DOE/ME-0038
Volume 7

Department of Energy
FY 2005 Congressional Budget Request

Interior & Related Agencies

Fossil Energy Research & Development
Naval Petroleum & Oil Shale Reserves
Elk Hills School Lands Fund
Energy Conservation
Economic Regulation
Strategic Petroleum Reserve
Energy Information Administration
Clean Coal Technology

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The Department of Energy's FY 2005 Congressional Budget justification is available on the Office of Management, Budget and Evaluation/CFO homepage at http://www.mbe.doe.gov/budget/

Department of Energy
Appropriation Account Summary
(dollars in thousands -OMB Scoring)

	FY 2003 Comparable Approp	FY 2004 Comparable Approp	FY 2005 Congress Request	FY 2005 vs. FY 2004	
Interior and Related Agencies					
Fossil energy research and development	611,149	672,771	635,799	-36,972	-5.5%
Naval petroleum and oil shale reserves	17,715	17,995	20,000	+2,005	+11.1%
Elk Hills school lands fund	36,000	36,000	36,000	——	——
Energy conservation	880,176	877,984	875,933	-2,051	-0.2%
Economic regulation	1,477	1,034	——	-1,034	-100.0%
Strategic petroleum reserve	171,732	170,948	172,100	+1,152	+0.7%
Strategic petroleum account	1,955	——	——	——	——
Northeast home heating oil reserve	5,961	4,939	5,000	+61	+1.2%
Energy information administration	80,087	81,100	85,000	+3,900	+4.8%
Subtotal, Interior Accounts	1,806,252	1,862,771	1,829,832	-32,939	-1.8%
Clean coal technology	-47,000	-98,000	-140,000	-42,000	-42.9%
Total, Interior and Related Agencies	**1,759,252**	**1,764,771**	**1,689,832**	**-74,939**	**-4.2%**

Department of Energy
Appropriation Account Summary
(dollars in thousands -OMB Scoring)

	FY 2003 Comparable Approp	FY 2004 Comparable Approp	FY 2005 Congress Request	FY 2005 vs. FY 2004	
Energy and Water Development					
Energy Programs					
Energy supply	730,215	788,620	835,266	+46,646	+5.9%
Non-Defense site acceleration completion	156,129	162,411	151,850	-10,561	-6.5%
Uranium enrichment D&D fund	320,563	414,027	500,200	+86,173	+20.8%
Non-Defense environmental services	161,852	306,439	291,296	-15,143	-4.9%
Science	3,322,244	3,500,169	3,431,718	-68,451	-2.0%
Nuclear waste disposal	144,058	188,879	749,000	+560,121	+296.6%
Departmental administration	89,219	93,720	122,611	+28,891	+30.8%
Inspector general	37,426	39,229	41,508	+2,279	+5.8%
Total, Energy Programs	4,961,706	5,493,494	6,123,449	+629,955	+11.5%
Atomic Energy Defense Activities					
National nuclear security administration:					
Weapons activities	5,961,345	6,233,503	6,568,453	+334,950	+5.4%
Defense nuclear nonproliferation	1,223,453	1,334,040	1,348,647	+14,607	+1.1%
Naval reactors	702,196	761,878	797,900	+36,022	+4.7%
Office of the administrator	330,314	336,826	333,700	-3,126	-0.9%
Total, National nuclear security administration	8,217,308	8,666,247	9,048,700	+382,453	+4.4%
Environmental and other defense activities:					
Defense site acceleration completion	5,496,409	5,576,760	5,970,837	+394,077	+7.1%
Defense environmental services	1,105,778	1,012,610	982,470	-30,140	-3.0%
Other defense activities	637,125	670,083	663,636	-6,447	-1.0%
Defense nuclear waste disposal	312,952	387,699	131,000	-256,699	-66.2%
Total, Environmental & other defense activities	7,552,264	7,647,152	7,747,943	+100,791	+1.3%
Total, Atomic Energy Defense Activities	15,769,572	16,313,399	16,796,643	+483,244	+3.0%
Defense EM privatization (rescission)	——	-15,329	——	+15,329	100%
Power marketing administrations:					
Southeastern power administration	4,505	5,070	5,200	+130	+2.6%
Southwestern power administration	27,200	28,431	29,352	+921	+3.2%
Western area power administration	167,760	176,900	173,100	-3,800	-2.1%
Falcon & Amistad operating & maintenance fund	2,716	2,625	2,827	+202	+7.7%
Total, Power marketing administrations	202,181	213,026	210,479	-2,547	-1.2%
Federal energy regulatory commission	——	——	——	——	——
Subtotal, Energy and Water Development	**20,933,459**	**22,004,590**	**23,130,571**	**+1,125,981**	**+5.1%**
Uranium enrichment D&D fund discretionary payments	-432,731	-449,333	-463,000	-13,667	-3.0%
Excess fees and recoveries, FERC	-22,669	-18,000	-15,000	+3,000	+16.7%
Colorado River Basins	-22,000	-22,000	-23,000	-1,000	-4.5%
Total, Energy and Water Development	**20,456,059**	**21,515,257**	**22,629,571**	**+1,114,314**	**+5.2%**
Total, Discretionary Funding	**22,215,311**	**23,280,028**	**24,319,403**	**+1,039,375**	**+4.5%**
Yucca mountain--mandatory collection to offset discretionary funding	——	——	-749,000	-749,000	n/a
Total, Discretionary Funding	**22,215,311**	**23,280,028**	**23,570,403**	**+290,375**	**+1.2%**

Fossil Energy Research and Development

Fossil Energy Research and Development

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Fossil Energy Research and Development

Proposed Appropriation Language

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95–91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), [$681,163,000] *$635,799,000*, to remain available until expended, [of which $4,000,000 is to continue a multi-year project for construction, renovation, furnishing, and demolition or removal of buildings at National Energy Technology Laboratory facilities in Morgantown, West Virginia and Pittsburgh, Pennsylvania; of which not to exceed $536,000 may be utilized for travel and travel-related expenses incurred by the headquarters staff of the Office of Fossil Energy; *$287,000,000 is for the Clean Coal Power Initiative, of which $237,000,000 is to continue a multi-year project coordinated with the private sector for FutureGen, without regard to the terms and conditions applicable to clean coal technology projects: Provided, That the initial planning and research stages of the FutureGen project shall include a matching requirement from non-Federal sources of at least 20 percent of the costs: Provided further, That any demonstration component of such project shall include a matching requirement from non-Federal sources of at least 50 percent of the costs of the component;* and of which [$172,000,000 are] *$50,000,000 is* available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use: Provided *further*, That no project may be selected for which sufficient funding is not available to provide for the total project: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading ‘‘Clean Coal Technology’’ in 42 U.S.C. 5903d: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Governments contribution to the project on terms and conditions that are acceptable to the Department including repayments from sale and licensing of technologies from both domestic and foreign transactions*: Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects, *subject to appropriation in advance*: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. § 7651n, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations [: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account].

Explanation of Change

.....$287,000,000 is for the Clean Coal Power Initiative, of which $237,000,000 is to continue a multi-year project coordinated with the private sector for FutureGen, without regard to the terms and conditions applicable to clean coal technology projects: Provided, That the initial planning and research stages of the FutureGen project shall include a matching requirement from non-Federal sources of at least 20 percent of the costs: Provided further, That any demonstration component of such project shall include a matching requirement from non-Federal sources of at least 50 percent of the costs of the component…

This change provides funding for the continuation of the FutureGen project as a subprogram of the Clean Coal Power Initiative and provides cost sharing guidelines for the initial planning and research phases as well as the demonstration component of the project.

.....: Provided further, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas…

Language is eliminated in the FY 2005 budget request. Historical efforts have proven that this approach is ineffective in producing oil and gas and the Department believes measures currently in place are sufficient.

.....Provided further, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account…

Language is eliminated in the FY 2005 budget request. Adequate funding is provided in the program direction account to accommodate these activities.

Fossil Energy Research and Development
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Fossil Energy Research and Development						
Coal and Other Power Systems	400,622	450,484	450,484	470,000	+19,516	+4.3%
Natural Gas Technologiesy	45,860	42,994	42,994	26,000	-16,994	-39.5%
Petroleum - Oil Technology	40,983	35,078	35,078	15,000	-20,078	-57.2%
Program Direction and Management Support	87,229	106,225	112,599	106,000	-6,599	-5.8%
Plant and Capital Equipment	6,954	6,914	6,914	0	0	0.0%
Fossil Energy Environmental Restoration	9,652	9,595	9,595	6,000	-3,595	-37.5%
Import/Export Authorization	2,981	2,716	2,716	1,799	-917	-33.8%
Advanced Metallurgical Processes	5,961	9,876	9,876	8,000	-1,876	-19.0%
National Academy of Sciences Program Review	497	494	494	0	0	0.0%
Cooperative Research and Development	7,970	8,395	8,395	3,000	-5,395	-64.3%
Energy Efficiency Science Initiative	2,440	0	0	0	0	0.0%
Total, Fossil Energy Research and Development	611,149	672,771	679,330	635,799	-43,531	-6.4%

Detailed Funding Table

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Fossil Energy Research and Development			
Coal and Other Power Systems			
President's Coal Research Initiative			
Clean Coal Power Initiative	145,116	178,770	287,000
Central Systems			
Innovations for Existing Plants	21,566	21,729	18,050
Advanced Systems	69,928	68,151	46,450
Total, Central Systems	91,494	89,880	64,500
Sequestration	39,101	40,297	49,000
Fuels			
Transportation Fuels and Chemicals	21,432	21,927	16,000
Solid Fuels and Feedstocks	5,808	5,986	0
Advanced Fuels Research	3,193	3,308	0
Total, Fuels	30,433	31,221	16,000
Advanced Research			
Coal Utilization Science	8,781	11,852	8,000
Materials	8,712	11,111	8,000
Technology Crosscut	11,078	11,326	10,500
University Coal Research	2,904	2,945	3,000
HBCUs, Education & Training	969	981	1,000
Total, Advanced Research	32,444	38,215	30,500
Total, President's Coal Research Initaitive	338,588	378,383	447,000
Other Power Systems			
Distributed Generation Systems			
Fuel Cells	59,107	68,644	23,000
Novel Generation	2,927	2,469	0
Total, Distributed Generation Systems	62,034	71,113	23,000
U.S./China Energy and Environmental Center	0	988	0
Total, Other Power Systems	62,034	72,101	23,000
Total, Coal and Other Power Systems	400,622	450,484	470,000

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Natural Gas Technologies			
Exploration and Production	22,712	22,203	17,500
Gas Hydrates	9,218	9,383	6,000
Infrastructure	8,780	8,939	0
Emerging Processing Technology	2,593	0	0
Effective Environmental Protection	2,557	2,469	2,500
Total, Natural Gas Technologies	45,860	42,994	26,000
Petroleum – Oil Technology			
Exploration and Production	22,667	18,450	3,000
Reservoir Life Extension/Management	8,724	6,914	5,000
Effective Environmental Protection	9,592	9,714	7,000
Total, Petroleum – Oil Technology	40,983	35,078	15,000
Program Direction			
Fossil Energy Research and Development	87,229	91,410	92,000
Clean Coal Technology	0	14,815	14,000
Total, Program Direction	87,229	106,225	106,000
Plant and Capital Equipment	6,954	6,914	0
Fossil Energy Environmental Restoration	9,652	9,595	6,000
Import/Export Authorization	2,981	2,716	1,799
Advanced Metallurgical Research	5,961	9,876	8,000
National Academy of Sciences Program Review	497	494	0
Cooperative Research and Development	7,970	8,395	3,000
Energy Efficiency Science Initiative	2,440	0	0
Total, Fossil Energy Research and Development	611,149	672,771	635,799

Preface

Secure, affordable, and environmentally acceptable energy sources are essential if the people of our Nation and future generations are to maintain a high quality of life. In support of this, the Fossil Energy (FE) Research and Development Program addresses issues related to the supply and use of fossil fuels.

Within the Interior and Related Agencies appropriation, Fossil Energy Research and Development has eleven programs: Coal (two subprograms), Gas (one subprogram), Petroleum (one subprogram), Program Direction (two subprograms), Plant and Capital Equipment, Environmental Restoration, Import/Export Authorization, Advanced Metallurgical Research, National Academy of Science Program Review, Cooperative Research and Development, and the Energy Efficiency Science Initative.

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals, and Funding by General Goal. These items together put the appropriation in perspective. This Overview will also address R&D Investment Criteria, Program Assessment Rating Tool (PART), and Significant Program Shifts.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus, the "goal cascade" is the following:

Department Mission → Strategic Goal (25 yrs) → General Goal (10-15 yrs) → Program Goal (GPRA Unit) (10-15 yrs)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA[a] Unit" concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will completa a Program Assessment Rating Tool (PART). A unique program goals was developed for each GPRA Unit. A numbering scheme has been established for tracking performance and reporting.[b]

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals and, ultimately, to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus, the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Mission

The mission of the Fossil Energy (FE) R&D Program is to create public benefits by enhancing U.S. economic, environmental, and energy security. The program carries out three types of activities: (1) managing and performing energy-related research that reduces market barriers to the reliable, efficient and environmentally sound production and use of fossil fuels; (2) partnering with industry and others to advance clean and efficient fossil energy technologies toward commercialization in the U.S. and international markets; and (3) supporting the development of information and policy options that benefit the public by ensuring access to adequate supplies of affordable and clean energy.

Benefits

The extent to which future public benefits are realized from FE R&D activities are a complex function of factors including: success meeting R&D goals; competition from other advanced technologies; future energy prices; and the future regulatory environment. Since the future of markets and regulations are uncertain, alternative, credible scenarios need to be considered. A summary of the methodologies,

[a] Government Performance and Results Act of 1993

[b] The number scheme uses the the following numbering convention: First 2 digits identify the General Goal (01 through 07); second two digits identify the GPRA Unit; last four digits are reserved for future use.

sensitivities, and assumptions used to develop benefits estimates are important and these estimates should not be cited or referenced without their inclusion. This information will be available on the DOE/Fossil Energy website (http://www.fe.doe.gov) by March, 2004. Assessment with the PART revealed that the Department needs to continue to improve the consistency in methodology in estimating benefits for applied R & D programs across the Department.

Strategic Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspect of the mission plus seven general goals that tie to the strategic goals. The Fossil Energy Research and Development appropriation supports the following goals:

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The programs funded by the Fossil Energy appropriation have the following three Program Goals which contribute to the General Goals in the "goal cascade":

Program Goal 04.55.00.00**:** Zero Emissions Coal-Based Electricity and Hydrogen Production: Create public/private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations, and ultimately, by 2015, zero emission plants (including carbon) that are fuel-flexible, and capable of multi-product output and efficiencies over 60 percent with coal and 75 percent with natural gas.

Program Goal 04.56.00.00: Natural Gas Technologies, Abundant Affordable Gas: The Natural Gas Technologies' goal is to provide technology and policy options capable of ensuring abundant, reliable, and environmentally sound gas supplies.

Program Goal 04.57.00.00: Oil Technology, Energy Security**:** The goal of the Oil Technology program is to enhance U.S. energy security by managing and funding oil exploration and production (E&P) research and policy which results in development of domestic oil resources in an environmentally sound and safe manner.

Contribution to General Goals

FE contributes to General Goal 4 through its Coal and Other Power Systems, Natural Gas Technologies, and Oil Technology Programs.

The Coal and Other Power Systems Program ($470 million FY 2005 Request/$450.5 million FY 2004) contributes by creating public/private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations, and ultimately, by 2015, zero emission plants (including carbon) that are fuel-flexible, and capable of multi-product output and efficiencies over 60% with coal and 75% with natural gas.

One component of this program is the President's Coal Research Initiative, which includes the Clean Coal Power Initiative (CCPI) and supporting research programs. Beginning in FY 2005, the Clean Coal Power Initiatitive includes the FutureGen research project designed to establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions, including carbon (sequestration). The Administration's FY 2005 request for FutureGen is $237 million. The Clean Coal Power Initiative demonstration projects ($50.0 million FY 2005 Request)/$169.9 million FY 2004), are cost-shared partnerships between the government and industry to demonstrate advanced coal-based power generation technologies (the most advanced example of which will be FutureGen).

The President's Coal Research Initiative also includes a number of important supporting research programs:

- Innovations for Existing Plants ($18.1 million FY 2005 Request/$21.7 million FY 2004) supports the President's Clear Skies Initiative by having technologies ready for commercial demonstration between 2005 and 2010 that can achieve substantial reductions in mercury, NO_x, and SO_2 emissions from power plants at significantly lower costs than currently available technology. This includes reductions of: mercury by 50 - 70 percent at 70 percent of today's cost; NO_x to less than 0.15 lb/mmBtu at three-quarters the cost of Selective Catalytic Reduction; and PM2.5 by 99.99 percent for less than $50-$70/Kw. By 2010, technologies will be tested for reducing mercury by 90 percent at 70 percent of today's cost.

- Advanced Power Systems ($46.5 million FY 2005 Request/$68.2 million FY 2004) supports the development of ultra-high efficiency coal powerplants for central station applications that will significantly reduce greenhouse gases compared to the existing fleet with costs at or below current technology. The primary focus is integrated gasification combined cycle (IGCC) and turbines that can use coal-derived gas. This includes, by 2010, demonstrating technologies at pilot scale which validate the feasibility of an advanced IGCC capable of achieving 50% thermal efficiency at a capital cost of $1000/kW or less for a coal-based plant.

- Achieving zero carbon emissions will require economic approaches for carbon capture and storage. The goal for Sequestration R&D ($49.0 million FY 2005 Request/$40.5 million FY 2004) is to demonstrate, by 2007, technologies to reduce the cost of carbon separation and capture from new coal-based power systems by 75 percent compared to current systems ($200/tonne carbon in year 2000), as well as creating regional partnerships for investigating potential sites and studies of the needs for essential infrastructure and permitting processes. By 2012, technologies will be developed that result in less than 10 percent increase in the cost of new energy services to separate, capture, transport, and sequester carbon using either direct or indirect systems.

- Making affordable hydrogen fuels available will create a potential pathway to zero emission vehicles, and would be particularly attractive if hydrogen can be generated with minimal emissions. Fossil fuels are considered to be the most cost-effective initial source of hydrogen, and by 2010, the goal for Coal Fuels Research under the President's Hydrogen Fuels Initiative ($16.0 million FY 2005 Request/$4.9 million FY 2004) is to complete development of modules capable of co-producing hydrogen from coal at $30/barrel crude oil equivalent (no incentives or tax credits) when integrated with advanced coal power systems.

- Successful R&D depends on a program to ensure the availability of fundamental enabling technologies. Advanced Research activities ($30.5 million FY 2005 Request/$38.2 million FY 2004) contribute to sustaining U.S. preeminence in fossil fuel technology by supporting development of material, computational method, and control system knowledge needed to bridge gaps between science and advanced engineering. This activity will allow development, by 2010, of enabling technologies that support the goals of Vision 21 power systems.

The remaining area under Coal and Other Power Systems Distributed Generation ($23.0 million FY 2005 Request/$71.1 million FY 2004) focuses on cost and efficiency improvements for smaller scale electricity generation applications. It seeks, by 2010, to increase the robustness of distributed generation and thereby lower vulnerability of the electricity grid by introducing prototypes of modular fuel cells with 10-fold cost reduction ($400/kW) with 50% - 60% efficiency, and fuel cell-turbine hybrids with 70% - 75% efficiency adaptable for coal.

The Natural Gas Technologies Program ($26.0 million FY 2005 Request/$43.0 FY 2004) contributes to Goal 4 by providing technology and policy options capable of ensuring (more safely and with greater security) abundant, affordable, reliable, and environmentally sound gas supplies. Program elements will develop technologies in the near, mid and long term to increase domestic supplies of conventional gas, and gas from vast unconventional sources such as methane hydrates, and ensure an adequate storage capability. Related policy efforts will provide import/export oversight and authorization to facilitate free natural gas and LNG markets among our international trading partners.

The Oil Technology Program ($15.0 million FY 2005 Request/$35.1 million FY 2004) supports General Goal 4 by providing technology and policy options capable of ensuring oil conservation and increasing energy security through development of existing domestic oil resources in an environmentally sound and safe manner.

This program has been realigned to specifically support the President's climate change and energy security goals. The budget delineates program goals such as Enhanced Oil Recovery/CO_2 Injection, Domestic Resource Conservation, and Environmental Science as funding categories. This allows the program to narrow the focus and highlight the program's mission and goals. These investments will maximize public benefit by concentrating solely on activities that require a Federal presence to attain the President's climate change and energy security goals. For the short term, the program focuses on working with domestic suppliers to maintain existing reserves and on diversifying global oil supplies. For the mid- to longer-term, the program seeks better technology that can be applied to locate new horizons. For the long-term, the program is defining frontiers of oil production that can provide a greater amount of the Nation's petroleum needs. This will help to ensure that an adequate supply of reasonably priced oil is available to meet the expected demand while minimizing environmental impact.

Funding by General Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Goal 4, Energy Security					
Coal and Other Power Systems					
President's Coal Research Initiative					
Clean Coal Power Initiative	145,116	178,770	287,000	+108,230	+60.5%
Central Systems	91,494	89,880	64,500	-25,380	-28.2%
Sequestration R&D	39,101	40,297	49,000	+8,703	+21.6%
Fuels	30,433	31,221	16,000	-15,221	-48.8%
Advanced Research	32,444	38,215	30,500	-7,715	-20.2%
Total, President's Coal Research Initiative	338,588	378,383	447,000	+68,617	+18.1%
Other Power Systems					
Distributed Generation Systems	62,034	71,113	23,000	-48,113	-67.7%
U.S./China Energy and Environmental Center	0	988	9	-988	-100.0%
Total, Other Power Systems	62,034	72.101	23.000	-49,101	-68.1%
Total, Coal and Other Power Systems	400,622	450,484	470,000	+19,516	+4.3%
Natural Gas Technologies	45,860	42,994	26,000	-16.994	-39;5%
Petroleum - Oil Technology	40,983	35,078	15,000	-20,078	-57.2%
Advanced Metallurgical Processes	5,961	9,876	8,000	-1,876	-19.0%
Total Goal 4, Energy Security	493,426	538,432	519,000	-19,432	-3.6%
All Other					
Program Direction and Management Support	87,229	106,225	106,000	-225	-0.2%
Plant and Capital Equipment	6,954	6,914	0	-6,914	-100.0%
Fossil Energy Environmental Restoration	9,652	9,595	6,000	-3,595	-37.5%
Import/Export Authorization	2,981	2,716	1,799	-917	-33.8%
National Academy of Sciences Program Review	497	494	0	-494	-100.0%
Cooperative Research and Development	7,970	8,395	3,000	-5,395	-64.3%
Energy Efficiency Science Initiative	2,440	0	0	0	-0.0%
Total, All Other	117,723	134,339	116,799	-17,540	-13.0%
Total, General Goal 4 (Fossil Energy Research and Development)	611,149	672,771	635,799	-36,972	-5.5%

R&D Investment Criteria

For the FY 2005 budget process OMB made revisions to its Program Assessment and Rating Tool (PART) to ensure alignment with the R&D Investment Criteria. There was additional information generated under the R&D Investment Criteria for the FY 2004 process, such as years to commercialization and level of risk that was also developed by Fossil Energy in the FY 2005 process. As a result of developing this additional information and using the updated PART, the breadth of items included in the R&D Investment Criteria was fully covered.

The President's Management Agenda identified the need to tie R&D investment to performance and well-defined practical outcomes. One criterion by which the Department's performance is measured involves using a framework in the R&D funding decision process and then referencing the use and outcome of the framework in budget justification material.

The goal is to develop highly analytical justifications for applied research portfolios in future budgets. This will require the development and application of a uniform cost and benefit evaluation methodology across programs to allow meaningful program comparisons.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish out-come and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2005 Budget Request, and the Department will take the necessary steps to continue to improve performance.

Based on application of the PART:

1) The oil and natural gas technology programs are rated as ineffective, and these programs lack a rigorous peer review process;

2) The fuel cell program is adequate, well designed, planned, and managed.

3) The Coal Research Initiative is adequate, with a clear purpose.

In general, the Department needs to improve conistency in methodology and assumptions in estimating potential benefits of all applied R & D programs.

Significant Program Shifts

The most significant shift is the focusing of the Coal and Power Systems funding on the FutureGen research project designed to establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions, including carbon (via sequestration). The $237 million dollar FY 2005 request is a major commitment by the Administration, and signals the private sector and potential international partners that the Administration is serious about carrying out this project.

In addition, the FY 2005 Request reflects significantly increased funding in support of the President's Hydrogen Fuels Initiative through the development of advanced technology for producing hydrogen from coal. Another area receiving increasing emphasis is carbon sequestration, in part based on activities that will result from the FY 2004 initiation of the Carbon Sequestration Leadership Forum and seven Regional Partnerships.

Congressional Items of Interest

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
NETL Office/Lab Building	3,974	3,951	0	-3,951	-100.0%
Total, Congressional Items of Interest ..	3,974	3,951	0	-3,951	-100.0%

Fossil Energy Research and Development

Office of Fossil Energy

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Chicago Operations Office					
Ames National Laboratory					
Coal and Power Systems	487	500	480	-20	-4.0%
Total, Ames National Laboratory	487	500	480	-20	-4.0%
Argonne National Laboratory (East)					
Coal and Other Power Systems	3,885	3,582	2,802	-780	-21.7%
Natural Gas Technologies	298	210	0	-210	-100.0%
Total, Argonne National Laboratory (East)	4,183	3,792	2,802	-990	-26.1%
Brookhaven National Laboratory					
Coal and Other Power Systems	200	200	100	-100	-50.0%
Total, Brookhaven National Laboratory	200	200	100	-100	-50.0%
Total, Chicago Operations Office	4,870	4,492	3,382	-1,110	-24.7%
Idaho Operations Office					
Idaho National Engineering and Environmental Lab					
Coal and Other Power Systems	850	850	570	-280	-32.9%
Natural Gas Technologies	300	100	0	-100	-100.0%
Petroleum – Oil Technology	343	0	0	0	0.0%
Total, Idaho National Engineering and Environmental Lab	1,493	950	570	-380	-40.0%
Total, Idaho Operations Office	1,493	950	570	-380	-40.0%
Livermore Site Office					
Lawrence Livermore National Laboratory					
Coal and Other Power Systems	0	140	0	-140	-100.0%
Natural Gas Technologies	150	250	0	-250	-100.0%
Petroleum – Oil Technology	302	200	175	-25	-12.5%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Total, Lawrence Livermore National Laboratory	452	590	175	-415	-70.3%
Total, Livermore Site Office	452	590	175	-415	-70.3%
Los Alamos Site Office					
Los Alamos National Laboratory					
Coal and Other Power Systems	1,775	1,834	1,300	-534	-29.1%
Natural Gas Technologies	150	300	0	-300	-100.0%
Petroleum – Oil Technology	825	50	0	-50	-100.0%
Total, Los Alamos National Laboratory	2,750	2,184	1,300	-884	-40.4%
Total, Los Alamos Site Office	2,750	2,184	1,300	-884	-40.4%
National Energy Technology Laboratory					
National Energy Technology Laboratory					
Coal and Other Power Systems	358,414	394,973	416,089	+21,116	+5.3%
Natural Gas Technologies	40,959	37,336	24,385	-12,951	-34.6%
Petroleum – Oil Technology	36,040	31,804	14,550	-17,254	-54.2%
Program Direction and Management Support	68,452	79,196	78,851	-345	-0.4%
Plant and Capital Equipment	6,954	6,914	0	-6,914	-100.0%
Fossil Energy Environmental Restoration	8,569	8,401	5,242	-3,159	-37.6%
Cooperative Research and Development	3,965	4,177	1,480	-2,697	-64.5%
Advanced Metallurgical Research	5,961	9,876	8,000	-1,876	-18.9%
Total, National Energy Technology Laboratory	529,314	572,677	548,597	-24,080	-4.2%
NNSA Service Center					
Lawrence Berkeley National Laboratory					
Coal and Other Power Systems	200	580	100	-480	-82.7%
Natural Gas Technologies	1,250	850	300	-550	-64.7%
Petroleum – Oil Technology	500	200	125	-75	-37.5%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Total, Lawrence Berkeley National Laboratory	1,950	1,630	525	-1,105	-67.7%
Total, NNSA Service Center	1,950	1,630	525	-1,105	-67.7%
Oak Ridge Operations Office					
Oak Ridge National Laboratory					
Coal and Power Systems	5,488	6,089	4,580	-1,509	-24.7%
Natural Gas Technologies	260	510	0	-510	-100.0%
Petroleum – Oil Technology	640	0	0	0	0.0%
Total, Oak Ridge National Laboratory	6,388	6,599	4,580	-2,019	-30.5%
Total, Oak Ridge Operations Office	6,388	6,599	4,580	-2,019	-30.5%
Richland Operations Office					
Pacific Northwest Laboratory					
Coal and Power Systems	7,290	9,358	5,090	-4,268	-45.6%
Natural Gas Technologies	350	275	0	-275	-100.0%
Total, Pacific Northwest Laboratory	7,640	9,633	5,090	-4,543	-47.1%
Total, Richland Operations Office	7,640	9,633	5,090	-4,543	-47.1%
Sandia Site Office					
Sandia National Laboratories					
Coal and Power Systems	600	900	550	-350	-38.8%
Natural Gas Technologies	686	340	0	-340	-100.0%
Total, Sandia National Laboratories	1,286	1,240	550	-690	-55.6%
Total, Sandia Site Office	1,286	1,240	550	-690	-55.6%
Washington Headquarters					
Coal and Power Systems	21,433	31,478	38,339	+6,861	+21.7%
Natural Gas Technologies	1,457	2,823	1,315	-1,508	-53.4%
Petroleum – Oil Technology	2,333	2,824	150	-2,674	-94.6%
Program Direction and Management Support	18,777	27,029	27,149	+120	+0.4%
Fossil Energy Environmental Restoration	1,083	1,194	758	-436	-36.5%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Import/Export Authorization	2,981	2,716	1,799	-917	-33.7%
National Academy of Sciences Program Review	497	494	0	-494	-100.0%
Cooperative Research and Development	4,005	4,218	1,520	-2,698	-63.9%
Energy Efficiency Science Initiative	2,440	0	0	0	0.0%
Total, Washington Headquarters	55,006	72,776	71,030	-1,746	-2.3%
Total, Fossil Energy Research and Development	611,149	672,771	635,799	-36,972	-5.4%

Site Description

Ames National Laboratory

The Ames National Laboratory is located in Ames, Iowa.

Coal and Other Power Systems
Ames National laboratory conducts advanced research on virtual simulations and high temperature materials.

Argonne National Laboratory (East)

The Argonne National Laboratory (ANL), located in Argonne, Illinois, is a major multi-program laboratory managed and operated for the U.S. Department of Energy (DOE) by the University of Chicago under a performance-based contract.

Coal and Other Power Systems
Argonne research supports concepts for various technologies for Central Systems; supports DOE strategies to capture CO_2 from existing and advanced fossil fuel conversion systems in Sequestration R&D; supports DOE strategies to develop non-destructive testing examination of materials and mineral sequestration kinetics in the Advanced Research; and supports the DOE-SECA core technology program in Distributed Generation Systems.

Natural Gas Technologies
Argonne research for the Fossil Energy Natural Gas Technologies program in FY 2003 supported Drilling, Completion and Stimulation technology development and Environmental Science R&D. No activities are planned in FY 2004 and FY 2005.

Brookhaven National Laboratory

The Brookhaven National Laboratory (BNL) is located on Long Island, New York.

Coal and Other Power Systems
The Brookhaven National Laboratory conducts research on various technologies for central systems.

Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is locate outside of Idaho Falls, Idaho.

Coal and Other Power Systems
Research conducted at INEEL supports concepts for various technologies for Central Systems; conducts research on breakthrough concepts to separate and capture CO_2 in Sequestration R&D; and conducts research and development on materials development and bio-processing research in Advanced Research.

Natural Gas Technologies
Research conducted in FY 2003 supported environmental technology development, drilling technology and microbial analysis of gas hydrates, and small pipe development. In FY 2004 and FY 2005 no activity is planned.

Petroleum – Oil Technology
Research conducted in FY 2003 supported microbial enhanced oil recovery (MEOR) and environmental research. In FY 2004 and FY 2005 no activity is planned.

Lawrence Berkeley National Laboratory

The Lawrence Berkeley National Lab (LBNL) is located in Berkeley, California.

Coal and Other Power Systems
The Lawrence Berkeley Nationla Lab conducts research which supports concepts for various technologies for Central Systems; and conducts research and development on geologic sequestration approaches and measurement, monitoring, and verification protocols in Sequestration R&D.

Natural Gas Technologies
Research conducted in FY 2003 and FY 2004 supported environmental analysis and modeling, heavy oil upgrading, reservoir characterization, and gas hydrates characterization. Some reservoir characterization activities will continue in FY 2005.

Petroleum – Oil Technology
Research supports enhanced oil recovery (EOR) and environmental modeling.

Lawrence Livermore National Laboratory

The Lawrence Livermore National Lab (LLNL) is located in Livermore, California.

Natural Gas Technologies
Research conducted in FY 2003 supported environmental emissions analysis, reservoir geophysics, and hydrates properties, and hyperspectral remote leak detection. No activity is planned in FY 2004 or FY 2005.

Petroleum – Oil Technology
Research supports environmental and reservoir modeling.

Los Alamos National Laboratory

The Los Alamos National Laboratory (LANL) is located in Los Alamos, New Mexico.

Coal and Other Power Systems
Research conducted by the Los Alamos National Laboratory supports concepts for various technologies for Central Systems; conducts research and development in the area of Sequestration R&D to lower the costs of CO_2 capture, provide fundamental scientific information on engineered terrestrial sequestration approaches, and develop advanced instrumentation to measure and validate terrestrially sequestered carbon; and conducts research and development in the area of Advanced Research to model mineral sequestration and develop hydrogen separation membranes.

Natural Gas Technologies
Research conducted in FY 2003 supported multi-purpose energy meter. No activity is planned in FY 2004 or FY 2005.

Petroleum – Oil Technology
Research conducted in FY 2003 supported seismic and drilling research. No activity is planned in FY 2004 or FY 2005.

National Energy Technology Laboratory

The National Energy Technology Laboratory (NETL), located in Morgantown, West Virginia, Pittsburgh, Pennsylvania, and Tulsa, Oklahoma, is a multi-purpose laboratory, owned and operated by the U.S. Department of Energy. NETL conducts and implements science and technology development programs for the Department in energy and energy-related environmental systems. NETL's key functions are to shape, fund, and manage extramural (external) RD&D projects, conduct on-site science and technology research, and support energy policy development and best business practices within the Department.

Coal and Other Power Systems

Scientists and engineers at the National Energy Technology Laboratory (NETL) conduct basic and applied research and development in support of the Office of Coal and Power Systems programs. In-house research in the coal gasification area involves advanced materials testing; gas-stream pollutant removal; sorbents development; particulate removal; and membrane separations. NETL researchers are also working to improve the next generation of gas turbines, fuel cells, and coupled turbine-fuel cell systems. In-house emissions control research focuses on the problems of Hg and $PM_{2.5}$ because these will be regulated in the

relatively near future, while the by-product utilization in-house research solves environmental problems related to wastes and by-products formed during combustion processes. Research in carbon sequestration science studies the scientific basis for carbon sequestration options for large stationary sources of CO_2. Finally, research in computational energy science is being conduced to utilize advanced simulation techniques to improve and speed the development of cleaner, more efficient energy devices and plants.

Natural Gas Technologies
Within the Natural Gas Program, NETL has unique capability in hydrogen testing, computational chemistry, laser ignition development, and plastic pipe defect detection. With the exception of laser ignition development and plastic pipe defect detection, these functions will continue in FY 2004. Support for gas hydrates and natural gas resource assessment will continue in FY 2005.

Petroleum – Oil Technology
Specific onsite expertise in enhanced oil recovery (EOR), environmental science, computational chemistry, and policy analysis supports the Oil Technology Program.

Program Direction and Management Support
This activity provides funding for salaries, benefits and overhead expenses for management of the Fossil Energy (FE) program at the National Energy Technology Laboratory (NETL), with sites in Morgantown, WV, Pittsburgh, PA, and Tulsa, OK.

Plant and Capital Equipment
This activity provides funding for general plant projects at the National Energy Technology Laboratory (NETL), with sites in Morgantown, WV, Pittsburgh, PA, and Tulsa, OK; and the Albany Research Center. Funding is also included for the 7-year project for construction, renovation, furnishing, and demolition or removal of buildings at NETL facilities in Morgantown, West Virginia, and Pittsburgh, Pennsylvania.

Fossil Energy Environmental Restoration
Activities are to ensure protection of workers, the public, and the environment in performing the mission of the National Energy Technology Laboratory (NETL) at the Morgantown, West Virginia, Pittsburgh, Pennsylvania, and Tulsa, Oklahoma sites, and the Albany Research Center at Albany, Oregon.

Oak Ridge National Laboratory

The Oak Ridge National Laboratory (ORNL) is located in Oak Ridge, Tennessee.

Coal and Other Power Systems
The Oak Ridge National Laboratory conducts research on advanced materials that are applicable to advanced coal based power generation systems such as Vision 21 in Central Systems; conducts research and development in the area of Sequestration R&D to further geologic sequestration concepts, including measurement, monitoring and verification, and to understand the important soil parameters that facilitate terrestrial sequestration; and conducts research and development in the area of Advanced Research to develop materials and perform bio-processing research.

Natural Gas Technologies
Research conducted in FY 2003 supported oil processing environmental mitigation technologies and characterization of gas hydrates. ORNL has unique capabilities in petroleum product physical measurements, and EMAT sensor development. No specific activities are planned in FY 2004 or FY 2005.

Pacific Northwest Laboratory

The Pacific Northwest Laboratory (PNNL) is located in Richland, Washington.

Coal and Other Power Systems
The Pacific Northwest Laboratory conducts research and development in the area of Advanced Research to perform materials research and environmental analyses; and conducts research and development in the area of Distributed Generation Systems in support of the DOE-SECA program.

Natural Gas Technologies
Research conducted in FY 2003 supported reservoir geophysics, hydrate characterization, and ultrasonic strain detection. No activity is planned in FY 2004 or FY 2005.

Sandia National Laboratories

The Sandia National Laboratory (SNL) is located in Albuquerque, New Mexico, and Livermore, California.

Coal and Other Power Systems
The Sandia National Laboratories conducts research and development in the area of Sequestration R&D on injection of CO_2 into depleted oil and gas formations, and advanced monitoring methodologies based on advances seismic concepts; and conducts research and development in the area of Advanced Research to develop hydrogen separation membranes and conduct fundamental combustion research.

Natural Gas Technologies
Research conducted in FY 2003 supported air emissions detection, measurement while drilling technology, reservoir geomechanical analysis, and airborne leak detection. No activity is planned in FY 2004 or FY 2005.

Washington Headquarters

Coal and Other Power Systems
This funding provides program support and technical support for each of the program within the Coal and Other Power Systems Program.

Natural Gas Technologies
The funding provides program support and technical support.

Petroleum – Oil Technology
The funding provides program support and technical support.

Program Direction and Management Support
This activity provides funding for salaries, benefits and overhead expenses for management of the Fossil Energy (FE) program at Headquarters.

Fossil Energy Environmental Restoration
The funding provides program support and technical support.

Import/Export Authorization
The Office of Import/Export Authorization manages the regulatory review of natural gas imports and exports, exports of electricity, and the construction and operation of electric transmission lines which cross U.S. international borders.

National Academy of Sciences Program Review
This program provide for a study, in FY 2003, by the National Research Council (NRC) of prospective future benefits of Fossil Energy R&D.

Cooperative Research and Development
The funding provides program support and technical support.

Other

Coal and Other Power Systems

- The Clean Coal Power Initiative subprogram funds research at major performers at non-DOE locations. Examples of these performers include Otter Tail Power Corp. with UNDEERC and W. L. Gore & Associates, Tampa Electric, Universal Aggregates, LLC., Sunflower Electric Power Corp., CONSOL Energy, Inc., TIAX, LLC., JEA, Air Products Liquid Phase Conversion Co., and Kentucky Pioneer Energy, Ltd. with Fuel Cell Energy and Global Energy.

- The Central Systems subprogram funds research at major performers at non-DOE locations. An example of these performers include the Albany Research Center focusing on various advanced materials and process-related concepts.

- The Sequestration R&D subprogram funds research at major performers at non-DOE locations. Examples of these performers include the CO_2 Capture Project (CCP), a collaborative effort involving nine major international energy companies, that has the goal of developing advanced technologies to significantly (75%) reduce the costs of capturing CO_2 from fossil fuel energy systems, an advanced fossil fuel conversion process with inherent CO_2 capture (Alstom), development of a combined membrane-fossil fuel combustion system that would produce a pure stream of CO_2 for sequestration (Praxair), and testing a regenerable sobent system capable of capturing CO_2 from advanced coal gasification systems (RTI). The Sequestration R&D subprogram also funds research at major colleges and universities–developing an accurate cost and performance model for CO_2 capture systems (CMU); using hardwoods to restore mine lands (University of Kentucky); developing a carbon management geographic information system (MIT)–and at non-governmental organizations such as the Nature Conservancy who is developing a carbon accounting system for large forest ecosystems.

- The Fuels subprogram funds research at major performers at non-DOE locations. Examples of these performers include APCI, Texaco and Praxair.

- The Advanced Research subprogram funds research at major performers at non-DOE locations. An example of these performers include, the Albany Research Center which conducts research on materials and mineralization sequestration processes.

- The Distributed Generation Systems subprogram funds research at major performers at non-DOE locations. Examples of these performers include the SECA industry teams and SECA core technology teams.

Natural Gas Technologies
The Department's Natural Gas Technologies program, within the Fossil Energy and Development program, funds research at major performers at non-DOE locations. Examples of these performers include partnerships with industry, universities, national laboratories, state and local governments, and other organizations. Private sector participation is emphasized through industry cost-sharing with individual companies and consortia to ensure market relevance and to facilitate the transfer of technology to the private sector while leveraging Federal R&D investment. University research supported by this program contributes to U.S. technological leadership.

Petroleum – Oil Technology
The Department's Oil Technology program, within the Fossil Energy and Development program, funds research at major performers at non-DOE locations. Examples of these performers include partnerships with industry, universities, state and local governments, and other organizations. Private sector participation is emphasized through industry cost-sharing with individual companies and consortia to ensure market relevance and to facilitate the transfer of technology to the private sector while leveraging Federal R&D investment.

Fossil Energy Environmental Restoration
Activities include environmental protection, and cleanup activities at several former off-site research and development locations.

Advanced Metallurgical Processes
The Advanced Metallurgical Processes program conducts inquiries, technological investigations, and research concerning the extraction, processing, use, and disposal of mineral substances under the mineral and materials science program at the Albany Research Center in Oregon.

Cooperative Research and Development
Provides the federal share of support for Jointly Sponsored Research Programs (JSRP) at the Western Research Institute (WRI) and the University of North Dakota Energy and Environmental Research Center (UNDEERC).

