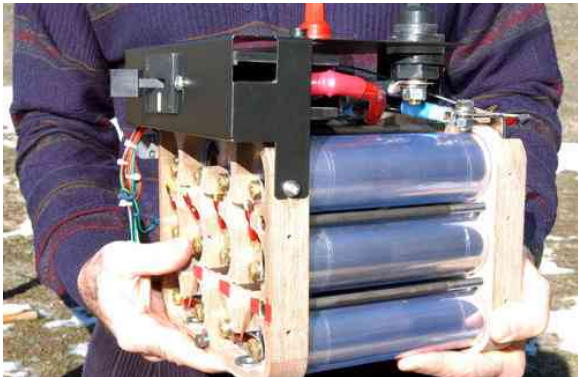
*So tonight I announce...push for breakthroughs in two vital areas...**change how we power our homes and offices, ...change how we power our automobiles.***





Change How We Power Our Automobiles

- President's Biofuels Initiative
- President's Hydrogen Fuel Initiative
- FreedomCAR





Change How We Power Our Homes & Offices

- President's Solar America Initiative
- Wind Energy Research
- Solid State Lighting Research
- Appliance Standards





Energy Technology Outreach

- Technology Advancement & Outreach
- State Energy Program
- Project Management Center





A Responsible & Focused Budget Request

	FY 2006 Approp	FY 2007 Request
Biomass and Biorefinery Systems R&D	90,718	149,687
Building Technologies	69,266	77,329
Federal Energy Management Program	18,974	16,906
Geothermal Technology	23,066	0
Hydrogen Technology	155,627	195,801
Hydropower	495	0
Industrial Technologies	56,855	45,563
Solar Energy	83,113	148,372
Vehicle Technologies	182,104	166,024
Weatherization & Intergovernmental Activities	316,866	225,031
Wind Energy	38,857	43,819
Program Support	13,321	10,930
Program Direction	98,529	91,024
TOTAL EERE	1,173,843*	1,176,421

*Congressionally directed activities = \$159 million



U.S. Department of Energy
Energy Efficiency and Renewable Energy

EERE Program Backup Slides

FY 2007 Budget Request



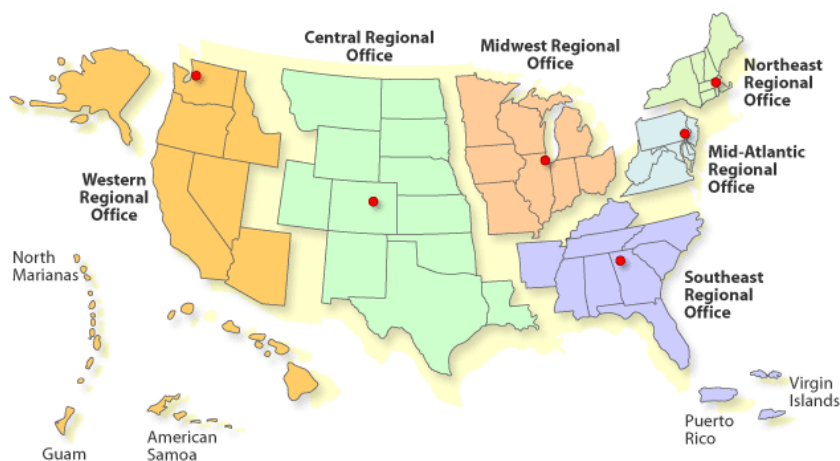
What's Different in the FY07 Request?

- Launching the **President's Solar America Initiative** to achieve market competitiveness for solar electricity by 2015 through Federal partnerships (+\$65.3 million)
- Launching the **President's Biofuels Initiative** to accelerate the cost-shared validation of biorefinery pathways using cellulosic residues and dedicated biomass crops to displace imported oil and gasoline (+\$59.0 million)
- Initiating research on technologies needed for cost effective **plug-in hybrid electric vehicles** (PHEVs) (+\$12.5 million)
- Expanding hydrogen research:
 - **Hydrogen production from renewables** (+\$28.3 million)
 - Materials based research for **hydrogen storage** (+\$8.0 million)
 - **Fuel cell stack** component research (+\$6.5 million)
 - **New manufacturing R&D activity** (\$2.0 million)



What's Different in the FY07 Request?