Coal and Other Power Systems

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Coal and Other Power Systems						
President's Coal Research Initiative						
Clean Coal Power Initiative	145,116	178,770	178,770	287,000	+108,230	+60.5%
Central Systems	91,494	89,880	89,880	64,500	-25,380	-28.2%
Sequestration	39,101	40,297	40,297	49,000	+8,703	+21.6%
Fuels	30,433	31,221	31,221	16,000	-15,221	-48.8%
Advanced Research	32,444	38,215	38,215	30,500	-7,715	-20.2%
Subtotal, President's Coal Research Initiative	338,588	378,383	378,383	447,000	+68,617	+18.1%
Other Power Systems						
Distributed Generation Systems	62,034	71,113	71,113	23,000	-48,113	-67.7%
U.S./China Energy and Environmental Center	0	988	988	0	-988	-100.0%
Subtotal, Other Power Systems	62,034	72,101	72,101	23,000	-49,101	-68.1%
Total, Coal and Other Power Systems	400,622	450,484	450,484	470,000	+19,516	+4.3%

Mission

The mission of the Coal and Other Power Systems program is to assure the availability of abundant low cost, domestic energy (including hydrogen) to fuel economic prosperity and strengthen energy security.

Benefits

The Coal and Other Power Systems program supports DOE's overarching mission to achieve national energy security in an economic and environmentally sound manor by developing the technological capability to eliminate all environmental concerns associated with coal use. In the near term this means having the ability to meet all existing and anticipated environmental regulations at low cost and to

increase the power generation efficiency for existing and new plants. Moreover, in the longer term, the aim is to nearly double coal power plant efficiencies (from 33% to 60%), create the capability to produce low cost hydrogen from coal and to sequester (capture and store) all carbon from future coal plants at affordable costs of electricity, allowing coal to remain a key, strategic fuel for the Nation. The program mission is carried out in support of several key Presidential Initiatives including the Coal Research Initiative, Clear Skies Initiative, Global Climate Change Initiative, Hydrogen Fuel Initiative, and the FutureGen Initiative.

Background

President's Coal Research Initiative

The goal of the President's Coal Research Initiative is to produce public benefits by conducting research and development on coal-related technologies that will improve coal's competitiveness in future energy supply markets. The Administration strongly supports coal as an important part of our energy portfolio. This request carries out the President's campaign commitment to spend $2 billion on clean coal research over 10 years.

The President's Coal Research Initiative consists of the Clean Coal Power Initiative, which embodies both an industry-led, cost-shared research and development program, and FutureGen, a prototype facility that will produce electricity and hydrogen while sequestering one million metric tons of carbon dioxide per year; Central Systems, targeting central station power generation equipment including low cost emissions control technology (especially mercury); Sequestration R&D, researching ways to mitigate or separate and dispose of greenhouse gas from combustion; and Advanced Research, a set of cross-cutting long-term research projects that can potentially contribute to many aspects of the coal research program. Each of these programs is described in detail in separate sections below.

Other Power Systems

A confluence of utility restructuring, technology evolution, public environmental policy, and an expanding electricity market are providing the impetus for distributed generation to become an important energy option.

Distributed generation is the strategic application of relatively small generating units (typically less than 30 MWe) at or near consumer sites to meet specific customer needs, to support economic operation of the existing power distribution grid, or both. Reliability of service and power quality are enhanced by proximity to the customer and efficiency is improved in on-site applications by using the heat from power generation.

The Distributed Generation Program contributes to two of the energy challenges that are being addressed in the National Energy Strategy: (1) "Improving the environmental acceptability of energy production and use by improving the efficiency and economics of the use of natural gas through the use of advanced technologies," and (2) "increasing the competitiveness and reliability of U.S. energy systems." This is achieved through the strategy of encouraging the development and deployment of distributed power technologies to satisfy market forces for smaller, modular power technologies that can be installed quickly, close to consumer demand centers.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Coal and Other Power Systems program supports the following goal:

Energy Strategic Goal

General Goal 4: Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Coal and Other Power Systems program has one program goal which contributes to General Goal 4 in the "goal cascade".

Program Goal 04.55.00.00: Create public/private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations, and ultimately, by 2015, zero emission plants (including carbon) that are fuel-flexible, and capable of multi-product output and efficiencies over 60 percent with coal and 75 percent with natural gas.

Contribution to Program Goal 04.55.00.00 (Zero Emissions Coal-Based Electricity and Hydrogen Production)

- The Clean Coal Power Initiative subprogram will develop advanced coal-based power generation technologies that: improve efficiency from 2002 baseline by 40-50 percent by 2010, with environmental and economic performance capable of achieving 90 percent Hg removal at a cost of 70 percent of current technology by 2010, 0.15 lb/MMBtu NO_x at 75 percent of the cost of current technology (selective catalytic reactors), and lower capital costs for gasification technologies from $1200 per kilowatt of capacity; co-produce heat, fuels, chemicals or other useful byproducts; and, provide a deployment-ready suite of advanced technologies that can produce substantial near-, mid-, and long-range economic and environmental public benefits.

- The FutureGen research prototype facility, within the Clean Coal Power Initiative subprogram, will prove the technical feasibility and economic viability of the zero emissions (including carbon) coal concept.

- The Innovations for Existing Plants activity, within the Central Systems subprogram, supports the President's Clear Skies Initiative by having technologies ready for commercial demonstration by 2005 with the potential to reduce: mercury by 50-70 percent at 70 percent of today's cost of $50,000-$70,000/lb of mercury; NO_x to less than 0.15 lb/mmBtu at three-quarters of the cost of selective catalytic reactors (SCR), which is currently $80-$100/Kw; $PM_{2.5}$ by 99.99 percent for less than $50-$70/Kw; and acid gases by 95 percent. By 2010, test technologies for advanced cooling, mercury

reduction by 90 percent at 70 percent of today's cost of $50,000-$70,000/lb. of mercury; and a 66 percent increase in byproducts utilization.

- The Advanced Power Systems activity, within the Central Systems subprogram, will develop, by 2010, advanced power systems capable of achieving 50% thermal efficiency at a capital cost of $1000/Kw or less for a coal-based plant.

- The Fuels subprogram, by 2010, will complete development of modules capable of co-producing hydrogen from coal at $30/barrel crude oil equivalent (no incentives or tax credits) when integrated with advanced coal power systems.

- The Advanced Research subprogram sustains U.S. preeminence in fossil fuel technology by supporting development of material, computational method, and control system knowledge needed to bridge gaps between science and advanced engineering. Advanced Research efforts will allow development, by 2010, of enabling technologies that support the goals of Vision 21 power systems.

- The Sequestration subprogram, by 2007, will demonstrate at a pilot plant scale, technologies to reduce the cost of carbon separation and capture from new coal-based power systems by 75 percent compared to current systems ($200/tonne carbon in year 2000). By 2012, develop technologies that result in less than 10 percent increase in the cost of new energy services to separate, capture, transport, and sequester carbon using either direct or indirect systems.

- The Distributed Generation Systems subprogram, by 2010, will increase the robustness of distributed generation and thereby lower vulnerability of the electricity grid by introducing prototypes of modular fuel cells with 10-fold cost reduction ($400/Kw) with 40-60 percent efficiency adaptable for coal.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.55.00.00 Zero Emissions Coal-Based Electricity and Hydrogen Production					
Clean Coal Power Initiative No targets reported	No targets reported	No targets reported	Complete CCPI Round 1 solicitation, proposal evaluations and project selections to assemble the initial portfolio of advanced technologies capable of improving the economic and environmental performance of coal-based electric power generation facilities. Complete NEPA process for 3 out of the 6 active PPII projects and initiate construction or operations phases for several of the projects. Complete sufficient implementation activities on remaining projects to resolve any barrier issues. Complete demonstration tests on the LPMeOH coal-to-methanol conversion project and provide comprehensive documentation of the system and its efficiency, economics, and environmental performance for use by industry in assessing the merit for further commercial deployment of the technology.	Make go/no go decisions regarding award of cooperative agreements for up to 5 Round 1 CCPI projects and issue a Round 2 CCPI solicitation.	Initiate 100% of the active industrial projects selected under the first round of the competitive CCPI solicitation and make project selections from the second round CCPI solicitation.
Central Systems Complete pilot studies on mercury emission controls that augment existing pollution control technologies, and are	Deliver to EPA 2 years worth of high-quality $PM_{2.5}$ ambient monitoring data from the upper Ohio River Project. (MET GOAL)	Complete Phase I report characterizing concentration and composition of ambient $PM_{2.5}$ emissions as input to the EPA $PM_{2.5}$ National	Initiate projects for developing technologies to address emerging electric utility/water issues and combustion byproducts	Complete bench- and pilot-scale testing of five novel mercury control concepts capable of achieving $\geq$90% mercury capture by 2010 and	Establish baseline data for emission, transport, and deposition of mercury from coal-fired boilers in support of Clear Skies mercury

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
expected to reduce mercury emission by over 50 percent at less than half the cost originally estimated in EPA's December 1997 Report to Congress on Mercury. (MET GOAL) Complete the first large sale (600 MW) test of selective noncatalytic reduction, which will allow coal-fired power plants to satisfy ozone transport (OTAG) requirements for reduction of emissions of oxides of nitrogen and also reduce fine particulate matter. (MET GOAL) Complete demonstration of the third integrated gasification combined cycle project (Pinon Pine) utilizing air-blown gasification and hot gas cleanup for improved thermal efficiency, and continue operations of one other project (Polk) in order to establish the engineering foundation leading to new generation of 60 percent efficient power plants. (NEARLY MET GOAL)	Issue request for proposals for the commercial scale demonstration of technologies to assure the reliability of the Nation's energy supply from existing and new electric generation facilities. (MET GOAL)Demonstrate hydrogen and CO_2 separation from syngas to meet the long-term goals of providing low-cost hydrogen for high-efficiency fuel cells, and for providing concentrated CO_2 streams for sequestration. (MET GOAL) Complete design and continue construction of Circulating Atmospheric Fluidized Bed demonstration project at Jacksonville, Florida. (MET GOAL)	Ambient Air Quality Standards (NAAQS) review. This data will help identify the impact of emission sources on air quality. (MET GOAL) Complete initial tests of the IGCC transport gasifier to confirm the feasibility of the technology to significantly improve reliability, cost effectiveness, and efficiency for producing electricity and other products. (MET GOAL)	utilization and disposal. Complete preliminary field testing of alternative mercury control technologies representing two approaches for achieving 50% or greater removal. Complete fine particulate monitoring in the Upper Ohio River Valley region; complete field testing of alternative particulate matter collection technologies representing at least two approaches for achieving 99.99% removal; initiate research on $PM_{2.5}$ and mercury transport and deposition. Initiate developmental testing of SCR catalysts for reducing NO_x emissions from alternatively fueled boilers. Establish a 1-5 tpd facility capable of determining engineering feasibility, defining technical performance, and establishing operating costs for oxygen separation using membrane technology. Complete initial laboratory-scale performance testing of hydrogen separation membranes using simulated gas streams. Complete initial laboratory tests to determine performance capabilities of sorbents, sieves, and membranes for removing mercury, sulfur, nitrogen, and	initiate seven new projects under second phase of field testing of mercury control technology capable of achieving 50-70% mercury capture. Complete Ion Transport Membrane (ITM) designs with target oxygen production of 95% purity, to obtain engineering data for further technology scale-up, ultimately leading to cost reductions of $75-$100/KW, and efficiency improvements of 1-2 points by 2010. Complete at least 250 hours of high efficiency desulfurization process units operating with coal-derived synthesis gas. Eventual process units improvements are targeted to contribute a 60-80 $/KW capital cost reduction and a 1 point efficiency gain to the gasification system performance by 2010. Initiate testing on advanced hydrogen separation membranes in simulated coal gasification product streams and complete design of a hydrate pilot-scale slipstream test unit. Advanced hydrogen separation technologies target eventual sequestering of CO_2 with a less than 10% increase in electricity cost by 2012. Perform modeling, facility modifications, and conduct pilot-scale tests for	reduction component. Complete integrated testing of advanced synthesis gas cleaning technologies for the removal of sulfur, ammonia, chlorides, and mercury to near-zero emissions levels with a pilot-scale coal gasifier that will lead to capital cost reductions of $60-80.kWe and efficiency improvements of >1 efficiency points.

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
			CO_2 from gas streams. Conduct gasification support tests on leachability of gasifier residues, improved refractories, and oxygen-blown gasification of alternative fossil fuel feedstocks, and develop a simulator for a Vision 21 plant. Develop technical and cost information sufficient for DOE decision-making on the viability of proceeding with plans for construction of a co-production plant. Complete conceptual studies to assess ATS and other machines for operation on coal syngas, as well as, ATS machines in coal and natural gas based integrated hybrid power modules, complete demonstration of a low-emission steam generator, demonstrated an integrated sensor suite for real-time monitoring of an advanced turbine's operational performance, and demonstrated in-situ single crystal bladewelding and repair techniques. In the area of advanced systems initiated work on gas turbine combustor and nozzle systems for fuel flexible low-NO_x performance in IGCC applications for designs that are capable of meeting Vision 21 performance requirements.	identifying technology opportunities to increase reliability, improved performance and increased feed flexibility of advanced gasifiers. Gasification improvements target eventual capital cost reductions and a 90% single train availability by 2010. Perform a thermal analysis of syngas turbine blades, initiate testing of an H2 delivery system, and perform a systems study of an optimized IGCC turbine design. Ultimately by 2008 these and follow-on efforts will reduce IGCC NOx emissions to less than 3 ppm, reduce turbine cost by 10-20% by increasing specific power output, increase turbine firing temperature and combined cycle integration to improve efficiency by 2-3 percentage points and reduce emissions associated with high hydrogen fuels.	

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
			Continued technology base development in the areas of thermal barrier coatings, emission reductions, combustion stability, heat transfer and aerodynamics in turbines for coal derived synthesis gas.		
Sequestration R&D Commence three to four small scale carbon sequestration development projects from those selected in the FY 1998 Novel Concepts solicitation, and initiate feasibility studies for one to two sequestration projects selected under FE's August and September 1999 solicitations. (MET GOAL)	For carbon sequestration, expand the number of possible cost effective, collaborative, multi-national applied R&D options carried to the "proof-of-concept" stage. Complete multiple field experiments on promising technologies. (MET GOAL)	Complete the injection of 2,500 tons of CO_2 into a depleted oil reservoir to monitor the transport of CO_2 and verify predictive geologic models on reservoir integrity. (NOT MET)	Establish modular carbon dioxide capture test facility. This facility will accelerate development and testing of emerging low-cost separation and capture technologies while facilitating partnerships with leading technology developers and academic institutions. Complete initial set of field tests of advanced monitoring and verification methods for carbon inventories on natural and engineered terrestrial systems and establish a database for mid-continent planning of geological storage projects. Initiate evaluations of three novel concepts, comprising integrated sequestration with enhanced coal bed methane recovery, mineral carbonation, and CO_2 flooding during enhanced oil recovery and establish initial recommendations for long-term monitoring of CO_2 geological storage to assure acceptability as a safe, long-term storage option. Complete initial planning, field testing, or analyses of sequestration concepts	Design and test multiple concepts for efficient, low-cost, advanced CO2 separation and capture including on oxy-fuel combustion, membranes, and hydrates for CO2 separation. Conduct field activities that evaluate sequestration opportunities in depleted oil reservoirs and saline aquifers. Collaboratively explore with the National Academy of Sciences novel and revolutionary means of storing greenhouse gases. This portfolio of over 22 projects targets reducing the cost of carbon dioxide separation and capture by 75% by 2012 compared to year 2000 systems. Develop instrumentation and initiate field tests of advanced monitoring and verification methods for carbon inventories for geologic and terrestrial sequestration. Complete a database for mid-continent geological storage projects and initiate a framework for U.S. wide project planning. Through regional partnerships, begin U.S.-wide infrastructure	Complete pilot tests on advanced capture technologies related to membrane and hydrate configurations.

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
			involving saline aquifer storage, ocean storage, and scientific feasibility of CO_2 storage as hydrate on the ocean floor, and complete initial comparative evaluation of energy technology scenarios to identify promising concepts for CO_2 sequestration.	development of MMV protocols for carbon accounting to ensure permanence of long-term storage of CO2.	
Fuels					
No targets reported.	No targets reported.	Tests to determine ceramic membrane performance in laboratory-scale apparatus are complete. The ITM H_2/Syngas project has now tested five membranes, each of which has been operated for over six months at high pressure. Tests confirmed the selection of membrane materials and provided data for performance models. Additional laboratory-scale testing of catalysts and membrane stability will continue in support of pilot-scale operations and future commercialization. (MET GOAL)	Complete development and communication of a hydrogen program and implementation plans. Continue development of ITM membrane technology at reduced pace leading to the scaleup of the concept at the SEP level.	Prepare and communicate a Hydrogen from Coal R&D program strategy and develop solicitation research guidance for technology innovation to reduce the cost of producing hydrogen from coal.	Complete tests of advanced water-gas shift membrane reactor.
Advanced Research					
No targets reported.	No targets reported.	No targets reported.	Prepare and evaluate novel sensors and new materials for high temperature, oxidative environments to improve control, increase efficiency and performance, and/or achieve lower emissions of CO_2 and other pollutants. Complete preparation and communication of consolidated Advanced Research program and program implementation plans that incorporate	No targets reported.	No targets reported.

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
			guidance from workshops with external stakeholders. Provide student and faculty training and education through selection of 8 students to participate in the undergraduate internship program for fossil energy and environmental science research and through 15 total awards under the University Coal Research and HBCU/OMI programs for research on critical needs for enabling Vision 21 power systems.		
Distributed Generation Systems Begin testing of first market prototype solid oxide fuel cell for distributed power applications. (MET GOAL) In support of Vision 21, complete testing of a 250 kw fuel cell/turbine hybrid, and deliver a conceptual design of a one MW fuel cell/turbine hybrid power plant to facilitate market entry. (MIXED RESULTS)	Begin testing of a 300 kw - 1 MW solid oxide fuel cell/turbine hybrid commercial prototype for distributed power applications (MET GOAL) Begin construction of a one MW solid oxide fuel cell (SOFC) hybrid. (NOT MET)	Complete demonstration of a commercial-scale, 250 kw molten carbonate fuel cell (MCFC) power plant system. This test will verify the commercial design for the MCFC technology for the combined heat and power (CHP) or distributed generation (DG) market and, if successful, will justify the construction of a MCFC manufacturing facility in the U.S. (MET GOAL)	Communicate fuel cell program objectives and results and conduct peer-reviews through conferences, workshops, and web-site tools. Manage the PSPG R&D portfolio through assessment of results and selection of new projects to fill portfolio gaps. Conduct field tests necessary to establish feasibility of high temperature fuel cell hybrids and novel systems, including design, procurement, construction, and testing. Conduct cost reduction R&D programs involving near-term developers, Siemens Westinghouse and Fuel Cell Energy, for the fuel cells, including manufacturing and balance of plant (BOP) components. The SECA industrial teams	Relative to FY 2003 baseline, demonstrate a 20% improvement in fuel cell stack power density for Solid State Energy Conversion Alliance (SECA) system design. Relative to FY 2003 baselines, complete 20% improvements in cathode performance and in the service life of electrical interconnect s and transfer technology advances to the SECA industry teams to facilitate systems cost reduction and efficiency goals of $400/kW and 40-60 percent. Annual stakeholder workshops and semi-annual peer reviews will communicate progress and define future R&D requirements.	Begin prototype validation of technical requirements for low-cost SECA fuel cell systems. Test at least one prototype capable of achieving SECA cost reductions and efficiency Phase I goals. Under the SECA Core Program, validate one new sealing concept; 20% improvement in metallic interconnect performance relative to FY 2004; and 20% sulfur tolerance relative to FY 2004. These validations will aid SECA industry teams in achieving cost reduction and energy efficiency goals.

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
			shall conduct stack design and testing, including manufacturing approaches, and materials and balance of plant (BOP) systems optimization leading to the demonstration of prototypes. Conduct contracted and in-house SECA core technology of crosscutting and proof-of-concept R&D for transfer to one or more industrial teams, including know-how, patents, licenses, reports, papers in peer reviewed journals, etc.		
Efficiency Measure					Efficiency goal of greater than 90 percent of procurement milestones (e.g. solicitation issue date, proposal ranking deadline, signing of selection statement, Congressional notification, making awards, etc.) meeting the procurement plan metric.

Means and Strategies

The Coal and Other Power Systems program will continue to promote a strategy in power systems R&D that incorporates a focused and collaborative effort between government and industry to achieve the environmental and economic goals of the technologies. It will continue its dissemination of information and data and build on government-industry partnerships to commercialize clean coal technologies. For carbon sequestration, the program will continue to work with domestic and international partners to complete field experiments on promising options.

The Coal and Other Power Systems program will use various means and strategies to achieve its program goals. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet it goals.

For all activities, DOE will work collaboratively with other government and industry partners, and participate cooperatively with other countries, for example, through the International Energy Agency in the Greenhouse Gas (IEAGHG) R&D Program and the Clean Coal Technology Center. Significant cost-sharing opportunities are possible through existing and new research agreements.

Program results may be affected by: world prices for competitive feedstocks and energy technologies; new and evolving environmental regulations; or any new legislation, in particular, new legislation related to CO_2 and air pollutants that affect coal and gas use. Also, industry restructuring/deregulation issues and uncertainties will continue to challenge coal use. Program results may be particularly affected by both evolutionary and revolutionary approaches to carbon sequestration.

Validation and Verification

The program and projects contained within this goal will be evaluated at the annual contractor's meeting. In addition, program benefits are estimated using macroeconomic and detailed industry-specific models. Modeling assumptions and methods are reviewed externally and the results are compared to results from other programs to determine the best application of R&D resources.

To validate and verify program performance, FE will conduct various internal and external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the General Accounting Office, the Department's Inspector General, the Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Engineering and Construction Management. Each year, the Office of Engineering and Construction Management conducts external independent reviews of selected projects. In addition, various Operations/Field Offices commission external independent reviews of site baselines or portions of the baselines. Additionally, FE Headquarters senior management and Field managers conduct quarterly, in-depth reviews of cost, schedule, and scope to ensure projects are on-track and within budget.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The Coal and Other Power Systems program has incorporated feedback from OMB into the FY 2005 Budget Request and has taken or will take the necessary steps to continue to improve performance.

The Coal and Other Power Systems program had the President's Coal Research Initiative and Other Power Systems areas PART reviewed separately. In the Purpose, Strategic Planning, and Program Management sections of the PART, OMB gave the Other Power Systems relatively high scores of 80,70, and 88 respectively while the President's Coal Research Initiative score some what lower at 60, 67, and 75 respectively. In both the FY 2004 and FY 2005 PARTs, most points have been lost in the Program Results/Accountability section.

The PART assessments found some notable improvements over the FY 2004 PARTS. These included agreement on goals and performance measures, clear purpose and demonstrated ability to articulate potential public benefits, and the improvement of the rating for the President's Coal Research Initiative from a "Results not Demonstrated" to an "Adequate".

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.55.00.00, Zero Emissions Coal-Based Electricity and Hydrogen Production					
Clean Coal Power Initiative	145,116	178,770	287,000	+108,230	+60.5%
Central Systems	91,494	89,880	64,500	-25,380	-28.2%
Sequestration R&D	39,101	40,297	49,000	+8,703	+21.6%
Fuels	30,443	31,221	16,000	-15,221	-48.8%
Advanced Research	32,444	38,215	30,500	-7,715	-20.2%
Distributed Generation Systems	62,034	71,113	23,000	-48,113	-67.6%
U.S./China Energy and Environmental Center	0	988	0	-988	-100.0%
Total, General Goal 4 (Coal and Other Power Systems)	400,622	450,484	470,000	+19,516	+4.3%

Clean Coal Power Initiative

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Clean Coal Power Initiative					
Clean Coal Power Initiative/FutureGen	145,116	169,881	287,000	+117,119	+68.9%
FutureGen[1]	0	8,889	(237,000)	(+228,111)	(+2566%)
Total, Clean Coal Power Initiative	145,116	178,770	287,000	+108,230	+60.5%

Description

The mission of the Clean Coal Power Initiative (CCPI) is to enable and accelerate deployment of advanced technologies to ensure that the United States has clean, reliable, and affordable electricity. The CCPI is a cost-shared partnership between the government and industry to research, develop and demonstrate advanced coal-based power generation technologies (the most advanced example of which will be FutureGen). The mission of the FutureGen project is to establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions, including carbon (sequestration).

Benefits

The Clean Coal Power Initiative subprogram will develop advanced coal-based power generation technologies that: improve efficiency from 2002 baseline by 40-50 percent by 2010, with environmental and economic performance capable of achieving 90 percent Hg removal at a cost of 70 percent of current technology by 2010, 0.15 lb/MMBtu NO_x at 75 percent of the cost of current technology (selective catalytic reactors), and lower capital costs for gasification technologies from $1200 per kilowatt of capacity; co-produce heat, fuels, chemicals or other useful byproducts; and, provide a deployment-ready suite of advanced technologies that can produce substantial near-, mid-, and long-range economic and environmental public benefits. The CCPI subprogram will create public/private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations, and ultimately, by 2015, zero emission plants (including carbon) that are fuel-flexible, and capable of multi-product output and efficiencies over 60 percent with coal.

The FutureGen project will establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions. The project is critical to the continued and expanded use of our most abundant and lowest cost domestic energy resource, coal. FutureGen will require integration of components yet to be developed, such as low cost CO_2 capture and storage technology, and thus involves considerable risk. However, the public benefits when we succeed will be

1 Funding for FutureGen was appropriated separately in FY 2004. The FY 2005 Budget includes FutureGen under the Clean Coal Power Initiative.

enormous. In order to assure that FutureGen is successful, it will be supported by a clean coal R&D effort focused on all the key technologies needed - such as carbon sequestration, membrane technologies for oxygen and hydrogen separation, advanced turbines, fuel cells, coal to hydrogen conversion, gasifier related technologies, and other technologies, funding for which is included in the Administrations FY 2005 budget request. CCPI demonstrations directly support the FutureGen project by driving down the costs of IGCC systems and other technologies whose extensions are critical to the success of FutureGen.

Coal is the most abundant U.S. energy resource, with domestic reserves exceeding the energy potential of the world's oil reserves. About 90% of all coal produced in the U.S. is used for electricity generation, and over half of our Nation's electricity is produced by coal-fired power plants. Meeting our Nation's rising demands for clean, reliable, and affordable electricity will require the use of coal for the foreseeable future. We must therefore develop and demonstrate technologies that will enable the continued use of coal to meet our growing demand for electricity in an environmentally sound manner.

The Bush Administration is advancing its new vision in clean coal research. The Clean Coal Power Initiative (CCPI) is an effort within the Department of Energy's Fossil Energy program that combines industry investments in research and development with federal matching funds for research, development and demonstration of advanced technologies on coal-fired power plants. The Administration is requesting $50 million in FY 2005 to fund joint government-industry-funded projects on new technologies that can enhance the reliability, efficiency, and environmental performance of coal-fired power generators. This FY 2005 funding will support the second round of projects under the Clean Coal Power Initiative, incorporating the latest advances in clean coal technologies. The CCPI responds to the National Energy Policy call to address the reliability and affordability of the Nation's electricity supply, particularly from its coal based generation, and is a key component of the President's commitment to research and development of clean coal technologies to meet this challenge. By enabling advanced technology to overcome technical risks and bringing them to the point of commercial readiness, the CCPI facilitates the movement of technologies into the market place that are emerging from the core research and development activities and directly responds to President's Clear Skies Initiative and Global Climate Change Initiative to reduce emissions of air pollutants (particularly NO_x and mercury) and carbon dioxide.

In FY 2003, the first round of CCPI projects commenced and NEPA was initiated including the conduct of public scoping meetings for three of the projects that will require Environmental Impact Statements. NEPA was completed for four of six Power Plant Improvement Initiative (PPII) projects and those projects are under construction or in operation. In FY 2004, the CCPI projects selected in the first round will be underway and sufficient CCPI funding exists to support a solicitation for a second round of projects. FY 2005 funding will enable the second round of CCPI projects to be awarded.

Detailed Program Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
▪ **Clean Coal Power Initiative/FutureGen**	**143,626**	**168,181**	**284,130**

For FY 2005, in support of the President's Coal Research Initiative, continue the Clean Coal Power Initiative (CCPI) to research, develop, and bring to commercial readiness advanced clean coal-based technologies that enhance electricity reliability, increase generation capacity, and provide clean, affordable power. Provide additional funding, complete evaluation of project applications and make project selections, and initiate negotiations with the second round of projects under the CCPI. For projects selected under the first solicitation, initiate operation for two projects, Neuco's plant-wide optimization system employing neural networks and the TOXECON sorbent injection system project for multi-pollutant control. Great River Energy will continue operation and four additional projects will initiate or continue construction activities. *Participants include: University of Kentucky Research Foundation, Neuco, Inc., Great River Energy, Western Greenbrier Co-Generation, LLC, Waste Management Processors Inc., PTY, LLC, Colorado Springs Utilities, and Wisconsin Electric Power Company. Additional participants will be determined based on results of the second competitive solicitation.*

For FY 2005, the Budget includes $237 million for the FutureGen project, as part of a total Federal contribution to FutureGen of $500 million, excluding related research. With the FY 2004 appropriation of $9 million, a total of $246 million will have been provided for FutureGen through 2005. In addition, in FY 2005 the Department will continue NEPA activities for the FutureGen project. Permitting activities will be initiated during FY2005 and must be completed before start of construction. Ordinarily, only a few permits (e.g., air, water, construction) require long lead times and/or public hearings. However, a large project such as FutureGen will require many state and local permits, and their issuance will therefore be staggered between FY 2005 and FY 2006. Site monitoring and characterization will be initiated during FY 2005. Information gleaned from design/engineering studies will be incorporated into detailed design activities, as appropriate. Typically, baseline environmental monitoring data must be gathered to support not only NEPA and Permitting activities, but also Design/Engineering. Candidate technologies will be considered and evaluated. Options will be considered in terms of success potential and leading edge characteristics. Preliminary design activity will include conceptual design of the plant's power train, air separation units, turbine and steam cycles and other generic balance of plant auxiliary systems. *Participants include:TBD.*

For FY 2005, within the Power Plant Improvement Initiative (PPII) program, complete four of six active projects including: Tampa Electric's Neural Network-Sootblower Optimization project; Sunflower Electric's optimized control system project; Universal Aggregates' ash utilization project; and Otter Tails' advanced particulate collector demonstration. Initiate operation for CONSOL Energy's multi-pollutant Circulating Dry Scrubber system and TIAX's advanced hybrid system for NO_x control. *Participants include: Otter Tail Power Corp. with UNDEERC and W. L. Gore & Associates, Tampa Electric Co., Universal Aggregates, LLC, Sunflower Electric Power Corp., CONSOL Energy, Inc., and TIAX, LLC.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

For FY 2004, within the Clean Coal Power Initiative (CCPI) program, provide funding to support issuing a second solicitation leading to expanding the portfolio of demonstration projects. Award remaining projects from the first solicitation and begin operation of Great River Energy's coal-dryer system for high-moisture lignite and Powder River Basin (PRB) coals. Complete National Environmental Policy Act (NEPA) requirements and initiate construction activities for four projects and continue design activities for three projects. *Participants included: University of Kentucky Research Foundation, Neuco, Inc., Great River Energy, Western Greenbrier Co-Generation, LLC, LG&E Energy Corp; Waste Management Processors, Inc., PTY, LLC, Colorado Springs Utilities, and Wisconsin Electric Power Company.*

For FY 2004, within the Power Plant Improvement Initiative (PPII) program, initiate operation for Tampa Electric's Neural Network-Sootblower Optimization project; Sunflower Electric's optimized control systems project; and Universal Aggregates' ash utilization project to product lightweight aggregate. Continue demonstration testing of the Advanced Hybrid Particulate Collector at Otter Tail Power's Big Stone Station. Complete National Environmental Policy Act (NEPA) activities and initiate construction of CONSOL Energy's multi-pollutant Circulating Dry Scrubber system and TIAX's advanced hybrid system for NO_x control. *Participants include: Otter Tail Power Corp. with UNDEERC and W. L. Gore & Associates, Tampa Electric Co., Universal Aggregates, LLC, Sunflower Electric Power Corp., CONSOL Energy, Inc., and TIAX, LLC.*

For FY 2003, initiated negotiation activities for eight project selections from the first CCPI solicitation. One project withdrew from negotiations. Initiated NEPA activities on all projects including conduct of the public scoping meetings for the three projects will be require the preparation of Environmental Impact Statements. Began planning activities for the second solicitation. *Participants included: University of Kentucky Research Foundation, Neuco., Inc., Great River Energy, Western Greenbrier Co-Generation, LLC, LG&E Energy Corp;, Waste Management Processors, Inc., PTY, LLC, Colorado Springs Utilities, and Wisconsin Electric Power Company.*

For FY 2003, within the Power Plant Improvement Initiative (PPII) program, awarded Cooperative Agreements for two projects, bringing the total awarded to four out of six active projects. Nation Environmental Policy Act (NEPA) activities were completed for all awarded projects. Began test operations on the Advanced Hybrid Particulate Collector, installed sensor equipment for the Sunflower combustor optimization project, and installed advanced soot-blowing equipment for the Tampa Electric project. Initiated construction of the processing facility for the Universal Aggregates project that will convert spray-dryer ash into lightweight aggregate for masonry or concrete. *Participants include: Otter Tail Power Corp. with UNDEERC and W. L. Gore & Associates, Tampa Electric Co., Universal Aggregates, LLC, Sunflower Electric Power Corp., CONSOL Energy, Inc., and TIAX, LLC.*

- **FutureGen** ..... **0** **8,889** **(237,000)**

For FY 2005, activities will continue under the Clean Coal Power Initiative described above.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

For FY 2004, the NEPA process will be initiated along with the conceptual plant design. Assessments of the availability of key cutting edge technologies will be conducted. Analyses will be conducted to establish critical site requirements. Detailed project schedules and competitive procurement plans for key components and technologies will be developed. *Participants include:TBD.*

▪ **Program Support**	**1,490**	**1,700**	**2,870**
Fund technical and program management support.			
Total, Clean Coal Power Initiative	**145,116**	**178,770**	**287,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
• Increase in the Clean Coal Power Initiative/FutureGen program will create a public/private partnership to prove out technology ultimately leading to zero emission plants; includes FY 2004 funding for FutureGen and associated technical and program support funds……	+108,230
Total Funding Change, Clean Coal Power Initiative	**+108,230**

Central Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Central Systems					
Innovations for Existing Plants	21,566	21,729	18,050	-3,679	-16.9%
Advanced Systems.....	69,928	68,151	46,450	-21,701	-31.8%
Total, Central Systems	91,494	89,880	64,500	-25,380	-28.2%

Description

As part of the President's Coal Research Initiative, FutureGen is a Presidential Initiative to create an advanced, full-scale integrated facility that will utilize advanced coal gasification technology to produce electric power and hydrogen while capturing and sequestering carbon dioxide. The Central Systems Programs is to provide critical research for FutureGen to dramatically reduce coal power plant emissions and significantly improve efficiency to reduce carbon emissions.

Benefits

The Central Systems subprogram supports DOE's overarching mission to advance national energy security in an economic and environmentally sound manner by developing a cost-effective, high-efficient technological capability to eliminate environmental concerns associated with coal use. In the near term this means having the ability to meet all existing and anticipated environmental regulations at low cost. In the longer term, the aim is to nearly double coal power plant efficiencies (from 33% to 60%) at affordable costs of electricity while working towards zero emissions, allowing coal to remain a key strategic fuel for the Nation. The program mission is carried out in support of several key Presidential initiatives including the Coal Research Initiative, Clear Skies Initiative, Global Climate Change Initiative, and the FutureGen Initiative.

Background

The National Energy Policy recommends that the Department continue to develop advanced clean coal technology with a goal of deploying high efficiency coal power plants achieving zero emissions. Further, the President's Clear Skies Initiative is supported by the development of advanced emission control technology and related byproducts and water research as part of the research portfolio under Central Systems. The President's Climate Change Initiative over the longer term is supported through technology for advanced power plants that can nearly double the average efficiency of today's fleet of coal power plants, thereby significantly reducing carbon emissions. The growing national economy relies increasingly on electricity supply that is secure, affordable, and reliable. This is especially true in the face of concerns over national energy security as well as electricity generation market restructuring. In addition, compliance with more stringent environmental regulations

requires reduced emissions from electric power plants. Further, new technology is needed to develop much cleaner and more efficient plants to replace and augment an aging power generation infrastructure. Electricity demand from both natural gas and coal is projected to increase significantly through the year 2015 to meet increased energy demand in the U.S. (Annual Energy Outlook, 2003).

The program elements for Central Systems include technology developed for existing plants, advanced systems, FutureGen and Vision 21 are as follows:

- Innovations for Existing Plants (IEP) - The IEP program element has a near-to-mid term focus on improving overall power plant efficiency (thereby reducing carbon emission) and developing advanced cost-effective environmental control technologies for retrofitting to existing powerplants and other coal technologies including those developed in support of the FutureGen initiative such as Integrated Gasification Combined Cycle. The research is also directed at the environmentally sound use and disposal of coal byproducts and at novel systems and technologies to minimize the impact of electricity production on water availability and quality. The IEP program directly supports the goals and objectives of the President's February 14, 2002 Clear Skies Initiative that calls for substantial reductions in mercury, NO_x, and SO_2 emissions from power plants. Results of this advanced research are used by those who develop, design, manufacture and operate both existing and advanced systems across the entire spectrum of coal utilization technologies not only to improve efficiencies, but also to improve environmental performance. This program=s crosscutting efforts address the cost-effective removal of pollutant causing contaminants from fossil fueled systems while maximizing the efficient recycling of all by products.

- Integrated Gasification Combined Cycle (IGCC) - The IGCC program supports both the President's Clear Skies Initiative and climate change goals by enhancing the thermal efficiency of converting coal to electricity, providing the potential for over 50% reduction in CO_2 compared to today's technologies, and through its performance goals of achieving near-zero emissions of SO_2, NO_x, mercury, and other pollutants. The IGCC program conducts research that fosters the development and deployment of fuel-flexible gasification-based processes for converting carbon-based feedstocks to electricity, steam, and a broad range of chemicals, including ultra-clean transportation fuels like hydrogen. In order to achieve the full potential of IGCC, significant advances must be made to reduce the capital and operating and maintenance costs and to improve both the reliability and the overall system availability. In FY 2005, the program will be more narrowly focused but will continue to develop technologies for gas stream purification to meet quality requirements for use with fuel cells and conversion processes; enhanced process efficiency; and reduced costs for producing oxygen. Development of technologies to cost effectively separate hydrogen from shifted synthesis gas and reduce gas emissions will continue at a substantially reduced level of effort. The successful accomplishment of these activities will enhance the commercialization prospects of advanced IGCC technologies for the production of electricity for use by utilities, independent power products, and other industrial stakeholders.

- Combustion Systems - This program was redirected in prior years to support advanced combustion hybrid concepts for Vision 21. In FY 2005, specific technologies from this category are included in the Gasification activity to enhance the integration of hybrid combustion/gasification concepts, including support for the test activity at the Wilsonville Power Systems Development Facility (PSDF).

- Turbines - The Turbines Program is designed to enable the low cost implementation of the President's Climate Change, Clear Skies, and FutureGen initiatives. The focus is on developing enabling technology for high efficiency hydrogen syngas turbines for advance gasification systems that can be deployed in the near-term at $1000/kW, and for hydrogen turbines that will permit the design of zero emission FutureGen plants with carbon capture and sequestration. The focus is on key technologies needed to enable the development of advanced turbines that will operate with zero emissions, and higher efficiency when fueled with coal derived synthesis gas and hydrogen fuels. Developing turbines with superior performance that operate on coal derived synthesis gas and hydrogen is critical to the deployment of advanced power generation technologies such as integrated gasification combined cycle and FutureGen plants. The Turbine Program is an investment in secure U.S. electric power production which is clean, efficient, affordable and is fuel-flexible. These advances in turbine technology will make possible the continued use of coal, our Nation=s largest domestic fossil energy resource.

  During FY 2003, DOE completed the concept studies to run ATS and other machines on coal syngas, as well as ATS machines in coal and natural gas based integrated hybrid power modules, demonstrated the Clean Energy Systems 10MW low-emission steam generator, demonstrated an integrated sensor suite for real-time monitoring of an advanced turbine's operational performance, and demonstrated in-situ single crystal blade welding and repair techniques. In FY 2004, the R&D will focus on combustor performance and design using coal derived syngas, models/simulation tools for low-emission combustion systems, and tools that can predict reliability, availability, and maintainability. In FY 2005, hybrids activities will focus on the continued development of sub-MW scale SECA fuel cell turbine hybrids, hybrids advanced cycles and component development, and systems and cost studies of advance zero emissions and/or hybrid systems. Additionally, work will be done through the University Turbine Systems Research Consortium to initiate studies concerning aerodynamics, materials, heat transfer and combustion for advanced hybrid systems. NETL will initiate the operation of a fuel cell/turbine hybrid simulation facility (HYPER Project). The hydrogen turbine work will include the initiation of work done through the University Turbine Systems Research Consortium targeted to resolve basic turbine issues associated with materials, combustion, and aero-thermal sciences that are applicable to hydrogen turbines in gasification. Work conducted at NETL will focus on performance validations of simulation of hydrogen combustor, measurements of flame electrical impedence in a full-scale combustor and development of test combustor concepts for syngas testing. Work at GE will be refocused to develop new methodology for advanced sensors and controls for coal/IGCC, and demonstrate the methodology in operating coal/IGCC power plants. Work initiated in FY 2004 with BBFA awards will continue on syngas combustion and cycle improvements a new designs for hydrogen turbines components with increased efficiencies and reduced emissions.

Vision 21 is a long-term concept, the ultimate manifestation of which is the FutureGen project. The Vision 21 concept will lead to the development of technologies that convert a combination of feedstocks (e.g., coal, natural gas, biomass, and opportunity fuels such as petroleum coke or heavy oil resid (refinery wastes) to electricity, heat (e.g., steam), and a suite of high-value products that may include synthesis gas, hydrogen, chemicals, and saleable by-products (e.g., sulfur and ash or slag). Research and development continues on key enabling technologies, supporting R&D, and systems analyses, simulations and integration through the

government/industry/laboratory/university cost-shared partnership based on the gasification route in the Vision 21 technology roadmap.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Innovations for Existing Plants	**21,566**	**21,729**	**18,050**

The FY 2005 request emphasizes field testing and evaluation of retrofit mercury technology. In addition, research will be carried out in the development of NO_x, and acid gas (SO_3, HC1, and HF) control technologies, as well as in mercury emission, transport, and deposition assessment, technological solutions to emerging energy-water issues, determining $PM_{2.5}$ source-receptor relationships as they relate to coal-fired power plant emissions and human health, and environmental characterization of coal-combustion and gasification and other advanced power system byproducts. This research directly supports the goals of both the President's Clear Skies and FutureGen initiatives.

- **Super Clean Systems** **1,485** **1,466** **1,485**

  In FY 2005, Super Clean Systems research focuses on reducing nitrogen oxide (NO_x) emissions from coal-based power plants in direct support of the Clear Skies Initiative. Work will continue on development of ultra low-NO_x combustor for integrated gasification combined cycle systems resulting from FY 2002 Broad Based solicitation. Research will also continue under FY 2004 targeted solicitation to develop advanced combustion NO_x control technology, novel catalysts and non-ammonia reagents for SCR systems, and advanced Asmart systems@ to achieve a mid-term (2010) emission target of <0.10 lbs/mmBtu and a long-term (2020) target of <0.01 lbs/mmBtu. *Participants include: Argonne National Lab, Precision Combustion, TBD.*

  In FY 2004, Super Clean Systems research focuses on reducing emissions of primary oxides associated with NO_x and SO_x pollution in support of the Clear Skies Initiative. The work will complete Ultra-low NO_x Burner development, and continue development and pilot-scale testing of novel NO_x control technology concepts selected under the FY 2002 Broad Based Solicitation and under an FY 2003 targeted solicitation. *Participants include: Argonne National Lab, GTI, Praxair, Wiley, Precision Combustion, TBD.*

  FY 2003 funding continued development of ultra-low NO_x combustion systems, oxygen-enhanced combustion, Methane-deNO_x technology, and approaches to controlling NO_x in cyclone boilers.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **Fine Particulate Control/Air Toxics** **14,217** **13,689** **9,949**

In FY 2005, focus on continuation of Phase II field testing of advanced mercury control technologies selected under FY 2003 targeted solicitation capable of achieving 50-70% mercury removal in direct support of Clear Skies Initiative, including a second round of awards made in late FY 2004. Research directed at lower-rank coals and balance-of-plant issues. Complete pilot-scale testing of novel mercury/multi-pollutant control concepts capable of >90% mercury capture. Complete mercury, trace metal, and fine particulate transport and deposition model for upper Ohio River valley region. Continue assessment of relationship between emissions from coal-fired power plants and human health. Continue study of mercury emission, transport, and deposition as it relates to local Ahot spots@ and global mercury inventory. Initiate acid gas control technology research. *Participants include: Brookhaven National Lab, Argonne National Lab, Lawrence Berkley National Lab, ATS, SRI, University of Utah, TVA, TBD.*

FY 2004, In support of Clear Skies Initiative, continue Phase II field testing of advanced mercury control technologies to achieve 50-70% mercury removal directed at lower rank coals and balance-of-plant issues. Continue bench- and pilot-scale development of novel technology to achieve 90%+ mercury capture. Develop fine particulate and acid gas control and sensor technology selected under FY 2002 solicitation. Continue with more comprehensive modeling assessment of fine particulate and mercury source-receptor relationships. Continue projects selected in FY 2003 to address energy-water issues. *Participants include: Brookhaven National Lab, Argonne National Lab, Lawrence Berkley National Lab, ATS, CONSOL, URS, CMU, SRI, Powerspan, Apogee, TVA, UMD, BNL, LBL, RBD.*

FY 2003 funding continued field testing of two advanced mercury control technologies - sorbent injection and wet-FGD enhancement - to achieve 50-70% mercury control and continued pilot-scale development of six novel mercury control concepts capable of achieving +90% control. Completed pilot-scale development and testing of additives to improve fine particulate capture in ESPs, alkaline injection for controlling acid gas emissions, and an advanced fine particle separation technology. Completed collection of ambient $PM_{2.5}$ samples from the upper Ohio River Valley region. Initiated development of on-line continuous SO_3 analyzer and study of in-plume mercury reactions. *Participants included: ATS, LSR, CONSOL, ADA-ES, MTI, Southern Research Institute, CMU, URS, UNDEERC, Apogee, REI, Powerspan, GE-EERC, BNL, ANL, TVA..*

- **In-House**..... **3,663** **3,911** **3,960**

In FY 2005, continue development of novel mercury control concepts and mercury emission characterization using 500 lb/hour combustion unit. Continue CFD modeling of mercury emission and control, issue analysis, by-product characterization, and water-related research in support of FutureGen and Clear Skies. Provide for customer service and business activities. *Participants include: NETL.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

FY 2004, Research and systems analysis was conducted on novel multi-pollutant control, mercury control and characterization, by-product characterization, and water-related issues in support of zero-emissions for FutureGen and Clear Skies. Provide for customer service and business activities. *Participants include: NETL.*

FY 2003 funding continued development of mercury control technologies and characterization of mercury emissions in 500 lb/hour combustor and collection of ambient $PM_{2.5}$ data from Pittsburgh campus monitoring site. Initiate computational fluid dynamic (CFD) modeling of mercury emission and control. Continued evaluation of mercury and other metal leachates from coal combustion byproducts. *Participants included: NETL.*

- **Waste Management** **1,980** **2,445** **2,475**

In FY 2005, assess potential environmental impacts of coal combustion and advanced combustion/gasification byproducts and solid residues, focusing on mercury and other trace metals, in support of both FutureGen and Clear Skies. Continue characterization of coal byproducts from Phase II mercury control technology field testing initiated under FY 2004 targeted solicitation. Conduct joint industry/government R&D activities to maximize recycle use of coal utilization byproducts for various market applications, and facilitate technology transfer. Complete development of byproduct treatment and separation technology selected under FY 2003 Broad Based solicitation. Continue advanced concepts and technologies selected under the FY 2003 targeted solicitation to manage power plant water use. *Participants include: Argonne National Lab, WVU, PPL, UNDEERC, University of Kentucky.*

FY 2004, Continue assessment of environmental impacts of coal combustion and gasification byproducts and solid residues, focusing on mercury and other trace metals. Conduct joint industry/government R&D activities to maximize recycle use of coal utilization byproducts for various market applications, and facilitate technology transfer. Continue development of byproduct treatment and separation technology selected under FY 2003 Broad Based solicitation. Initiate projects selected under the FY 2003 targeted solicitation to maximize water utilization efficiency with minimal environmental impact. *Participants include: WVU, PPL, UNDEERC.*

FY 2003 funding continued development of ozone-based unburned carbon separation technology and evaluation of mercury leaching and volatilization from coal byproducts. Initiated assessment of coal drying technology to reduce cooling water makeup requirements. Continued development of high-volume applications for coal byproducts. *Participants included: University of Kentucky, PPL Generation, EPRI, UNDEERC, Lehigh University, CONSOL, WVU.*

- **Vision 21**..... **0** **0** **0**

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Beginning in FY 2003 and continuing in FY 2004 and FY 2005, activities that are focused on efficiency issues are addressed under the Advanced Research Materials program.

- **Program Support** **221** **218** **181**

Fund technical and program management support.

Advanced Systems **69,928** **68,151** **46,450**

Advanced Systems focus on the development of critical enabling technologies and systems for new, cost-competitive plants with increasingly higher efficiencies and inherent ultra-low emissions that support the President=s Clear Skies and Global Climate Change, and FutureGen initiatives, leading ultimately to near-zero emission Vision 21 power plants compatible with carbon sequestration.

Integrated Gasification Combined Cycle **43,301** **50,372** **34,450**

- **Gasification Systems Technology** **20,352** **29,334** **15,305**

Gasification: In FY 2005, the primary focus of the Power Systems Development Unit (PSDF) will be on preparation of the facility for testing advanced Vision 21 modules while continuing to characterize the operation of the oxygen-blown transport gasifier on a range of coal feedstocks including lignite. Validation of the CFD model for the transport gasifier will continue using performance data from the PSDF, the Transport Reactor Development Unit (TRDU), and the cold model at NETL.

Gas Cleaning/Conditioning: In FY 2005, R&D will focus on achieving near-zero emissions from gasification-based systems. Operation of the Gas Process Development Unit for obtaining scale-up data for the design of transport desulfurizer using the RT13 sorbent at moderate temperatures will be completed. Validation of the transport desulfurizer CFD model will be completed using performance data from the GPDU and integrated testing with a 2.5 ton/day pilot-scale coal gasifier. Continue R&D to develop advanced concepts for removing mercury, ammonia, and chlorides to near-zero levels suitable for use in fuel cell and synthesis gas conversion applications. Construction of a skid-mounted unit of the Selective Catalytic Oxidation of Hydrogen Sulfide (SCOHS) process will be initiated. A go/no decision on field testing of the Single-step Sulfur Reduction Process (SSRP) will be made based on prior experimental and economic performance. *Participants include: SCS, NETL, UNDEERC, Fluent, RTI.*

Gasification: In FY 2004, continue to develop and test the oxygen-blown transport gasifier and associated particulate control devices at the PSDF to reduce cost and improve reliability of gasifier technology. Primary focus at the PSDF will be on oxygen-blown operations to provide options for producing hydrogen and capturing CO_2 and multi-fuel capability to enhance the applicability of the technology. Validate the oxygen-blown transport gasifier CFD model using data generated from the

PSDF and the Transport Reactor Development Unit (TRDU) using various coal feedstocks. Utilize the TRDU to pre-screen coal feedstocks, alternative feed systems, and process conditions to provide guidance for testing at the PSDF. Develop advanced materials for refractories and thermocouples to improve refractory performance and improve gasifier reliability. Test prototype refractory bricks in a commercial coal gasifier to demonstrate performance under actual operating conditions, and begin to install a novel high temperature measurement device to demonstrate improved gasifier performance and process control. Continue development of other advanced technologies such as burner flame monitoring, refractory wear monitoring, diffusion coatings, etc. to improve the reliability, availability, and performance of gasifiers. Investigate fundamental pre-competitive technology issues and needs to improve gasification process performance and reliability through the Gasification Technology Research Consortium.

Gas Cleaning/Conditioning: In FY 2004, efforts are directed to obtaining near-zero emissions from gasification based systems including construction of a gas cleanup module at PSDF to pave the way for Vision 21 testing of advanced modules for carbon capture and near-zero emission gas cleaning technologies. Development of advanced sorbents for achieving ultra-low sulfur levels of all contaminants at moderate temperatures. Operate the Gas Process Development Unit=s (GPDU) using the RT13 sorbent at moderate temperatures in the transport mode to provide design data for scale-up of the technology. Continue validation of the transport desulfurizer CFD model using data from the GPDU and data generated in a pilot-scale test facility integrated with a coal gasifier. Develop the novel Selective Catalytic Oxidation of Hydrogen Sulfide (SCOHS) technology and begin bench-scale evaluations for proof-of-concept testing of the technology to demonstrate ultra-low sulfur emissions at reduced cleanup costs. *Participants include: SCS, NETL, UNDEERC, Fluent, RTI, Albany, ChevronTexaco, VPI, FluoreScience, IET, GTI, GEC, MSE, SRI, and Comb Spec.*

In FY 2003, the transport gasifier and associated particulate control devices will be further developed under oxygen-blown conditions at the PDSF. The TRDU will pre-screen coal feedstocks and process conditions for testing at the PDSF. Bituminous coals will be processed at the PSDF to determine the applicability of the gasifier for high rank coals. A new dry coal feed system will be evaluated to reduce cost and improve performance over conventional lock hopper feed systems. Performance of new refractory bricks under simulated gasifier conditions will be evaluated, and if successful, bricks will be installed in high wear areas of Eastman Chemicals= coal gasifier in Kingsport, TN. Development of technologies to improve the reliability, availability, and performance of gasifiers will continue with testing of one high-temperature measurement device on the TECO IGCC gasifier. The Gas Process Development Facility (GPDU) will be operated using the EXSO3 sorbent developed previously for hot gas desulfurization and will transition to lower temperature operations to support the scale-up of the RT13 sorbent. Development of the Selective Catalytic Oxidation of Hydrogen Sulfide (SCOHS) process will continue to confirm process performance at the laboratory scale in preparation for future

(dollars in thousands)

FY 2003	FY 2004	FY 2005

bench-scale testing.

- **Systems Analysis/Product Integration**..... **2,843** **3,912** **4,000**

In FY 2005, work will continue on assessing the economics of advanced Vision 21 process concepts and establishing performance targets for novel process concepts in the R&D program. Work at the PSDF will focus on developing integration strategies for advanced process concepts and developing experimental programs, cost, and schedules for testing the various technologies. The final reports on the final phases of the Early Entrance Coproduction Plant project for the production of electricity, fuels, and hydrogen will be prepared. Engineering support will be provided as needed for the development and evaluation of the FutureGen project. The update of the worldwide gasification database with the latest plant project announcements will be completed. *Participants include: NETL, CTC, E2S, Mitretek, SCS, ChevronTexaco, GE, Praxair, Parsons, GTC.*

In FY 2004, complete engineering designs of Early Entrance Coproduction Plants for clean fuels like hydrogen and high efficiency power productions as pre-Vision 21 concepts. Continue systems analyses for research guidance and product outreach activities. Update the worldwide gasification database. Establish size of standardized IGCC plants from market analysis and begin design of modular unit to reduce plant cost, shorten plant startup schedule, and improve system reliability. *Participants include: NETL, CTC, E2S, Mitretek, SFA, Pacific, Texaco, Parsons, WMPI, GE, KBR, Praxair.*

In FY 2003, work is continuing on risk mitigation for the Early Entrance Co-production Plants and the results were used to update the preliminary process design and analysis. The co-production design optimization study is being completed and a comprehensive report will be issued. Systems studies are being conducted to evaluate the cost and performance improvements of all technologies being developed and will be used to develop a comprehensive program roadmap. The biannual update of the world-wide gasification database was performed. *Participants included: NETL, CTC, E2S, Mitretek, SFA Pacific, ChevronTexaco, Parsons, WMPI, GE, KBR, Praxair, Global Energy, Dow Corning, Dow Chemical, Siemens Westinghouse, Methanex, Nexant.*

- **Vision 21**..... **19,662** **16,622** **14,800**

In FY 2005, efforts will focus on the development of novel technologies that lead to ultra-high efficiencies, the production of hydrogen for ultra-clean fuels, and the elimination of all environmental issues that present barriers to the continued use of coal, including reductions of SO_2, NO_x, CO_2 particulates, and trace elements such as mercury, arsenic, cadmium, and selenium. Laboratory testing of improved materials for membrane-based air separation technologies and life testing of commercial membrane elements will be completed. The design of a 25-50 ton/day air separation module for integrated testing with a gas turbine and coal gasifier to address overall system performance and integration issues will begin. Development of novel process concepts for the production of hydrogen and

the capture of CO_2 for sequestration will continue at a minimal level. Work on developing improved membranes for hydrogen/ CO_2 separation will continue with focus on developing and optimizing the membrane fabrication process and addressing performance characteristics under actual process conditions. Continue fabrication of a skid-mounted process unit to demonstrate they hydrate process for separation of hydrogen and CO_2 from shifted synthesis gas. Testing of an advanced polymer membrane that removes CO_2, and H_2S from either a raw or shifted synthesis gas stream in conjunction with a pilot-scale coal gasifier will be completed. Complete a 500 hour integrated test of the transport desulfurizer, the direct sulfur reduction process, and advanced technologies for the removal of mercury, ammonia, and chlorides in conjunction with a 2.5 ton/day pilot-scale coal gasifier to assess technology performance on coal-derived synthesis gas. *Participants include: APCI, Praxair, ANL, Concepts NREC, Ceramatec, ChevronTexaco, PSU, Penn, Nexant, RTI, Medal, Protech, IGT, Siemens-Westinghouse, NETL, Eltron, Coorstech, Noram, Sud Chemie, SIR, KBR.*

In FY 2004, to achieve the Vision 21 program goals, develop novel technologies that lead to ultra-high efficiencies, near-zero emissions, carbon capture for sequestration and the production of hydrogen for ultra-clean fuels and powers. Scale-up and test ceramic membrane modules for advanced air separation at the 1-5 ton/day scale to reduce the cost of oxygen and pave the way for the economical capture of CO_2. Begin initial planning of 50 ton/day membrane modules for integration with a gasifier and gas turbine. Investigate improved membrane materials, fabrication techniques, and module design for H_2/CO_2 separations to address capture of CO_2 and for producing low-cost hydrogen from coal. Conduct life testing of advanced ceramic hydrogen membranes and develop conceptual process designs. Construct a polymer hydrogen membrane module for integrated testing with a pilot-scale coal gasifier to address performance under actual process conditions. Construct skid-mounted unit for the development of the low temperature hydrate technology to demonstrate effective carbon management by separating hydrogen and carbon dioxide and begin preliminary site evaluation for integration with a gasifier. Investigate advanced gas cleaning technologies to meet near-zero emission requirements in response to the Clean Skies Initiative. Begin testing of an advanced sulfur cleanup technology integrated with a pilot-scale coal gasifier to evaluate process performance under realistic conditions. Construct skid-mounted process units for mercury, ammonia, and chloride control for possible integrated testing with a pilot-scale coal gasifier. Complete conceptual design and economic analysis of a novel coal gasification concept for producing hydrogen and sequestration-ready CO_2 that has potential for cost reductions over conventional approaches. *Participants include: APCI, Praxair, ANL, Concepts NREC, Ceramatec, ChevronTexaco, PSU, Penn, Bechtel, LANL, RTI, Medal, Protech, IGT, Siemens-Westinghouse, NETL, GEERC, INT, Eltron, Coors, INEEL, Sud Chemie, SRI, ORNL, McDermott, KBR.*

In FY 2003, negotiations with ChevronTexaco will be completed on the testing of the RT13 advanced transport sorbent integrated with their pilot-scale coal gasifier. The transport desulfurizer module will be designed, constructed, and installed in preparation for a 500-1000 hour test run. Investigation of

ammonia, chloride, and mercury removal approaches will focus on obtaining sufficient performance and process data to design modules for integration with a pilot-scale coal gasifier. Laboratory scale testing of advanced ceramic air separation membranes will be completed to provide process design data for the 1-5 TPD engineering-scale unit and to finalize the design of the commercial-scale modules. Preliminary investigations of potential sites for integrated testing of the membrane modules with a gasifier and gas turbine will commence. Development of ceramic-based H_2/CO_2 membranes will focus on further increases in H_2 flux to achieve commercially relevant flux targets. Development of the polymer-based membrane for H_2/CO_2 separation will focus on further testing of the membrane to improve CO_2 flux and to obtain engineering data for the design of a module for integration with a pilot-scale coal gasifier. Engineering data will be obtained from a laboratory-scale flow unit for the CO_2 hydrate process to establish the design basis for a skid-mounted unit. Initial study on the feasibility of a novel gasification concept for producing hydrogen and sequestration-ready CO_2 will be completed. *Participants included: APCI, Praxair, ANL, Concepts NREC, Ceramatec, ChevronTexaco, PSU, Penn, Bechtel, LANL, RTI, Medal, Protech, IGT, Siemens-Westinghouse, NETL, REI, GEERC, INT, Eltron, Coors, INEEL, Sud Chemie, SRI, ORNL, McDermott, KBR.*

▪ **Program Support**	**444**	**504**	**345**

Fund technical and program management support.

Combustion Systems	**10,097**	**4,939**	**0**
▪ **Gas Stream Cleanup**	**5,310**	**1,350**	**0**

In FY 2005, there are no activities planned.

In FY 2004, efforts are directed toward completing key cleanup projects for qualifying candle filters in pressurized applications, improving environmental control technology in CFB systems, and development of ammonia free NO_x control systems. *Participants include: Foster Wheeler, WKU Research Foundation.*

FY 2003 funding continued development of hot gas filters, a number of hot gas filter materials, certain designs validated and a broad fail safe development initiated at the PSDF. Pilot plant testing of partial gasification Vision 21 modules was undertaken and the first tests of various coal and biomass were completed, including one run oxygen in place of air. *Participants included: Southern Co.*

▪ **Hybrid Combustion**	**4,227**	**3,539**	**0**

In FY 2005, there are no activities planned.

In FY 2004, efforts will be focused on the development of novel technology in hybrid combustion-

gasification; catalytic unmixed combustion of coal; high pressure coal combustion kinetics and continuous pressure feeds for solid feedstocks to validate the engineering, economic and environmental viability to meet Vision 21 performance targets. *Participants include: Foster Wheeler, ALSTOM, GEGR, Stamet, Fluent, Inc.*

FY 2003 funding continued development of Vision 21 hybrid system enhancements and design optimization studies were undertaken as well as development of novel hybrid concepts. Two hybrid site specific repowering studies were completed and accepted by participating utilities. *Participants included: NETL, Alstom*

- **Vision 21**..... **457** **0** **0**

This activity was concluded in FY 2004 and folded into the gasification activity.

In FY 2003, Vision 21 combustion kinetic studies and testing were initiated and development of viable codes were undertaken. Investigations were begun into the feasibility of enabling Vision 21 combustion technologies such as chemical looping. *Participates included: Fluent.*

- **Program Support**..... **103** **50** **0**

Fund technical and program management support.

Turbines..... **16,530** **12,840** **12,000**

- **Vision 21**..... **2,921** **0** **0**

In FY 2005, funding for this activity provides for the development and deployment of syngas/hydrogen turbines for FutureGen power systems. All work in this key activity, will be conducted within the Next Generations Turbines subprogram area. Funding activities will be directed towards the reduction of NO_x emissions, efficiency improvements and technical issues associated with the combustion of high hydrogen fuels. Support for SECA based Vision 21 fuel cell hybrids will be continued under the Distributed Generation Fuel Cell Program.

In FY 2004, this activity is continued in the Next Generation Turbines subprogram described below.

In FY 2003, conducted enabling R&D for coal-based turbine systems, and initiated an accelerated effort to determine the path forward for SECA based turbine hybrids.

- **Next Generation Turbines**..... **13,440** **12,712** **11,880**

In FY 2005, the DOE-Office of Fossil Energy will transition the Turbine Program, which is focused on the adaptation of existing advanced turbines for applications to coal derived synthesis gas, to a

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Syngas/Hydrogen Turbine Program. The Syngas/Hydrogen Turbine Program is designed to support the successful deployment of FutureGen type power systems. FutureGen plants will allow the continued use of coal our nation's largest source of fossil fuel and provide options for the capture and sequestration of carbon dioxide. This transition can be accomplished in a seamless fashion due to the similarities of technical issues associated with the combustion of coal derived synthesis gas and coal derived hydrogen. These similarities when compared to natural gas include one-third the heat content, higher flame speeds and typically higher post combustion moisture content. The lower heat content, higher flame speed and high post combustion moisture content offer significant technical challenge to develop highly efficient and clean burning combustion turbines for FutureGen applications.

The FY 2005 program will build upon work initiated in FY 2004 to address technical issues and ultimately provide turbine designs capable of burning up to 100% hydrogen in a 2008 time frame. These turbines could then be applied to FutureGen designs. The relevant technical issues are driven by the need to produce highly efficient systems with near zero emissions of NO_x emission to less than 3 ppm is being addressed through fuel pre-mixing and catalytic combustion concepts. Turbine efficiency will be addressed by optimizing F- and G-class machines for hydrogen combustion that yields higher first stage turbine inlet temperature and machines that are fully integrated with the air separation unit and steam cycle. It is expected that work to improve efficiency will address better thermal barrier coatings, better methods for blade cooling, optimizing the mass throughout and aerodynamics, and extending or realizing the full torque limitations of existing machines.

New work will be initiated to further resolve technical issues associated with the use of hydrogen fuels from FutureGen power plants. Work initiated in FY 2004 will continue as appropriate on high hydrogen fuel combustion for NO_x reduction and efficiency improvements. This work includes GE's efforts to assess premixing issues associated with high hydrogen fuels and integration issues of F-class machines in coal based plants. Work by Pratt & Whitney and Siemens Westinghouse will continue to explore catalytic combustion for NO_x reduction through the extension of the lean premix limit through hydrogen doping. Work will continue and new work initiated through the University Turbine Systems Research Consortium concerning aerodynamics, materials, heat transfer and combustion of coal derived syngas and hydrogen fuels. NETL will continue the simulation and validation of combustion phenomena associated high hydrogen content fuels. Funding for the operation of a fuel cell/turbine hybrid simulation facility (HYPER Project) will continue under the Turbine Program. *Participants include: GE, Siemens Westinghouse, Clemson-University Turbine Systems Research Consortium, NETL, TBD.*

FY 2004, the Turbine Program continues to focus on key technologies needed to enable the development of advanced turbines that will operate cleanly and efficiently when fueled with coal derived synthesis gas and high hydrogen content fuels. Developing turbine technology to operate on coal derived synthesis gas and hydrogen is critical to the development of advanced power generation technologies

(dollars in thousands)

FY 2003	FY 2004	FY 2005

such as integrated gasification combined cycle and deployment in FutureGen systems. Turbine R&D will focus on the adaptation of existing F- and G-class machines for application to coal-derived synthesis gas. Studies will be initiated to identify candidate technical approaches and combustion turbines for optimization/modification in IGCC systems. These studies will determine the technologies and modifications needed to meet goals for the near zero emissions, higher efficiency and machines that produce a lower cost of electricity for application to coal derived syngas and hydrogen fuels. These scoping studies will provide the direction, scope and approach for activities to follow in FY 2005-FY 2008. *Participants include: GE, SWPC, Praxair, EPRI, NETL, UTSR-SCIES, Florida Turbine Tech., ORNL, ANL, and TBD.*

In FY 2003, completed studies to assess ATS and other machines for operation on coal syngas, as well as ATS machines in coal and natural gas based integrated hybrid power modules, completed demonstration of low-emission steam generator, demonstrate an integrated sensor suite for real-time monitoring of an advanced turbine's operational performance, and demonstrated in-situ single crystal blade welding and repair techniques. *Participants included: GE, SWPC, Solar, EPRI, NETL, SCIES, U. of CA-Irvine, CFD Research, ORNL, ANL.*

▪ **Program Support**	**169**	**128**	**120**
Fund technical and program management support.			
Total, Central Systems	**91,494**	**89,880**	**64,500**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Innovations for Existing Plants	
▪ Decrease in Fine Particulate Control/Air Toxics funding available for projects to be selected under Round II of FY 2004 Phase II Hg Field Testing solicitation focused on low-rank coals, smaller bituminous coal units, cost and performance data, and balance-of-plant issues	-3,740
▪ Increase in Super Clean Systems funding available for Advanced NO_x Control Technology solicitation	+19
▪ Increase in In-House Research funding available for Hg control technology development and coal combustion byproducts characterization	+49
▪ Increase in Waste Management funding available for characterization of coal byproducts from Phase II Hg field testing projects	+30
▪ Program Support	-37
Total, Innovations for Existing Plants	**-3,679**
Advanced Systems	
Integrated Gasification Combined Cycle (IGCC)	
▪ Decrease in Gasification Systems Technology key activity will significantly reduce or terminate all projects focusing on advanced gasification concepts and improving the reliability and performance of gasifier technology through the development of advanced materials and instrumentation	-14,029
▪ Increase in Systems Analysis/Production Integration	+88
▪ Decrease in Vision 21 key activity will significantly reduce the level of effort on projects focusing on the development of advanced hydrogen/carbon dioxide separation technologies for carbon sequestration	-1,822
▪ Program Direction	-159
Total, Integrated Gasification Combined Cycle	**-15,922**

	FY 2005 vs. FY 2004 ($000)
Combustion Systems	
▪ Decrease in Gas Stream Cleanup activities as existing projects are concluded	-1,350
▪ Decrease in Hybrid Combustion activities as existing projects are concluded	-3,539
▪ Program Direction	-50
Total, Combustion Systems	**-4,939**
Turbines	
▪ Increase in Vision 21result of turbines for hybrids initiatives	+3,600
▪ Decrease in Next Generation Turbines due to restructuring to focus on hydrogen turbines	-3,600
▪ Program Support	-840
Total, Turbines	**-840**
Total, Advanced Systems	**-21,701**
Total Funding Change, Central Systems	**-25,380**

Sequestration R&D

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Sequestration R&D					
Greenhouse Gas Control.....	39,101	40,297	49,000	+8,703	+21.6%
Total, Sequestration R&D	39,101	40,297	49,000	+8,703	+21.6%

Description

The mission of the Sequestration R&D program is to create public benefits by discovering and developing ways to economically separate and permanently store (sequester), and to offset, greenhouse gas emissions from the combustion of fossil fuels.

Benefits

The Global Climate Change Initiate (GCCI) has defined a metric goal of an 18 percent reduction in greenhouse gas intensity over the next ten years. The Sequestration Program will show substantial contributions toward meeting greenhouse gas intensity reduction goals of the GCCI and provide a portfolio of "commercially ready" technologies to support the decision making process for future action (if required) in 2012, as mandated by GCCI.

Technology developments will occur such that by the 2012 timeframe, carbon sequestration technologies will be available that result in less than 10 percent increase in cost of energy services for direct capture technologies and less than $10/ton carbon sequestered for indirect capture technologies. Current capture and sequestration technology options result in at least a 30 percent increase for new plants and a 70 percent increase for retrofit plants. Using results from an FE/NETL analysis, the Sequestration Program has estimated the contribution that various options will make toward meeting the future greenhouse gas emissions reduction needs. Sequestration technologies have the potential to account for more than 30 MMtCE (million metric tons of carbon equivalents) greenhouse gas reduction in 2012 or about a 30 percent direct contribution to the President's GCCI goals. Sequestration technologies could potentially account for more than 90 MMtCE of greenhouse gas reduction in 2020 and up to 1025 MMtCE in 2050.

Background

A successful research and development effort will allow the continued use of economical fossil fuels during the transition to a hydrogen economy.

About 90 percent of coal produced in the United States is used for electricity generation and over half of all electricity is produced by coal-fired power plants. Including electricity generated by oil and natural gas-fired power plants, approximately 70% of all electricity produced in the United States is generated

from fossil fuels. The continued use of fossil fuels to generate affordable electricity is critically important to the United States economy and the power generation industry needs to maintain a diversified fuel mix to ensure adequate energy supplies at a reasonable price. The continued use of fossil fuels has many environmental challenges, and sustained use could be severely limited unless satisfactory solutions can be found to overcome these environmental challenges, especially with regard to global climate change and the ability to substantially reduce carbon dioxide (CO_2) emissions in the United States.

Since electric generation is expected to grow and fossil fuels will continue to be the dominant fuel source, there is growing recognition that the public/private collaboration must be part of the solution to curbing greenhouse gas emissions by capturing and permanently sequestering carbon dioxide. The President's recently announced climate change goal is to significantly reduce the greenhouse gas intensity of the United States economy over the next 10 years, while sustaining the economic growth needed to finance investment in new, clean energy technologies. The Carbon Sequestration Program directly supports these and several National Energy Policy (NEP) goals targeting the development of new technologies, market mechanisms, and international collaboration to reduce greenhouse gas intensity and greenhouse gas emissions. The development of carbon capture and sequestration technologies must play a key role if the United States is to set a path to slow the growth of greenhouse gas emissions, and -- if the emerging science justifies -- to stop and then reverse that growth.

The DOE is developing a portfolio of technologies and mitigation strategies designed to reduce the emissions of greenhouse gases using a two-prong approach: (1) Making energy systems more efficient, and; (2) Capture and sequestration of greenhouse gases. The first approach is being addressed by the core fossil energy coal, oil and gas programs and "Vision 21" that seek to almost double the current average efficiency of existing coal power plants by 2015. The second approach is being addressed by the Carbon Sequestration R&D Program. The Carbon Sequestration Program is developing a portfolio of technologies that hold great potential to reduce greenhouse gas emissions. The Program will focus primarily on the following area:

- Developing capture and separation technologies that dramatically lower the costs of reducing carbon dioxide emissions from fossil fuel processes.

The programmatic time line is to develop (to a state of commercial readiness) a portfolio of safe and cost effective greenhouse gas capture, storage and mitigation technologies by 2012, leading to substantial market penetration beyond 2012. Technology developments within the Sequestration Program are expected to significantly contribute to the President's goal of reducing greenhouse gas intensity by 18% by 2012 and would play a critical role should it be necessary to stabilize greenhouse gas emissions in the United States beyond 2012.

In addition to maintaining core R&D, the Sequestration Program will focus on the following programmatic thrusts in FY 2005:

- Pursue sequestration strategies that support zero. This activity enables sequestration opportunities that support the Global Climate Change, Clear Skies and FutureGen Initiatives.

- Strengthen U.S. and DOE leadership in carbon sequestration by pursuing global public/private R&D partnerships through the Carbon Sequestration Leadership Forum. In addition to seeking new opportunities, emphasis will be placed on strengthening and expanding existing cooperative efforts with Canada, Japan, Australia, Italy, Norway, and the European Union.

- Continue the development of the Regional Carbon Sequestration Partnerships. This activity focuses on promoting development of the infrastructure for wide-scale deployment of mitigation technologies and places more emphasis on bringing low-cost, value-added CO_2 capture and storage to the commercial implementation stage before 2012, while establishing the longer-term capability for addressing capture and sequestration from power generation. In FY 2005, the Partnerships will complete the following: (1) identify regional opportunities and benefits; (2) create a baseline and characterize a region by matching source and sink opportunities; (3) address safety, permitting, and public acceptance; and (4) provide technology validation for regional capture and storage opportunities. Planning will be completed and the solicitation for the Phase II Regional Carbon Sequestration Partnerships will also be released in FY 2005.

- Increase R&D focus on restoration of disturbed lands. Strengthen and expand R&D, including collaboration with the Department of Agriculture, Department of Interior and the Environmental Protection Agency to produce near-term benefits that directly contribute to the 2012 greenhouse gas intensity goal of the Global Climate Change Initiative.

- Accelerate Novel Sequestration Systems R&D to create expanded and new means of storing or reusing carbon and other greenhouse gas residuals that provide additional pathways to near zero emissions energy facilities of the future. Strong emphasis will be placed on technologies that offer permanent storage using chemical/biological pathways to inert, benign solids and useful products. The novel concepts projects awarded via collaboration with the National Academy of Sciences (NAS) will be reaching their midpoint in FY 2005 and future NAS collaboration opportunities will be assessed. These efforts will be coordinated with the DOE Office of Science, the IEA/GHG and other science organizations involved in the area.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Greenhouse Gas Control	**31,277**	**33,050**	**41,580**

In FY 2005, continue core R&D program toward meeting the goals in the following areas: developing efficient, low-cost, advanced CO_2 separation and capture concepts; identifying issues associated with carbon sequestration in differing geologic formations , and reducing the cost, and environmental uncertainties (including storage stability, permanence, rates and characteristics of migration)of large-scale carbon sequestration through innovative Public-Private R&D partnerships. Close collaboration with the carbon management science programs and activities in the Office of Science will be maintained for the purposes of applying promising basic science principles to novel concepts, thereby providing an integrated approach to advancing the science and technology of carbon sequestration. Regional partnerships to have (1) identified regional opportunities and

benefits; (2) established a baseline and characterized a region by matching source and sink opportunities; (3) established preliminary monitoring and verification protocols; (4) identified appropriate regulatory framework for sequestration options; and (5) communicated with stakeholders through education and outreach programs. Launch technology validation phase of the regional carbon sequestration partnerships. Complete pilot tests on advanced capture technologies related to membrane and hydrate configurations. Complete field tests for non-CO2 greenhouse gas mitigation related to fugitive methane emissions from coalmines. Complete field tests for geologic sequestration combined with enhanced coal bed methane recovery. *Participants include: NETL, LANL, Battelle, Praxair, Dakota Gasification, ARI, Nature Conservancy, Univ. of KY, Univ. of TX, VA Tech, MIT, Princeton University, Consol, IEA, TBD.*

In FY 2004, refocus core R&D program toward meeting the goals of the following areas: developing efficient, low-cost, advanced CO_2 separation and capture concepts; identifying issues associated with carbon sequestration in differing geologic formations, and reducing the cost, and environmental uncertainties (including storage stability, permanence, rates and characteristics of migration) of large-scale carbon sequestration through innovative Public-Private R&D partnerships. Close collaboration with the carbon management science programs and activities in the Office of Science will be maintained for the purposes of applying promising basic science principles to novel concepts, thereby providing an integrated approach to advancing the science and technology of carbon sequestration. *Participants include: NETL, LANL, Battelle, Praxair, Dakota Gasification, ARI, Nature Conservancy, Univ. of KY, Univ. of TX, VA Tech, MIT, Princeton University, Consol, IEA, TBD.*

FY 2003 funding continued development of models and predictive tools that will be required to assess the effectiveness of sequestration, advanced CO_2 capture approaches that are significantly less costly (capital and energy penalty costs), practical sequestration technologies specific to the types of geologic reservoirs found in the U.S., advanced fossil fuel conversion systems that produce a concentrated stream of CO_2 ready for sequestration, and measures to capture and control non-CO_2 greenhouse gases, and issue a solicitation for the Integrated Sequestration and Hydrogen Initiative. *Participants included: RTI, Media Processing Technology, LBNL, LLNL, ORNL, Texas Tech University, University of Kansas, TVA, MBARI, Alabama Geological Survey, Ohio University, PSU, University of Utah, OSU.*

- **Focus Area for Carbon Sequestration Science**.... **7,425** **6,844** **6,930**

In FY 2005, the most advanced CO_2 capture sorbent known, $LiSiO_4$, will be tested in the flexible Modular CO_2 Capture Facility (MCCF) in the fuel gas mode. Several other sorbents will also be evaluated in the MCCF with particular emphasis on support to FutureGen or other large scale demonstrations. Measurement, monitoring & verification activities will continue to develop, evaluate, demonstrate and test new low cost surface and near surface methods for monitoring and verification of the integrity of geologically sequestered CO_2 at domestic sequestration sites, and possibly some foreign sites. NETL will continue to develop the theoretical basis for understanding field results from both the Burlington Resources and the CONSOL CO_2-enhanced coalbed methane

(dollars in thousands)

FY 2003	FY 2004	FY 2005

recovery projects. New insights and confirmation of previously developed hypotheses that are central to the continued development of coal seam sequestration will be developed. Key laboratory experiments will be conducted that confirm or deny previously developed insights. NETL's geological sequestration core flow laboratory (GSCFL) will obtain drilling core samples from the AEP/Battelle Mountaineer project in New Haven, WV, and begin evaluating the rock's permeability and porosity. The effects of CO_2 injection upon the host rock mineralogy and petrography will be investigated. *Participants include: NETL.*

In FY 2004, refocus activities toward the areas of capture, geologic and deep ocean CO_2 sequestration, establish the scientific and technical bases needed to cost-effectively capture and permanently sequester CO_2. *Participants include: NETL*

FY 2003 funding continued development of wet scrubber systems to concentrate CO_2 from coal-fired power plants, facilities to test and evaluate advanced CO_2 capture systems applicable to both existing and advanced coal conversion processes and determine CO_2 flow characteristics in brine formations and coal seams, a state-of-the-art facility to mimic the formation of CO_2 hydrates in the deep ocean, and models to predict the extent of and verify sequestration of CO_2 in brine formations and in coals seams. *Participants included: NETL*

■ **Program Support**	**399**	**403**	**490**

Fund technical and program management support.

Total, Sequestration R&D	**39,101**	**40,297**	**49,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Sequestration R&D	
• Increased funding will be used to accelerate and broaden the characterization of additional regional geologic settings as potential sites for future sequestration, and accelerate the establishment of verification protocols and development of permitting issues to be addressed through the Carbon Sequestration Regional Partnerships	+8,703
Total Funding Change, Sequestration R&D	**+8,703**

Fuels

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Fuels					
Transportation Fuels and Chemicals	21,432	21,927	16,000	-5,917	-27.0%
Solid Fuels and Feedstocks	5,808	5,986	0	-5,986	-100.0%
Advanced Fuels Research	3,193	3,308	0	-3,308	-100.0%
Total, Fuels	30,433	31,221	16,000	-15,221	-48.8%

Description

The mission of the Fuels program is to create public benefits by conducting the research necessary to promote the transition to a hydrogen economy. Research will target reducing costs and increasing efficiency of derived hydrogen from coal feedstocks as part of the President's Hydrogen Fuel Initiative.

Benefits

Coal has the potential to be an affordable resource that can produce the large amounts of hydrogen needed in the mid-term for the Nation to begin the transition to a hydrogen economy. Hydrogen produced from Coal and used in advanced technologies, especially in efficient fuel cell vehicles (FCVs), will improve energy security by reducing the United States' oil imports by over 3 million barrels per day for every 100 million FCVs or nearly half of the U.S. fleet. Even without sequestration, production and use of coal-derived hydrogen in 100 million FCVs is estimated to also reduce carbon dioxide, a greenhouse gas (GHG), by 278 million tons per year, a reduction of 24 percent of the carbon dioxide emissions associated with the current U.S. light-duty vehicle fleet. Nitrogen oxide (NO_x) emissions will be reduced by about 100,000 tons per year, while sulfur oxides (SO_x) and particulate matter emissions would be reduced by 43 thousand tons and 40 thousand tons, respectively. When hydrogen production from fossil fuels is combined with carbon sequestration, carbon dioxide emissions will be reduced by over 530 million tons per year for each 100 million FCVs, a reduction of 45 percent for the current U.S. light-duty vehicle fleet. Also, a 250-year supply of coal to produce hydrogen ensures that there will be a clean and affordable alternative to imported oil.

Background

Currently, the United States imports approximately 11 million barrels per day of petroleum crude and finished products (55% of consumption). By 2025 imports are projected to rise to 19.8 million barrels per day of crude and refined products (68% of consumption). Coal-derived hydrogen can be an important part of a strategy to diversify and expand our domestic fuel resource base, reduce emissions from the transportation sector, and help limit our reliance on imported oil.

In addition to energy security issues, major challenges facing transportation are urban and regional air pollution and emissions of greenhouse gases. EIA 2000 data indicates that of man-made emissions, the U.S. transportation sector is responsible for nearly 80 percent of the carbon monoxide (CO), over one half of the nitrogen oxides (NO_x), and 40 percent of the volatile organic compounds (VOC). Vehicles are responsible for about 35% of the U.S. energy sector's carbon dioxide production. As the Nation transitions toward advanced engine platforms, ultra-low emission vehicles and eventually to near-zero emission vehicles, such as the Administration's fuel cell-powered "FreedomCAR", the demand for hydrogen will increase dramatically. The Administration's Hydrogen Fuel Initiative is a coordinated effort among the Department's Offices (EERE, FE, NE, Science) to provide the technology for the private sector to meet the anticipated hydrogen demand and the infrastructure needed to provide the hydrogen to the end-user. Our large domestic resources of coal can provide high volume, low-cost, hydrogen for fuel cells in the longer term.

Research will address the development of technologies to produce, distribute and store hydrogen as an affordable, safe fuel for consumers. Specifically, this research activity will encompass a technology envelope that begins with the separation of hydrogen from mixed gas streams and conclude with the interface of the hydrogen with fuel cells and other end-use systems. In FY 2004, research will target the development of technologies (1) capable of economically producing large quantities of pure hydrogen from coal-derived synthesis gas, (2) capable of safely and economically storing, distributing and handling hydrogen derived from coal gasification processes for end-use in the utility, transportation, commercial, industrial and residential markets, and (3) that will enable hydrogen from coal feedstocks to play a major role in the transition to sustainable hydrogen based energy systems.

Centralized production of hydrogen from coal feedstocks will produce a concentrated stream of carbon dioxide which will facilitate its economic capture and sequestration. There are two routes to supplying hydrogen from these advanced coal gasification facilities. A portion of the hydrogen can be separated from the mixed gas stream (i.e. synthesis gas) which is produced during the gasification process and then stored for distribution. The other alternative is to produce, via synthesis gas conversion processes, zero-sulfur, high hydrogen content coal-derived fuels that can be moved through the present distribution system, then reformed at facilities in close proximity to the customer or directly on-board the vehicle.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Transportation Fuels and Chemicals	**21,432**	**21,927**	**16,000**

This program conducts laboratory and process research to develop advanced technology for producing ultra clean fuels and hydrogen from coal by use of gasification technology possibly with coproduction of electricity and other products.

- **Reactor/Process Development** **2,400** **1,491** **0**

  No funding is requested for this activity in FY 2005.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

FY 2003 and FY 2004 funding will be used to continue the coproduction feasibility studies to establish optimal marketable products and plant configurations for specific facilities for production of clean synthesis gas derived liquid fuels, clean electric power and heat based on coal gasification.

- **Syngas Membrane Technology** **6,310** **6,552** **0**

In FY 2005 no funds are requested for this activity.