- Weatherization request lower
- Geothermal Program being closed out
- Project Management Center – Incorporating Regional Offices staff and functions





The SAI mission is to reduce the cost of solar power faster, resulting in cost-competitive solar electricity across all market sectors by 2015

Key photovoltaic (PV) technologies with the greatest potential for cost-competitiveness will be selected for aggressive R&D

Industry-led partnerships will pursue novel system designs and manufacturing approaches for low-cost, high-reliability, high-performance PV systems

Benefits (2015): 5-10 gigawatts of new electric capacity (powers 1-2 million homes); 10 million metric tons of avoided carbon dioxide emissions; 30,000 new jobs in the PV industry

From Lab...



...to Industry...



...to Homes & Businesses





The Biofuels Initiative objective is to foster the production of biofuels to replace more than 75 percent of our oil imports from the Middle East by 2025

Achieving this ambitious goal will require looking at corn and other biomass resources to produce ethanol, including:

- Agricultural crops & residues
- Woody plants & grasses

Biomass Program will initiate a major solicitation in FY 2007 to validate near-term ethanol biorefineries in collaboration with industry (1st validation will occur in FY 2009)

Benefits (2030): Develop technologies to enable US to displace 2.6 MMbbl/d oil equivalent, keeping \$44 billion in the US economy to create jobs at home

From Lab...



...to Industry...



...to Consumers





Moving Closer to the Hydrogen Economy

One Accomplishment at a Time

• R&D Advances

- Develop and demonstrate improved hydrogen storage materials and complete sub-scale system prototype with 2.5 wt% projected system capacity in 2006 (150% improvement over 1 wt% baseline in 2003).
- Reduce the high-volume cost of automotive fuel cells from \$275/kW (2002) to \$110/kW (2005) by increasing the power density and reducing the platinum loading (to be independently verified in FY06).
- Reduce the cost of natural gas-based hydrogen production from \$5.00 per gallon gasoline equivalent (gge) in 2003 to \$3.00 per gge in 2006 (research progress in reforming and purification technologies to be independently verified in FY06 and validated in full-scale hardware in 2009).

• Publish Learning Demonstration Composite Data Results

- Four Learning Demonstration teams are submitting fuel cell, vehicle and refueling station operational and maintenance data (63 fuel cell vehicles and 9 hydrogen refueling stations).
- Teams have submitted dynamometer testing data, e.g. fuel economy and durability testing.

• International Partnership for the Hydrogen Economy (IPHE)

- 16 nations and the European Commission now participate in the partnership.
- IPHE selected 10 international research and development projects, e.g. high-temperature thermochemical cycling for water splitting (Switzerland and U.S.).
- IPHE has conducted international workshops (on hydrogen production, hydrogen storage, fuel cells, safety, education, and socioeconomics) to identify critical activities and international partners that can leverage R&D worldwide.



Chino, California Hydrogen Fueling Station



President Bush Visits Washington, DC Hydrogen Fueling Station, May 2005



U.S. Department of Energy
Energy Efficiency and Renewable Energy

EERE Program Details

FY 2007 Budget Request



President's Hydrogen Fuel Initiative FreedomCAR Program

Budget Request

Activity	Funding (\$ in thousands)		
	FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Hydrogen Fuel Initiative			
EERE Hydrogen	166,772	155,627	195,801
FE	16,518	21,635	23,611
NE	8,929	24,750	18,665
SC	29,183	32,500	50,000
DOE TOTAL	221,402	234,512	288,077
DOT	549	1,411	1,420
HFI TOTAL	221,951	235,923	289,497
FreedomCAR			
EERE Fuel Cells	Included in Hydrogen above		
EERE Vehicles	83,374	99,000	109,774
FC-HFI TOTAL	305,325	334,923	399,271

Key Activities

- Ramp up R&D for breakthrough hydrogen storage materials through Centers of Excellence and independent projects; down-select materials to meet 2007 targets of 4.5 wt.% system capacity (EERE).
- Expand fuel cell stack component research on membranes, water transport, cathode catalysts and supports, cell hardware, innovative concepts, and effects of impurities (EERE).
- Initiate configuration studies for scaling up hydrogen membrane reactors and advanced CO₂/H₂ separation for coal-based hydrogen systems (FE).
- Complete assembly and pre-operational testing of integrated laboratory-scale sulfur-iodine thermochemical and high-temperature electrolysis experiments (NE).
- Expand basic research on nanomaterials for hydrogen storage, catalysis for fuel cells, and bio-inspired and solar hydrogen production. Increase emphasis on nanostructured design, novel synthesis, and theory and modeling of the physical and chemical interactions of hydrogen with materials (SC).
- Develop national safety guidelines, support the development of long-term vehicle system safety and materials compatibility codes and standards, and support medium and heavy duty truck and bus demonstrations (DOT).
- Initiate research to develop plug-in hybrid electric vehicle batteries incorporating promising lithium-ion battery chemistries (EERE).