FY 2003 and FY 2004 funding continued exploratory research activities of novel conversion concepts of promising chemical and small-scale physical conversion technology innovations. Continued research and development of a novel syngas ceramic membrane technology to enhance Fischer-Tropsch (F-T) gas conversion for environmentally superior liquid fuels and hydrogen. Conducted fundamental supporting fuels research at NETL. *Participants included: APCI, NETL, LANL, Univ. Of Alaska, Canmet, Praxair.*

- **Ultra Clean Fuels**..... **10,222** **8,786** **0**

In FY 2005 no funds are requested.

FY 2003 and FY 2004 funding continued cost-shared industrial research for the development of ultra-clean fuels technology for fossil resources (natural gas, petroleum, coal). Projects will continue to develop advanced technology for the production of natural gas derived synthesis gas and ultra-clean fuels. Funding will also be provided for the completion of a novel, molten metal reactor for production of hydrogen with a concentrated stream of carbon dioxide for capture from coal-based feedstock.

- **Hydrogen from Coal Research**..... **2,280** **4,879** **15,840**

In FY 2005, perform research for the development of novel technology for: 1) separating hydrogen from mixed gas streams (continuation) including polishing technology to remove remaining impurities prior to utilization (new); 2) producing high hydrogen content coal-derived liquids for subsequent reforming on-board vehicles and/or at distributed generation facilities (continuation); 3) storing and delivering hydrogen/liquid hydrogen carriers (continuation); 4) utilizing hydrogen in non-fuel cell powered applications (new); 5) small-scale hydrogen production systems with CO_2 capture/sequestration capability (new), and utilize NETL's computation science expertise to provide 6) the technical foundation upon which to facilitate the development of advanced system components associated with the production, delivery, storage and utilization of hydrogen from coal (continuation and expansion

In FY 2004, initiate hydrogen from coal initiative by competitive procurement. Identify appropriate organizations to (1) establish the feasibility of emerging alternate coal-based hydrogen technologies, (2) investigate advanced separation technologies, and (3) utilize a combination of experimental and advanced computational methods to determine optimal reaction chemistries for producing hydrogen from coal-derived fuels. *Participants include: NETL, TBD.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

FY 2003, continue funding to test advanced hydrogen separation membranes and evaluate carbon fibers for high density hydrogen storage; and initiate five new projects to separate hydrogen from mixed gas streams and produce hydrogen from coal-derived methanol via an advanced reforming process. *Participants include: NETL TBD.*

- **Program Support**..... **220** **219** **160**

  Fund technical and program management support.

Solid Fuels and Feedstocks..... **5,808** **5,986** **0**

Research provided advanced technologies to produce clean high value carbon products from coal such as high purity carbon electrodes and specialty graphite. Composite fuels comprised of coal and waste biomass for greenhouse gas reduction and separation technology for producing additional clean coal from wastes.

- **Premium Carbon Products**..... **1,027** **987** **0**

  No funding requested in FY 2005.

  FY 2003 and FY 2004 funding is to continue development of novel processes to produce high value graphics, activated carbon, carbon fibers for high strength materials, carbon foams for military applications and carbon electrodes for batteries and fuel cells. *Participants include: Penn State, NETL.*

- **Advanced Separation** **2,881** **2,964** **0**

  No funding requested in FY 2005.

  FY 2003 and FY 2004 funding is to continue developing processes for reclamation of coal fines to monetize coal from waste coal sites and mitigate potential environmental issues associated with these sites; and to develop solid-liquid coal separation processes that have crosscutting applicability the mineral industry. *Participants include: Virginia Tech, WVU.*

- **Coal-derived Jet Fuels**..... **1,840** **1,975** **0**

  No funding requested in FY 2005.

  FY 2003 and FY 2004 funding is to initiate research and development to determine the technical requirements and cost implications of integrating the coal-derived jet fuel production and by-product processes into refinery operations.

- **Program Support**..... **60** **60** **0**

  Fund technical and program management support.

Advanced Fuels Research..... **3,193** **3,308** **0**

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Provide the scientific underpinning for the development of advanced ultra clean liquid fuels and hydrogen technology from coal.

• **Advanced Research**	**3,160**	**3,275**	**0**

No funding is requested for this activity in FY 2005.

FY 2003 and FY 2004 funding is to provide supporting science that will facilitate the development of high-efficiency, affordable processes for converting coal to high value fuels, including hydrogen and hydrogen precursors; and to develop a coal extraction process that provides precursor chemicals suitable for production of premium coal-derived materials.

■ **Program Support**	**33**	**33**	**0**

Fund technical and program management support.

Total, Fuels	**30,433**	**31,221**	**16,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Transportation Fuels and Chemicals	
• Complete synthesis gas membrane activities to develop novel ceramic membrane reactors for producing synthesis gas and hydrogen production	-6,552
• Complete reactor/process development and ultra-clean fuels activities for production of clean low sulfur liquid fuels	-10,277
• Continue Hydrogen from Coal Research to developed improved, novel technology for the production of hydrogen and its separation, delivery, storage and utilization at lower cost including the initiation of studies for advanced concepts for simultaneous separation of carbon dioxide, H_2S and other trace components from hydrogen	+10,961
• Program Support	-59
Total, Transportation Fuels and Chemicals	-5,927

	FY 2005 vs. FY 2004 ($000)
Solid Fuels and Feedstocks	
• Complete premium carbon, advanced mining separation and jet fuel activities	-5,926
• Program Support	-60
Total, Solid Fuels and Feedstocks	-5,986
Advanced Fuels Research	
• Complete advanced research activities for C1 conversion for producing clean liquid fuels and reformable fuels and coal extraction to produce high value products	-3,275
• Program Support	-33
Total, Advanced Fuels Research	-3,308
Total Funding Change, Fuels	**-15,221**

Advanced Research

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Advanced Research					
Coal Utilization Science	8,781	11,852	8,000	-3,852	-32.5%
Materials	8,712	11,111	8,000	-3,111	-28.0%
Technology Crosscut	11,078	11,326	10,500	-826	-7.3%
University Coal Research	2,904	2,945	3,000	+55	+1.9%
HBCUs, Education & Training	969	981	1,000	+19	+1.9%
Total, Advanced Research	32,444	38,215	30,500	-7,715	-20.2%

Description

The mission of the Advanced Research subprogram is to serve as a bridge between basic and applied research to foster the development and deployment of innovative systems for improving efficiency and environmental performance, while reducing costs, of Advanced Coal and Power Systems.

Benefits

Advanced Research provides the means by which advanced concepts are transformed into future working technologies. It is crosscutting in nature and supports all Fossil Energy Coal and Power Systems in its development of highly efficient power plants with zero emissions and also FutureGen. Improvement of our energy infrastructure, which includes power plants, power transmission systems, environmental protection and remediation efforts, is dependent on research. This research must produce technologies that meet the performance specifications for hostile operating conditions, economic constraints of advanced industrial applications, and public demand for a cleaner environment, reliability, and low consumer cost. These constraints require that advanced Research develop fundamental understandings of relationships among energy processes, their performance requirements, and the environment through a greater understanding of the physical, chemical, biological and thermodynamic barriers to achieving these goals. Especially important research is being conducted in the areas of materials research, sensors and controls, and computational energy science that is expected to eliminate the need for constructing expensive pilot plants.

Background

The Advanced Research Program works to create public benefits through two types of activities. The first is a set of crosscutting studies and assessment activities in environmental, technical and economic analyses, coal technology export and international program support. The public benefits from these activities because the improvement of programs and regulatory activities will help to maximize their benefits and lower their costs. The second is a set of crosscutting fundamental and applied research

programs which include coal utilization science, materials, bioprocessing of coal, and university-based research. The public benefits from these activities because the long-term, high-risk activities target areas where industry is reluctant to invest. These research activities can produce public benefits such as increased energy efficiency, reduced pollution, or more reliable power supplies. For example, the university-based research programs include the University Coal Research program and the Historically Black Colleges and Universities and Other Minority Institutions (HBCU/OMI) program, address the full spectrum of fossil utilization research and development, technology transfer, outreach, and private sector partnerships.

In the crosscutting studies and assessments subprograms, the thrusts of international program support, environmental activities, coal technology export, and technical and economic analysis are to complement and enhance all Fossil Energy endeavors by providing both financial and technological leverage. International involvement is limited to those selected areas where it has been determined that the U.S. will benefit at least to the extent it contributes. Fossil Energy, through these activities, always attempts to encourage the leveraging of research and development funds while promoting U.S. industrial interests and to use them as opportunities to achieve responsible international consensus and opinion on technical business assessment and policy issues.

The crosscutting fundamental and applied research programs focus upon developing the technology base in the enabling science and technology areas that are critical to the successful development of both superclean, very high efficiency coal-based power systems and coal-based fuel systems with greatly reduced or no net emissions of CO_2. These systems are encompassed in the Vision 21 energyplex and FutureGen initiative. Advanced Research seeks a greater understanding of the physical, chemical, biological and thermodynamic barriers to achieving economic, technologic, and environmental goals and identifies ways to overcome those barriers. The program is unique in that it is directed to specific underlying fundamental scientific and engineering problems closely connected to short-term, mid-term and long-range Fossil Energy objectives.

In order to achieve these goals, an Advanced Research focus area on Computational Energy Sciences was established at the National Energy Technology Laboratory (NETL). This focus area will conduct simulations and modeling activities to produce a "technology base" from which the energy plants of the future will be designed, built and operated.

The Coal Utilization Science subprogram focuses on research pertinent to all coal utilization systems, with specific attention paid to increasing our knowledge of the principal mechanisms that control coal conversion processes. It will address issues affecting the utilization of coal, and its primary thrust is in support of the development of the Vision 21 concept. It will involve novel concepts for CO_2 capture and sequestration, such as mineral carbonation, and virtual simulations and modeling of components and subsystems. It will also include research on instrumentation and diagnostics to support the development of advanced controls and sensors. High performance Advanced Materials and equipment are essential to advanced coal technologies. Thus, the thrust of the Advanced Materials subprogram is to develop materials for advanced gas separation and particulate removal, as well as to develop solutions to materials performance barriers unique to very high temperature, highly corrosive coal combustion and gasification environments. Exploratory research and innovation to maximize the use of coal in environmentally preferable ways is typified by the bioprocessing of coal subprogram. The focus of the

Biotechnology subprogram is to conduct biological research to produce clean fuels and to reduce greenhouse gas emissions (NO_x, SO_x, and CO_2) from existing and new powerplants. The University Coal Research and HBCU/OMI subprograms are both education and training programs that support competitively awarded research grants at U.S. colleges and universities to address Fossil Energy's highest priority research needs.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Coal Utilization Science	**8,781**	**11,852**	**8,000**
• **Coal Utilization Science (Core)**	**8,692**	**6,802**	**7,920**

In FY 2005, conduct research that supports the development of highly efficient and clean power plants, focusing on the reduction or elimination of adverse environmental impacts of coal use. Sensors and controls: Complete prototype development and testing of sensors critical to enhancing and controlling plant efficiencies and emissions. Continue to develop new class of sensors based on projects selected through FY 2002 and FY 2003 solicitations that are suitable for monitoring in harsh conditions that will enable the operation of ultra-clean fossil energy systems. Enabling Technologies: Complete development of computational workbench for Vision 21. Initiate mechanistic 3D modeling of Vision 21 plant. Continue to investigate basic combustion and gasification chemistry to discern rates and mechanisms that control emissions behavior of coal under advanced and conventional combustion/gasification conditions to efficiently minimize NO_x, SO_x, air toxics, and other pollutants in support of the clear skies initiative. Complete integration of mechanical, chemical, and chemico-mechanical pretreatment into CO_2 mineral carbonation process. No funds for Arctic Energy Office. *Participants include: NETL, SNL, CMU, U. of Pittsburgh, ARC, Ohio State U., REI, U. of Fl, MSU.*

In FY 2004, conducted research to enable reduction or elimination of environmental impacts of coal use; focus on greenhouse gases that may affect global climate change. Sensors and Controls: Completed pilot-scale tests of select gasification and combustion sensors; complete feasibility tests of other sensor development projects selected under FY 2002 solicitations. Select fewer projects for award under FY 2003 solicitations for fundamental sensor devices including applications of nanotechonlogy. Continued stochastic modeling and systems analysis for zero emissions power plants concepts and FutureGen. Completed Round 2 course grid simulations and computational workbench projects and continued projects selected under round III of broad-based agency Vision 21 solicitation to develop critical enabling technologies for advanced zero emissions power and fuel systems. Investigated basic combustion and gasification chemistry to discern rates and mechanisms that control emissions behavior of coal under advanced and conventional combustion gasification conditions to efficiently minimize NO_x, SO_x, air toxics, and other pollutants in support of the Clear Skies Initiative. Developed predictive models as a tool for designers of Vision 21 plants. Demonstrate the feasibility of the in-situ CO_2 mineral sequestration

concept through laboratory tests of drill-core samples and maintain minimum levels of fundamental lab-scale research to addresses process design issues. Continue support for the Arctic Energy Office Activities. *Participants include: NETL, SNL, CMU, U. of Pittsburgh, Princeton, ARC, University of Alaska.*

FY 2003 funding continued development of instrumentation, diagnostics and controls for advanced power systems; model testing and research for Virtual Demonstration plant; development of critical enabling technologies in support of Vision 21; fundamental coal combustion research; and research on fundamental mechanisms for CO_2 mineral sequestration process, and continue support for the Arctic Energy Office activities. *Participants included: Ames Research Lab, SNL, ARC, LANL, NETL, SAIC.*

- **Mercury Control**..... **0** **1,961** **0**

No funding requested in FY 2005.

In FY 2004, conducted fundamental research on mercury formation and control. As part of a new sensors and control solicitation, developed sensors to detect and monitor mercury emissions. Developed atmospheric modeling (plume chemistry and deposition) with a focus towards mercury. *Participants to be determined.*

No funding was requested for this activity in FY 2003.

- **Center for Zero Emissions Coal Research**..... **0** **2,970** **0**

No funding requested in FY 2005.

In FY 2004, create a strategic center for zero emission coal research at the High-Temperature Electrochemistry Center (HiTEC) to conduct research in support of advanced coal programs and FutureGen, and to enhance collaboration between Universities and national Labs. *Participants include: Montana State Univ., NETL.*

No activity in FY 2003.

- **Program Support**..... **89** **119** **80**

Fund technical and program management support.

Materials..... **8,712** **11,111** **8,000**

- **High Temperature Materials Research**..... **5,365** **5,682** **3,976**

In FY 2005, develop a new generation of corrosion resistant high temperature alloys and refractories that will be used as hot components in advanced fossil energy combustion and conversion systems. Laboratory research is accompanied by testing of the alloys in actual power

plant conditions. Demonstrated stability of proton-conducting ceramics in atmosphere of coal-derived gas and operated membrane reactor to produce low cost hydrogen from coal. *Participants include: ANL, INEEL, ORNL, ARC, Ames, Eltron, NETL.*

In FY 2004, continued to develop improved materials for high-temperature, high-pressure heat exchangers, high-temperature inorganic membranes, refractories, and activated carbons for next generation, ultra clean fossil energy power systems. Continued to develop new alloys to include intermetallics, advanced austenitic alloys, advanced ferritic alloys, and oxide-dispersion-strengthened alloys. Functional materials research addressed hot-gas particulate filters, gas separation membranes, and physical absorbents, i.e, advanced carbons and non-destructive evaluation techniques. *Participants included: ANL, INEEL, ORNL, Ames, Eltron, Special Materials, NETL, U. of Cal at SD.*

FY 2003, funding continued development of the high temperature structural and functional materials that are critical enabling technologies needed to achieve the highly efficient, economical and environmentally clean fossil energy power systems for Vision 21. *Participants included: ANL, INEEL, ORNL, Eltron, Ames, ARC, Special Materials, NETL, U. of Cal at SD.*

- **Materials for Ultra Supercritical and Gas Separation Systems** **3,260** **4,503** **3,944**

In FY 2005, identify improved alloys, fabrication processes and coating methods that will permit boiler operation of steam temperatures up to 1400° F and steam pressures up to 5500 psi. Work with alloy developers, fabricators, equipment vendors and power generation plant operators to obtain cost targets for the commercial deployment of alloys and processes developed. Define issues impacting designs that can permit power generation at steam temperatures greater than or equal to 1600° F. Identify materials needed to develop steam turbines capable of operating at the ultra supercritical temperature and pressure conditions and develop a plan to evaluate and qualify materials for the critical components. Increase permeance of new membrane materials for achieving very low cost hydrogen and oxygen separation from mixed gas streams achieving repeatability with defect-free membranes, and employing techniques that can be used in manufacturing on a large scale. Study impact of new materials and processes for stabilizing greenhouse gases for next generation energy plants. *Participants include: LANL, SNL, ORNL, PNNL, Energy Industries of Ohio.*

In FY 2004, developed alloys for ultra supercritical systems with operating temperatures raised to 1400-1600°F; ensure the weldability of these high temperature materials, and developed the base materials technology needed to develop steam turbines capable of operating at the ultra supercritical temperature and pressure conditions which are critical to the success of not only the ultra supercritical program, but also the Vision 21 program. Pursued breakthrough concepts to develop materials for achieving very low cost hydrogen and oxygen separation from mixed gas

streams and for stabilizing greenhouse gases for Vision 21 energy plants. *Participants include: LANL, SNL, ORNL, PNNL, ARC, Energy Industries of Ohio.*

FY 2003 funding supported development of alloys for ultra supercritical systems and new materials able to separate hydrogen and oxygen and for stabilizing greenhouse gases at very low costs. These are critical enabling technologies needed to make deployment of Vision 21 energy plants possible. *Participants included: LANL, SNL, ORNL, PNNL, ARC, Energy Industries of Ohio.*

- **Materials for Mercury Control** 0 500 0

In FY 2005, no funding is requested for this activity.

In FY 2004, evaluated novel materials for the conversion or removal of mercury from process streams. *Participants to be determined.*

No funding was requested for this activity in FY 2003.

- **Materials for Advanced Fuel Cell Concepts** **0** **315** **0**

In FY 2005, no funding is requested for this activity.

In FY 2004, developed advanced concepts that utilize carbon material from coal directly in a fuel cell. Such a concept will permit high and intermediate temperature fuel cells to directly convert carbon to electrical power without the need of an intermediate coal gasification step. National Laboratories may also contribute materials research in support of other advanced fuel cell concepts. *Participants to be determined*.

No funding was requested for this activity in FY 2003.

- **Program Support** **87** **111** **80**

Fund technical and program management support.

Technology Crosscut **11,078** **11,326** **10,500**

Coal Technology Export **795** **988** **1,000**

- **Coal Technology Export** **795** **988** **1,000**

In FY 2005, intensify the facilitation of the development and deployment of Zero Emissions Technologies for fossil fuels internationally. Continue compounding the pursuit of opportunities identified by the World Energy Council Committee on Cleaner Fossil Fuel Systems and the Southern States Energy Board for the international sale and deployment of U.S. clean coal technologies and advanced power systems. Strengthen established partnerships and pursue the

establishment of additional effective partnerships to advance U.S. interest in environmental protection by promoting deployment of cleaner energy systems through training, conferences, site visits and information and technical exchanges on clean power systems, best practices, privatization with targeted utilities and governments, and advising countries on identification and elimination of barriers for deployment of cleaner coal and power systems. Promote the deployment of carbon capture and storage technologies worldwide, and provide support for the Carbon Sequestration Leadership Forum. Initiate the implementation of Clean Energy/Industrial Ecology Projects in developing countries as a means of Mitigating CO_2 emissions growth as these countries expand electrification. *Participants to be determined.*

In FY 2004, sustained continued support for collaboration of zero emission technologies internationally. Intensified the pursuit of opportunities identified by the World Energy Council Committee on Cleaner Fossil Fuel Systems and the Southern States Energy Board for the international sale and deployment of U.S. clean coal technologies and advanced power systems. Continue pursuit of the establishment of effective partnerships to advance U.S. interests in environmental protection by promoting deployment of cleaner energy systems through training, conferences, site visits and information and technical exchanges on clean power systems, best practices, privatization with targeted utilities and governments and advising countries on identification and elimination of barriers for deployment of cleaner coal and power systems. This funding level supported fewer conferences and site visits when compared to FY 2003. *Participants to be determined.*

FY 2003 funding continued development of training, conferences, site visits, and information and technical exchanges in order to promote the deployment of cleaner energy. *Participants included: Latin America, China, Australia, Africa, India.*

Bioprocessing of Coal	**1,341**	**1,481**	**1,500**
• **Bioprocessing of Coal**	**1,328**	**1,466**	**1,485**

In FY 2005, continue testing at large scale (power plant) toxin process to safely control zebra mussles as a means of improving the efficiency and reliability of existing power plants. Continue development of technical protocol for screening marine microalgae for maximum biofixation and its conversion into alternative fuels. Complete development of bench scale testing of biohydrogen from carbon containing waste products to determine food sources that will support microbial growth and hydrogen production. Continue to investigate global, and natural CO_2 sequestration. Demonstrate whitings catalyzed CO_2 fixation at pilot scale. Investigate production value of added chemicals via nonaqueous biocatalysis. Continue bioremediation of coal to reduce mercury emissions when burned in power plants. *Participants include: ORNL, INEEL, PNNL, NY State U., NETL.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2004, initiated large scale testing to develop toxin to safety control zebra mussels as a means of improving the efficiency and reliability of existing power plants. Initiated development of technical protocol for screening marine microalgae for maximum biofixation and its conversion into alternative fuels. Investigated global, natural CO_2 mitigation strategies such as whitings and ocean scale algae sequestration. Continued development of biogeochemical environmental remediation of ammonia discharges associated with coal wastes from existing power plants. In furtherance of launching the hydrogen economy, investigated biohydrogen generation from carbon containing waste products to determine food sources that will support microbial growth and hydrogen production, conduct tests at bench scale. Investigated novel bio-environmental remediation processes related to coal conversion technology. *Participants include: ORNL, INEEL, U. State of NY, Cal. State U.*

FY 2003 funding continued development of CO_2 mitigation strategies, such as whitings; develop toxin for control of zebra mussels; and biohydrogen generation from carbon containing waste products. *Participants included: ORNL, INEEL, U. of State of NY, Calif. State U.*

• **Program Support**	**13**	**15**	**15**

Fund technical and program management support.

Environmental Activities	**1,987**	**1,975**	**2,000**
• **Environmental Analyses and Studies**	**1,987**	**1,975**	**2,000**

In FY 2005, continue analyses of issues associated with air and water quality, solid waste disposal, and toxic substances, and global climate change. Continued emission trends and forecast studies. *Participants include: ANL, ICF, Resource Dynamics, TMS, PNNL*

In FY 2004, continued analyses of issues associated with air and water quality, solid waste disposal, and toxic substances, and global climate change. Continued emission trends and forecast studies. *Participants include: ANL, ICF, Resource Dynamics, TMS, PNNL.*

FY 2003 funding continued environmental issues analyses of ambient, water, solid effluents, and global climate change and conducted emission trends and forecast studies. *Participants included: ANL, ICF, Resource Dynamics, TMS, PNNL.*

Technical and Economic Analyses	**994**	**988**	**1,000**
• Technical and Economic Analyses	**994**	**988**	**1,000**

In FY 2005, continue studies supporting multi-year planning FE strategy and program formulation; conducted contract fewer studies on issues that crosscut FE programs including strategic benefits of and new markets for fossil fuel technology. Conducted critical studies to

identify major challenges, "leapfrog" technologies, and advanced concepts that are applicable to fossil energy systems, and have the potential to improve their efficiency, cost, and/or environmental performance. *Participants include: ANL, ICF, EIA, Resource Dynamics, TMS.*

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International Program Support	**994**	**988**	**1,000**
• **International Program Support**	**994**	**988**	**1,000**

In FY 2005, continue Fossil Energy's commitment to the International Energy Agency (IEA) program support. Continue to provide leadership, direction, cooperation and coordination of office activities with other Federal agencies, state and local governments, energy trade associations, and the energy industry. Continue preservation and enhancement of active relationships with national and international organizations such as the World Energy Council (WEC), United States Energy Association (USEA), Southern States Energy Board (SSEB), and universities and other non-governmental organizations. Enhance the expansion of cleaner energy technology power systems activities in southern and western regional African countries, eastern Europe, the pacific Rim, Russia and Newly Independent States, South Asia/Near East, western Europe, and the Western Hemisphere. Promote the deployment of carbon capture and storage technologies worldwide. Influence opportunities for cleaner power systems and clean fuels from coal in selected countries. Initiate the implementation of Clean Energy/Industrial Ecology Projects in developing countries as a means of mitigating CO_2 emissions growth as these countries expand electrification. *Participants to be determined.*

FY 2004 funding continued support of Fossil Energy's commitment to the International Energy Agency (IEA) program effort. Provide leadership, direction, cooperation and coordination of office activities with other Federal agencies, state and local governments, energy trade associations, and the energy industry. Preserved and enhanced active relationships with national and international organizations such as the World Energy Council (WEC), United States Energy

Association (USEA), Southern States Energy Board (SSEB) and universities and other non-governmental organizations. Focused on expanding cleaner energy technology power systems activities in Southern and Western regional African countries, Eastern Europe, the Pacific Rim, Russia and Newly Independent States, South Asia/Near East, Western Europe, and the Western Hemisphere. Determined opportunities for cleaner power systems and clean fuels from coal in targeted countries. *Participants to be determined.*

FY 2003 funding continued the maintenance and heightening of established relationships with national and international organizations with emphasis on collaboration, transfer, and deployment of zero emission technologies. *Participants included: WEC, USEA, SSEB, universities and other non-governmental organizations.*

Focus Area for Computational Energy Science	**4,967**	**4,905**	**4,000**
• **Focus Area for Computational Energy Science**.....	**4,917**	**4,856**	**3,960**

In FY 2005, NETL to continue development of virtual simulations capability using mathematical computational simulations and modeling to accelerate development time and reduce costs of technology systems that have high efficiencies with near-zero emissions to reduce the effects of coal use on global warming. Begin to apply the virtual integrated simulators of high efficiency and near-zero emission processes to study proposed systems and evaluate their design and performance. Analyze and evaluate these advanced processes, using the advanced simulation capability, at both the individual component level and overall system level. Complete the initial application of process simulation of high efficiency and near-zero emission process incorporating MFIX-based component model describing an advanced gasification process to provide detailed information describing the gasification process. Complete the initial application of process simulation of high efficiency and near-zero emission process based on fuel cell/gas turbine hybrid system which incorporates a detailed fuel cell component model that will provide detailed information describing fuel call stack performance. At a reduced level of effort, continue the Supercomputing Science Consortium support activities in advanced simulations by providing high performance computing, internet access, technical support and visualization development in direct support of virtual integrated simulators. Complete a virtual integrated simulation of a high efficiency and near-zero emission process, such as a hybrid or advanced gasifier, to demonstrate the ability to simulate a dynamic coupled system. *Participants include: NETL, CMU, U. of WVU, State of WV, PSCC, U. of Pittsburgh.*

In FY 2004, NETL continued development of virtual demonstration capability using mathematical simulations and modeling to improve the speed and reduce the costs of technology systems that have high efficiencies with near-zero emissions to reduce the effects on global warming. Developed simulations that couple fluid flow, chemical reactions, heat generation, heat transfer, and electrochemistry for modeling multi-dimensional transients in fuel cells, heat engines, gasifiers, and other crucial unit processes in Vision 21 plants. Completed CFD models of fuel

cells, turbines, and gasifiers. Enhanced multi-phase flow models (MFIX) with meshing, large eddy simulations and chemistry and heat transfer improvements. Integrated subsystem component modules and dynamic system models to simulate a first case Vision 21 plant. Continued to perform data reduction and data extraction on extensive information available from simulations of advanced energy plants for incorporation into codes being developed. Continue supercomputing Science Consortium supporting activity in advanced simulations by providing high speed computing, technical support, and visualization simulations. *Participants include: Carnegie Mellon University, University of West Virginia, Pittsburgh Supercomputing Center, University of Pittsburgh.*

FY 2003, funding continued development of models and dynamic simulations of advanced energy plants, including modeling tools for sub-elements in turbines and fuel cells. Integration of subsystem component modules and dynamic system models into virtual models. Supercomputing Science Consortium support in advanced simulations utilizing high performance computing and communications. *Participants included: NETL, CMU, U. of WV, State of WV, PSCC, U. of Pittsburgh.*

• **Program Support**	50	49	40

Fund technical and program management support.

University Coal Research	**2,904**	**2,945**	**3,000**
• **University Coal Research**	**2,875**	**2,916**	**2,970**

In FY 2005, the University Coal Research (UCR) Program plans to continue to support grants at U.S. colleges and universities by emphasizing longer-term research for achieving Fossil Energy's strategic objectives. Critical key research areas that accelerate technology development and seeking to identify breakthrough technologies for the next century will be supported. The key research areas that will be supported will include: Vision 21, hydrogen initiative, global climate change, coal-based mercury emissions, materials, sensors and controls, and coal-by-product utilization for the measurement, characterization, and the development of cost-effective control technologies.

Support will continue in all three portions of the UCR Program: the Core, Innovative Concepts Phase-I and, Innovative Concepts Phase-II areas. Under the Core area, the program will continue to encourage collaboration through joint proposals involving university/industry teams. $200,000 to $400,000 grants will be awarded in this area. The number of grants will depend on the number of meritorious proposals submitted.

Exploration of novel approaches and innovative concepts developed in other scientific and technological areas that assist in developing breakthrough technologies for coal utilization will

also be continued in the Innovative Concepts Phase-I and Phase-II areas. Approximately six to eight, $50,000, one year, Innovative Concepts Phase I grants could be awarded. Further, plans are to continue the Innovative Concepts Phase II Program where one or more Phase I projects can be selected for a $200,000 Phase-II grant award. *Participants to be determined.*

FY 2004, funding supported grants at U.S. universities which emphasized longer-term research that will accelerate technology development and identify breakthrough technologies for the next century; focus was on scientific and technological issues that are key to achieving FE's strategic objectives. The support continued in critical key research areas to include Vision 21, global climate change, materials, sensors and controls, and by-products from coal. Breakthrough technologies for the measurement, characterization, and the development of cost-effective control technologies for fossil coal-based mercury emissions was also sought. *Participants to be determined.*

Exploration of novel approaches and innovative concepts developed in other scientific and technological areas that assist in developing breakthrough technologies for coal utilization was continued. Approximately six to eight, $50,000, one year, Innovative Concepts Phase-I Projects could be awarded. Further, plans are to continue the Innovative Concepts Phase II program.

FY 2003, funding provided competitively awarded research grants to U.S. colleges and universities to address FE's highest priority research needs, supported joint proposals involving university and industry teams of researchers, and continued to explore novel approaches and Innovative solutions to achieve technological breakthroughs for clean coal utilization and support to Vision 21. *Participants included: Various colleges and universities.*

• **Program Support**	**29**	**29**	**30**

Fund technical and program management support.

HBCUs, Education and Training	**969**	**981**	**1,000**
• **HBCUs, Education and Training**	**959**	**971**	**990**

Conduct research activities with HBCU and other minority institutions and support an HBCU annual technology transfer symposium. *Participants to be determined.*

FY 2004 and FY 2003 funding continued research activities at HBCU and other minority institutions and supported HBCU annual technology transfer symposium. *Participants included: Various colleges and universities.*

• **Program Support**	**10**	**10**	**10**

Fund technical and program management support.

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Total, Advanced Research	**32,444**	**38,215**	**30,500**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Coal Utilization	
• Eliminate funding for mercury control. No funding is requested for the Center for Zero Missions Coal Research which was established in FY 2004. Since there will be a delay in fully implementing this program in FY 2004, current funding will continue the program through FY 2005. Increased funding for sensors and control and enabling technologies activities	-3,852
Materials	
• Decrease funding for high temperature materials research and materials for ultra supercritical and gas separation activities. Eliminate funding for mercury control and materials for advanced fuel cell concepts	-3,111
Technology Crosscut	
• Activities continued at a reduced level of effort	-826
University Coal Research	
• Award one additional innovative concept Phase-1 grant	+55
HBCUs, Education and Training	
• Activities continue at current level of effort	+19
Total Funding Change, Advanced Research	**-7,715**

Distributed Generation Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Distributed Generation Systems					
Fuel Cells	59,107	68,644	23,000	-45,644	-66.5%
Novel Generation	2,927	2,469	0	-2,469	-100.0%
Total, Distributed Generation Systems	62,034	71,113	23,000	-48,113	-67.7%

Description

The objectives of the Distributed Generation Systems Fuel Cell activity are to provide the necessary technology base development of fuel cell systems for electric utility, industrial, and commercial/residential markets; and to provide technologies that improve U.S. international competitiveness in this new manufacturing industry.

Benefits

Fuel cell modules in IGCC and FutureGen systems have the potential to double the efficiency of coal-based systems and achieve near-zero emissions. Fuel cells can concentrate CO_2 which lends itself to removal by separation or other capture means. Fuel cells provide a bridge to the hydrogen economy by using coal derived hydrogen to produce power efficiently and by offering the potential to produce hydrogen, as well as electricity, from coal.

Background

Fuel cells and other innovative power systems are being developed for distributed generation applications that can create public benefits by enhancing the overall efficiency, security and reliability of the Nation's energy supply. The Fuel Cells Program supports the President's climate change goals by increasing the efficiency of electricity production, creating the potential for over 50% reduction in CO_2. It supports the Clear Skies Initiative with near zero NO_x, SO_x, and mercury emissions, and it supports energy security goals distributed generation alternatives to grid-based power and through multi-fuel capability (less dependence on one fuel). High-temperature fuel cells can operate on hydrogen and hydrogen carriers such as methane and syngas. Low-cost, ultra-high efficiency, fuel flexible, integrated fuel cell/turbine hybrids systems for snyfuel and hydrogen-based plants will provide essential power modules for FutureGen projects and concepts in the 2010 to 2015 time frame. Hence, the Distributed Generation Program is a bridge to the hydrogen economy of the future envisioned in the FreedomCAR and Hydrogen Fuel Initiatives.

Distributed generation complements electricity supply from central generation systems, by providing another source of energy through smaller-scale production of electric power in stationary plants at or

near the end user. Fuel cells as small modular resources may be used on a stand-alone basis, or integrated with other generators, and even connected to a central system grid. These systems may be owned and/or operated by utilities, utility customers, and third parties. Fuel cell systems are capable of reducing criteria pollutants well below current New Source Performance Standard levels, reducing non-criteria pollutants such as CO_2 and acid rain precursors, and reducing thermal emissions to the environment. Fuel Cells systems provide important carbon management options because of their inherently low emissions and ultra-high efficiency, and significant water conversation options because they can be operated in areas where water resources are scarce.

Fuel cell applications in distributed generation systems offer potential opportunities for cost-effectively meeting peak demand without the need for costly investments in transmission and distribution. They can be used to provide clean power to remote end users; and can provide new business opportunities in both utility and non-utility owners.

The Fuel Cells Program is leveraging technical innovation to develop advanced power systems for distributed generation that will improve power quality, boost system reliability, reduce energy costs, and help delay/defray capital investments. The program goal is to develop low-cost, high efficiency, fuel flexible, modular power systems with lower cost, higher quality electricity, and significantly lower carbon dioxide emissions than current plants, as well as near-zero levels of pollutants.

The current strategy is to develop clean high efficiency fossil fueled powerplants: Immediate near-term (2005-2006) - develop and conduct initial proof-of-concept tests of the Solid State Energy Conversion Alliance (SECA) low-cost, 3-10 kilowatt solid-state fuel cell modules for distributed and auxiliary power unit applications; Mid-term (2007-2010) - develop and test SECA fuel cell prototype modules capable of manufacture of $400 per kilowatt (a ten-fold reduction from today's cost), and develop combined cycle $400 per kilowatt gas-based fuel cell/turbine hybrids under Vision 21 Hybrids that will enable the design of synfuel and hydrogen-fueled hybrid powerplants; Long-term (2010-2015) - develop and demonstrate the critical high risk technology advancements which will permit U.S. industry to establish commercial availability of advanced, low-cost, ultra-high efficiency, fuel flexible, integrated fuel cell/turbine hybrids systems for synfuel and hydrogen-based plants. Fuel cell systems have specifically identified goals which coincide with coal-based and other fuel-flexible Vision 21 power modules and concepts in the 2010 to 2015 time frame.

Currently, the Advanced Research subactivity within the Fuel Cell program supports the program objectives by conducting research to identify new, highly innovative electrochemical technology concepts and by solving fundamental crosscutting high-temperature electrochemical issues through the High Temperature Electrochemistry Centers (HiTec) at PNNL and Montana State University.

Currently, the Fuel Cell/Turbine Hybrids subactivity under Vision 21 provides a alternative options for deploying fuel cell systems in a variety of applications. Integration into a single system lowers system costs and increases system efficiency. Hybrid power modules are expected to be a key enabling technology for long-term FutureGen and Vision 21 systems. Hybrid power modules are important element of the Department's hydrogen initiative and strategies for carbon management.

The Innovative Concepts subactivity includes the Solid-State Electricity Conversion Alliance (SECA), the Department's major initiative for stationary fuel cells development. The objective of the SECA is to drastically reduce fuel cells costs to make them a broadly applicable and more widespread commodity in the competitive, mature distributed generation and auxiliary power markets. The SECA program incorporates an integrated strategy to address the technical barriers of solid-state fuel cell systems within the cost constraint of $400 per kilowatt for a complete system. The benefits of SECA are projected by NEMS to include $15 billion saving through Clear Skies and Climate Change emissions reductions by 2025 from 50 GW of SECA fuel cell capacity. Additional management benefits can be expected to accrue with the introduction of SECA hybrid systems. Work under SECA core program includes, gas processing (reforming and cleanup), power electronics, controls and diagnostics, heat recovery, modeling and simulation, and material and manufacturing/fabrication research at universities and national laboratories. SECA industry teams are engaged in the development of common modules for diverse applications in multiple and mobile market applications. SECA includes exploration of designs that combine functions to reduce size, weight, and costs.

The Fossil Energy R&D program is committed to searching for promising new ideas for low-cost, low-pollutant power generation. In recent years, Fossil Energy R&D has funded research on the Ramgen engine, an innovative power systems technology under the Distributed Generation Systems Novel Generation Concepts activity. The Ramgen system is capable of utilizing a variety of fuel gases including waste gases, and components of Ramgen show potential for adaption to other power systems.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Fuel Cells	**59,107**	**68,644**	**23,000**

The focus of the Fuel Cells program is to reduce cost by an order of magnitude enabling the widespread deployment of clean reliable fuel cells and fuel cell hybrids for distributed generation, FutureGen, and Vision 21 applications through low-cost, ultra-clean, and ultra-high efficiencies.

Advanced Research	**3,389**	**9,876**	**0**
• **Advanced Research**	**3,354**	**9,778**	**0**

In FY 2005, no additional work is planned in this category. DOE considers these technologies at a point of development where industry can pursue their commercial development without further Federal funding.

In FY 2004, fund research to develop a fundamental understanding of processes that limit the performance of high temperature electrochemical systems. Such systems have applications in fossil energy conversion, energy storage, and electrolysis. Parallel experimental and modeling activities, research conducted by HiTEC will eventually lead to new concepts and technologies in fossil fuel utilization. *Participants to be determined.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

FY 2003 funding continued generic research to capitalize on the intrinsic high efficiency and environmentally benign characteristics of advanced electrochemical technology. Research will be conducted to identify new highly innovative electrochemical technology concepts and to solve fundamental crosscutting issues. *Participants included: ANL, PNNL.*

- **Program Support** **35** **98** **0**

  Fund technical and program management support.

Fuel Cell Systems **9,675** **10,865** **0**

- **Fuel Cell Systems** **9,576** **10,757** **0**

  In FY 2005, no additional work is planned in this category. DOE considers these technologies at a point of development where industry can pursue their commercial development without further Federal funding.

  In FY 2004, with the conclusion of molten carbonate fuel cells stack development in FY 2003, this subactivity will support advanced fuel cell systems development and testing in a variety of crosscutting areas in FY 2004.

  FY 2003 funding continued cost-shared cost reduction and performance improvement on one full molten carbonate system for market entry by the private sector; continue supportive distributed generation infrastructure, economic and market study assessments and system assessments and evaluations. *Participants included: FCE.*

- **Program Support** **99** **108** **0**

  Fund technical and program management support.

Vision 21 Hybrids **13,062** **12,840** **0**

- **Vision 21 Hybrids** **12,928** **12,712** **0**

  In FY 2005, no additional work is planned in this category.

  In FY 2004, conduct a redirected Vision 21 enabling cost reduction and performance enhancement program with low-cost Vision 21 fuel cell/turbine hybrid technologies; explore Vision 21 zero-emissions system concepts; conduct system studies and explore fuel flexibility and integration issues as permitted. *Participants include: NETL, GE, FCE, Siemens*.

  FY 2003 funding continued a Vision 21 enabling cost reduction and performance enhancement program with Vision 21 fuel cell/turbine hybrid technologies, such as the tubular SOFC hybrid; conduct system studies and explore fuel flexibility and integration issues as permitted. *Participants included: SWPC, NETL, GE, FCE.*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
• **Program Support**	**134**	**128**	**0**
Fund technical and program management support.			
Innovative Systems Concepts	**32,981**	**35,063**	**23,000**
• **Innovative Systems Concepts**	**32,643**	**34,712**	**22,770**
In FY 2005, begin prototype validation of Phase I technical requirements for low-cost SECA fuel cell systems; enhance individual components and systems performance; conduct SECA core technology R&D to resolve crosscutting technical issues; develop innovative reformers, sensors, and controls; initiate designs of coal-derived gas-based SECA systems as permitted. *Participants include: GE, Siemens Westinghouse, Delphi, FCE/MRI, Acumentrics, Cummins-SOFC, PNNL, ANL, NETL, and other core technology participants.*			
In FY 2004, **SECA** - Develop four concept designs for prototype mid- to high-temperature low-cost solid state fuel cell systems; develop SECA core technology for materials to reduce manufacturing costs, enhance performance, and develop innovative sensors and converters; initiate designs of hybrid coal-based SECA systems. *Participants include: GE/Honeywell, Siemens Westinghouse, FCE/Versa Power, Acumentrics, Delphi, Cummins-SOFC, ANL, PNNL, NETL, and other core technology participants.*			
FY 2003 funding continued the mid- to high-temperature low-cost SECA solid state fuel cell program; fund multiple SECA industrial teams and a core technology program; conduct coal-based SECA-hybrid integration studies as permitted. *Participants included: McDermott, ADL, NL, NETL.*			
• **Program Support**	**338**	**351**	**230**
Fund technical and program management support.			
Novel Generation	**2,927**	**2,469**	**0**
In FY 2005, no additional work is planned in this category. DOE considers these technologies at a point of development where industry can pursue their commercial development without further Federal funding.			
• **Supporting Technologies**	**2,897**	**2,444**	**0**
In FY 2005, no additional work is planned in this category.			
In FY 2004, continue to openly solicit new fossil-fuel based power generation technology that shows promise of improving efficiencies and/or lower emissions through the novel concepts program. *Participants to be determined*.			
FY 2003 funding was used to issue a solicitation for novel generation systems.			

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
• **Program Support**.....	**30**	**25**	**0**
Fund technical and program management support.			
Total, Distributed Generation Systems.....	**62,034**	**71,113**	**23,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Fuel Cells	
Advanced Research	
• In FY 2005, no additional work is planned in this category	-9,778
• Program Support	-98
Total, Advanced Research	-9,876
Fuel Cell Systems	
• In FY 2005, no additional work is planned in this category	-10,757
• Program Support	-108
Total, Fuel Cell Systems	-10,865
Vision 21 Hybrids	
• In FY 2005, no additional work is planned in this category	-12,712
• Program Support	-128
Total, Vision 21 Hybrids	-12,840
Innovative Systems Concepts	
• Decrease in Innovative Systems Concepts due to FutureGen funding priorities	-12,012
• Program Support	-121
Total, Innovative Systems Concepts	-12,063
Novel Generation	
• In FY 2005, no additional work is planned in this category	-2,444
• Program Support	-25
Total, Novel Generation	-2,469
Total Funding Change, Distributed Generation Systems	**-48,113**

U.S./China Energy and Environmental Center

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
U.S./China Energy and Environmental Center	0	988	0	-988	-100.0%
Total, U.S./China Energy and Environmental Center	0	988	0	-988	-100.0%

Description

The U.S./China Energy and Environmental Technology Center (EETC) is co-funded by the DOE and China's Ministry of Science and Technology. The EETC works to facilitate the export of American goods and services to China's growing power industry, with its focus on increasing the market share of U.S. clean coal technologies.

Benefits

China's growing power industry represents a potential market for U.S. goods and services running into the billions of dollars. The adaptation of U.S. clean coal technologies can, in addition to generating export revenue, minimize the global environmental impact of China's growth.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
U.S./China Energy and Environmental Technology Center	**0**	**988**	**0**

No funding is requested for this activity in FY 2005. It is anticipated that activity will continue into FY 2005 with existing funding.

In FY 2004, the EETC has a baseline set of activities that includes maintenance of its facilities, support of industrial partners meetings and activities related to the U.S./China Fossil Energy Protocol, and emissions reductions in China. Two industrial partners meetings will be held in FY 2004, one in February 2004, and the other in the summer of 2004. The summer meeting will include plant tours for Chinese attendees, where they will observe U.S. clean coal technologies in commercial operations. In FY 2004, the EETC is assisting in a study that will result in NO_x reductions from China's largest thermal power plant. Toward this end, the EETC is providing information to plant management on the performance of NO_x control technologies, including those that were developed and demonstrated under the Clean Coal Technology Program. Additionally, the EETC is assisting its

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Chinese partners in the development of a coal quality management plan for the City of Beijing. Beijing will use the results of this plan in the implementation of its planned air quality improvement program which is being undertaken prior to the 2008 Olympic Games. This project is part of an overall EETC program to adapt U.S. techniques for the reduction of emissions from industrial and municipal heating plants in China. These plants emit hundreds of millions of tone of CO_2 annually.

In FY 2003, the EETC maintained its baseline activities. Two meetings of industrial partners were held. This activity was funded under the Clean Coal Technology Appropriation.

Total, U.S./China Energy and Environmental Technology Center	**0**	**988**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
U.S./China Energy and Environmental Center	
It is anticipated that activities will continue into FY 2005 with existing funds	-988
Total Funding Change, U.S./China Energy and Environmental Center	**-988**

Natural Gas Technologies

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Natural Gas Technologies	45,860	42,994	42,994	26,000	-16,994	-39.5%
Total, Natural Gas Technologies	45,860	42,994	42,994	26,000	-16,994	-39.5%

Mission

This program will develop policies and new technologies that stimulate a diverse supply of natural gas - both in North America and around the world so that the market can function to the benefit of all Americans.

Benefits

Each year Fossil Energy estimates the benefits of program activities to support Government Performance and Results Act (GPRA) reporting. Methods are complex and vary by program. The oil and Gas Programs have traditionally used two separate economic and engineering modeling systems to calculate selected economic and energy security benefits. In 2002, a two-year effort, involving external peer review, was begun to integrate these two separate modeling systems into one system for improved simulation of resource and market conditions, and consistency of technology assumptions and model outputs. Under the previous two model systems, deficiencies, such as the assumption of unlimited industry capital availability, could result in an overestimation of industry's response to DOE's R&D products. Conversely, deficiencies, such as only modeling upstream R&D activities and not calculating the synergistic benefits of oil and gas R&D efforts, could result in an underestimation of the benefits of DOE's programs.

The new model will provide the following expected benefits:

- Complimentary technology development in oil and gas research.
- Full R&D program activities can be modeled.
- Ability to calculate synergistic benefits of the oil program on gas production and the gas program on oil production.

As part of the effort to conform to the President's Management Agenda in a shorter-term, Fossil Energy has undertaken an integrated program benefits analysis of oil, natural gas, coal and power systems research within Fossil Energy to develop Fossil Energy-wide program benefits estimates. This analysis, using the Energy Information Administration National Energy Modeling System (NEMS), is examining all Fossil Energy research programs on a common basis with respect to modeling assumptions and should enable aggregate and comparative assessments of the benefits of Fossil Energy research

programs. This spring, a complete explanation of methodology and assumptions will be posted on the Department's website.

Background

Natural Gas is the cleanest burning fuel, and we rely on it to provide a quarter of our Nation's energy needs. However, wide fluctuations in prices and concerns for adequate supplies have been directly responsible for the loss of American jobs.

This program supports three Presidential initiatives. Clear Skies, Climate Change, and energy security provide the underpinning for the Natural Gas Technologies program.

Clear Skies and Climate Change: Growing supplies of natural gas are required to meet the increased demand for electric generation and other residential and industrial use. A primary reason for this demand is that electricity generators can competitively meet increasingly more stringent environmental emissions, including the Clear Skies goal, provided natural gas remains abundant and therefore affordable. Through technology and policy options, the program will provide clean, abundant, affordable natural gas in support of these Presidential initiatives.

Energy Security: The natural gas technologies program goal provides technology and policy actions to increase domestic fuel supplies, expand import/export options, and assure reliable, and secure transmission, distribution, and storage infrastructures.

To meet the increasing U.S. demand for natural gas (AEO 2004 expects present use of 22.8 Tcf to grow to 31.4 Tcf by 2025, an almost 40% increase) at stable and affordable prices, new supplies must be found. Sources of North American natural gas are extensive, but much of it is uneconomic to find and produce. Technology is the key to producing this resource economically.

Natural Gas Exploration and Production-Sustainable Supply program will provide new tools and technologies that can improve access, economics and environmental performance of onshore and offshore gas operations. Significant emphasis will be placed on public lands in the Rocky Mountain region where much of the nation's undiscovered gas resource is located.

Natural gas storage will also assume increasing significance as more power plants require consistent, year-round supplies of natural gas. A nationwide, industry-led consortium will develop ways to improve the reliability and efficiency of the nation's gas storage system.

The program will also work to facilitate Liquefied Natural Gas (LNG) importation. Natural gas supply can be increased through liquefied natural gas (LNG) imports, which can respond readily to demand swings. The global gas industry and domestic consumers will benefit through an association of value chain participants who can openly and freely exchange both technical and market information.

Gas Hydrates: Over the long-term, the production of natural gas from the U.S.'s vast deposits of methane hydrates, which is the program goal, could strengthen energy security. Understanding hydrates can also improve the scientific understanding of greenhouse gases and possible offer future mechanisms for sequestering carbon dioxide. In the near-term, implications for drilling or producing oil and gas near

or through hydrate formations must be understood to avoid significant environmental damage that could occur with conventional oil and gas operations.

Effective Environmental Protection-Environmental Science: Improved technology and policy will facilitate increased access to Federal and environmentally sensitive lands. The environmental science program includes a focus on issues constraining produced water from coalbed methane production.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Coal and Other Power Systems program supports the following goal:

Energy Strategic Goal

General Goal 4: ENERGY SECURITY: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Natural Gas Technologies program has one program goal which contributes to General Goal 4 in the "goal cascade".

Program Goal 04.56.00.00: Natural Gas Technologies, Abundant Affordable Gas: The Natural Gas Technologies' goal is to provide technology and policy options capable of ensuring abundant, reliable, and environmentally sound gas supplies.

Contribution to Program Goal 04.56.00.00 Natural Gas Technologies, Abundant Affordable Gas

The Program Goal will support General Goal 4 through three long-term goals that increase the amount of gas available to the domestic consumer and support the transition to the hydrogen economy. Benefits from these long-term goals are based upon the target funding level. Benefits from natural gas environmental funding are combined with benefits from the oil environmental funding and reported with the oil program.

- Over the planning horizon (2003-2015), program efforts through public-private partnerships will add 50 Tcf of economically recoverable natural gas resources to domestic supply resulting in a cumulative cost savings of $85 billion by lowering the price of natural gas. Annually, the National Energy Modeling System (NEMS) will be used to assess the cost savings associated with abundant gas supply.
- Over the planning horizon (2003-2025), program efforts will add 22 Tcf of technically recoverable methane hydrates to the gas resource base.

The key to affordable natural gas in a rising demand environment is increasing supply, and the key to increasing supply is technology coupled with appropriate policy. The program will work in public-private partnerships with industry, universities, and other stakeholders to develop technologies to increase the supply of natural gas through technology and policy.

Annual targets for the gas supply target will track advances in key technology areas like advanced drilling, stripper-well production, and storage. Roughly half of the program's projects are successful. Based upon modeling considerations, four successful projects are sufficient to keep the program on target. Successful projects decrease cost of production and/or increase efficiency of finding gas. Either increases the economically recoverable natural gas resource. When this technology is implemented by industry, the production (supply) of natural gas increases and the price of natural gas likely declines. The price drop results in a cost savings to the consumer.

Annual targets for the methane hydrates will track critical progress in key program areas including resource characterization and safety and seafloor stability that will eventually led to identification of technically recoverable resources.

The program's performance measures will be tracked on a quarterly basis using DOE's JOULE Performance Measures system. In this system the quarterlies will roll up to the annuals and the annuals will roll up to the Program Goal. To date, the program has received perfect scores on its FY 2003 performance measures.

The key to affordable natural gas in a rising demand environment is increasing supply in an environmentally acceptable manner. The key to increasing supply is a balanced policy and technology initiative focused on expanding the gas supply from key regions in the U.S., and diversifying the supply portfolio through increased imports. The program will work in public-private partnerships with industry, universities, and other stakeholders to develop policies and technologies to increase the supply of natural gas.

The program's performance measures will be tracked on a quarterly basis using DOE's JOULE Performance Measures system. In this system the quarterlies will roll up to the annuals and the annuals will roll up to the Program Goal.

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Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY2002 Results	FY 2003 Results	FY 2004 Targets	FY2005 Targets
Program Goal 04.56.00.00 Natural Gas Technologies, Abundant Affordable Gas					
Exploration and Production					
Demonstrate a cost-effective horizontal well and advanced exploration and stimulation technologies in low permeability natural gas formations for increasing recovery of the 5,000+ TCF of gas in place in the Greater Green River and Wind River Basins. (NEARLY MET GOAL)		Demonstrate safe economic slimhole drilling technology in actual use under Arctic conditions. This technology can significantly reduce cost and environmental impacts. (MET GOAL) Develop and demonstrate two technologies to detect and quantify areas of high fracture density in currently uneconomic low permeability gas reservoirs. This program has the near-term commercial potential to double average per-well productivity. (MET GOAL)	Complete basin model for the Wind River basin and well site selection in Greater Green River Basin to evaluate integrated remote sensing, seismic surveys and basin structural analysis to differentiate gas-bearing from uneconomic fractured reservoirs, complete a conceptual model of regional water distribution to help operators avoid poor production areas, and build and have field ready an initial prototype of a 400-geophone receiver array to improve seismic resolution necessary to locate economically productive gas zones. (MET GOAL) Conduct 2 field tests of improved drilling technology that will improve the productivity of gas reservoirs and reduce drilling costs and 2 field tests of technologies to improve natural fracture detection to increase the percentage of economically producing wells of all wells drilled. (MET GOAL)	Conduct laboratory studies and feasibility analyses necessary to justify the next stage of R&D for a drilling vibration monitoring and control system, a novel mud hammer, high-temperature high-pressure cements, gas resources in the Uinta and Anadarko basins, and high-temperature electronics. This is accomplished by completing prototype development and validation testing of data fusion algorithms, a power amplifier, and simulating software for fractured reservoirs prior to field trials. Complete field tests and analysis of stripper well technologies, a jet assisted drilling system, advanced fracture stimulation designs, natural fracture predictions, and downhole power and communications systems to determine the overall technical and cost efficiency of the technology and the next step(s) to be taken, i.e., commercialization, additional modifications and testing, or termination.	Complete four of the prototype near-term products or field tests from three critical technology areas: advanced drilling, stripper-well enhancement, and gas storage. When these technologies are fully transferred to industry, they will substantially reduce costs or increase efficiency in gas exploration, production and storage. The prototype projects can be found on the program's website. Based on modeling estimates.
Gas Hydrates					
Identify a site containing gas hydrates suitable for testing the feasibility of methane recovery. (MET	Quantify a hydrate deposit by correlating core samples with geophysical and well log data. (MET GOAL)		Exchange information and coordinate effort between government agencies. Award subprojects under Joint Industry Projects for	Hold interagency meetings to exchange hydrate information and coordinate hydrate efforts between government agencies; issue	

FY 2000 Results	FY 2001 Results	FY2002 Results	FY 2003 Results	FY 2004 Targets	FY2005 Targets
GOAL)			Gulf of Mexico seafloor stability and monitoring programs. Issue newsletters, publish available technical reports on the methane hydrate website, and hold 2 workshops to communicate program results to researchers. Conduct annual Federal Advisory Committee meeting. (MET GOAL)	newsletters; and hold workshops to communicate program results to stakeholders.	
			Complete hydrate modeling for Alaska drilling program. Report strength and thermal property tests at national labs, this is fundamental data needed to model production and seafloor stability of hydrates. Develop prototype Raman Spectroscopy to use lasers to define hydrate molecular structure. (MET GOAL)	Complete laboratory analysis of core samples from the Malik research well and the Hot Ice No. 1 well, thermal property and thermal conductivity measurements, and complete installation of a 12-liter hydrate cell to obtain the necessary data for modeling and characterizing hydrate deposits.	Conduct an ocean expedition to retrieve gas hydrate samples for laboratory analysis. This will increase the understanding of sub-sea resources, which is a prerequisite for development of safe production technologies.
			Complete initial report of improved hydrate coring device on Ocean Drilling Program, Leg 204. Study of oceanic samples is essential to understanding the distribution and properties of hydrates in nature. Drill 1 test well to determine aerial extent of hydrate occurrence in Alaska. Complete evaluation of hydrate occurrence in Gulf of Mexico to understand the interaction of hydrate and seafloor stability. (MET GOAL)	Complete field tests of hydrate logging and coring operations in the Gulf of Mexico, and drilling and coring Hot Ice No. 1, and analyze results and publish reports on ODP leg 204 and Malik well to advance our understanding of seafloor stability and production potential.	

FY 2000 Results	FY 2001 Results	FY2002 Results	FY 2003 Results	FY 2004 Targets	FY2005 Targets
Infrastructure					
		Complete laboratory testing and begin field demonstration of an improved remedial technology for storage wells. (MET GOAL)	Conduct 4 field tests to demonstrate technical feasibility of advanced remote sensing and pipeline inspection technologies to reduce unintentional damage and increase pipeline integrity. Complete 2 field tests for underground gas storage facilities to improve gas storage well deliverability. Complete field testing of energy meter prototype.		
Effective Environmental Protection					
			Analyze results of bench-scale reverse osmosis in produced water treatment equipment. Develop kinetics for model compounds to be used in enzymatic and biomimetic catalysts for upgrading heavy crude oils. Construct greenhouse prototype for phytoremediation for methane (natural gas) from coal beds (CBM) water. Collect data on fine particulate matter emission factors. These studies will provide the scientific basis for lower-cost commercial-scale environmental technologies. (MET GOAL)	Ensure that refining and gas production and use are safe for the environment and the public by conducting field tests and data analysis for remediation, produced water treatment, and synthetic mud technologies. Also preparing baseline characterization of impacts of Wyoming and Montana coalbed methane (gas from coal seams) production on groundwater systems and utilizing laser-coupled technology to identify natural gas distribution system leaks.	
					Efficiency Measure: Meet the procurement plan metric which requires successfully completing greater than 90 percent of the procurement milestones (e.g., solicitation

FY 2000 Results	FY 2001 Results	FY2002 Results	FY 2003 Results	FY 2004 Targets	FY2005 Targets
					issue date, proposal ranking deadline, signing of selection statement, Congressional notification, making awards, etc.).

Means and Strategies

Three Presidential initiatives: Clear Skies, Climate Change, and energy security provide the underpinning for the Natural Gas Technologies program. These initiatives form the basis for the program strategy: (1) protecting the environment through enhanced design and efficiency of domestic natural gas exploration, production, transport, and storage operations; (2) supporting technology paths that private companies cannot risk undertaking alone; (3) providing scientific and technological information and analysis to assist policymakers in their decision-making; and, (4) optimizing environmental protection by contributing to science-based improvements in regulations that reduce uncertainties and costs.

The Natural Gas Technologies program will use various means and strategies to achieve its program goals. However various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The strategies related to increasing domestic supplies are achieved by: increasing recovery through lower cost drilling, wellbore improvements, and improved stimulation technology; improving geoscience technologies to locate and measure gas within reservoirs; extending the life of mature gas fields and reducing well abandonments; and modeling estimates of potential economic recovery of domestic gas through a range of technologies, economic criteria, and legislative and regulatory scenarios.

Validation and Verification

The program is a major supporter of DOE's performance measures tracking system (JOULE) and has pioneered many of the system's tracking and reporting tools. GPRA reporting requirements are handled through the JOULE system, and the program has also used the same software JOULE to track performance on a number of additional measures covering the full breath of the program's activities (FE JOULE) including efforts to track the status of key outreach milestones into JOULE. In FY 2003, the program got to and stayed at "Green."

To validate and verify program performance, FE will conduct various internal and external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the General Accounting Office, the Department's Inspector General, the Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Engineering and Construction Management. Each year, the Office of Engineering and Construction Management conducts external independent reviews of selected projects. In addition, various Operations/Field Offices commission external independent reviews of site baselines or portions of the baselines. Additionally, FE Headquarters senior management and Field managers conduct quarterly, in-depth reviews of cost, schedule, and scope to ensure projects are on-track and within budget.

Collaboration Activities: The impact of the Domestic Gas Supply program is expanded by: performing R&D activities in partnership with universities, State and local governments, industry, and other stakeholders; using cost-share projects and diverse technology paths to improve chances of success, and to create a direct technology transfer component; seeking synergy of the capabilities of multiple governmental agencies and industry, including the unique capabilities of National Laboratories; collaborating with other agencies to effectively promulgate domestic production technologies; investing jointly with other groups in promising technologies for target resource areas; conducting, with input

from National Laboratories, field demonstrations in collaboration with industry, academia, and others; and transferring technologies in cooperation with State and industry organizations.

External Factors Affecting Performance: Access to pubic land is the single most important factor impacting the supply of domestic natural gas. Additional factors include world oil prices, corporate mergers and acquisitions, availability and cost of capital, and new and evolving environmental legislation and regulation may affect gas program results.

Planned Program Evaluation: The Office of Natural Gas and Petroleum Technology annually performs an internal review of the R&D portfolio as an integral part of annual budget preparation. Projects are evaluated periodically at contractor review conferences and as part of road-mapping workshops to determine R&D gaps. National Energy Technology Laboratory (NETL) product managers individually monitor projects with status and major milestone reporting documented in a NETL project database. NETL in-house R&D projects are peer reviewed by external experts from academia and industry. DOE has recently developed specific metrics to better quantify and value R&D results. In addition, program benefits are estimated using the National Energy Modeling System (NEMS) supported by macroeconomic and detailed industry-specific models. Modeling assumptions and methods are reviewed externally, and the results are compared to results from other programs to determine the best application of R&D resources. Headquarter and field teams have been established to insure close cooperation in the implementation of performance measure and benefit calculations.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The Gas Technologies program has incorporated feedback from OMB into the FY 2005 Budget Request and has taken or will take the necessary steps to continue to improve performance.

Assessment under PART found the program was ineffective and lacks a vigorous peer review. Its annual and long-term measures have been agreed upon, but modeling assumptions need to be made more transparent.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.56.00.00, Natural Gas Technologies, Abundant Affordable Gas					
Exploration and Production	22,712	22,203	17,500	-4,703	-21.1%
Gas Hydrates	9,218	9,383	6,000	-3,383	-36.1%
Infrastructure	8,780	8,939	0	-8,939	-100.0%
Emerging Processing Technology	2,593	0	0	0	0.0%
Effective Environmental Protection	2,557	2,469	2,500	+31	+1.3%
Total, General Goal 4 (Natural Gas Technologies)	45,860	42,994	26,000	-16,994	-39.5%

Natural Gas Technologies

Funding Schedule by Activity

(dollars in thousands)

	FY PY	FY CY	FY BY	$ Change	% Change
Natural Gas Technologies					
Exploration and Production	22,712	22,203	17,500	-4,703	-21.1%
Gas Hydrates.....	9,218	9,383	6,000	-3,383	-36.1%
Infrastructure	8,780	8,939	0	-8,939	-100.0%
Emerging Processing Technology	2,593	0	0	0	0.0%
Effective Environmental Protection	2,557	2,469	2,500	+31	+1.3%
Total, Natural Gas Technologies	45,860	42,994	26,000	-16,994	+39.5%

Detailed Justification

(dollars in thousands)

FY 2003	FY2004	FY 2005

Exploration and Production..... **22,712** **22,203** **17,500**

In FY 2005, this program will continue develop technologies that will overcome major market and technological barriers to increase domestic supply of natural gas at reasonable prices without harm to the environment.

- **Sustainable Supply**..... **0** **0** **12,375**

  In FY 2005 the program will focus on resources in high-priority regions to find and produce gas from non-conventional and deep gas reservoirs with minimal environmental impact. Deep Trek projects for EM telemetry, microwave drillpipe, advanced diamond cutters and fluid systems will complete field testing. Deep Trek projects for high temperature electronics, super cement, and advanced MWD will complete prototype development. Projects selected under the FY 2004 Deep Gas Imaging and Technologies for Tight Gas Solicitation will continue. DOE will continue the long-term sustainability program and

complete ongoing projects in advanced diagnostics and imaging, and drilling completion and stimulations.

DOE will continue the National Stripper Well Consortium involving industry and the research community to investigate multiple technologies to improve stripper well production and prevent the abandonment of 8% of total U.S. production. In addition, DOE will support industry-led efforts in technology transfer through workshops and publications focused on the small- to mid-sized independents.

To assure efficient and reliable availability of natural gas to end users, DOE will continue funding a National, industry-driven consortium in gas storage (similar to the Stripper Well Consortium), to improve the reliability and efficiency of the existing storage system. In addition, DOE will conduct two research projects to develop advanced sensors for plastic and metal pipes.

Participants include: Honeywell, Schlumberger, E-Spectrum, Cementing Soultions, Hart Publications, PTTC, PSU, ACPT, Terra Tek, CSI, GTI, E2S, NETL, State of California, TBD.

In FY 2004 and FY 2003, project activities were funded in other key activities, below

- **Advanced Drilling, Completion and Stimulation** . **9,870** **9,876** **0**

  No activity in FY 2005. Technologies for advanced drilling and drilling greater than 15,000 feet included in Sustainable Supply above.

  FY 2003 and FY 2004 funding continued development of real-time fracture height growth diagnostic tool, ultra-light weight cement for deep water applications, high-pressured coiled tubing drilling system, mud hammer, long-term, revolutionary technologies such as laser drilling and perforations, technologies for drilling deeper than 16,000 feet including high performance drilling and completion systems, advanced coatings and hardening of "Smart" systems and sensors. *Participants included: NETL, Novatek, Mauer, Tempress, Tech Int., Cementing Solutions, Real-Tme Zone, Terra Tek, GTI, TBD*

- **Advanced Diagnostics and Imaging Systems** **3,964** **3,952** **0**

  No activity in FY 2005. Advanced Diagnostics and Imaging Systems are combined under Sustainable Supply above.

  FY 2004 and FY 2003 funding continued development of infill drilling optimization in the San Juan basin and Delaware basin of New Mexico, next generation of fracture detection technologies, long-term sustainability of gas supply study in Rocky Mt. basins, improved completion technologies, solutions to high water production problems in tight sand regions, super high resolution seismic tools and shear wave imaging. *Participants included: NETL, ARI, Stanford, LBL, SUNY, SNL, Paulsson Geophysical, University of Texas, Cementing Solutions, N. Mex. Tech.*

- **Multi National Laboratory/ Industry Partnership** **1,987** **1,975** **0**

  No activity in FY 2005.

(dollars in thousands)

FY 2003	FY2004	FY 2005

FY 2004 and FY 2003 funding continued research in 10 projects focused on advanced drilling, completion, and stimulation technologies and advanced diagnostics and imaging technologies.

- **Secondary Gas Recovery Program** **497** **0** **0**

  No activity in FY 2005 or FY 2004.

  FY 2003 funding was used to issue a broad based financial assistance competition for secondary gas recovery studies in regions outside of the Gulf of Mexico. *Participants to be determined.*

- **Stripper Well Revitalization** **1,192** **1,185** **0**

  In FY 2005, this activity will continue under the Sustainable Supply effort described above.

  FY 2004 and FY 2003 funding continued National, industry-driven consortium to investigate multiple technologies to improve stripper well production. *Participants included: Penn St. Univ.*

- **Technology Transfer** **497** **494** **0**

  In FY 2005, this activity will continue under the Sustainable Supply effort described above.

  FY 2004 and FY 2003 funding continued industry led efforts in technology transfer. *Participants included: PTTC, Hart Publications*.

- **Deep Trek** **1,490** **1,481** **0**

  In FY 2005, this activity will continue under Sustainable Supply effort described above.

  FY 2004 and FY 2003 funding continued development of technologies for drilling deeper than 16,000feet below the earth's surface, including high performance drilling and completion systems, advanced coatings and hardening of "Smart" systems and sensors, low friction, wear resistant coatings/materials. *Participants included: SNL, Honeywell, Schlumberger*.

- **Liquefied Natural Gas**..... **0** **0** **4,950**

  Increased gas supplied to the market place through LNG imports will reduce the price volatility in the market. In FY 2005, initiatives will be started to complete analyses of the economic impact of LNG supplies in the US gas market, the impact LNG tanker traffic on shipping in U.S. ports, and specific safety and security issues related to the delivery of LNG to terminals in the U.S. A federal agency task force will be established to streamline the LNG terminal approval process. An analysis of the benefits of LNG production vs. flaring will be completed for presentation to nations currently wasting associated gas produced along with oil. *Participants include: Conversion Gas Imports, NYSEG, TBD.*

- **Arctic Research**..... **2,982** **2,964** **0**

  No funding requested for this activity in FY 2005.

  FY 2004 and FY 2003 funding supported the Arctic Energy Office and research concerning the natural gas pipeline.

- **Program Support**..... **233** **276** **175**

  Fund technical and program management support.

(dollars in thousands)

FY 2003	FY2004	FY 2005

Gas Hydrates **9,438** **9,383** **6,000**

Gas Hydrates, located in Alaska and the Gulf of Mexico and other offshore locations of the U.S., contain huge resources of natural gas (if only 1% were economically producible, we could triple our resource base). In addition to their potential as a resource, hydrates appear to have implications for the global climate. Significant research is needed to provide the knowledge and technology to understand the fundamental characteristics of hydrates by 2010, and commercially produce gas from hydrates starting in 2015-2020, when more conventional resources decline. Because this research is high risk and long-term, and could potentially lower the value of current reserves, there is little incentive for industry to take the lead in hydrate development.

- **Gas Hydrates** **9,124** **9,290** **5,940**

  In FY 2005 and FY 2004 the program will support one ongoing joint industry project needed to drill initial coring wells in the Gulf of Mexico in order to assess the potential resource in the Gulf of Mexico. In addition, one Alaska hydrate project funded in FY 2003 will be continued to assess the extent of gas resources locked in hydrate formations in Alaska. Main emphasis will be on taking stratigraphically deep cores from hydrate formations in the Gulf of Mexico. *Participants include: TBD, Chevron Texaco*

  FY 2003 funding continued industry-led field activities to drill and collect samples of naturally occurring hydrate from Alaska permafrost for characterization, Joint Industry Project to understand fundamental hydrate issues in the Gulf of Mexico, national lab work and Gulf of Mexico Seafloor Monitoring work.. *Participants included: U. Miss., Chevron Texaco, BP, Maurer*.

- **Program Support** **94** **93** **60**

  Fund technical and program management support.

Infrastructure **8,780** **8,939** **0**

This program develops technology to ensure the operational reliability and integrity of transmission and utility distribution pipeline systems. The research is focused on five categories: inspection technologies, remote sensing, materials development, operational technologies, and storage. Benefits of the program are expected to be reduced greenhouse methane emissions, increased pipeline capacity, improved pipeline assessment techniques, more efficient pipeline operations, and increased safety and security.

- **Storage Technology** **1,940** **1,956** **0**

  In FY 2005, this activity has been combined with the Sustainable Supply program described above.

  FY 2004 and FY2003 funding was used to continue development of an energy meter, to establish an industry driven underground gas storage consortium, initiate bedded salt and electronic flow meter data modeling efforts, and initiate field testing of critical components of a novel LNG process. *Participants included SwRI, Terralog, Schlumberger, Conversion Gas Imports, Furness-Newbruge, Penn State University.*

(dollars in thousands)

	FY 2003	FY2004	FY 2005
▪ **Delivery Reliability**	**6,790**	**6,845**	**0**

No funding is requested for this activity in FY 2005. See Sustainable Supply above.

In FY 2004 and FY 2003, continue research directed to ensure the reliability and integrity of the gas transmission and distribution network, develop smart automated inside pipeline inspection sensor systems, conduct research on obstacle detection systems for horizontal boring applications for laying distribution pipelines, develop systems capable of detecting external force damage, develop technology to improve the efficiency for reciprocating and turbo compressors, and develop advance technology capable of determining pipeline wall integrity. *Participants included SwRI, Tuboscope, NYGAS, GTI, Battelle, CSU, ARC, ANL, INEEL, LLNL, SNL, ORNL, PNNL, NETL.*

▪ **Program Support**	**50**	**138**	**0**

Fund technical and program management support.

Emerging Processing Technology	**2,593**	**0**	**0**
▪ **Coal Mine Methane**	**2,566**	**0**	**0**

No activity in FY 2005 or FY 2004.

FY 2003 funding will complete three existing projects in coal mine methane. Fuel Cell Energy will conduct a demonstration of using a fuel cell to produce electricity from coal mine methane. The funding provided in FY 2003 was sufficient to fully fund all remaining project obligations. One project will likely be active in FY 2005, however, no new funding is requested.

▪ **Program Support**	**27**	**0**	**0**

Fund technical and program management support.

Effective Environmental Protection	**2,557**	**2,469**	**2,500**

This program seeks to reduce the environmental impacts of gas operations and reduce the cost of environmental compliance through a combination of technology development, risk assessment, and regulatory streamlining. The program will emphasize research that will improve access to onshore public lands.

▪ **Environmental Science**	**0**	**2,444**	**2,475**

In FY 2005 and FY 2004, conduct targeted initiatives to define and solve specific problems in key focus areas, specifically: 1) environmental barriers to coal bed methane production, and 2) air quality issues affecting natural gas production. Develop objective, credible scientific data for regulatory decisions as part of a program-wide environmental strategy for maintaining sustainable supplies of natural gas. *Partcipants include: NETL, National Labs, TBD.*

In FY 2003, project activities were funded in separate key activities described below.

▪ **Program Planning Data and Analysis**	**357**	**0**	**0**

In FY 2005 and FY 2004, activity continued in Environmental Science above.

(dollars in thousands)

FY 2003	FY2004	FY 2005

FY 2003 funding continued data collection and the development of analytical tools for program planning, for outreach and technology transfer, including the capability to quantify environmental costs and assess constraints to gas resource recovery, collection and distribution. Continue to perform legislative and regulatory impact analysis related to both upstream and downstream gas environmental issues. *Participants to be determined.*

- **Technology Development** **993** **0** **0**

  Activity continued in Environmental Science above in FY 2005 and FY 2004.

  FY 2003 funding continued efforts to develop and demonstrate technologies for improving the environmental performance of all gas exploration and production. *Participants to be determined.*

- **Outreach and Technology Transfer** **1,181** **0** **0**

  Activity continued in Environmental Science above in FY 2005 and FY 2004.

  FY 2003 funding continued outreach and technology transfer efforts on environmental issues affecting natural gas supply, including compliance efforts with industry, states, and others to identify and address environmental challenges to expanded natural gas production. *Participants to be determined.*

- **Program Support** **26** **25** **25**

  Fund technical and program management support.

Total, Natural Gas Technologies **45,860** **42,994** **26,000**

Explanation of Funding Changes

	FY 2004 vs. FY 2005 ($000)
Exploration and Production	
• Funding in FY 2005 will support research to address critical barriers to the expansion of gas storage and LNG supply. Several ongoing technical projects in drilling and advanced diagnostics and imaging will be terminated. New work will be started in Deep Trek. The National Lab Partnership will be terminated. Arctic Energy Office funding will be eliminated	-4,602
• Program Support	-101
Total, Exploration and Production	-4,703
Gas Hydrates	
• Decreased funding in FY 2005 for Alaska project	-3,350
• Program Support	-33
Total, Gas Hydrates	-3,383
Infrastructure	
• In FY 2005, most ongoing projects will be terminated	-8,801
• Program Support	-138
Total, Infrastructure	-8,939
Effective Environmental Protection	
▪ Continues the program at current year level of effort	+31
Total Funding Change, Natural Gas Technologies	**-16,994**

Oil Technology

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Petroleum – Oil Technology	40,983	35,078	35,078	15,000	-20,078	-57.2%
Total, Petroleum – Oil Technology	40,983	35,078	35,078	15,000	-20,078	-57.2%

Mission

The mission of the Oil Technology Program is to implement a policy, science and technology development program to resolve the environmental, supply, and reliability constraints of producing and using fossil energy resources. We do this by investing in research with clear and tangible public benefits and by developing policy options. These benefits include a cleaner environment, more secure and stable energy supplies, and increased domestic oil production.

Benefits

Each year Fossil Energy estimates the benefits of program activities to support Government Performance and Results Act (GPRA) reporting. Methods are complex and vary by program. The oil and Gas Programs have traditionally used two separate economic and engineering modeling systems to calculate selected economic and energy security benefits. In 2002, a two-year effort, involving external peer review, was begun to integrate these two separate modeling systems into one system for improved simulation of resource and market conditions, and consistency of technology assumptions and model outputs. Under the previous two model systems, deficiencies, such as the assumption of unlimited industry capital availability, could result in an overestimation of industry's response to DOE's R&D products. Conversely, deficiencies, such as only modeling upstream R&D activities and not calculating the synergistic benefits of oil and gas R&D efforts, could result in an underestimation of the benefits of DOE's programs.

The new model will provide the following expected benefits:

- Complimentary technology development in oil and gas research.
- Full R&D program activities can be modeled.
- Ability to calculate synergistic benefits of both programs.

As part of the effort to conform to the President's Management Agenda in a shorter-term, Fossil Energy has undertaken an integrated program benefits analysis of oil, natural gas, coal and power systems research within Fossil Energy to develop Fossil Energy-wide program benefits estimates. This analysis,

using the Energy Information Administration National Energy Modeling System (NEMS), is examining all Fossil Energy research programs on a common basis with respect to modeling assumptions and should enable aggregate and comparative assessments of the benefits of Fossil Energy research programs.

Background

Fossil Energy programs have been realigned to support the President's climate change and energy security goals. The Oil Technology Program increases energy security by facilitating environmentally responsible oil and gas exploration and development. The President's National Energy Policy emphasizes that 21st century technology is the key to environmental protection and new energy production.

The program's focus is on areas that require a Federal presence to achieve national energy goals. The budget delineates program goals, such as Enhanced Oil Recovery/CO_2 Injection, Domestic Resource Conservation, and Environmental Science, as funding categories. For example, the President's climate change goal will be met by research and technology development that supports effective management practices of carbon dioxide and other greenhouse gases. CO_2 injection supports this goal by revitalizing domestic energy production while storing carbon. When appropriate, collaborations with other Federal agencies, industry, academia, and states are used to meet program goals.

America's energy security is enhanced by research and technology development to support a vibrant U.S. oil and gas industry that will continue to be the base for global exploration and production. The Oil Technology Program includes research to support solid policy decision-making and technology development to allow greater access to energy resources with minimal environmental impact.

Strategic and Program Goals

The Department’s Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Coal and Other Power Systems program supports the following goal:

Energy Strategic Goal

General Goal 4: ENERGY SECURITY: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Oil Technology program has one program goal which contributes to General Goal 4 in the “goal cascade”.

Program Goal 04.57.00.00: Oil Technology, Energy Security**:** The goal of the Oil Technology program is to enhance U.S. energy security by managing and funding oil exploration and production (E&P) research and policy which results in development of domestic oil resources in an environmentally sound and safe manner

Contribution to Program Goal 04.57.00.00: Oil Technology, Energy Security

A strong domestic oil resource provides a solid foundation for energy security. The Program accomplishes this goal through the following long-term goal:

- Over the planning horizon (2003-2025), program efforts through public-private partnerships will result in a cumulative economically recoverable reserve increase of 2 billion barrels. The program benefit estimate is based upon the Energy Information Administration's National Energy Modeling Systems (NEMS).

This measure is the cumulative total economically recoverable oil resource added from existing and expected projects. The baseline production is the AEO 2003 Reference case production forecast and price assumptions. Benefits with and without the program will be calculated over the planning horizon via an integrated econometric computer program – the Energy Information Administration's National Energy Modeling System (NEMS). The targets for this measure reflect the cumulative total output through 2025 from the NEMS model analysis. Annually, technology results will be used to update the NEMS parameters to model the program annual outputs and long-term projected outcomes. This analysis is to be repeated retrospectively each year to obtain a comparative actual value reflective of the R&D success. Benefits from natural gas environmental funding are combined with benefits from the oil environmental funding and reported in the oil program.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003Results	FY 2004 Targets	FY 2005 Targets
Complete demonstration and transfer of seven advanced secondary and tertiary technologies, adding 92 million barrels of reserves, increasing the number of economic wells and reducing abandonment rates (MET GOAL) Complete field testing and monitoring of two technologies for downhole separation of oil and water, resulting in reduction in produced water and potential increase in oil production per well. (NEARLY MET GOAL)	Complete demonstration of five advanced secondary and tertiary technologies. Based on models, it is estimated these technologies will increase near-term incremental production by 1.7 million barrels of oil, and long-term incremental production by over 2.4 billion barrels of oil. (NEARLY MET GOAL) Demonstrate the field application of a shoulder-mounted, portable video methane leak detection system that can be used to significantly reduce costs of leak monitoring at refineries and other facilities while reducing harmful air emissions. Annual savings of $500,000 per year per refinery, on average, would result from regulatory acceptance and application of this technology. (BELOW EXPECTATIONS)	Demonstrate a small-diameter, lightweight composite drill pipe for ultra-short radius drilling. (MET GOAL)	Increase access to the domestic oil resources remaining in the reservoir due to lack of advanced technology. Focus on high risk research (award 6 projects and issue 1 solicitation - Micro-hole technologies) for future applications on state and federal lands and waters, and on addressing nearer-term barriers. Select and award 4 projects with independents, and on a regional basis award 4 projects-PUMP. Award 2 projects in Advanced Technologies and select band award projects under the Broad Funding Announcement. (MET GOAL) Advance the state-of-the-art in oil recovery processes by conducting bench tests (in surfactant behavior, and in paraffin deposition) and develop conceptual models and techniques related to chemical flooding, reservoir and flow simulation, reservoir characterization for enhanced oil recovery technologies to increase the amount of oil that can be recovered from discovered reservoirs (MET GOAL) Reduce the number of dry holes drilled in frontier areas, and increase near-term energy security through field testing (3 projects) improved oil recovery techniques, seismic (1 project), data acquisition (2 projects), and interpretation (1 project) in existing light and heavy oil	Enhance access to remaining domestic oil resources using advanced technology by focusing on high-risk research (award 3 projecgts—Micro-hole technology); issuing competitive solicitation and awarding three projects. Initiate Russian cooperative Research Program; and conduct model integration peer review and industry strategic program review. Advance the state-of-the-art in oil recovery processes by conducting bench tests in surfactant behavior (2 projects); modeling on-conventional reservoirs, studying gel control of water production, developing seismic algorithms to better identify hydrocarbon targets; testing 2 prototypes (3-phase separator and micro-hole completion), modeling sweep efficiency for enhanced oil recovery technologies to increase the amount of oil that can be recovered from discovered reservoirs, and completing tundra modeling and pond work, conducting wettability studies as well as initiating fracture development study.	Develop technologies through 4 projects which will contribute to increasing domestic oil supplies in an environmentally friendly manner.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003Results	FY 2004 Targets	FY 2005 Targets
			reservoirs at sites ranging from Alaska to Utah. Initiate full-scale test of newly developed vibration sonic tool. (NEARLY MET GOAL) Stimulate current production through accelerated transfer of technology to U.S. producers, especially small independent companies that have limited exposure to the technology needed to increase the oil resource base through 66 regional workshops, including one on micro-hole technologies, publish 2 newsletters, and 2 reports. (MET GOAL)		

Means and Strategies

Domestic Oil and Gas Supply: Four strategies are the focus of efforts in this program: (1) protecting the environment through enhanced design and efficiency of Domestic oil and natural gas exploration, recovery, processing, transport, and storage operations; (2) supporting technology paths that private companies cannot risk undertaking alone; (3) providing scientific and technological information and analysis to assist policymakers in their decision-making; and, (4) optimizing environmental protection by contributing to science-based improvements in regulations that reduce uncertainties and costs. The strategies related to increasing domestic supplies are achieved by: increasing recovery through lower cost drilling, wellbore improvements, and improved stimulation technology; improving geoscience technologies to locate and measure oil and gas within reservoirs; extending the life of mature oil and gas fields and reducing well abandonment; improving technologies for enhanced oil recovery processes; and modeling estimates of potential economic recovery of domestic oil and gas through a range of technologies, economic criteria, and legislative and regulatory scenarios.

The Oil Technology program will use various means and strategies to achieve its program goals. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

Validation and Verification

The impact of the Domestic Oil Supply program is expanded by: performing R&D activities in partnership with universities, State and local governments, industry, and other stakeholders; using cost-share projects and diverse technology paths to improve chances of success, and to create a direct technology transfer component; seeking synergy of the capabilities of multiple governmental agencies and industry, including the unique capabilities of National Laboratories; collaborating with other agencies to effectively promulgate domestic production technologies; investing jointly with other groups in promising technologies for target resource areas; conducting, with input from National Laboratories; field demonstrations in collaboration with industry, academia, and others; and transferring technologies in cooperation with State and industry organizations, including the Petroleum Technology Transfer Council (PTTC).

External Factors Affecting Performance:
World oil prices, corporate mergers and acquisitions, issues related to access to public lands, availability of capital, and new and evolving environmental legislation and regulation may affect oil program results.

Planned Program Evaluation:
The Office of Natural Gas and Petroleum Technology annually performs an internal review of the R&D portfolio as an integral part of annual budget preparation. Projects are evaluated periodically at contractor review conferences and as part of road-mapping workshops to determine R&D gaps. National Energy Technology Laboratory (NETL) product managers individually monitor projects with status and major milestone reporting documented in a NETL project database. NETL in-house R&D projects are peer reviewed by external experts from academia and industry. At this time, DOE is developing specific metrics that are applicable to better quantify and evaluate R&D results. In addition, program benefits are

estimated using macroeconomic and detailed industry-specific models. Modeling assumptions and methods are reviewed externally, and the results are compared to results from other programs to determine the best application of R&D resources.