Program Focus: Research, develop, and validate fuel cell and hydrogen production, delivery, and storage technologies for transportation and stationary applications.

Budget Request

Activity	Funding (\$ in thousands)		
	FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Hydrogen Production & Delivery	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 Sys.	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 Mgt. Support	535	0	0
Congressionally Directed Act.	40,236	42,520	0
TOTAL	166,772	155,627	195,801

Key Activities

- Initiate new manufacturing research to lower manufacturing costs of membrane electrode assemblies for both fuel cells and electrolyzers.
- Restart and fully fund competitively awarded renewable hydrogen production R&D including photoelectrochemical, high temperature thermochemical, biomass/ethanol and reforming, and electrolysis technologies.
- Develop and down-select materials to meet 4.5 wt.% hydrogen storage system target.
- Reduce 80kW vehicle fuel cell system cost to \$90/kW (high volume production) toward achieving 2010 goal of \$45/kW.
- Conduct “learning demonstrations” with auto & energy industry:
 - Begin operation and data collection of 2nd generation vehicles to meet 2,000 hour fuel cell durability target by 2009.
 - Validate refueling time of 5 minutes or less for 5 kg of hydrogen at 5,000 psi.
- Improve electrical efficiency for natural gas/propane fueled 5-250 kW stationary fuel cell system to 34 % at full power.
- Complete R&D on the safety of high pressure (10,000 psi) hydrogen refueling including understanding systems limitations on refueling rate.
- Develop training modules for emergency responders and code officials. Restart state and local government training and university learning centers.
- Develop models for complete energy efficiency and emission lifecycle analysis of distributed natural gas and electrolysis pathways.



Program Focus: Enable America to use less petroleum through research and development of technologies to improve the energy efficiency of cars and trucks.

Budget Request

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

Key Activities

- Initiate R&D for high energy storage batteries, power electronics/motors, and systems analysis/testing needed for plug-in hybrid electric vehicles.
- Enhance research on advanced combustion regimes with the potential for very high efficiencies and near zero emissions.
- Initiate cost shared activity with National Biodiesel Board to conduct biodiesel testing.
- Expand research for the recovery of energy from waste heat using advanced thermoelectric materials.
- Accelerate materials research directed at light, strong vehicle structures and engine components that can enhance cycle efficiency and recover waste heat.



Program Focus: Reduce oil imports through the development and validation of advanced bioconversion techniques for the production of fuels, chemicals, and materials in integrated biorefineries.

Budget Request

Key Activities

Activity	Funding (\$ in thousands)		
	FY 2005	FY 2006	FY 2007
	Approp	Approp	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

- Validate conversion technologies performance and their economics at 10% commercial scale by 2009.
- Further lower the cost of sugars and ethanol through integration of advanced enzymes with optimized pretreatment processes.
- Develop improved yeasts to reduce the cost of fermenting sugars to ethanol.
- Continue development of advanced technologies for bio-based products to enable efficient and economic integrated biorefineries.
- Initiate establishment of regional feedstock development partnerships to ensure an affordable and sustainable biomass supply across the United States.



Program Focus: 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.

Budget Request

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

Key Activities

- Launch the President’s Solar America Initiative (SAI), designed to achieve market competitiveness for solar electricity by 2015 through Federal partnerships with industry, universities, National Laboratories, States, and/or other government entities.
- Continue R&D work on PV technologies with potential for dramatic cost reductions and performance and reliability improvements.
- Continue concentrating solar power work on next-generation solar concentrators, engines, and receivers. Expand research on thermal storage.
- Terminate all solar heating and lighting activities having completed major milestones.



Program Focus: Technology development for large and small wind turbines onshore and offshore, and R&D for integrating wind into electric grid systems and distributed power applications.

Budget Request

Key Activities

Activity	Funding (\$ in thousands)		
	FY 2005	FY 2006	FY 2007
	Approp	Approp	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

- Continue support for public-private partnerships focused on large-scale, onshore low wind speed technologies and offshore development.
- Extend offshore wind technology development to include transitional (up to 60 meters) water depths, greatly expanding the U.S. wind resource near densely populated demand centers.
- Complete R&D activities to meet Distributed Wind Technology (DWT) goal of 10-15 cents per kWh for residential and small commercial-sized turbines (<100 kw) in Class 3 winds.
- Provide technical and outreach assistance that results in at least 22 States with over 100 MW wind installed.