To validate and verify program performance, FE will conduct various internal and external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the General Accounting Office, the Department's Inspector General, the Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, state environmental and health agencies, the Defense Nuclear Facilities Safety Board, and the Department's Office of Engineering and Construction Management. Each year, the Office of Engineering and Construction Management conducts external independent reviews of selected projects. In addition, various Operations/Field Offices commission external independent reviews of site baselines or portions of the baselines. Additionally, FE Headquarters senior management and Field managers conduct quarterly, in-depth reviews of cost, schedule, and scope to ensure projects are on-track and within budget.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The Oil Technology program has incorporated feedback from OMB into the FY 2005 Budget Request and has taken or will take the necessary steps to continue to improve performance.

Assessment under PART found the program ineffective. The program purpose is well-defined and annual performance measures have been agreed to. However, modeling assumptions need to be made transparent and the program lacks a vigorous peer review process.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.57.00.00, Oil Technology, Energy Security					
Exploration and Production	22,667	18,450	3,000	-15,450	-83.7%
Reservoir Life Extension/Management	8,724	6,914	5,000	-1,914	-27.7%
Effective Environmental Protection	9,592	9,714	7,000	-2,714	-27.9%
Total, General Goal 4 (Petroleum – Oil Technology)	40,983	35,078	15,000	-20,078	-57.2%

Oil Technology

Funding Schedule by Activity

(dollars in thousands)

	FY PY	FY CY	FY BY	$ Change	% Change
Oil Technology					
Exploration and Production.....	22,667	18,450	3,000	-15,450	-83.7%
Reservoir Life Extension/ Management.....	8,724	6,914	5,000	-1,914	-27.7%
Effective Environmental Protection.....	9,592	9,714	7,000	-2,714	-27.9%
Total, Oil Technology.....	40,983	35,078	15,000	-20,078	-57.2%

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Exploration and Production	**22,667**	**18,450**	**3,000**

This program develops technologies that will address major market and technological barriers to increase domestic supply of oil at reasonable prices while protecting the environment. In FY 2005, the Exploration and Production program will be focused on Enhanced Oil Recovery (EOR) and CO_2 injection technologies and diversification of the global oil supply. The oil remaining after conventional production (377 billion barrels) cannot be recovered without the application of EOR technologies. Carbon dioxide flooding is a proven EOR technology that prolongs the life of some mature oilfields while contributing to long-term climate change goals. Bilateral technology exchange and joint research, in areas including EOR, CO_2 injection and unconventional oil resources, between the U.S. and non-OPEC countries will also increase oil supplies.

- **EOR/CO_2 Injection** **0** **1,975** **1,980**

  In FY 2005 the President's focus on Energy Security will be supported through both short and long term efforts to enhance utilization of industrial CO_2. The long term focus will continue studies related to EOR/CO_2 injection initiated in FY2004. The short term focus will include new programs to accelerate commercial adoption of CO_2-EOR based on use of industrial CO_2. The strategy used in this short-term focus will be to increase the adoption of "best practices" to opportunities existing in the near-term. Specifically, basin-wide strategies would be examined to identify ways to lower cost and accelerate infrastructure development to cost effectively deliver CO_2 from industrial sites to candidate oil fields; this effort includes resolving potential permitting

and regulatory issues.

The enhanced domestic supply resulting from these programs support the vision of ensuring a reliable and affordable supply of petroleum. The reliable supply aspect will be augmented by programs engaging in international relationships to support and enhance diversity of global oil supply. These programs will include such activities as technology transfer and conservation in priority countries/regions. *Participants include Northrop Grumman, 4th Wave Imaging, Paulsson Geophysical Services, Univ. Wyoming, Mass. Inst. Tech, TBD.*

In FY 2004, reservoirs will be identified based upon economics, technological issues, and feasibility for benefit from CO_2 injection. Technology to make CO_2 flooding applicable to a wider class of reservoirs will be pursued. Oil reservoirs will be mapped with locations of existing industrial sources and the price and/or incentives for CO_2 that would be needed to make the project economical. Flooding scenarios will be considered to leave maximum CO_2 in the reservoir. Program success will offer options for future carbon management policy choices. *Participants to be determined.*

There was no activity in FY 2003.

- **Diversity of Global Oil Supply** **0** **0** **990**

In FY 2005, diversification of international sources of oil supplies will be supported through bilateral activities with nations that are expanding their oil industry, including Venezuela, Canada, Russia, Mexico, and certain countries in West Africa. Bilateral and multi-lateral work will include technology exchanges and joint research, development and demonstration under the Administration's North American Initiative and other international agreements.

No funding was requested for this activity in FY 2004 and FY 2003.

- **Advanced Drilling, Completion and Stimulation** **1,987** **1,975** **0**

No funding is requested for this activity in FY 2005.

FY 2004 and FY 2003 funding continued upgrades to the Advanced Cuttings Transport Facility that allowed high-temperature/high-pressure experimentation on energized fluids (air, mist, gas assisted, foam, etc.) and synthetic drill fluids, cements, and transport of fluids in horizontal and inclined wellbores. *Participants included: PRRC, University of Tulsa, National Labs, NETL.*

- **Advanced Diagnostics and Imaging Systems**..... **4,967** **4,939** **0**

No funding is requested for this activity in FY 2005.

FY 2004 and FY 2003 funding continued development of advanced reservoir diagnostics and imaging systems to optimize oil discovery and recovery. Developed quantitative engineering parameters that control rock-fluid interactions which impact oil production. Continued fundamental geoscience efforts focusing on geoscience/engineering reservoir characterization on naturally fractured reservoirs. *Participants included: Cal Tech, National Labs, NAS, ERCH.*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
■ **Multi-National Laboratory/Industry Partnership and National Laboratory Supporting Research**	**1,987**	**1,975**	**0**

No funding is requested for this activity in FY 2005.

FY 2004 and FY 2003 funding continued the transfer of technologies that advance understanding of the characteristics and producibility from oil reservoirs. *Participants included: National Labs*

■ **Reservoir Efficiency Processes** **5,100** **4,940** **0**

No funding is requested for this activity in FY 2005.

FY 2004 and FY 2003 funding continued development of improved gas flooding recovery methods and advanced the state-of-the-art in reservoir simulation. *Participants included: NETL, TBD*.

■ **Analysis and Planning** **1,936** **0** **0**

No funding is requested for this activity in FY 2005 and FY 2004. Appropriate planning and analysis activities will be undertaken in the relevant program areas.

FY 2003 funding continued technical planning and analysis support for implementing and evaluating effective and efficient oil technology research programs. Enhanced and maintained statistical data, models and supporting systems to evaluate petroleum policy options and to enhance metrics capabilities. Validated the effectiveness of the oil technologies to meet programmatic and agency goals. *Participants included: RMC, IOGCC, TRW*.

■ **Fundamental Research - PRIME** **4,967** **0** **0**

No funding is requested for this activity in FY 2005 and FY 2004.

FY 2003 funding continued development of PRIME, pre-application research focused on the development of exploration and production technologies. General areas include remote sensing, geochemical survey and improved resolution of 3-component seismic, slimhole tools for logging and testing, remote wireless monitoring and control tools, and advanced petroleum recovery technologies. *Participants include Univ. of AL, Univ. of WY, TerraTek, Univ. of Tulsa, Univ. of So. Miss., Univ. of TX at Austin, Rice Univ., TX EES, Stanford.*

■ **Arctic Research** **1,491** **1,481** **0**

No activity in FY 2005.

In FY 2004 and FY 2003, research will continue on the oxygen transport membrane being conducted at the University of Alaska, Fairbanks. Other research will be conducted in oil-related projects through the Office of Arctic Energy including tundra travel model for the North Slope of Alaska, characterization and alteration of wettability states of Alaskan reservoirs, and physical, biological and chemical implications of mid-winter pumping of tundra ponds. *Participants*

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005

included UAF, AK Dept. Natural Resources, TBD.

- **Russia Technology Program**..... **0** **988** **0**

  No funding is requested for this activity in FY 2005.

  In FY 2004, the Russian Cooperative Research Program will include, but not be limited to, one or more of the following technology focus areas: USGS-Russian Offshore Arctic Resource Assessment; World Bank Global Gas Flaring Initiative; Arctic Construction and Operations Technology Transfer Initiative; "Full Value Chain" Oil Spill Restoration; Prevention, and Response Program; and/or, U.S.-Russia Commercial Energy Summit Education Initiative.

  No funding was requested for this activity in FY 2003.

- **Program Support**..... **232** **177** **30**

  Fund technical and program management support.

Reservoir Life Extension/Management **8,724** **6,914** **5,000**

In FY 2005, the Reservoir Life Extension/Management program will focus on Domestic Resource Conservation (DRC) that will target partnerships with industry and academia to foster cost effective technologies and encourage best practices and approaches to conserve reservoir access to marginal well fields that make up 40% of our domestic production. The overall goal of DRC is to optimize Federal efforts to maintain U.S. domestic oil production capacity and enhance access to the remaining oil resource target.

In FY 2004, the Reservoir Life Extension/Management program was refocused on Domestic Resource Conservation which will target partnerships with industry and academia to foster cost effective technologies and encourage best practices and approaches to conserve reservoir access to marginal well fields that make up 40% of our domestic production. The goal is to optimize Federal efforts to maintain U.S. domestic oil production capacity and enhance access to the remaining oil resource target.

In previous years, Reservoir Life Extension/Management focused on shorter-term research with public benefits and a much more defined return on investment. Given the industry's incentive to continue this type of research on its own, Federal funding was redirected to longer-term, higher risk efforts that can help preserve U.S. academic and technological leadership in this area.

- **Domestic Resource Conservation** **8,635** **6,844** **4,950**

  In FY 2005, elements include: 1) Key technology prototype development, such as micro-hole technologies, for enabling improved access and minimizing environmental impact; 2) Technology transfer with special emphasis on independents; and 3) Policy analysis and planning to prioritize program efforts and provide policy evaluations to maximize impact on domestic oil recovery over a wide range of technological and economic conditions. *Participants include PTTC, Northrop Grumman, NETL and TBD.*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2004, elements include: 1) Key technology prototype development, such as micro-hole technologies, for enabling improved access and minimizing environmental impact; 2) Technology transfer with special emphasis on independents; and, 3) Policy analysis and planning to prioritize program efforts and provide policy evaluations to maximize impact on domestic oil recovery over a wide range of technological and economical conditions. *Participants to be determined.*

In FY 2003, the following activities were conducted: selected competitive projects that partner with independents to accelerate field testing and use of effective technologies; addressed critically underdeveloped resources owned and managed by Native American Tribes and Corporations; disseminated petroleum RD&D results to domestic stakeholders; developed mechanisms that foster communication between industry and researchers; continued to expedite the use of cost effective, more efficient, environmental friendly technologies that increase recovery; continued support of Minority Education Initiative; continued to provide other energy related educational opportunities; populated the Internet-accessible database of "best practices" resulting from the PUMP projects and conferences; and issued solicitation for "PUMP" projects to address short-term demonstrations of critical technologies in specific regions. *Participants included: INEEL, Penn State, HQ, APTA, CEED, COMET, GWPC, U. of Ok, PTTC, RMC, NETL, other National Labs, TBD*.

■ **Program Support**	**89**	**70**	**50**

Fund technical and program management support.

Effective Environmental Protection	**9,592**	**9,714**	**7,000**

The Effective Environmental Protection program will continue to focus on technologies and practices that reduce the environmental impact of oil exploration, production, and processing while minimizing the cost of effective environmental protection and compliance. The program supports energy security by helping to overcome the environmental barriers that limit access to domestic resources. The program also supports the President's Clear Skies Initiative by reducing emissions from oil production and processing. The program supports the recommendations of the National Energy Policy by encouraging additional recovery from existing wells, providing science and technology to allow additional oil development on Federal lands and providing answers to environmental questions that are limiting oil exploration and production in the National Petroleum Reserve - Alaska. Activities will provide a complete examination of specific impact of produced water and the more general problem of water management. A detailed roadmap of the necessary actions will be presented in a public workshop for discussion and inclusion of stakeholder views. The overall objective is to help balance the need to develop the Nation's energy resources while maintaining our environmental values. This program fills critical information and technical gaps that are needed to meet the Nation's energy needs without sacrificing environmental quality.

■ **Environmental Science**	**0**	**9,618**	**6,930**

In FY 2005, conduct targeted activities to define and solve specific problems in key areas,

specifically: 1) management of produced water and technology development that makes produced water a resource for beneficial uses; and 2) ensuring maximum sustainable access to oil resources on Federal lands. A public education and outreach program will be conducted to ensure that accurate information about the impacts of oil development is presented to the public. Develop objective, credible scientific data for regulatory decisions as part of a program-wide environmental strategy for maintaining U.S. oil production capacity. *Participants include: KS State Univ, Northrop Grumman, TX -EES, Univ of N Carolina, Univ of TX at Austin, NETL, LBNL, LLNL TBD.*

In FY 2004, conduct targeted activities to define and solve specific problems in key focus areas, specifically: 1) management of produced water and technology development that makes produced water a resource for beneficial uses; and, 2) ensuring maximum sustainable access to oil and gas resources on Federal lands. An outreach program will be conducted to ensure that accurate information about the impacts of oil and gas development is presented to the public. Develop objective, credible scientific data for regulatory decisions as part of a program-wide environmental strategy for maintaining U.S. oil production capacity. *Participants include: NETL, National Labs, BLM, TBD*

FY 2003 funding was included in the activities below.

- **Program Planning and Data Analysis** **880** **0** **0**

In FY 2005 and FY 2004, activity combined in Environmental Science activity above.

FY 2003 funding continued analysis of industry environmental trends and available technologies. Maintained performance measurement data for program planning and technology transfer. Provided energy and economic analyses for legislative and regulatory initiatives related to oil environmental issues. Provided analysis of refinery related environmental issues and regulations. *Participants included: PERF, National Labs, EPA*

- **Streamline State/Tribal/Federal Regulations** **2,687** **0** **0**

In FY 2005 and FY 2004, activity combined in Environmental Science activity above

FY 2003 funding continued development, in cooperation with Federal and State agencies, of streamlined environmental regulations and regulatory processes with emphasis on reducing permitting times for refinery upgrades and domestic production from public lands, while maintaining environmental protection. The objective of this key activity was to increase domestic production and refinery capacity by reducing the cost of compliance. *Participants included: ORNL and other National Labs, University of Tulsa, IOGCC.*

- **Risk Assessment**..... **1,953** **0** **0**

In FY 2005 and FY 2004, activity combined in Environmental Science activity above.

FY 2003 funding continued development of credible scientific data for regulatory decision making in all aspects of exploration, production, and processing. *Participants included: National*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Laboratories, BLM, PERF, GWPC			
■ **Technology Development**	**3,974**	**0**	**0**
In FY 2005 and FY 2004, activity combined in Environmental Science activity above.			
FY 2003 funding continued development of technologies to reduce produced water handling costs and explored innovative refinery technologies that could significantly reduce CO_2 emissions. *Participants included: NETL and other National Laboratories, University of Tulsa, GEER.*			
■ **Program Support**	**98**	**96**	**70**
Fund technical and program management support.			
Total, Petroleum - Oil Technology	**40,983**	**35,078**	**15,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Exploration and Production	
■ Deceases consist of termination of work in Advanced Drilling, Completion and Stimulation, Advanced Diagnostics and Imaging Systems, Partnership Program, Advanced Technologies for High Risk Resources; and Arctic Research. Planning and Analysis is reduced because the program is being realigned to specifically support the President's climate change and energy security goals	-15,450
Reservoir Life Extension	
■ Decreases consist of termination of work in Technology Development with independents, Native American program, Field Demonstrations, and PUMP. Outreach and Technology Transfer is reduced because the program is being realigned to specifically support the President' climate change and energy security goals	-1,914
Effective Environmental Protection	
■ Decreases consist of termination of research on lower priority environmental issues, such as remediation, NORM, air emissions, and work the conducted by the Natural Gas and Oil Technology Partnership	-2,714
Total Funding Change, Petroleum - Oil Technology	**-20,078**

Program Direction and Management Support

Funding Profile by Category

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	% Change	% Change
Headquarters					
Fossil Energy Research and Development					
Salaries and Benefits	12,131	15,043	15,200	+157	+1.0%
Travel	536	530	623	+93	+17.5%
Support Services	6,110	6,616	6,926	+310	+4.7%
Total, Fossil Energy Research and Development	18,777	22,189	22,749	+560	+2.5%
Clean Coal Technology					
Salaries and Benefits	0	2,717	2,750	+33	+1.2%
Travel	0	183	185	+2	+1.1%
Support Services	0	1,940	1,465	-475	-24.5%
Total, Clean Coal Technology	0	4,840	4,400	-440	-9.1%
Headquarters Program Direction					
Salaries and Benefits	12,131	17,760	17,950	+200	+1.1%
Travel	536	713	808	+95	+13.3%
Support Services	6,110	8,556	8,391	-165	-1.9%
Total, Headquarters	18,777	27,029	27,149	+120	+0.4%
Full Time Equivalents	110	127	127	0	+0.0%
National Energy Technology Laboratory					
Fossil Energy Research and Development					
Salaries and Benefits	34,211	37,002	37,756	+754	-2.0%
Travel	1,515	1,432	1,495	+63	+4.4%
Support Services	32,726	30,787	30,000	-787	-2.6%
Total, Fossil Energy Research and Development	68,452	69,221	69,251	+30	+0.04%
Clean Coal Technology					
Salaries and Benefits	0	6,543	6,625	+82	+1.2%
Travel	0	118	120	+2	+1.7%
Support Services	0	3,314	2,855	-459	-13.9%
Total, Clean Coal Technology	0	9,975	9,600	-375	-3.8%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	% Change	% Change
National Energy Technology Laboratory					
Salaries and Benefits	34,211	43,545	44,381	+836	+1.9%
Travel	1,515	1,550	1,615	+65	+4.2%
Support Services	32,726	34,101	32,855	-1,246	-3.7%
Total, National Energy Technology Laboratory	68,452	79,196	78,851	-345	-0.4%
Full Time Equivalents	348	397	397	0	0.0%
Total Program Direction Headquarters Fossil Energy Research and Development					
Salaries and Benefits	12,131	15,043	15,200	+157	+1.0%
Travel	536	530	623	+93	+17.5%
Support Services	6,110	6,616	6,926	+310	+4.7%
Total, Headquarters Fossil Energy Research and Development	18,777	22,189	22,749	+560	+2.5%
National Energy Technology Laboratory Fossil Energy Research and Development					
Salaries and Benefits	34,211	37,002	37,756	+754	-2.0%
Travel	1,515	1,432	1,495	+63	+4.4%
Support Services	32,726	30,787	30,000	-787	-2.6%
Total, National Energy Technology Laboratory Fossil Energy Research and Development	68,452	69,221	69,251	+30	+0.04%
Clean Coal Technology					
Salaries and Benefits	0	9,260	9,375	+115	+1.2%
Travel	0	301	305	+4	+1.3%
Support Services	0	5,254	4,320	-934	-17.8%
Total, Clean Coal Technology	0	14,815	14,000	-815	-5.5%
Total, Program Direction					
Salaries and Benefits	46,342	61,305	62,331	+1,026	+1.7%
Travel	2,051	2,263	2,423	+160	+7.1%
Support Services	38,836	42,657	41,246	-1,411	-3.3%
Total, Program Direction	87,229	106,225	106,000	-225	-0.2%
Total Full Time Equivalents	458	524	524	524	524

Mission

Program Direction and Management Support provides the Federal staffing resources and associated costs required to provide overall direction and execution of the Fossil Energy Research and Development program.

As stated in the Departmental Strategic Plan, DOE's Strategic and General Goals will be accomplished not only through the efforts of the major program offices in the Department but with additional effort from offices which support the programs in carrying out the mission. Fossil Energy performs critical functions which directly support the mission of the Department. Headquarters staff provide functions including overall direction of the programs that includes implementing DOE policy, communicating guidance consistent with that policy to the FE field offices, establishing program objectives, developing program plans and evaluating alternative program strategies, developing and defending budget requests to the Office of Management and Budget and to Congress, reviewing procurement plans, monitoring work progress, and approving revisions in work plans as required to attain program goals. The NETL performs the day-to-day project management functions of assigned programmatic areas that include monitoring Fossil Energy contracts and National Laboratory activities, developing project budgets, implementing procurement plans, and other program and site support activities necessary to achieve program objectives.

In FY 2004 and FY 2005, all program direction and management support costs associated with the Clean Coal Technology program have been combined with those of Fossil Energy Research and Development under this account.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Headquarters	**18,777**	**27,029**	**27,149**
Salaries and Benefits	**12,131**	**17,760**	**17,950**

In FY 2005, provide funds for 127 FTE=s (includes 17 FTE=s transferred from the CCT account) at Headquarters. This staff implements and communicates policy to the NETL=s and other field offices, sets program objectives, develops program plans and evaluates alternative strategies; develops and defends budget requests; approves procurement plans; and monitors work progress.

FY 2004 funds provided for 127 FTE=s (includes 17 FTE=s transferred from the CCT account) at Headquarters. FY 2003 funding provided funds for 110 FTE=s (Fossil Energy R&D only) at Headquarters. Salaries and benefits for the CCT staff were provided under the CCT account in FY 2003. This staff implements and communicates policy to the NETL=s and other field offices, sets program objectives, develops program plans and evaluates alternative strategies; develops and defends budget requests; approves procurement plans; and monitors work progress.

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Travel	**536**	**713**	**808**

In FY 2005, provide funds for travel in support of the activities stated above. Both domestic and international travel are conducted.

FY 2004 funding provided for travel in support of the activities stated above. FY 2003 funding provided for Fossil Energy R&D Headquarters staff only; at that time Clean Coal Technology travel was funded under the CCT account. Both domestic and international travel was conducted.

Support Services	**6,110**	**8,556**	**8,391**
▪ **Technical and Management Support Services**	**1,838**	**4,113**	**3,465**

In FY 2005, provide for contractual services that are generic to the entire FE program. Included are items such as computer services, technical and management support services.

FY 2004 funding provided for contractual services that are generic to the entire FE program. FY 2003 funding provided for Fossil Energy R&D Headquarters contract services only, at that time Clean Coal Technology contract services were funded under the CCT account. Included are items such as computer services, technical and management support services.

▪ **Computer Systems and Support**	**795**	**988**	**1,026**

The Headquarters information technology investment includes costs associated with general information technology infrastructure support including LAN, internet and intranet networking, cyber security, desktop support, tele-video, information architecture planning and systems support.

▪ **Working Capital Fund**	**3,477**	**3,455**	**3,900**

In FY 2005, provides funding for the Departments working capital fund.

In FY 2004 and FY 2003, provided funding for the Department=s working capital fund.

▪ **Small Business and Innovative Research (SBIR)**	**0**	**0**	**0**

In FY 2005, fund SBIR in the amount of $11,873,000 from prior year and/or various R&D program funds within the Fossil Energy R&D account.

In FY 2004, funded SBIR in the amount of $12,137,000 from prior year and/or various R&D program funds within the Fossil Energy R&D account.

FY 2003 funded SBIR in the amount of $11,444,000 using prior year and/or various R&D program funds with the Fossil Energy R&D account.

▪ **Small Business Technology Transfer (STTR)**	**0**	**0**	**0**

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2005, fund STTR in the amount of $699,000 from prior year and/or various R&D program funds within the Fossil Energy R&D account.

In FY 2004, fund STTR in the amount of $702,000 from prior year and/or various R&D program funds within the Fossil Energy R&D account.

FY 2003 funded STTR in the amount of $695,000 using prior year and/or various R&D program funds with the Fossil Energy R&D account.

National Energy Technology Laboratory	**68,452**	**79,196**	**78,851**
Salaries and Benefits	**34,211**	**43,545**	**44,381**

In FY 2005, provide funds for NETL staff of 397 FTEs (includes 49 FTE=s transferred from the CCT account). Activities of the staff include project management, product development, contract management, and other service activities related to program and site support. It is anticipated that 20 FTEs of the 397 FTEs will be paid via reimbursable agreements, therefore, salaries and benefits associated with these FTEs are not included in the budget estimate

In FY 2004, provided funds for NETL staff of 397 FTEs (includes 49 FTE=s transferred from the CCT account). Activities of the staff include project management, product development, contract management, and other service activities related to program and site support. Of the 397 FTEs, 20 FTEs were paid via reimbursable agreements, therefore, salaries and benefits associated with these FTEs are not included in the budget estimate.

FY 2003 funding provided for NETL staff of 348 FTEs (does not include 49 FTE=s funded in CCT account) . Activities of the staff include project management, product development, contract management, and other service activities related to program and site support. Nine of the FTEs in FY 2003 were paid via reimbursable agreements, therefore, salaries and benefits associated with these FTEs are not included in the budget estimate.

Travel.....	**1,515**	**1,550**	**1,615**

In FY 2005, provide funds for travel in support of the above activities in the attainment of program goals, both on the domestic front and abroad.

In FY 2004, provide funds for travel in support of the above activities in the attainment of program goals, both on the domestic front and abroad.

FY 2003 funding provided for travel in support of the activities stated above; at that time Clean Coal Technology travel was funded under the CCT account. Both domestic and international travel was conducted.

Support Services	**32,726**	**34,101**	**32,855**

(dollars in thousands)

FY 2003	FY 2004	FY 2005

The NETL information technology investment is funded in this budget line. This investment includes costs associated with general information technology infrastructure support including LAN, internet and intranet networking, cyber security, desktop support, televideo, telecom, information architecture planning and systems support. Additionally, this investment covers specific mission related systems support including the TORIS and PROMIS systems.

In FY 2005, provide funding for facility operations, maintenance, finance, information automation, administrative, management and technical support.

In FY 2004, provide funding for facility operations, maintenance, finance, information automation, administrative, management and technical support.

FY 2003 funding provided for facility operations, maintenance, finance, information automation, administrative, management and technical support. In FY 2003, those activities related to the Clean Coal Technology program were funded under the CCT account.

Total, Program Direction and Management Support	**87,229**	**106,225**	**106,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Headquarters	
▪ Mandatory pay increase	+190
▪ Increase in Travel	+95
▪ Increase in Contract Services	-165
National Energy Technology Laboratory	
▪ Mandatory pay increase	+836
▪ Increase in Travel	+65
▪ Increase in Contract Services	-1,246
Total Funding Change, Program Direction	**-225**

Plant and Capital Equipment

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	% Change	% Change
Construction	6,954	6,914	0	-6,914	-100.0%
Total, Plant and Capital Equipment	6,954	6,914	0	-6,914	-100.0%

Mission

The mission of the Plant and Capital Equipment program is to maintain the facilities necessary to safely and effectively carryout the mission of the Fossil Energy R&D program.

Benefits

General plant projects include repairs, improvements, alteration and additions that are essential to the safe, environmentally acceptable and efficient operations of NETL sites and ARC.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
■ **GPP at NETL and ARC**	**2,980**	**2,963**	**0**

Provides no funding in FY 2005 for General Plant Projects (GPP) at the National Energy Technology Laboratory and the Albany Research Center.

■ **NETL Office/Lab Building**	**3,974**	**3,951**	**0**

Provides no funding in FY 2005 for the fourth year of the National Energy Technology Laboratory's seven-year facilities and infrastructure renovation project.

FY 2004 and FY 2003 funding provided for building design for facilities at both the Pittsburgh and Morgantown sites; renovation of several buildings; demolition of several buildings and subsequent site preparation; expand parking facilities; and enhanced security measures.

Total, Plant and Capital Equipment	**6,954**	**6,914**	**0**

Explanation of Funding Changes

	FY 2005 vs FY 2004 ($000)
The FY 2005 request includes no funding for GPP and the fourth year of the National Energy Technology Laboratory's seven-year facilities and infrastructure renovation project.	-6,914
Total Funding Change, Plant and Capital Equipment	**-6,914**

Fossil Energy Environmental Restoration

Funding Schedule by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Fossil Energy Environmental Restoration	9,652	9,595	9,595	6,000	-3,595	-37.5%
Total, Fossil Energy Environmental Restoration	9,652	9,595	9,595	6,000	-3,595	-37.5%

Mission

The objectives of the Fossil Energy (FE) Environmental Restoration activities are to ensure protection of workers, the public, and the environment in performing the mission of the National Energy Technology Laboratory (NETL) at the Morgantown (MGN), West Virginia, Pittsburgh (PGH), Pennsylvania, and Tulsa, Oklahoma sites, and the Albany Research Center (ARC) at Albany, Oregon.

Benefits

Environment, Safety and Health activities include those necessary to protect workers and the public from exposure to hazardous conditions and materials (e.g., fires, carcinogens, asbestos, lead, etc.), identify and correct safety and health hazards, improve workplace monitoring and industrial safety programs, achieve compliance with Federal, state and local environment, safety, and health requirements, including Department of Energy (DOE) initiatives, and implement initiatives related to achieving best-in-class performance. Activities also include environmental protection, and cleanup activities on-site, and at several former off-site research and development locations. Groundwater and soil monitoring/remediation is also required at the NETL and ARC sites to ensure compliance with Federal, state and local requirements.

FY 2005 performance measures are listed below that support the overarching goal of making consistent and measurable progress in reducing and eliminating injuries, incidents and environmental releases.

- Maintain risk management programs and Federal permit compliance status at NETL.
- Conduct remediation activities at Rock Springs and Hoe Creek, WY sites.
- Conduct environmental monitoring and surveillance activities (air, water, wastewater) in support of permit maintenance.
- Conduct ES&H training according to job hazard analyses.
- Conduct a series of lead and asbestos abatement actions and remove hazardous materials at ARC.
- Maintain emergency response and security program capabilities at ARC.

- Continue with equipment/facility upgrades and infrastructure repairs, including facility evaluations at ARC.
- Complete lead and asbestos abatement actions at NETL as required by maintenance, construction, and projects.
- Conduct groundwater monitoring and remediation activities at ARC.
- Implement limited activities to meet waste minimization and energy efficiency goals.
- Implement continuity of operations program at NETL.
- Maintain programs for purchasing environmentally preferable products and services.
- Reduce sanitary waste from routine operations at ARC.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
CERCLA Remedial Actions	**1,987**	**1,843**	**1,250**
■ **Rock Springs Sites**	**795**	**592**	**592**

In FY 2005, operate and maintain the *In-Situ* Aeration Bioremediation Systems at Rock Spring Sites to remove BTEX compounds from Tipton aquifer ground water, as required by the WDEQ. Conduct periodic ground water sampling events to determine progress in removing contaminants from the Tipton aquifier. *Participants include: Army Corps of Engineers.*

In FY 2004, continue second year of full-scale cleanup of Rock Springs sites (~7 year program). *Participants include: Army Corps of Engineers.*

FY 2003 funding continued cleanup of the Rock Springs sites, with full-scale cleanup beginning in FY 2003. *Participants included: Army Corps of Engineers.*

■ **Hoe Creek Site**	**298**	**306**	**306**

FY 2005, seal and abandon all wells, except long-term monitoring wells to be used in contaminant rebound evaluations, as required by the WDEQ. *Participants include: Army Corps of Engineers.*

In FY 2004, continue third year of full-scale cleanup of Hoe Creek site (~7 year program). *Participants include: Army Corps of Engineers.*

FY 2003 funding continued full-scale cleanup of the Hoe Creek site. *Participants included: Army Corps of Engineers.*

■ **Hannah Site Revegetation**	**70**	**25**	**25**

In FY 2005, closeout active operations with respect to revegetation initiatives.

In FY 2004, continue Hannah Site revegetation (~10 year program).

FY 2003 funding continued Hannah Site revegetation.

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
■ **NETL Preliminary Site Investigations**	**298**	**439**	**77**

In FY 2005, initiate the discovery and investigation of one former FE Research and Development (R&D) site. Conduct preliminary assessments (PA) if necessary to determine environmental risk prior to contract closeout.

In FY 2004 implement three additional off-site investigations and remediations related to project closeouts, based on results of risk analyses.

FY 2003 funding continued implementation of ne CERCLA site investigations and project closeouts.

■ **NETL Site Remediation**	**30**	**30**	**0**

In FY 2005, no funding is requested for this activity.

In FY 2004 perform on-site building and soil type remediation assessments at NETL (re-assessment).

FY 2003 funding provided for on-site CERCLA-type remediation assessments at NETL.

■ **CERCLA PRP Response Activities**	**496**	**451**	**250**

In FY 2005, conduct remedial investigations and feasibility studies on sites found to be contaminated and requiring cleanup under Federal CERCLA and State cleanup standards.

In FY 2004, implement CERCLA PRP Response Activities.

FY 2003 funding continued implementation of CERCLA PRP Response Activities.

RCRA Remedial Actions	**2,285**	**2,039**	**1,758**
■ **NETL On-Site Remediation**	**1,540**	**1,398**	**1,208**

In FY 2005, continue NETL on-site regulatory and corrective, activities such as: lead and asbestos abatement; waste minimization and pollution prevention activities including managing residual wastes; achieving/maintaining compliant wastewater treatment plant operations, and site support contractor RCRA-related maintenance activities.

In FY 2004, continue NETL on-site corrective, preventive, and improvement activities such as; lead and asbestos abatement; upgrading chemical handling facilities; waste minimization and pollution prevention activities including managing residual wastes; environmental management plan implementation required for maintenance of ISO 14001 certifications; surface water compliance; and site support contractor RCRA related maintenance activities.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

FY 2003 funding continued NETL on-site corrective, preventive, and improvement activities such as; lead and asbestos abatement; hazardous material and waste compliance; waste minimization and pollution prevention activities including managing residual wastes; environmental management plan implementation required for maintenance of ISO 14001 certifications; surface water compliance; and site support contractor RCRA related maintenance activities.

- **Albany Research Center RCRA** **745** **641** **550**

In FY 2005, continue ARC RCRA cleanup actions including abating lead and asbestos exposures; resolving chemical storage and labeling; monitoring soil and groundwater; upgrading ventilation and air pollution systems; and improving air emission management, materials handling, and waste disposal activities.

In FY 2004, continue ARC RCRA cleanup actions including abating lead and asbestos exposures; resolving chemical storage and labeling issues; monitoring soil and groundwater; upgrading ventilation and air pollution control system; implementing environmental management system plan required for ISO 14001 certification; and improving air emission management, materials handling, and waste disposal activities.

FY 2003 funding continued ARC RCRA cleanup actions including abating lead and asbestos exposures; characterizing and resolving chemical storage and labeling; monitoring soil and groundwater; upgrading ventilation and air pollution control system; and improving air emission management, materials handling, and waste disposal activities.

Other ES&H Actions **5,380** **5,713** **2,992**

- **Other ES&H Actions at NETL** **4,282** **4,494** **2,224**

In FY 2005, implement baseline regulatory and Integrated Safety Management/ISO 14001 programs (emergency management, occupational medicine and health, safety, environmental management, ergonomics, training, and fire protection) at NETL. Implement limited actions in support of achieving DOE's pollution prevention and energy management goals.

In FY 2004, maintain regulatory and Integrated Safety Management/ISO 14001 programs (emergency management, occupational medicine and health, safety, environmental management, ergonomics, training, and fire protection) at NETL. Identify safety improvements required to achieve external OSHA-type certifications. Identify and implement safety-related security improvements. Continue to execute environmental objectives and targets under NETL's ISO 14001 programs, including incremental and continued achievement of DOE's pollution prevention and energy leadership goals. Conduct highest priority indoor and CFC-related air quality fixes.

FY 2003 funding maintained regulatory and Integrated Safety Management/ISO 14001 programs (emergency management, occupational medicine and health, safety, environmental management, ergonomics, training, and fire protection) at NETL. . Continued to execute environmental objectives and targets under NETL's ISO 14001 programs, including incremental and continued

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005

achievement of DOE's pollution prevention and energy leadership goals. Conducted highest priority indoor and CFC-related air quality fixes.

- **ES&H Corrective Action at NETL Tulsa Site**..... 15 25 10

In FY 2005, perform ES&H-related training and an ergonomics review to determine personnel at risk of ergonomic injury. Perform testing of and maintenance on fixed fire protection systems. Conduct emergency management drills.

In FY 2004, continue ES&H program activities at NPTO including inspections, emergency management and drills, training, etc. Expand environmental management system to Tulsa site.

FY 2003 funding continued ES&H program activities at NETL Tulsa site including inspections, emergency management and drills, training, etc.

- **ES&H Corrective Action at ARC**..... **984** **1,098** **698**

In FY 2005, continue ARC safety and health programs and corrective actions including monitoring and surveillance, emergency preparedness and drills, and security improvements. Maintain indoor air quality and ventilation systems, walking surfaces, personal protective equipment maintenance, facility seismic evaluations, and training. Continue incremental progress toward DOE's pollution prevention and energy management goals. Costs also include contracted security, ISM, and ISO 14001 support.

In FY 2004, continue ARC safety and health programs and corrective actions including monitoring and surveillance; emergency preparedness and drills; and security improvements. Upgrade indoor air quality and ventilation systems; medical and industrial hygiene services; fire detection and suppression systems; walking surfaces; personal protective equipment maintenance; facility seismic evaluations; and training. Continue to execute revised environmental objectives and targets under ARC's ISO 14001 programs, including incremental and continued achievement of DOE's pollution prevention and energy leadership goals. Costs also include contracted security, ISM, and ISO 14001 support.

FY 2003 funding continued ARC safety and health programs and corrective actions including monitoring and surveillance; emergency preparedness and drills; security improvements; and contracted security support. Upgrade indoor air quality and ventilation systems; medical and industrial hygiene services; fire detection and suppression systems; walking surfaces; personal protective equipment maintenance; and training.

- **Program Support**..... **99** **96** **60**

Fund technical and program management support.

Total, Fossil Energy Environmental Restoration	**9,652**	**9,595**	**6,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
■ Decrease in CERCLA Remedial Actions will defer actions including the conduct of remedial investigations and feasibility studies and Treatability studies on sites found to be contaminated and requiring cleanup under CERCLA and State Standards; risk assessments of on-site inactive waste sites; and on-site sampling and analysis to determine the need for site cleanup	-593
■ Decrease in RCRA funding will defer actions including the decontamination/ decommissioning of selected NETL-PGH R&D buildings; upgrading chemical handling and dispensing facilities and environmental management plan implementation required for maintenance of ISO 14001 certification at NETL and ARC	-281
■ Decrease in Other ES&H funding will defer actions including the monitoring and cleanup of environmental contamination at ARC; the upgrade of gas alarm systems in NETL buildings; execution of environmental plans, objective and targets under NETL's and ARC;s ISO 4001 programs; identification and implementation of safety-related security and infrastructure improvements; conduct of high priority air quality fixes including CFC-elimination and ventilation improvement activities; enhancement of energy management program including metering of individual facilities/projects for energy use; indoor air quality/ventilation fixes at NETL R&D buildings; implementation emergency power systems for NETL''s ES&H critical operations; and the retrofit of chillers grater than 150 tons of cooling capacity manufactured before 1984 using Class I refrigerants	-2,721
Total Funding Change, Fossil Energy Environmental Restoration	**-3,595**

Import/Export Authorization

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Import/Export Authorization	2,981	2,716	2,716	1,799	-917	-33.7%
Total, Import/Export Authorization	2,981	2,716	2,716	1,799	-917	-33.7%

Mission

The Office of Import/Export Authorization (OIEA) manages the regulatory review of natural gas imports and exports. In addition, the program exercises regulatory oversight of the conversion of existing oil and gas-fired powerplants, processes exemptions from the statutory provisions of the Powerplant and Industrial Fuel Use Act of 1978 (FUA), as amended, and processes certifications of alternate fuel capability pursuant to the provisions of the amended FUA.

Benefits

These regulatory activities help promote the national energy strategy goal of securing future energy supplies by helping to ensure: the availability of reliable, competitively priced natural gas; and that surplus domestic gas supplies can be marketed internationally in a competitive and environmentally sound manner.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Import/Export Authorization	**2,981**	**2,716**	**1,799**
■ **Import/Export Authorization**	**2,683**	**2,445**	**1,619**

In FY 2005, modify or rescind 3 conversion orders. Process 50 certifications of coal capability and 3 exemptions. Process 226 gas import/export applications. Provide support for consultations with U.S. trading partners. Provide regulatory compliance and industry monitoring. Provide petroleum policy support for ASFE. The electricity regulatory functions of this program have been transferred to the Office of Electricity Transmission and Distribution.

In FY 2004, modify or rescind 3 conversion orders. Process 50 certifications of coal capability and

(dollars in thousands)

FY 2003	FY 2004	FY 2005

3 exemptions. Process 220 gas import/export applications. Provide support for consultations with U.S. trading partners. Provide regulatory compliance and industry monitoring. Provide petroleum policy support for ASFE. Process 103 electricity export applications and 11 construction permits. Monitor and analyze international and domestic electricity trade. Participate in FERC proceedings, international studies, and trade negotiations. Perform NEPA compliance activities.

FY 2003 funding provided for activities to modify or rescind 3 conversion orders. Process 50 certifications of coal capability and 3 exemptions. Process 200 gas import/export applications. Provide support for consultations with U.S. trading partners. Provide regulatory compliance and industry monitoring. Provide petroleum policy support for ASFE. Process 100 electricity export applications and 10 construction permits. Monitor and analyze international and domestic electricity trade. Participate in FERC proceedings, international studies, and trade negotiations. Perform NEPA compliance activities.

■ **Program Support**	**298**	**271**	**180**
Fund technical and program management support.			
Total, Import/Export Authorization	**2,981**	**2,716**	**1,799**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
■ Decrease in Import/Export Authorization due to an transfer of the electricity regulatory function to the Office of Electricity Transmission and Distribution	-917
Total Funding Change, Import/Export Authorization	**-917**

Advanced Metallurgical Research

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Advanced Metallurgical Research	5,961	9,876	9,876	8,000	-1,876	-19.0%
Total, Advanced Metallurgical Research	5,961	9,876	9,876	8,000	-1,876	-19.0%

Mission

The Advanced Metallurgical Processes program conducts inquiries, technological investigations, and research concerning the extraction, processing, use, and disposal of mineral substances under the mineral and materials science program at the Albany Research Center (ARC) in Oregon.

Projects are focused on areas where there are large potential public benefits, but where industry would not invest on its own. The program addresses the full life cycle of materials production and cost-effective processing of improved materials through to their disposal and recycling. For example, the program seeks to determine the factors that limit service life of materials in industrial, structural, or engineering applications and to provide solutions to service-life problems through new materials technology. This is an area where the benefits to any single firm may be too low to attract investment, but will sum to large economic improvements if applied throughout the economy.

Another focus is to develop and demonstrate technologies that will create public benefits by reducing waste and pollution. For example, for the last four years the Program has sought ways to sequester CO_2, a greenhouse gas, by converting it to a stable mineral form; such a process, if proved practical and economic, could contribute to Fossil Energy's goal of a zero emission power plant. Thus, the research at ARC directly contributes to Fossil Energy's objectives by providing information on the performance characteristics of materials being specified for the current generation of power systems, on the development of cost-effective materials for inclusion in Vision 21 systems, and for solving environmental emission problems related to fossil fired energy systems. The program at ARC stresses full participation with industry through partnerships and emphasizes cost sharing to the fullest extent possible.

Benefits

The Advanced Metallurgical Program creates public benefits by carrying out long-term, high-risk research on materials that are key to the energy industry. Another focus is to create public benefits through the development of technologies that reduce waste and pollution.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Advanced Metallurgical Research	**5,961**	**9,876**	**8,000**
■ **Advanced Metallurgical Processes**	**5,901**	**9,777**	**7,920**

In FY 2005, continue research to contribute to Fossil Energy's Vision 21 Systems by extending component service lifetimes through the improvement and protection of current materials, by the design of new materials, and by defining the service operating conditions for new materials in order to ensure their safe and effective use. Emphasis is placed on high-temperature erosion testing and modeling in environments anticipated for Vision 21 concepts, on the development of sulfidation/oxidation resistant materials, and development and repair of refractory materials, for coal gasifiers. The Albany Research Center will participate in an effort to develop, fabricate and evaluate the performance of materials to be used in solid oxide fuel cell applications. These could include metallic interconnects, seals, heat exchanger materials and reformer materials to support the Solid State Energy Conversion Alliance's (SECA's) goal of significantly reducing the cost of producing commercial, environmentally friendly solid oxide fuel cells. Continue research focused on developing an economically and environmentally acceptable integrated process for disposal of carbon dioxide. Redirect emphasis to application of mineral carbonation reactions to address leakage/sealing issues in geological sequestration approaches. *Participants include: ARC*.

FY 2004 funding continued development of advanced refractories for IGCC applications, CO_2 sequestration via mineral carbonation, advanced austenitic steels, and microchannel reactors for reformer and heat exchanger applications. In addition, efforts to support materials development for solid oxide fuel cell applications were initiated. *Participants included: ARC*

■ **Program Support**	**60**	**99**	**80**

In FY 2004, fund technical and program management support.

Total, Advanced Metallurgical Research	**5,961**	**9,876**	**8,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Advanced Metallurgical Research	
• Redirect and reduce sequestration research related to mineral carbonation approaches. Eliminate funding for oxidation/sulfidation resistant materials development. Reduce funding levels for ultra-super critical steam turbine materials development. General reduction in research directed at fundamentals of materials performance in high temperature Fossil Energy applications	-1,857
• Program direction	-19
Total Funding Change, Advanced Metallurgical Research	**-1,876**

National Academy of Sciences Program Review

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
National Academy of Sciences Program Review	497	494	494	0	-494	-100.0%
Total, National Academy of Sciences Program Review	497	494	494	0	-494	-100.0%

Mission

This program provides for a study by the National Research Council (NRC) of prospective future benefits of Fossil Energy R&D. In FY 2003 and FY 2004, funding was appropriated to the Department's Office of Energy Efficiency and Renewable Energy (EERE), which will be combined with Fossil Energy (FE) funding for the NRC study. The study will focus on methodology and case studies. Past attempts at measuring future R&D benefits have been criticized on a variety of grounds, and the NRC study will need to address these criticisms. Once a methodology has been developed, a subset of FE and EERE technologies will be selected to test and showcase the methodology.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
National Academy of Sciences Program Review	**497**	**494**	**0**
■ **National Academy of Sciences Program Review**	**497**	**494**	**0**

No funding is requested for this activity in FY 2005.

In FY 2004 and FY 2003, a study by the National Research Council (NRC) of prospective future benefits of Fossil Energy R&D was conducted.

Total, National Academy of Sciences Program Review	**497**	**494**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
National Academy of Sciences Program Review	
• The study conducted by the National Research Council will be completed	-494
Total Funding Change, National Academy of Sciences Program Review	**-494**

Cooperative Research and Development

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Cooperative Research and Development	7,970	8,395	8,395	3,000	-5,395	-64.3%
Total, Cooperative Research and Development	7,970	8,395	8,395	3,000	-5,395	-64.3%

Mission

The Cooperative Research and Development program supports activities of federal/industry/research institute endeavors and federal/state/industry partnerships. It was originally created in FY 1989 and provided the federal share of support for Jointly Sponsored Research Programs (JSRP) at the Western Research Institute (WRI) and the University of North Dakota Energy and Environmental Research Center (UNDEERC). The research projects under the JSRP at those centers receive at least 50 percent cost sharing from non-federal partners. The Department anticipates that these centers can compete successfully for Fossil Energy funding through the competitive solicitation process.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Cooperative Research and Development	**7,970**	**8,395**	**3,000**
■ **Cooperative Research and Development**	**7,930**	**8,355**	**2,960**

In FY 2005, continue support for cooperative research programs at WRI and UNDEERC which are 50-50 cost-shared with non-federal clients. Funding will be split evenly between the two participants.

FY 2004 and FY 2003 funding provided support for cooperative research programs at WRI and UNDEERC which are 50-50 cost-shared with non-federal clients. Funding was split evenly between the two participants.

■ **Program Support**	**40**	**40**	**40**

Fund technical and program management support.

Total, Cooperative Research and Development	**7,970**	**8,395**	**3,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
■ Decrease in Cooperative R&D because it is a lower priority activity	-5,395
Total Funding Change, Cooperative Research and Development	**-5,395**

Energy Efficiency Science Initiative

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Energy Efficiency Science Initiative	2,440	0	0	0	0	0.0%
Total, Energy Efficiency Science Initiative	2,440	0	0	0	0	0.0%

Mission

Energy Efficiency Science Initiative seeks to identify and fund "bridging" research and development (R&D) that falls between fundamental exploratory science and pre-commercial applied R&D by stimulating R&D that maximizes synergies among different research fields, technologies, investigator communities, and end-use applications. It also cuts across traditional energy end-use sectors by emphasizing distributed power generation applications for industrial and buildings systems, transportation, and stationary power. This initiative expands on existing cooperative efforts between the Office of Fossil Energy (FE) and the Office of Energy Efficiency and Renewable Energy (EE) in areas such as natural gas-fueled turbine and fuel cell technologies, combined heat, power and cooling applications, hydrogen production, and carbon emission sequestration. This effort also involves extensive coordination with the Office of Science in pursuing follow-on research in areas critical to energy efficiency and clean energy development, such as basic biosciences, heat transfer, new materials, catalysts, and computational science.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Energy Efficiency Science Initiative	**2,440**	**0**	**0**
■ **Energy Efficiency Science Initiative**	**2,416**	**0**	**0**

No funding is requested for this activity in FY 2004 and FY 2005.

In FY 2003, EE and FE competitively solicited applications for cooperative agreements to advance research and development of energy technologies at universities and the private sector. Four priority areas of interest identified include: material science, fuels and chemistry science, sensor and control science, and energy conversion science.

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
■ **Program Support**.....	**24**	**0**	**0**
Fund technical and program management support.			
Total, Energy Efficiency Science Initiative.....	**2,440**	**0**	**0**

Naval Petroleum & Oil Shale Reserves

Naval Petroleum & Oil Shale Reserves

Naval Petroleum and Oil Shale Reserves

Proposed Appropriation Language

For expenses necessary to carry out naval petroleum and oil shale reserve activities, $20,000,000 [$18,102,000], to remain available until expended: Provided, That, notwithstanding any other provision of law, unobligated funds remaining from prior years shall be available for all naval petroleum and oil shale reserve activities.

Explanation of Change

The change reflects an increase in environmental restoration activities.

Naval Petroleum and Oil Shale Reserves
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Naval Petroleum and Oil Shale Reserves……	17,715	17,995	18,147	20,000	+1,853	+10%

Preface

Since the NPOSR no longer served the national defense purpose envisioned in the early 1900s, the National Defense Authorization Act for Fiscal Year 1996 (P.L. 104-106) required the sale of the Government's interest in NPR-1. To comply with this requirement, the Elk Hills field in California was sold to Occidental Petroleum Corporation in 1998. Subsequently, the Department transferred two of the Naval Oil Shale Reserves (NOSR-1 and NOSR-3), both in Colorado to the Department of the Interior's Bureau of Land Management. In January 2000, the Department also returned the NOSR-2 site to the Northern Ute Indian Tribe.

Mission

Following the sale of Elk Hills and the transfer of the oil shale reserves, DOE retains two Naval Petroleum Reserve properties:

The Naval Petroleum Reserve 3 in Wyoming (Teapot Dome field) - A stripper well oil field that the Department will maintain until it reaches its economic production limit. Environmental remediation efforts are underway, and the field is being used as the Rocky Mountain Oilfield Testing Center (RMOTC). Activities performed at RMOTC include field testing of new technology, evaluation of new equipment, and demonstration of new processes.

The Buena Vista Hills Naval Petroleum Reserve 2 in California - A checkerboard pattern of government and privately owned tracts adjacent to the Elk Hills field. Of the 30,181 acres, 10,446 acres are owned by the government and leased by private oil companies. Revenues from 1976 through 2001 totaled $62 million. Discussions have begun with the Department of the Interior on transfer of this asset.

Benefits

The Department continues activities to finalize its Elk Hills equity interests with ChevronTexaco, co-owner of Elk Hills. Under the *Equity Redetermination Process Agreement*, the ASFE is to impartially determine final equity shares between ChevronTexaco and the Department of Energy. The final equity determinations could result in a combined financial impact worth several hundred million dollars for the total of all four of the NPR-1 producing zones. Financial settlements will occur after final decisions have been made for all four zones, by the end of FY 2007.

The RMOTC program at NPR-3 continues to support the Administration's goal to develop new/alternative energy sources and energy efficiency technologies for use in the petroleum industry. RMOTC offers a place to perform hands-on, applied research (testing and demonstration) that is tailored to the U.S. independent oil producers – helping speed new technology to the market place.

Significant Program Shifts

To meet the deadline set in the Authorization Act, it was necessary for the Department to commit to a number of activities after closing the sale of the Elk Hills site. The commitments were formalized in several legal agreements. The program continues work to close the remaining environmental findings, as required by the agreement between DOE and the California Department of Toxic Substance Control (DTSC). A human health and an ecological Risk Assessment on the 131 DTSC areas of concern are primary activities supported by this budget. Following completion of the Risk Assessments, the program will complete appropriate Corrective Action Studies to determine cleanup in the field. Completion of Risk Assessments and Corrective Action Studies is scheduled for FY 2009.

Since 1996, the program's primary focus has been to operate NPR-3 in Wyoming to its economic limit, and pursue a phased environmental restoration and equipment salvage program at those parts of NPR-3 that are no longer needed for operation. Initial estimates projected that the field would be shut-in by 2003, however, the favorable oil prices and application of new oil field strategies and technologies have arrested the decline in production. It is expected that profitable operations at NPR-3 will continue.

Naval Petroleum and Oil Shale Reserves

Detailed Funding Table

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Naval Petroleum and Oil Shale Reserves (NPOSR)			
Production Operations ……	2,550	3,457	3,300
Environmental Restoration ……..	2,279	3,279	5,207
Rocky Mountain Oilfield Testing Center ……..	3,000	2,963	2,169
Subtotal, Production & Operations ……..	7,829	9,699	10,676
Program Direction ……	3,511	4,073	5,342
Equity ……..	3,900	2,223	1,750
Business Management and Support ……	2,475	2,000	2,232
Subtotal, Management ……..	9,886	8,296	9,324
TOTAL, NPOSR ……	17,715	17,995	20,000

Naval Petroleum and Oil Shale Reserves

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
Naval Petroleum & Oil Shale Reserves					
NPR California ……	4,229	5,050	6,347	+1,297	+26%
NPOSR – Colorado, Utah, Wyoming ……..	8,337	9,632	10,225	+593	+6%
Washington Headquarters ……	5,149	3,313	3,428	+115	+3
Total, NPOSR ……	17,715	17,995	20,000	+2,005	+11%

Site Descriptions

NPR – California
The NPR-California field office, located in Bakersfield, California, is responsible for completing closeout activities, environmental remediation, and cultural resource assessment from the sale of the Elk Hills site.

NPOSR -Colorado, Utah and Wyoming
The NPOSR – Colorado, Utah, and Wyoming (CUW), located in Casper, Wyoming supports activities to produce NPR-3 at the maximum efficient rate. This site is co-located with the Rocky Mountain Oilfield Testing Center - a testing and demonstration facility.

Washington Headquarters
The headquarters office located in Washington, DC supports the independent evaluation and recommendation of final equity for Elk Hills as well as the geologic, petrophysical and reservoir engineering services required to prepare and support the Government's equity position before an Independent Petroleum Engineer and the Assistant Secretary for Fossil Energy (ASFE). Program Direction funding for the NPR Headquarters staff (10 FTEs) in Washington, DC is also included in this category.

Naval Petroleum and Oil Shale Reserves

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Production & Operations						
Production Operations ……..	2,550	3,457	3,457	3,300	-167	-5%
Environmental Restoration …….	2,279	3,279	3,279	5,207	+1,928	+1%
Rocky Mountain Oilfield Testing Center …….	3,000	2,963	2,963	2,169	-794	-27%
Total, Production & Operations ……...	7,829	9,699	9,699	10,676	+977	+10%

Public Law Authorization:
P. L. 94-258, Naval Petroleum Reserves Production Act of 1976

Mission

The mission of the Production and Operations subprogram includes:

- Environmental remediation and cultural resource activities required as a result of the Elk Hills sale agreement. To meet the deadline set in the Authorization Act, it was necessary for the Department to commit to a number of activities after closing the sale. The commitments were formalized in several legal agreements between DOE, Occidental, Chevron, and the State of California. Activities include completing environmental and archaeological work; assessing sites where remediation was not completed before the sale; and concluding any lawsuits related to the operation of Elk Hills that had been brought by third parties against the Government and/or its contractors.

- Ongoing conventional oil field management and operations at NPR-3. Since 1996, the program's primary focus has been to operate NPR-3 in Wyoming to its economic limit, and pursue a phased environmental restoration and equipment salvage program at those parts of NPR-3 that are no longer needed for operation. Initial estimates projected that the field would be shut-in by 2003, however, the favorable oil prices and application of new oil field strategies and technologies have arrested the decline in production. It is expected that profitable operations at NPR-3 will continue.

- Field testing and demonstration of upstream and environmental products at the Rocky Mountain Oilfield Testing Center (RMOTC), which is co-located with NPR-3.

- Management of leases associated with Naval Petroleum Reserve 2 in California (Buena Vista Hills) until transfer to the Department of the Interior and subsequent environmental remediation activities.

Benefits

Revenue from production and operation of the Naval Petroleum Reserve 3 in Wyoming (Teapot Dome field) is estimated to be over $5 million dollars in FY 2005. Associated revenues from the NPR-2 leases are estimated at approximately $2 million dollars.

The RMOTC program at NPR-3 continues to support the Administration's goal to develop new/alternative energy sources and energy efficiency technologies for use in the petroleum industry. RMOTC offers a place to perform hands-on, applied research (testing and demonstration) that is tailored to the U.S. independent oil producers – helping speed new technology to the market place.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Production and Operations ……	**7,829**	**9,699**	**10,676**
• Production Operations ……	2,550	3,457	3,300

Continue to maintain and produce approximately 670 stripper wells at NPR-3 (expected to produce 440 barrels of oil and 1,400 gallons of natural gas liquids per day). Includes routine O&M activities for production facilities, well maintenance, electricity, utilities, buildings, roads, heavy field equipment, motor vehicles and capital projects where warranted.

FY2003 and FY2004 funding continued routine O&M activities at NPR-3 for production facilities, well maintenance, electricity and utilities, buildings, roads, heavy field equipment, motor vehicles and capital projects to be undertaken provided oil prices warrant such expenditures

• Environmental Restoration ……	2,279	3,279	5,207

Continue Elk Hills environmental and archeological closeout activities. Continue work to clean close 3 inactive permitted landfills. Perform a human health and an ecological Risk Assessment on the 131 California Department of Toxic Substances Control (DTSC) areas of concern. Following completion of Risk Assessments, complete appropriate Corrective Action Studies to determine cleanup in the field. Completion of Risk Assessments and Corrective Action Studies is scheduled for FY 2009. Continue negotiations with ChevronTexaco on the disposition of sites

listed on Exhibit H of the Unit Plan Contract Termination Agreement. Continue restoration activities at NPR-3 for reservoirs that are no longer able to produce economically.

FY 2003 and FY 2004 funding continued efforts to document the results of cultural resource work scheduled for completion in FY 2004. Released information to the public and curated artifacts at a facility meeting Federal curation standards. Continued plugging and abandonment of uneconomic wells and closing surface facilities at NPR-3 that were no longer required to support production operations.

- Rocky Mountain Oilfield Testing Center ……. 3,000 2,963 2,169

Continue field testing and demonstration of upstream petroleum and environmental products to support the Administration's goal to develop new/alternative energy sources and energy efficiency technologies for use in the petroleum industry. Includes tech transfer, business development and small instrumentation activities, as well as cost share dollars for small, short timeframe tests.

FY 2003 and FY 2004 funding supported RMOTC activities such as geothermal well drilling and geothermal electricity production using heat mining, produced water bioremediation, single entry inclined reservoir drainage concepts and other drilling concepts that will reduce impacts on the environment.

Total, Production and Operations	**7,829**	**9,699**	**10,676**

Explanation of Funding Changes

FY 2005 vs. FY 2004 ($000)

Production and Operations

Increase in environmental remediation activities offset by decrease in NPR-3 facilities maintenance..... +1,928

Decrease in RMOTC field testing and demonstration projects ..... -794

Total Funding Change, Production and Operations ..... +977

Naval Petroleum and Oil Shale Reserves

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Management						
Program Direction	3,511	4,073	4,225	5,342	+1,117	+26%
Equity	3,900	2,223	2,223	1,750	+473	+21%
Business Management & Support	2,475	2,000	2,000	2,232	+232	+12%
Total, Management	9,886	8,296	8,448	9,324	+876	+10%

Public Law Authorization:
P. L. 94-258, Naval Petroleum Reserves Production Act of 1976

Mission

The mission of the Management subprogram is to support business management activities for all active sites, NPR-1 closeout, and NPR-2 lease management. Support for the settlement of equity shares with ChevronTexaco, the minority owner of Elk Hills, is a major activity for which geologic, petrophysical and reservoir engineering services are required to prepare and support the Government's equity position before an Independent Petroleum Engineer and the Assistant Secretary for Fossil Energy (ASFE).

Benefits

The final equity determinations could result in a combined financial impact worth several hundred million dollars for the total of all four of the NPR-1 producing zones. Financial settlements will occur after final decisions have been made for all four zones, by the end of FY 2007.

Detailed Justification

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Management	**9,886**	**8,296**	**9,324**
• Program Direction ……	3,511	4,073	5,342

Provides salaries, travel, support services and other related expenses required for management and execution of the NPOSR program. Supports various activities including:

o Salaries and Benefits ……	3,263	3,835	3,906

Staff of 32 FTEs (11 at Headquarters and 21 in the field) performs policy and planning, equity determination, petroleum engineering, financial management, procurement, environment and safety, and administration of reimbursable work programs.

o Travel ……	125	238	240

Provides travel to assure the accomplishment of program mission. FY 2003 requirements were offset with available carryover. FY2004 and FY 2005 reflect full funding requirements.

o Support Services ……	50	0	226

Provide analytic support for policy decisions. FY 2003 and FY 2004 requirements were offset with available carryover. FY 2005 reflects full funding requirements.

o Other Related Expenses ……	73	0	970

Major elements are communications, utilities, building leases, supplies and materials. FY 2003 and FY 2004 requirements were offset with available carryover. FY 2005 reflects full funding requirements.

• Equity ……	3,900	2,223	1,750

The Dry Gas Zone, Carneros Zone and Stevens Zone are finalized. A provisional recommendation for the Shallow Oil Zone was issued by the independent petroleum engineer in May 2003. The final recommendation is not expected until early 2005. The process could take until 2007 for final ASFE decision.

FY2003 and FY2004 funding supported the independent petroleum engineer, legal support, and expert technical analysis/ consultation required to support the final Fossil Energy decision.

• Business Management & Support …….	2,475	2,000	2,232

Continue payments for post-employment medical and dental benefits to former Management & Operating (M&O) contractor employees. For NPR-2, ensure compliance of the 17 lease agreements expected to generate $2.0 million in royalty revenues. Continue general operational and administrative support at the field sites.

Total, Management ……	**9,886**	**8,296**	**9,324**

Explanation of Funding Changes

FY 2005 vs. FY 2004 ($000)

Management

Mandatory increase for Cost of Living adjustment and general pay raises ..... +152

Increase in contract support for environmental restoration & closeout activities offset by decrease in equity finalization support ..... +876

Total Funding Change, Management ..... +1,028

Program Direction

Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
NPR - California					
Salaries and Benefits.....	706	727	756	+29	+3.9%
Travel.....	28	28	28	+0	+0.0%
Support Services	0	0	0	0	+0.0%
Other Related Expenses	0	0	257	+257	+100.0%
Total, NPR - California.....	734	755	1,041	+286	+37.9%
Full Time Equivalents	4	4	4	+0	+0.0%
NPOSR – Colorado, Utah, Wyoming					
Salaries and Benefits.....	1,429	1,844	1,950	+106	+5.8%
Travel.....	49	160	160	+0	+0.0%
Support Services	0	0	0	+0	+0.0%
Other Related Expenses	50	0	513	+513	+100.0%
Total, NPOSR – Colorado, Utah, Wyoming	1,528	2,004	2,623	+619	+30.9%
Full Time Equivalents	15	17	17	0	+0.0%
Headquarters					
Salaries and Benefits.....	1,128	1,264	1,200	-64	-5.1%
Travel.....	48	50	52	+2	+3.8%
Support Services	50	0	226	+226	+100.0%
Other Related Expenses	23	0	200	+200	+100.0%
Total, Headquarters.....	1,249	1,314	1,678	+364	+27.7%
Full Time Equivalents	10	11	11	0	0.0%
Total Program Direction					
Salaries and Benefits.....	3,263	3,835	3,906	+71	+1.9%
Travel.....	125	238	240	+2	+0.8%
Support Services	50	0	226	+226	+100.0%
Other Related Expenses	73	0	970	+970	+100.0%
Total Program Direction …….	3,511	4,073	5,342	+1,269	+31%
Total Full Time Equivalents …..	29	32	32	0	0%

NAVAL PETROLEUM AND OIL SHALE RESERVES
PROJECTED FEDERAL REVENUES
(Dollars in thousands)

	FY 2003			FY 2004			FY 2005		
Naval Petroleum Reserve No. 3									
	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)
Crude Oil	525 BOPD	$26.00	$4.982	466 BOPD	$26.00	$4,420	440 BOPD	$30.00	$4,796
Liquid Products	1,400 GPD	$.40/gal	$204	1,400 GPD	$.40/gal	$204	1,400 GPD	$.60/gal	$307
Total NPR-3			**$5,186**			**$4,932**			**$5,103**
Naval Petroleum Reserve Number 2 -- Royalties from 17 Lease Agreements									
	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)
Crude Oil	161 BOPD	26.65	$1,363	162 BOPD	$24.00	$1,416	168 BOPD	$24.00	$1,470
Natural Gas	630 MCF/D	3.75	$815	660 MCF/D	$2.30	$534	660 MCF/D	$2.30	$554
Liquid Products	404 GPD	$.25/gal	$39	408 GPD	$.30/gal	$45	424 GPD	$.30/gal	$46
Total NPR-2			**$2,217**			**$1,995**			**$2,070**
TOTAL NPOSR REVENUE			**$7,403**			**$6,927**			**$7,173**

NAVAL PETROLEUM AND OIL SHALE RESERVES
PROJECTED FEDERAL REVENUES
(Dollars in thousands)

	FY 2006			FY 2007			FY 2008		
Naval Petroleum Reserve No. 3									
	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)
Crude Oil	395 BOPD	$31.00	$4,469	353 BOPD	$32.00	$4,123	317 BOPD	$34.00	$3,934
Liquid Products	1,400 GPD	$.65/gal	$332	1,400 GPD	$.70/gal	$358	1,400 GPD	$.75/gal	$383
Total NPR-3			**$4,801**			**$4,481**			**$4,317**
Naval Petroleum Reserve Number 2 (Royalties from 17 Lease Agreements)									
	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)	Production	Price	Revenues ($000)
Crude Oil	174 BOPD	$24.00	$1,521	180 BOPD	$24.00	$1,574	180 BOPD	$25.00	$1,643
Natural Gas	683MCF/D	$2.30	$573	707 MCF/D	$2.30	$593	707 MCF/D	$2.40	$619
Liquid Products	439 GPD	$.30/gal	$48	456 GPD	$.30/gal	$50	456 GPD	$.31/gal	$52
Total NPR-2			**$2,142**			**$2,217**			**$2,314**
TOTAL NPOSR REVENUE			**$6,943**			**$6,698**			**$6,631**

Elk Hills School Lands Fund

Elk Hills School Lands Fund

Elk Hills School Lands Fund

Proposed Appropriation Language

[For necessary expenses in fulfilling installment payments under the Settlement Agreement entered into by the United States and the State of California on October 11, 1996, as authorized by section 3415 of Public Law 104–106, $36,000,000 for payment to the State of California for the State Teachers' Retirement Fund from the Elk Hills School Lands Fund.]

Explanation of Change

No change.

Elk Hills School Lands Fund

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Elk Hills School Lands Fund……..	36,000	36,000	36,000	36,000	0	0%

Public Law Authorization:
P.L. 104-106, National Defense Authorization Act for FY 1996

Preface

The Elk Hills School Lands Fund provides settlement to the State of California with respect to its longstanding claims to parcels of land within NPR-1.

Mission

The mission of the Elk Hills School Lands Fund subprogram is to provide settlement to the State of California with respect to its longstanding claims to two parcels of land ("school lands") within NPR-1. The Act also provided for nine percent of the net sales proceeds to be reserved in a contingent fund in the Treasury for payment to the State, subject to appropriation. The Departments estimate of 9 percent of the net sales proceeds was $324 million, of which $298 million has already been deposited into the contingent fund. The Department will adjust the amount in the contingent fund once all divestment related costs have been paid and final equity has been determined.

Benefits

The agreement calls for payment from the contingent fund to the State of California, subject to appropriation, of 9% of the net sales proceeds, with respect to its longstanding claims to two parcels of land (“school lands”) within NPR-1.

Elk Hills School Lands Fund

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
ELK HILLS SCHOOL LANDS FUND					
State of California……	36,000	36,000	36,000	0	0.0%

Site Description

State of California
The Agreement calls for payment from the contingent fund to the State of California, subject to appropriation, of nine percent of the net sales proceeds, with respect to its longstanding claims to two parcels of land ("school lands") within NPR-1.

Elk Hills School Lands Fund

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
ELK HILLS SCHOOL LANDS FUND					
State of California ……..	36,000	36,000	36,000	0	0.0%

Mission

The first installment payment was appropriated in FY 1999. No appropriation was provided in FY 2000, but the FY 2000 Interior and Related Agencies Appropriations Act provided an advance appropriation of $36 million, which was paid in FY 2001 (second installment). The third, fourth and fifth installments of $36 million were paid at the beginning of FY 2002, FY 2003, and FY 2004 respectively. The FY 2004 Appropriations Act contained an advance appropriation for the sixth installment payable on October 1, 2004. The FY 2005 request reflects payment of that sixth installment. In light of the delays in equity finalization, the Department expects to consult with the State of California to discuss a revised payment schedule in calendar year 2004.

Benefits

The agreement calls for payment from the contingent fund to the State of California, subject to appropriation, of 9% of the net sales proceeds, with respect to its longstanding claims to two parcels of land ("school lands") within NPR-1.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Elk Hills School Lands Fund……	36,000	36,000	36,000

FY 2005 reflects the payment of the sixth installment – provided for in the FY 2004 Appropriations Act.

Explanation of Funding Changes

None.

Energy Conservation

Energy Conservation

Table of Contents

Energy Conservation

Proposed Appropriation Language

For necessary expenses in carrying out energy conservation activities, [$888,937,000] $875,933,000 to remain available until expended: Provided, That [$274,500,000] $331,998,000 shall be for use in energy conservation grant programs as defined in section 3008(3) of Public Law 99-509 (15 U.S.C. 4507): Provided further, That notwithstanding section 3003(d)(2) of Public Law 99-509, such sums shall be allocated to the eligible programs as follows: [$230,000,000] $291,200,000 for weatherization assistance grants and [$44,500,000] $40,798,000 for State energy program grants.

Explanation of Change

The increase +$61,200,000 in weatherization assistance grants maintains the President's continuing commitment to helping families and individuals, especially the elderly, poor and disabled, lower their monthly energy bills.

Energy Conservation
Office of Energy Efficiency and Renewable Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Energy Conservation						
Vehicle Technologies ...	174,171	178,002	178,002	156,656	-21,346	-12.0%
Fuel Cell Technologies ..	53,906	65,187	65,187	77,500	+12,313	+18.9%
Weatherization and Intergovernmental Activities.....	314,155	308,612	308,612	364,067	+55,455	+18.0%
Distributed Energy Resources.....	60,054	61,023	61,023	53,080	-7,943	-13.0%
Building Technologies ...	58,327	59,866	59,866	58,284	-1,582	-2.6%
Industrial Technologies	96,824	93,068	93,068	58,102	-34,966	-37.6%
Biomass and Biorefinery Systems R&D	24,050	7,506	7,506	8,680	+1,174	+15.6%
Federal Energy Management Program...	19,299	19,716	19,716	17,900	-1,816	-9.2%
Program Management...	76,950	85,004	87,950	81,664	-6,286	-7.1%
Energy Efficiency Science Initiative.....	2,440	0	0	0	0	0.0%
Total, Energy Conservation...	880,176	877,984	884,270	875,933	+8,337	+0.9%

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Energy Supply (EERE)						
Hydrogen Technology ..	38,113	81,991	81,991	95,325	+13,334	+16.3%
Solar Energy.....	82,330	83,393	83,393	80,333	-3,060	-3.7%
Zero Energy Buildings ...	7,572	0	0	0	0	0.0%
Wind Energy	41,640	41,310	41,310	41,600	+290	+0.7%
Hydropower	5,016	4,905	4,905	6,000	+1,095	+22.3%
Geothermal Technology	28,390	25,508	25,508	25,800	+292	+1.1%
Biomass and Biorefinery Systems R&D	85,283	86,471	86,471	72,596	-13,875	-16.0%
Intergovernmental Activities.....	14,449	14,720	14,720	16,000	+1,280	+8.7%
Departmental Energy Management Program...	1,445	1,963	1,963	1,967	+4	+0.2%
Renewable Program Support	0	4,919	4,919	0	-4,919	-100.0%
National Climate Change Technology Initiative Competitive Solicitation	0	0	0	3,000	+3,000	
Facilities and Infrastructure	5,297	12,950	12,950	11,480	-1,470	-11.4%
Program Direction.....	12,615	12,364	12,364	20,711	+8,347	+67.5%
Subtotal, Energy Supply (EERE)	322,150	370,494	370,494	374,812	+4,318	+1.2%
Use of prior year balances	0	-13,000	-13,000	0	+13,000	+100.0%
General Reduction	0	0	0	0	0	0.0%
Total, Energy Supply (EERE)	322,150	357,494	357,494	374,812	+17,318	+4.8%
Total, Energy Supply and Energy Conservation.....	1,202,326	1,235,478	1,235,478	1,250,745	+15,267	+1.2%

Detailed Funding Table

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Energy Conservation			
Vehicle Technologies			
Vehicle Systems			
Heavy Vehicle Systems R&D			
Vehicle Systems Optimization	9,555	10,188	8,983
Truck Safety Systems	397	394	100
Total, Heavy Vehicle Systems	9,952	10,582	9,083
Ancillary Systems	1,100	1,185	1,300
Simulation and Validation	2,433	2,568	3,500
Total, Vehicle Systems	13,485	14,335	13,883
Innovative Concepts			
Graduate Automotive Technology Education	500	494	500
Cooperative Automotive Research for Advanced Technology	494	0	0
Stimulate Truck Innovative Concepts and Knowledge	596	0	0
Total, Innovative Concepts	1,590	494	500
Hybrid and Electric Propulsion			
Energy Storage			
High Power Energy Storage	17,241	17,457	17,675
Advanced Battery Development	2,403	1,481	1,500
Exploratory Technology Research	1,923	4,469	9,525
Total, Energy Storage	21,567	23,407	28,700
Advanced Power Electronics	13,355	13,522	13,900
Subsystem Integration and Development			
Light Vehicle Propulsion and Ancillary Subsystems	3,135	3,097	3,735
Heavy Vehicle Propulsion and Ancillary Subsystems	3,939	4,976	5,486
Total, Subsystem Integration and Development	7,074	8,073	9,221
Total, Hybrid and Electric Propulsion	41,996	45,002	51,821

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Advanced Combustion R&D			
Combustion and Emission Control	22,994	22,716	22,000
Light Truck Engine	14,734	12,944	0
Heavy Truck Engine	12,174	11,832	10,436
Waste Heat Recovery Subactivity	488	2,469	1,500
Off-Highway Engine R&D	3,414	3,456	0
Health Impacts	1,463	988	2,000
Total, Advanced Combustion R&D	55,267	54,405	35,936
Materials Technology			
Propulsion Materials Technology			
Automotive Propulsion Materials	1,952	2,964	2,000
Heavy Vehicle Propulsion Materials	5,705	5,778	5,000
Total, Propulsion Materials Technology	7,657	8,742	7,000
Lightweight Materials Technology			
Automotive Lightweight Materials	14,242	16,632	21,000
Heavy Vehicle High Strength Weight Reduction Materials	8,731	8,839	7,799
Total, Lightweight Materials Technology	22,973	25,471	28,799
High Temperature Materials Laboratory	5,464	5,531	4,000
Total, Materials Technology	36,094	39,744	39,799
Fuels Technology			
Advanced Petroleum Based Fuels	12,955	10,272	4,000
Non-Petroleum Based Fuels & Lubricants			
Medium Trucks	1,314	1,284	0
Heavy Trucks	1,409	1,383	0
Fueling Infrastructure	1,204	1,185	0
Renewable and Synthetic Fuels Utilization	0	395	2,800
Total, Non-Petroleum Based Fuels & Lubricants	3,927	4,247	2,800

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Environmental Impacts	2,282	1,975	0
Total, Fuels Technology	19,164	16,494	6,800
Technology Introduction			
Legislative and Rulemaking (formerly Energy Policy Act Replacement Fuels)			
State & Fuel Provider Fleet	750	746	1,000
Private & Local Fleet	250	199	300
Fuel Petitions	100	105	314
Federal Fleets	500	0	700
Regulatory Support	92	37	200
Total, Legislative and Rulemaking (formerly Energy Policy Act Replacement Fuels)	1,692	1,087	2,514
Testing and Evaluation			
Federal Fleets	0	507	0
Vehicle Evaluation	1,934	2,358	2,450
Infrastructure Testing	50	98	50
Total, Testing and Evaluation	1,984	2,963	2,500
Advanced Vehicle Competitions	894	889	1,000
Total, Technology Introduction	4,570	4,939	6,014
Technical Program Management Support	2,005	2,095	1,903
Biennial FreedomCAR Peer Review	0	494	0
Total, Vehicle Technologies	174,171	178,002	156,656
Fuel Cell Technologies			
Transportation Systems	6,160	7,506	7,600
Distributed Energy Systems	7,268	7,408	7,500
Stack Component R&D	14,803	25,186	30,000
Fuel Processor R&D	23,489	14,815	13,858
Technology Validation	1,788	9,877	18,000

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	398	395	542
Total, Fuel Cell Technologies	53,906	65,187	77,500
Weatherization and Intergovernmental Activities			
Weatherization Assistance Grants			
Weatherization Assistance	220,184	223,759	286,832
Training and Technical Assistance	3,353	3,407	4,368
Total, Weatherization Assistance Grants	223,537	227,166	291,200
State Energy Program Grants	44,708	43,952	40,798
State Energy Activities			
Cooperative Programs with States	2,928	0	0
Planning and Evaluation Support for State and Local Grant Programs	2,337	2,324	2,353
Total, State Energy Activities	5,265	2,324	2,353
Gateway Deployment			
Rebuild America	11,034	10,003	8,826
Energy Efficiency Information and Outreach	2,267	1,392	1,200
Building Codes Training and Assistance	4,569	4,445	4,800
Clean Cities	10,924	10,973	7,000
Energy Star	4,173	3,654	5,000
National Industrial Competitiveness through Energy, Environment, and Economics	2,670	0	0
Inventions and Innovations	3,776	4,318	2,500
International Market Development	646	0	0
Technical/Program Management Support	586	385	390
Total, Gateway Deployment	40,645	35,170	29,716
Total, Weatherization and Intergovernmental Activities	314,155	308,612	364,067

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Distributed Energy Resources			
Distributed Generation Technology Development			
Industrial Gas Turbines	4,769	3,950	3,000
Microturbines	6,955	6,914	7,000
Advanced Reciprocating Engines	11,792	13,828	9,000
Technology Based – Advanced Materials and Sensors	7,925	8,155	8,279
Fuel Flexibility	745	0	250
Thermally-Activated Technologies	7,610	7,566	5,160
Total, Distributed Generation Technology Development	39,796	40,413	32,689
End-Use System Integration and Interface			
Distributed Energy Systems Applications Integration	8,284	8,234	7,861
Cooling, Heating and Power Integration	11,448	11,852	12,000
Total, End-Use System Integration and Interface	19,732	20,086	19,861
Technical/Program Management Support	526	524	530
Total, Distributed Energy Resources	60,054	61,023	53,080
Building Technologies			
Residential Buildings Integration			
Research and Development: Building America	11,558	12,484	18,342
Residential Building Energy Codes	575	583	590
Total, Residential Buildings Integration	12,133	13,067	18,932
Commercial Buildings Integration			
Research and Development	3,858	3,905	4,454
Commercial Building Energy Codes	528	535	541
Total, Commercial Buildings Integration	4,386	4,440	4,995
Emerging Technologies			
Lighting R&D	9,982	11,402	12,500
Space Conditioning and Refrigeration R&D	5,580	5,337	3,000
Appliances and Emerging Technologies R&D	1,703	1,980	1,755

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Building Envelope R&D	8,041	8,190	5,000
Analysis Tools and Design Strategies	3,032	3,088	2,802
Technology Road Maps	2,226	0	0
Total, Emerging Technologies	30,564	29,997	25,057
Equipment Standards and Analysis	9,635	10,387	7,800
Oil Heat Research for Residential Buildings	0	494	0
Technical/Program Management Support	1,609	1,481	1,500
Total, Building Technologies	58,327	59,866	58,284
Industrial Technologies			
Industries of the Future (Specific)			
Forest and Paper Products Industry	10,488	8,021	3,000
Steel Industry	10,083	6,685	3,767
Aluminum Industry	7,908	6,583	2,704
Metal Casting Industry	5,228	4,052	2,000
Glass Industry	4,462	3,301	1,763
Chemicals Industry	14,079	13,184	7,075
Mining Industry	5,484	4,694	1,400
Supporting Industries	1,561	727	700
Total, Industries of the Future Specific (Specific)	59,293	47,247	22,409
Industries of the Future (Crosscutting)			
Industrial Materials of the Future	13,328	12,542	11,000
Combustion	1,952	1,975	1,600
Gasification Programs	0	4,939	0
Robotics	0	1,975	0
Sensors and Control Techniques	3,683	3,728	3,100
Industrial Technical Assistance	14,570	14,745	16,200
Total, Industries of the Future (Crosscutting)	33,533	39,904	31,900
Technical/Program Management Support	3,998	5,917	3,793
Total, Industrial Technologies	96,824	93,068	58,102

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Biomass and Biorefinery Systems R&D			
Utilization of Platform Outputs	8,960	7,110	8,280
Industrial Gasification	14,279	0	0
Technical Program Management Support	811	396	400
Total, Biomass and Biorefinery Systems R&D	24,050	7,506	8,680
Federal Energy Management Program			
Project Financing			
Energy Savings Performance Contracts	6,059	6,367	5,950
Utilities Program	1,780	1,759	1,500
Total, Project Financing	7,839	8,126	7,450
Technical Guidance and Evaluation			
Direct Technical Assistance	5,800	6,165	6,000
Training and Information	2,025	1,975	1,900
Total, Technical Guidance and Evaluation	7,825	8,140	7,900
Planning, Reporting, and Evaluation	2,751	2,571	2,550
Technical/Program Management Support	884	879	0
Total, Federal Energy Management Program	19,299	19,716	17,900
Program Management			
Program Direction			
Salaries and Benefits	47,467	48,300	52,107
Travel	2,764	2,996	3,025
Support Services	11,731	10,111	10,557
Other Related Expenses	7,979	8,725	9,420
Total, Program Direction	69,941	70,132	75,109
Planning, Evaluation, and Analysis	4,972	4,944	5,005
Information, Communications, and Outreach	1,540	1,531	1,550

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Cooperative Programs with States	0	4,939	0
Congressionally Directed Activities	497	3,458	0
Total, Program Management	76,950	85,004	81,664
Energy Efficiency Science Initiative	2,440	0	0
Total, Energy Conservation	880,176	877,984	875,933

Preface

It is in the nation's long term national and economic security interest to use our energy resources wisely. The Office of Energy Efficiency and Renewable Energy (EERE) pursues a balanced portfolio of research, development, demonstration, and deployment, investing in: 1) the technologies that allow us to harvest domestic solar, wind, hydropower, geothermal, and biomass energy; 2) the technologies to use those resources efficiently in our homes, schools, businesses, factories, and vehicles; and 3) the tools, processes and methods to help consumers fully and productively use these new energy opportunities.

EERE comprises 12 main programs: Hydrogen and Fuel Cell Infrastructure Technology, Solar Energy Technology, Wind Energy Technology, Hydropower Technologies, Geothermal Technologies, Biomass and Biorefinery Systems R&D Technology, Weatherization and Intergovernmental Activities, and Federal Energy Management Program, Vehicle Technologies, Distributed Energy Resources, Building Technologies, and Industrial Technologies. In addition, EERE supports Renewable Program Support, National Climate Change Technology Initiative Competitive Solicitation, Facilities and Infrastructure, Program Direction, and Energy Efficiency Science Initiative. Two appropriation accounts, Energy Conservation and Energy Supply fund these activities. Four programs have complementary funding in Energy Conservation and Energy Supply. They are: Biomass and Biorefinery Systems R&D; Federal Energy Management Program; Fuel Cells, and the Weatherization and Intergovernmental Program.

Within the Energy Conservation appropriation, EERE currently supports eight programs: Vehicle Technologies (nine subprograms), Fuel Cell Technologies (six subprograms), Weatherization and Intergovernmental Activities (four subprograms), Distributed Energy Resources (three subprograms), Building Technologies (six subprograms), Industrial Technologies (three subprograms), Biomass and Biorefinery Systems R&D (three subprograms), and Federal Energy Management Program (four subprograms).