Program Focus: Develop technologies, tools, and standards for making residential and commercial buildings and appliances more energy efficient.

Budget Request

Key Activities

Activity	Funding (\$ in thousands)		
	FY 2005	FY 2006	FY 2007
	Approp	Approp	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 Intro.	0	0	8,249
Oil Heat Research for Residential Bldgs.	493	990	0
Technical/Program Mgt. Sup.	1,479	1,485	0
Congressionally Directed Activities	0	5,346	0
TOTAL	65,155	69,266	77,329

- “Leap-frog” current lighting technology by advancing organic and inorganic light emitting diodes (LEDs) with a focus on applied research that enables the industrial base to manufacture LEDs.
- Integrate renewable energy systems into highly efficient building designs and operations, the focus of which is design packages that enable residential buildings to use 40-50% less energy than current practice.
- Improve the energy efficiency of building components and equipment, and their effective integration using whole-building-system-design techniques.
- Commitment to clear the equipment standards and test procedures backlog as well as the newly covered EPACT 2005 products.



Program Focus: Reduce the energy intensity of the U.S. industrial sector through a coordinated program of research and development, validation, and dissemination of energy efficiency technologies and operating practices.

Budget Request

Key Activities

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 Mgt. Support	3,740	3,755	0
TOTAL	73,371	56,855	45,563

- Perform industrial energy saving assessments through the Secretary of Energy's "Easy Ways to Save Energy" campaign to identify cost-effective natural gas savings of 5 to 10 percent.
- Develop a transformational pulping process that can reduce energy consumption by 2 MMBtu/ton of pulp, a 15% reduction in Kraft chemical pulping energy use.
- Develop a microchannel catalytic distillation technology with enhanced heat and mass transfer to achieve energy savings on the order of 50% for a broad range of chemical processes.
- Demonstrate new materials to extend the life of roll equipment used to produce galvanizing steel sheet from 2 weeks to 2 months, reducing process downtime, yield losses, and energy consumption.
- Continue to develop a wireless sensor network that reduces 11-18% energy consumption in industrial motor system through real-time system control.
- Form working groups for future industrial cooperation in the areas of transforming manufacturing technologies and industrial fuels and feedstock flexibility.



Program Focus: Facilitate the movement of energy efficient and renewable energy products into the marketplace for a wide range of consumers, including State and local governments, weatherization agencies, communities, companies, fleet managers, building code officials, technology developers, Native American Tribal Governments, and international agencies.

Budget Request

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

Key Activities

- Weatherize 64,084 homes at an energy savings of 2.0 million MMBtus annually.
- Provide States with grants and technical assistance to develop energy emergency plans, foster clean energy supplies, reduce demand through energy efficiency, and promote oil displacement technologies and practices.
- Provide technical support and funding for Tribal energy projects.
- Provide incentive payments for electricity production from renewables.



Program Focus: Reduce energy costs and environmental impacts of government by promoting energy efficiency, water conservation and renewable energy at Federal sites, including DOE.

Budget Request

Key Activities

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

- Will achieve between \$90 and \$130 million in private sector investment through Super ESPCs and/or UESCs, which will result in about 12 trillion Btus in energy saved over the lifecycle of the projects.
- Will provide technical and design assistance at federal facilities and provide funding for energy efficiency retrofit projects at DOE facilities, which will result in about 5 trillion Btus in lifecycle energy saved.
- Will train Federal energy attendees in energy management best practices.
- Conduct Federal awards program and publish annual report to Congress.



Program Focus: Increase the U.S. geothermal resource base and reduce the cost of heat and power through advanced technologies.

Budget Request

Key Activities

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

- Complete final closeout of Geothermal Technologies program.



Program Focus: Strengthen America's energy infrastructure and provide utilities and consumers with a greater array of energy efficient technology choices for the on-site generation of electricity and use of thermal energy.

Budget Request

Key Activities

Activity	Funding (\$ in thousands)		
	FY 2005 Approp	FY 2006 Approp	FY 2007 Request
Distributed Generation Technology Dev.	38,410	0	0
End-Use System Integration and Interface	20,136	0	0
Technical/Program Mgt. Support	523	0	0
TOTAL	59,069	0	0

- As directed in the FY 2006 Energy & Water Development Appropriation, this program was transferred functionally and budget-wise to the DOE Office of Electricity Delivery and Energy Reliability.