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals and Funding by General Goal. These items together put the appropriation in perspective. This Overview will also address R&D Investment Criteria, Program Assessment Rating Tool (PART), and Significant Program Shifts.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus, the "goal cascade" is the following:

Department Mission -> Strategic Goal (25 yrs) -> General Goal (10-15 yrs) -> Program Goal (GPRA Unit) (10-15 yrs)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA[a] Unit" concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will complete a Program Assessment Rating Tool. A unique program goal was developed for each GPRA unit. A numbering scheme has been established for tracking performance and reporting.[b]

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals and, ultimately, to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus, the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Mission

The Office of Energy Efficiency and Renewable Energy strengthens America's energy security, environmental quality, and economic vitality through public-private partnerships that:

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

Benefits

EERE pursues this mission through a mix of research, development, demonstration and deployment efforts which improve the energy efficiency of our economy and increase the use of domestic renewable energy resources. Making more productive use of all of our energy resources and making greater use of our abundant, clean domestic renewable energy resources provides a number of economic, environmental, and security benefits to the United States. Energy bills are lower and consumers are less susceptible to energy price fluctuations. Emissions of Clean Air Act criteria pollutants (sulfur dioxide, nitrogen oxide, carbon monoxide, and particulates), mercury, and carbon dioxide are lower. Energy security is enhanced as dependence on imported petroleum (and, increasingly in the future, natural gas)

[a] Government Performance and Results Act of 1993

[b] The numbering scheme uses the following numbering convention: First 2 digits identify the General Goal that (01 through 07); second two digits identify the GPRA Unit; last four digits are reserved for future use.

is reduced and the mix of domestic energy resources increases. Security is also enhanced as the loads on our energy infrastructure are reduced, reducing the potential for wide-spread energy outages. Additionally, the development of distributed energy resources increases the reliability of energy supplies, even during emergencies.

Based on its modeling efforts, EERE estimates that U.S. consumption of non-renewable energy resources would, given current policies and a business-as-usual energy future, be about 10 quads lower in 2025 and over 30 quads lower in 2050 as a result of being able to realize these efficiency and renewable improvements. This will offset more than 50 percent of the expected growth in energy consumption through 2050. More detailed, integrated and comprehensive economic, energy and energy security benefits estimates and their sensitivities are provided in the Expected Integrated Program Outcomes section at the end of this overview.

Strategic Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Energy Conservation appropriation supports the following goals:

Energy Strategic Goal: To protect our national and economic security by promoting a diverse supply of reliable, affordable, and environmentally sound energy.

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The programs funded by the Energy Conservation appropriation have the following ten Program Goals which contribute to the General Goal in the "goal cascade":

Program Goal 04.02.00.00: Vehicle Technologies. The Vehicle Technologies Program goal is to develop technologies that enable cars and trucks to become highly efficient, through improved power technologies and cleaner domestic fuels, and to be cost and performance competitive. Manufacturers and consumers will then use these technologies to help the Nation reduce both energy use and greenhouse gas emissions thus improving energy security by dramatically reducing dependence on oil.

Program Goal 04.01.02.00: Fuel Cell Technology. The Hydrogen, Fuel Cells and Infrastructure Technologies Program goal is to develop hydrogen production, storage, and delivery technologies to the point that they are cost and performance competitive and are being used by the Nation's transportation, energy, and power industries. As such, the Program will expand and make our clean domestic energy supplies more flexible dramatically reducing or even ending dependence on foreign oil.

Program Goal 04.09.00.00: Weatherization. The mission of the Weatherization Assistance Program is to increase the energy efficiency of dwellings occupied by low-income Americans, thereby reducing their energy costs, while safeguarding their health and safety. DOE works directly with States and local governments, which contract with local governmental or non-profit agencies to deliver weatherization services.

Program Goal 04.10.00.00: State Energy Program Grants. The State Energy Program Grants goal is to strengthen and support the capabilities of States to promote energy efficiency and to adopt renewable

energy technologies, helping the nation achieve a stronger economy, a cleaner environment and greater energy security.

Program Goal 04.11.02.00: Intergovernmental Activities. The mission of Intergovernmental Activities is to fund activities that facilitate the movement of energy efficient and renewable energy products into the market place and the integrated deployment of efficiency and renewable resources to communities and customers.

Program Goal 04.59.00.00: Distributed Energy Resources. The Distributed Energy Resources Program goal is to develop and facilitate market adoption of a diverse array of cost competitive integrated distributed generation and thermal energy technologies in homes, businesses, industry, communities, and electricity companies, increasing the efficiency of electricity generation, delivery, and use, improving electricity reliability, and reducing environmental impacts.

Program Goal 04.04.02.00: Building Technologies. The Building Technologies Program goal is to develop cost effective tools, techniques and integrated technologies, systems and designs for buildings that generate and use energy so efficiently that buildings are capable of generating as much energy as they consume.

Program Goal 04.60.00.00: Industrial Technologies. The Industrial Technologies Program goal is to partner with our most energy-intensive industries in strategic planning and energy-specific RD&D to develop the technologies needed to use energy efficiently in their industrial processes and cost-effectively generate much of the energy they consume. The result of these activities will save feedstock and process energy, create domestic supply, improve the environmental performance of industry, and help America's economic competitiveness.

Program Goal 04.08.02.00: Biomass and Biorefinery Systems R&D. Develop biorefinery-related technologies to the point that they are cost- and performance-competitive and are used by the Nation's transportation, energy, chemical and power industries to meet their market objectives. This helps the Nation by reducing fossil energy consumption, our oil dependence, and greenhouse gas emissions, while also expanding domestic energy supplies and improving the Nation's energy infrastructure.

Program Goal 04.13.02.00: Federal Energy Management Program (FEMP). FEMP's goal is to provide the efficiency and renewable energy related technical assistance Federal agencies need to lead the Nation by example through government's own actions, expressly increasing Federal renewable energy use by 2.5% by 2005 and reducing energy intensity in Federal buildings by 35% by 2010 (using 1985 as a baseline).

Contributions to General Goal 4, Energy Security

Vehicle Technologies, Fuel Cell Technologies, Weatherization and Intergovernmental Activities, Distributed Energy Resources, Building Technologies, Industrial Technologies, Biomass and Biorefinery Systems R&D, and Federal Energy Management Programs contribute to General Goal 4 by working together and with supply programs to reduce the probability and magnitude of energy based disruptions.

These integrated contributions to improving energy security include (1) reducing demand-side pressure on our energy markets, (2) reducing energy imports; (3) diversifying the mix of domestic energy production; (4) providing smaller, non-fuel based sources of electricity generation that are inherently less susceptible to interdiction, attack or large losses; and (5) increasing our ability to adjust demand loads as needed, particularly during emergencies.

Clean distributed generation can reduce transmission and distribution bottle-necks, and can help maintain critical electricity functions during an outage without adding to the unhealthy air quality that often accompanies peak electricity days. EERE programs also provide key areas of support during emergencies: The State Energy Program (SEP) funds on-the-ground energy emergency planning and response while FEMP is often called upon to help when local energy markets become constrained. Clean distributed generation can reduce transmission and distribution bottle-necks and help maintain critical electricity functions during an outage, which are more like during peak electricity demand. These technologies cannot replace the need to maintain well-functioning energy infrastructure. They can, however, improve the inherent security of our energy systems, as well as reduce the need for costly expansions of our transmission lines, pipelines, and other infrastructure.

Given current expectations about future energy technologies and markets, and assuming no changes in energy policies, EERE's integrated portfolio can be expected to: (1) reduce future demand for traditional energy sources by approximately 10 quads in 2025 and over 30 quads in 2050 (beyond the efficiency and renewable improvements expected in the absence of these programs); and (2) reduce the need for new electricity capacity by nearly 150 gigawatts (GW) in 2025. Oil savings would be roughly 2 million barrels per day (MBD) in 2025 and over 10 MBD in 2050. Individual program activities planned for and funded by this appropriation would contribute to these improvements in the following ways under these business-as-usual conditions:

Vehicle Technologies contribute to this goal by developing technologies that enable highly efficient cars and trucks, including power technologies, clean domestic fuels, and lightweight materials which will enable overall Vehicle Technologies oil savings of 3 MBD by 2025 and 8 MBD in 2050 under expected market conditions.

Fuel Cell Technologies contribute to this goal by integrating hydrogen, fuel cell and infrastructure technology research and development resulting in lower cost and higher efficiency fuel cells which in conjunction with the development of the means to produce large quantities of competitively produced hydrogen from natural gas and renewables will enable the integrated program to displace 0.4 MBD of oil in 2025 and over 5 MBD in 2050 under business-as-usual conditions, while providing the country with the option for substantially faster growth in hydrogen use if circumstances warrant.

Weatherization and Intergovernmental Activities contribute to this goal by accelerating adoption of cost-effective efficient technologies through weatherization, state energy grants, technology demonstration, building code improvements, technical assistance, and education which will help reduce energy intensity in all sectors of the economy, with a resulting reduction in energy consumption of 1.1 quads in 2025.

Distributed Energy Resources contribute to this goal by making available by 2015 a diverse array of integrated distributed generation and thermal energy technologies at market competitive prices, which can provide 14 GW of additional distributed generation by 2025.

Building Technologies contribute to this goal by developing advanced lighting and appliances, which when coupled with improved building system integration and design, will provide marketable technologies that can reduce energy use by up to 70 percent in homes by 2020 and commercial buildings by 2025. Improvements in equipment standards, building codes, and consumer access to these technologies will also facilitate marketable improvements in the efficiency of existing buildings by 20 percent, which can reduce building energy use by 1.4 quads per year in 2025 and nearly 3 quads by 2050.

Industrial Technologies contribute to this goal by developing more efficient industrial processes in energy intensive industries, which when coupled with wider best practice application of these technologies, will reduce industrial energy use by an additional 2 quads per year by 2025.

Biomass and Biorefinery Systems R&D contribute to this goal by developing by 2010 validated cost- and performance-competitive biorefinery technologies that co-produce bio-based fuels, products, and power which will displace 115 trillion Btus per year of oil in 2025, more than 1 quad by 2050, and potentially more with fully integrated approaches.

Federal Energy Management Program (including DEMP) contributes to this goal by project financing, technical assistance, and project evaluation which will reduce energy intensity in Federal buildings by 35 percent in 2010 from 1985 levels.

Funding by General Goal

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Request	$ Change	% Change
Goal 4, Energy Security					
Program Goal 04.02.00.00, Vehicle Technologies	174,171	178,002	156,656	-21,346	-12.0%
Program Goal 04.01.02.00, Fuel Cell Technologies	53,906	65,187	77,500	+12,313	+18.9%
Program Goal 04.09.00.00 Weatherization and Intergovernmental Activities	223,537	227,166	291,200	+64,034	+28.2%
Program Goal 04.10.00.00 State Energy Program	49,973	46,276	43,151	-3,125	-6.8%
Program Goal 04.11.02.00 Intergovernmental Activities	40,645	35,170	29,716	-5,454	-15.5%
Program Goal 04.12.00.00 Distributed Energy Resources	60,054	61,023	53,080	-7,943	-13.0%
Program Goal 04.04.02.00 Building Technologies	58,327	59,866	58,284	-1,582	-2.6%
Program Goal 04.60.00.00, Industrial Technologies	96,824	93,068	58,102	-34,966	-37.6%
Program Goal 04.08.02.00, Biomass and Biorefinery Systems R&D	23,057	7,506	8,680	+1,174	+15.6%
Program Goal 04.13.02.00, Federal Energy Management Program	19,299	19,716	17,900	-1,816	-9.2%
Total Goal 4, Energy Security	799,793	792,980	794,269	+1,289	+0.2%

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Request	$ Change	% Change
All Other					
Biomass and Biorefinery Systems R&D	993	0	0	0	0.0%
Program Management	76,950	85,004	81,664	-3,340	-3.9%
Energy Efficiency Science Initiative	2,440	0	0	0	0.0%
Total, All Other	80,383	85,004	81,664	-3,340	-3.9%
Total, Energy Conservation	880,176	877,984	875,933	-2,051	-0.2%

R&D Investment Criteria

The President's Management Agenda identified the need to tie R&D investment to performance and well-defined practical outcomes. One criterion by which the Department's performance is assessed involves using a framework in the R&D funding decision process, and then referencing the use and outcome of the framework in budget justification material.

The goal is to develop analytical justifications for applied research portfolios in future budgets. This will require the development and application of a uniform cost and benefit evaluation methodology across programs to allow meaningful program comparisons.

This process is underway in several key areas; 1) common, consistent, and integrated analysis (modeling grounded in the EIA basecase); 2) development of a more complete and robust framework for describing program benefits -- provided in the Expected Integrated Program Outcomes section of the overviews and in the individual Expected Program Outcomes section; and 3) development of sound analytic tools to better estimate and link potential impacts, support budget justification and describe how the R&D Investment Criteria (RDIC) influenced budget decisions.

EERE used the RDIC to support determination of relative areas of strength and weakness in the program and in selected areas of technology development. Programs have made improvements using the individual criteria as a guide to opportunities to improve program strategic management and planning, incorporating key RDIC criteria into their multi-year planning and PART (Program Assessment Rating Tool) documentation. Pilot application of the RDIC to DOE Energy Applied R&D programs was somewhat different than that used for other government programs that underwent PART; there were evidence requirements, a two-tier scoring system, and unique portfolio questions and support requirements that made scoring well on the PART more challenging. That EERE's program generally scored well reflects the quality of these programs. DOE and OMB are working to resolve the requirements and process so they productively meet the intent of the President's Management Agenda.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office

of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish outcome- and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2005 Budget, and the Department will take the necessary steps to continue to improve performance.

In the FY 2005 PART Review, OMB assessed the Weatherization, Building Technologies and Distributed Energy Resources (DER) programs within the Interior and Related Agencies account (the DER program was added in FY 2005). EERE program and corporate management have incorporated PART questions into program planning, performance and management. As noted above the PART was revised for FY2005 to incorporate the RDIC and to reflect other improvements. The net effect made scoring well quite challenging especially for DOE's applied R&D programs which concurrently addressed the changes in questions and evidence requirements, a two-tier scoring system and unique portfolio questions and support requirements applied to the DOE Energy R&D programs, as distinct from what was required from other government programs that underwent PART.

The Buildings and Weatherization Programs have directly addressed FY 2004 PART findings and recommendations within their control. FY 2005 performance hierarchy, goals, targets and program indicators are consistent in PART and program budgets. EERE has corporately addressed common items. For example it has begun improving consistency of benefits estimates through the consolidation of these analyses in its new organization, although work remains in this area. EERE has also added a corporate wide measure to reduce uncosted balances, contributed to by all programs. EERE is working with Departmental and OMB staff to improve PART processes, systems and scoring consistency to enable our performance to be accurately portrayed by PART.

Significant Program Shifts

Vehicle Technologies: With the completion of the light truck combustion engine R&D in FY 2004 (-$12.9 million), focus is being shifted to Hybrid and Electric Propulsion (+$5.1 million) to explore energy storage systems with potential for significant improvements over existing technologies for use in hybrid vehicles, including fuel cell hybrid vehicles. Fuels Technology is reduced (-$9.7 million) as research into the sensitivity of emission control after treatment to sulfur will be completed in FY 2005, and as light-duty natural gas engine/vehicle/infrastructure technology (brought to conclusion with FY 2004 funding) is considered mature and ready for commercialization. Increased funds (+$2.4) will be used to evaluate variances in molecular makeup in commercially available biomass-based fuels and to initiate development of specifications so that these fuels will not adversely affect engine performance when blended with petroleum based feedstocks.

Fuel Cell Technologies: Funding will be increased to accelerate stack component research (+$4.8 million) to develop advanced fuel cell membrane technologies with higher performance capacity and durability. Within Technology Validation, increased funding (+$8.1 million) will support demonstrations to validate performance, durability, and reliability of fuel cell systems and to gather and analyze fuel cell vehicle performance data.

Weatherization and Intergovernmental Activities: Funding for Weatherization Assistance Grants will be increased (+$64.0 million), reflecting the President's continuing commitment to reduce energy bills of low-income households.

Building Technologies: Within Emerging Technologies, Solid State Lighting will be funded at $10.2 million (+$3.3 million) within the Lighting R&D subprogram, to accelerate development of this advanced lighting technology that can achieve upwards of 70 percent. Thermal insulation research is suspended (-$3.2 million) to accelerate higher-priority Residential Buildings Integration R&D (+$5.9 million).

Industrial Technologies: Funding for this program is reduced (-$35.0 million) to better align requested resources in support of DOE's General Goal 4 (Energy Security) and enhance support for higher-priorities such as Fuel Cell Technologies and Weatherization Assistance Grants within the EERE Energy Conservation program portfolio.

Congressional Items of Interest

(dollars in thousands)

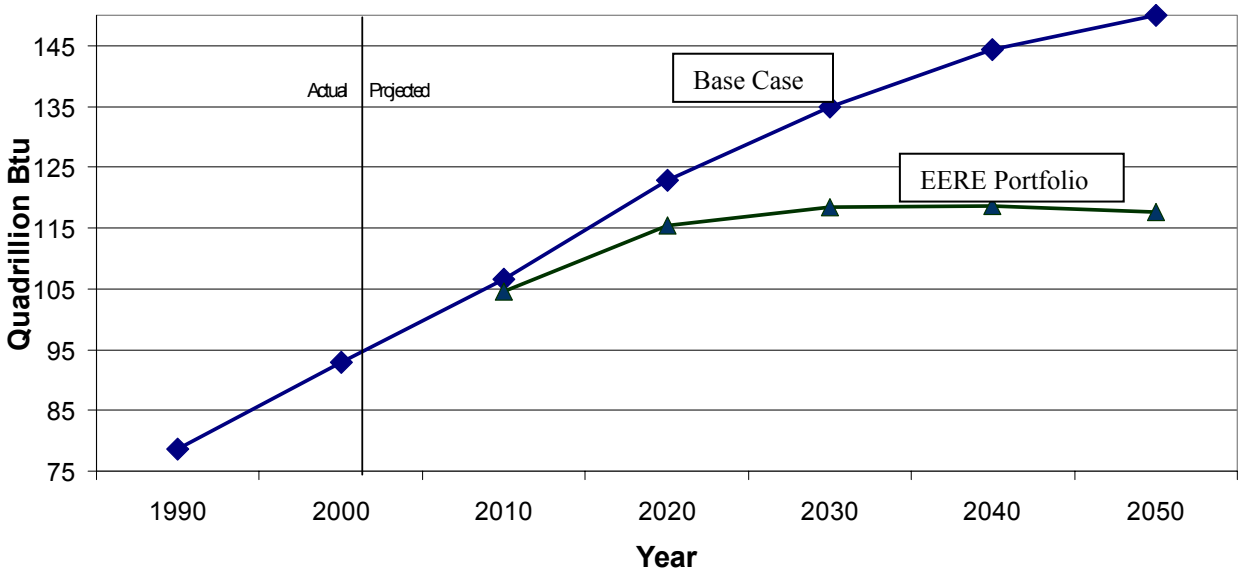
	FY 2003	FY 2004	FY 2005	$ Change	% Change
Vehicle Technologies (Energy Conservation)					
Northwest Alliance for Transportation Technologies	3,225	0	0	0	0.0%
Total, EERE	3,225	0	0	0	0.0%

Expected Integrated Program Outcomes

EERE's programs pursue their mission through an integrated portfolio of Research, Development, Demonstration and Deployment activities which improves the energy efficiency and productivity of our economy. Figure 1 below depicts the related potential shift in nonrenewable energy consumption. We expect the energy efficiency and renewable energy components of these energy savings to result in lower energy bills and reduced susceptibility to energy price fluctuations; reduced EPA criteria pollutants and other pollutants; enhanced energy security as petroleum and natural gas dependence is reduced and domestic fuel supplies increase; and greater energy security and reliability from improvements in energy infrastructure. Indicators of some of these programs benefits are provided in the tables below. The results shown in the long term benefits tables are preliminary estimates based on initial modeling of some of the possible program production technologies. The assumptions and methods underlying the modeling efforts have significant impact on the expected benefits, the resulting point estimates could also vary significantly based upon market interactions and commodity prices. A summary of the methods, assumptions, sensitivities, and models used in developing these benefit estimates that are important for understanding these results are provided at

www.eere.energy.gov/office_eere/budget-gpra.html. Final documentation is estimated to be completed and posted by March 15, 2004.

Figure 1. U.S. Nonrenewable Energy Consumption, 1990-2000, and Projections to 2050



EERE's portfolio includes a mix of efforts intended to produce short, mid, and long term benefits. The size of these benefits depend not only on the success of the EERE program efforts funded in this budget request, but on how future energy markets and policies evolve. EERE estimates a sub-set of these benefits assuming a continuation of current policies and business-as-usual development of energy markets. These estimates do not include the underlying, basecase improvements in energy efficiency and renewable energy use that would be expected in the absence of continued funding of EERE's programs.

Mid-term Benefits

		(calendar year)			
		2010	2015	2020	2025
Economic	Energy bill savings (billion 2001$)	27	51	90	134
Environment	CO2 emissions reductions (mmtce)	35	74	139	213
Security	Oil savings (mmbpd)	0.2	0.5	1.1	2.1
	Natural gas savings (quads)	0.7	1.0	1.9	1.9
	Reduced need for additions to central conventional power (GW)	24	65	102	153

Under these assumptions, EERE's programs could provide mid-term benefits in 2025 of over $100 million in annual energy bill savings; a reduction of about 200 million metric tons of annual carbon emissions; a savings of about 2 million barrels of oil per day; and a reduction of over 1.5 quads of

natural gas consumption. A combination of reduced peak demand for electricity and additional renewable and DG capacity reduces the need for some 150 GW of additional conventional central power generation, increasing the flexibility and diversity of our electricity system while reducing the potential for a shortage of new generating capacity.

EERE's portfolio includes a number of efforts to develop fundamental breakthroughs in technologies that promise major changes in how we will produce, and the ways we use energy in the decades to come. If these breakthroughs succeed, benefits could continue to grow in the long term. By 2050 benefits may include reductions in the overall annual cost of our energy systems of over $200 billion; reductions in annual carbon dioxide emissions of nearly 600 mmtce; reductions in oil demand of over 10 million barrels per day; and annual savings in natural gas demand of over 4 quads.

Long-Term Benefits

		(calendar year)		
		2030	2040	2050
Economic	Overall Energy cost savings (billion 2001$)	88	171	236
Environment	CO2 emissions reductions (mmtce)	334	471	593
Security	Oil savings (mbpd)	4.7	9.0	11.6
	Natural gas savings (quads)	2.8	5.2	4.5

These mid and long term estimates are derived utilizing a similar baseline case, but different modeling techniques and, as a result, are not directly comparable. While point estimates are presented, both mid-term and long-term modeling are dependent upon the methodology and assumptions used. Many of the key variables affecting the benefits estimates are listed as the external factors that could affect expected results in the means and strategy sections of the individual programs and include variables such as: market and policy interactions, and the future price of oil, natural gas and electricity generation. Uncertainties also increase for the longer-term estimates. Long term estimates should be considered preliminary as EERE refines its analytical approaches for the 2030-2050 timeframe. Nonetheless, they provide a useful picture of growing national benefits over time. A summary of the methodologies, sensitivities and assumptions which are important to the development and understanding of these estimates can be found at http: www.eere.energy.gov/office_eere/budget-gpra.html.

These benefits result from the mix of interrelated investments supported by EERE's budget request. More efficient buildings and factories, for instance, provide the basis for distributed energy resources, such as building solar photovoltaic systems and combined heat and power cogeneration

In addition to these "business-as-usual" benefits, EERE's portfolio would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs. The development of wide-spread sources of wind, solar, geothermal, biomass, and hydropower energy sources; new ways of using energy through hydrogen and distributed power; and technologies that would fundamentally improve the basic efficiency of our homes, businesses, factories, and vehicles could allow us, if desired, to make substantially larger reductions in our oil use and convert a larger portion of our electricity system to decentralized capacity and renewable energy sources.

Energy Conservation

Office of Energy Efficiency and Renewable Energy

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Atlanta Regional Office					
Program Management	2,979	2,915	3,268	+353	+12.1%
Boston Regional Office					
Program Management	2,458	2,405	2,696	+291	+12.1%
Chicago Operations Office					
Ames Laboratory					
Vehicle Technologies	300	300	300	0	0.0%
Argonne National Laboratory (East)					
Vehicle Technologies	20,334	23,173	21,434	-1,739	-7.5%
Fuel Cell Technologies	9,054	8,954	6,890	-2,064	-23.1%
Weatherization and Intergovernmental	600	500	500	0	0.0%
Distributed Energy Resources	775	1,800	775	-1,025	-56.9%
Building Technologies	0	15	0	-15	-100.0%
Industrial Technologies	2,316	2,177	1,081	-1,096	-50.3%
Biomass & Biorefinery Systems R&D	108	0	0	0	0.0%
Program Management	646	643	651	+8	+1.2%
Total, Argonne National Laboratory (East)	33,833	37,262	31,331	-5,931	-15.9%
Brookhaven National Laboratory					
Vehicle Technologies	2,188	1,300	1,150	-150	-11.5%
Fuel Cell Technologies	270	300	300	0	0.0%
Distributed Energy Resources	450	0	0	0	0.0%
Building Technologies	225	903	225	-678	-75.1%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Program Management	273	272	275	+3	+1.1%
Total, Brookhaven National Laboratory	3,406	2,775	1,950	-825	-29.7%
Chicago Operations Office					
Vehicle Technologies	14,166	0	0	0	0.0%
Fuel Cell Technologies	114	0	0	0	0.0%
Biomass & Biorefinery Systems R&D	1	0	0	0	0.0%
Program Management	740	0	0	0	0.0%
Total, Chicago Operations Office	15,021	0	0	0	0.0%
National Renewable Energy Laboratory					
Vehicle Technologies	19,855	18,524	12,114	-6,410	-34.6%
Fuel Cell Technologies	2,094	2,561	3,028	+467	+18.2%
Weatherization and Intergovernmental	4,712	4,718	4,800	+82	+1.7%
Distributed Energy Resources	1,814	1,814	1,814	0	0.0%
Building Technologies	3,105	3,053	3,834	+781	+25.6%
Industrial Technologies	1,796	1,006	138	-868	-86.3%
Biomass & Biorefinery Systems R&D	624	506	506	0	0.0%
Federal Energy Management Program	5,091	4,125	4,125	0	0.0%
Program Management	731	727	736	+9	+1.2%
Total, National Renewable Energy Lab.	39,822	37,034	31,095	-5,939	-16.0%
Total, Chicago Operations Office	92,382	77,371	64,676	-12,695	-16.4%
Chicago Regional Office					
Fuel Cell Technologies	0	50	0	-50	-100.0%
Biomass & Biorefinery R&D	77	0	0	0	0.0%
Program Management	2264	2,216	2,484	+268	+12.1%
Total, Chicago Regional Office	2,341	2,266	2,484	+218	+9.6%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Denver Regional Office					
Biomass & Biorefinery R&D	2	0	0	0	0.0%
Program Management	3,521	3,446	3,863	+417	+12.1%
Total, Denver Regional Office	3,523	3,446	3,863	+417	+12.1%
Golden Field Office					
Vehicle Technologies	0	6,699	0	-6,699	
Fuel Cell Technologies	0	0	0	0	0.0%
Weatherization and Intergovernmental	264,684	267,505	327,240	+59,735	+22.3%
Biomass & Biorefinery Systems R&D	150	250	250	0	0.0%
Program Management	6,002	7,345	9,898	+2,553	+34.8%
Total, Golden Field Office	270,836	281,799	337,388	+55,589	+19.7%
Idaho Operations Office					
Idaho National Engineering & Environmental Laboratory					
Vehicle Technologies	3,395	2,632	3,770	+1,138	+43.2%
Weatherization and Intergovernmental	50	50	50	0	0.0%
Industrial Technologies	1,002	40	190	+150	+375.0%
Biomass & Biorefinery Systems R&D	541	316	316	0	0.0%
Total, Idaho National Engineering & Environmental Laboratory	4,988	3,038	4,326	+1,288	+42.4%
Idaho Operations Office					
Vehicles Technologies	30	0	0	0	0.0%
Program Direction	500	0	0	0	0.0%
Total, Idaho Operations Office	530	0	0	0	0.0%
Total, Idaho Operations Office	5,518	3,038	4,326	+1,288	+42.4%
Livermore Site Office					
Lawrence Livermore National Laboratory					
Vehicle Technologies	2,025	3,242	3,060	-182	-5.6%
Fuel Cell Technologies	425	175	175	0	0.0%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Industrial Technologies	400	335	140	-195	-58.2%
Total, Lawrence Site Office	2,850	3,752	3,375	-377	-10.0%
Los Alamos Site Office					
Los Alamos National Laboratory					
Vehicle Technologies	1,110	670	1,208	+538	+80.3%
Fuel Cell Technologies	5,310	4,959	8,059	+3,100	+62.5%
Building Technologies	0	250	0	-250	-100.0%
Industrial Technologies	1,672	925	678	-247	-26.7%
Total, Los Alamos National Site Office	8,092	6,804	9,945	+3,141	+46.2%
National Energy Technology Laboratory					
Vehicle Technologies	4,910	15,459	33,300	+17,841	+115.4%
Fuel Cell Technologies	300	0	0	0	0.0%
Weatherization and Intergovernmental Activities	680	680	680	0	0.0%
Distributed Energy Resources	1,600	2,400	1,000	-1,400	-58.3%
Building Technologies	600	600	600	0	0.0%
Biomass & Biorefinery Systems R&D	12,152	370	0	-370	-100.0%
Program Management	0	894	0	-894	-100.0%
Total, National Energy Technology Laboratory	20,242	20,403	35,580	+15,177	+74.4%
Nevada Site Office					
Vehicle Technologies	1,619	0	0	0	0.0%
National Nuclear Security Administrations Service Center (NNSA)					
Lawrence Berkeley National Laboratory					
Vehicle Technologies	4,873	5,309	8,051	+2,742	+51.6%
Fuel Cell Technologies	400	450	450	0	0.0%
Weatherization and Intergovernmental	433	700	700	0	0.0%
Distributed Energy Resources	200	200	200	0	0.0%
Building Technologies	10,627	10,290	10,627	+337	+3.3%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Industrial Technologies	1,615	2,050	50	-2,000	-97.6%
Federal Energy Management Program	2,868	2,400	2,400	0	0.0%
Program Management	393	391	395	+4	+1.0%
Total, Lawrence Berkeley National Laboratory	21,409	21,790	22,873	+1,083	+5.0%
NNSA Service Center					
Vehicle Technologies	10,110	0	0	0	0.0%
Fuel Cell Technologies	24,823	0	0	0	0.0%
Total, NNSA Service Center	34,933	0	0	0	0.0%
Total, National Nuclear Security Administration Service Center	56,342	21,790	22,873	+1,083	+5.0%
Oak Ridge Operations Office					
Oak Ridge Institute for Science & Education					
Vehicle Technologies	322	320	0	-320	-100.0%
Oak Ridge National Laboratory					
Vehicle Technologies	40,318	44,279	26,328	-17,951	-40.5%
Fuel Cell Technologies	2,385	2,206	1,758	-448	-20.3%
Weatherization and Intergovernmental	3,720	4,215	4,238	+23	+0.5%
Distributed Energy Resources	27,051	27,522	25,374	-2,148	-7.8%
Building Technologies	5,154	5,152	3,841	-1,311	-25.4%
Industrial Technologies	13,555	11,516	4,140	-7,376	-64.1%
Biomass & Biorefinery Systems R&D	954	160	160	0	0.0%
Program Management	1,139	1,132	1,146	+14	+1.2%
Total, Oak Ridge National Laboratory	94,276	96,182	66,985	-29,197	-30.4%
Oak Ridge Operations Office					
Vehicle Technologies	27,578	25,648	0	-25,648	-100.0%
Federal Energy Management Program	4,068	3,170	3,170	0	0.0%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Program Management	115	0	0	0	0.0%
Total, Oak Ridge Operations Office	31,761	28,818	3,170	-25,648	-89.0%
Total, Oak Ridge Operations Office	126,037	125,000	70,155	-54,845	-43.9%
Philadelphia Regional Office					
Biomass & Biorefinery Systems R&D	50	0	0	0	0.0%
Program Management	2,658	2,601	2,916	+315	+12.1%
Total, Philadelphia Regional Office	2,708	2,601	2,916	+315	+12.1%
Richland Operations Office					
Pacific Northwest National Laboratory					
Vehicle Technologies	6,816	6,347	6,619	+272	+4.3%
Fuel Cell Technologies	2,750	1,200	1,550	+350	+29.2%
Weatherization and Intergovernmental	3,380	3,430	3,400	-30	-0.9%
Distributed Energy Resources	1,200	200	200	0	0.0%
Building Technologies	3,478	3,387	3,478	+91	+2.7%
Industrial Technologies	1,362	1,251	740	-511	-40.8%
Biomass & Biorefinery Systems R&D	760	195	195	0	0.0%
Federal Energy Management Program	2,708	2,419	2,419	0	0.0%
Program Management	810	806	816	+10	+1.2%
Total, Pacific Northwest National	23,264	19,235	19,417	+182	+0.9%
Sandia Site Office					
Sandia National Laboratories					
Vehicle Technologies	7,899	9,119	9,013	-106	-1.2%
Fuel Cell Technologies	25	0	0	0	0.0%
Industrial Technologies	2,891	956	650	-306	-32.0%
Federal Energy Management Program	486	240	240	0	0.0%
Program Management	249	247	250	+3	+1.2%
Total, Sandia Site Office	11,550	10,562	10,153	-409	-3.9%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Seattle Regional Office					
Program Management	2,659	2,603	2,917	+314	+12.1%
Washington Headquarters					
Office of Scientific & Technical Information					
Vehicle Technologies	178	50	0	-50	-100.0%
Distributed Energy Resources	45	0	0	0	0.0%
Total, Office of Scientific & Technical Information	223	50	0	-50	-100.0%
Washington Headquarters					
Vehicle Technologies	6,145	14,931	30,309	+15,378	+103.0%
Fuel Cell Technologies	5,956	44,332	55,290	+10,958	+24.7%
Weatherization and Intergovernmental	35,896	26,814	22,459	-4,355	-16.2%
Distributed Energy Resources	26,919	27,087	23,717	-3,370	-12.4%
Building Technologies	35,138	36,216	35,679	-537	-1.5%
Industrial Technologies	70,215	72,812	50,295	-22,517	-30.9%
Biomass & Biorefinery Systems R&D	8,631	5,709	7,253	+1,544	+27.0%
Federal Energy Management Program	4,078	7,362	5,546	-1,816	-24.7%
Program Management	48,813	56,361	49,353	-7,008	-12.4%
Energy Efficiency Science Initiative	2,440	0	0	0	0.0%
Total, Washington Headquarters	244,231	291,624	279,901	-11,723	-4.0%
Total, Washington Headquarters	244,454	291,674	279,901	-11,773	-4.0%
Total, Energy Conservation	880,176	877,984	875,933	-2,051	-0.2%

Site Description

Atlanta Regional Office

Introduction

The Atlanta Regional Office provides support to the R&D programs by administering grants and cooperative agreements to regional, State, and local organizations, both public and private and Provides direction, guidance, and support deployment and outreach programs on a local and regional level. It is located in Atlanta, Georgia.

Program Management

Program Management funds the personnel and overhead costs for 25 FTE in the Atlanta Regional Office (ARO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2) administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). ARO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities.

Boston Regional Office

Introduction

The Boston Regional Office provides support to the R&D programs by administering grants and cooperative agreements to regional, State, and local organizations, both public and private and provides direction, guidance, and support deployment and outreach programs on a local and regional level. It is located in Boston, Massachusetts and supports Program Management.

Program Management

Program Management funds the personnel and overhead costs for 18 FTE in the Boston Regional Office (BRO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2) administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). BRO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities.

Chicago Operations Office

Ames Laboratory

Introduction

Ames Laboratory is located in Ames, Iowa. Ames provides research for Vehicle Technologies in new materials. Ames conducts basic research on new materials with unique properties.

Vehicle Technologies

Ames Laboratory work for FCVT includes the development of low-cost power metallurgy manufacturing methods for particle reinforced aluminum (PRA) composite components. Materials efforts are developing to improve powder for permanent magnets.

Argonne National Laboratory

Introduction

Argonne National Laboratory is located in Argonne, Illinois. It is a multi-discipline laboratory providing support to Vehicle Technologies, Fuel Cell Technologies, Weatherization and Intergovernmental Activities, Distributed Energy Resources, Industrial Technologies, Biomass and Biorefinery Systems R&D, and Program Management.

Vehicle Technologies

Provides simulation, analysis, and develops transient models for hybrid and fuel cell systems. Develops sophisticated software for hardware-in-the loop testing. Provides technical support and analysis for heavy hybrids. Conducts research to reduce parasitic loads on heavy vehicles including reductions in idling losses, rolling resistance, aerodynamic drag, and under hood thermal management. Also, works to improve oil filtration, coolants, and regenerative shocks for trucks. Performs high-performance computing with particular focus on computational fluid dynamics (combustion, underhood cooling, HVAC, etc.). Utilizes the Advanced Photon Source facility to characterize fundamental mechanisms of friction, lubrication, and fuel spray from fuel injectors. Develops nano fluid technology and new designs for higher efficiency heavy vehicle cooling systems. Monitors R&D in industry for underhood electrification for heavy vehicle components and new brake material developments. Provides technical and analytical expertise to the GATE activities. Conducts HEV component and subsystem performance and emissions tests in a state-of-the-art test facility. Validates components and subsystems performance targets for hybrid and fuel cell technology using hardware-in-the loop testing to simulate vehicle operating environment. Develops test procedures for advanced vehicle testing and control strategies to improve overall vehicle efficiency and reduce emissions. Conducts research in energy storage for EVs and HEVs and high performance capacitors. Provides battery technical support, and testing of advanced batteries.

Conducts research and development of in-cylinder emission control techniques for CIDI engines and the evaluation of innovative technologies to reduce emissions and improve fuel efficiencies in heavy-duty diesel engines. Develops wide range of materials (both metals and ceramics), with particular expertise in nondestructive evaluation, rapid prototyping, sensors, and catalysts. Develops economic processes for automotive recycling. Develops permanent magnet materials for high performance motors. Characterizes the effect of microdimpling on reduction of surface friction and wear. Develops lower

temperature, high strength bonding method for ceramics and dissimilar materials. Conducts technology analysis (energy, environmental, and economic) as well as vehicle system and subsystem modeling.

Fuel Cell Technologies

Argonne National Laboratory (ANL) is the lead laboratory in all facets of the research and development of fuel processor catalysts and fuel cell system analysis. ANL provides technical assistance in the management of DOE cooperative agreements with industry. ANL develops catalysts, materials, and processes for the autothermal reforming of gasoline and other fuels including diesel with CO clean-up, investigates the effect of fuel additives on fuel processor performance, and characterizes the stability and degradation of fuel processing catalysts. In FY 2003 and FY 2004, ANL is designing, constructing and optimizing a fast-start fuel processor for on-board gasoline reforming, with support from National Laboratories such as PNNL and ORNL and other fuel cell suppliers. Continuation of ANL fast start fuel processor activities in FY 2005 will depend upon the recommendations of on-board fuel processing go/no-go decision in June 2004.

Weatherization and Intergovernmental Activities

ANL works with engine and platform manufacturers to develop natural gas school buses as part of the Clean Cities platform development effort.

Distributed Energy Resources

ANL performs research and development including non-destructive evaluation (NDE) of advanced ceramics, high temperature recuperators and coatings and laser ignition research for reciprocating engines.

Building Technologies

ANL supports the Building Technology program by assessing the impacts of potential policy choices on building technology markets through the use of market and benefits models, and external analysis.

Industrial Technologies

ANL performs research and development for the Chemical industry R&D area. Argonne provides unique expertise in advanced separations process technologies and new innovative membrane systems. The laboratory also does research on refractory materials for the steel industry. The laboratory also has unique expertise in anode and cathode development for the aluminum industry using technology to analyze the surface effects conditions on the advanced candidate materials.

Biomass and Biorefinery Systems R&D

ANL conducted R&D for the program's Industrial Gasification activity

Program Management

Provide analytical support for major crosscutting issues, such as market and benefit analyses.

Brookhaven National Laboratory

Introduction

Brookhaven National Laboratory (BNL) is located in Upton, New York. It is a multi-discipline laboratory providing support to Vehicle Technologies, Fuel Cell Technology, and Building Technologies.

Vehicle Technologies

Performed analysis studies and conducted research in advanced materials that improved the performance and abuse tolerance of lithium battery systems and provided research support for analysis of internal combustion (IC) engine emissions for FreedomCAR partnership.

Fuel Cell Technologies

Conducts research and development of electrocatalyst alloys for fuel cells focusing on synthesis and characterization of the materials for Fuel Cell Technologies.

Distributed Energy Resources

BNL performs research and development of novel concepts in oil heat combustion and fuel flexibility technologies. This work has lead to proof-of-concept systems and to the acceleration of commercialization and integration of advanced technologies necessary to bring oil heating equipment to their practical potential. These technologies contribute to the combined heat and power initiative.

Building Technologies

BNL conducts research and development activities for the space heating and cooling technologies for Building Technologies.

Program Management

Provides analytical support for crosscutting issues such as market and benefit analyses.

Chicago Operations Office

Introduction

Chicago Operations Office is located in Argonne, Illinois. It provides procurement support, solicited, awarded, and administered research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations. Assisted in the contract awards and administration of general support service contracts. It provides support to Vehicle Technologies, Fuel Cell technologies, and Biomass & Biorefinery Systems R&D.

Vehicles Technologies

Provides procurement support for Vehicle Technologies through solicited, awarded and administered research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations.

Fuel Cell Technologies

The Chicago Operations Office administers the Fuel Cell Technology's Cooperative Agreements with recipients conducting research and development for advanced fuel cell materials and components.

Biomass & Biorefinery Systems R&D

The Chicago Operations Office provides oversight of the program's Industrial Gasification program, which is not funded in FY 2004 or FY 2005.

Program Management

Provides analytical support for crosscutting issues, such as market and benefit analysis.

National Renewable Energy Laboratory

Introduction

National Renewable Energy Laboratory is located in Golden, Colorado. It is a multi-discipline laboratory providing support to Vehicle Technologies, Fuel Cell Technologies, Weatherization and Intergovernmental, Distributed Energy Resources, Building Technologies, Industrial Technologies, Biomass & Biorefinery Systems R&D, Federal Energy Management Program and Program Management.

Vehicle Technologies

Provides analysis of performance targets for light and heavy vehicles, including developing a Technical Targets Tool for government use. Develops system models and provides analysis and simulations of advanced hybrid and fuel cell configurations using the ADVISOR software developed at the lab as well as other tools. Performs trade-off analysis and optimization for fuel cell and other advanced vehicles to identify opportunities for decreased fuel consumption using advanced technology and study the impacts of future fuel cell characteristics on vehicle performance. Provides CAD/CAE for optimized vehicle system solutions in support of FreedomCAR partnership goals, and general engineering assessments of HEV and AFV technologies. Conducts research in reducing ancillary and climate control loads for light vehicles and energy losses in general for both heavy and light vehicles such as rolling resistance, aerodynamics, heat losses, friction, pumping, fuel delivery losses, etc. Investigates and develops advanced battery thermal management for hybrid and fuel cell vehicles. Provides analysis, modeling, and technical support for power electronics and electric machines for heavy vehicles. Conducts engine/vehicle integration and platform studies. Develops component models of engine/after treatment systems to allow for quick and inexpensive evaluations of proposed combinations of fuel/engine/emissions control combinations. Leads an effort to identify the effects of sulfur levels of diesel fuels on near term emissions control devices. Leads an effort to determine the lube oil effects on exhaust after treatment devices. Conducts tests of bio-based diesel fuel blending agents to determine their ability to act as reductants in the exhaust stream of diesel engines. Supports EPAct regulatory programs including Federal Fleet, State and Fuel Provider, Private and Local, and Fuel petitions. Tests and evaluates heavy-duty, medium duty and transit alternative and advanced technology vehicles.

Fuel Cell Technologies

National Renewable Energy Laboratory (NREL) will lead the Systems Integration and Analysis function for the Program. Models of the technical, economic, and integration aspects of the hydrogen infrastructure and fuel cell vehicle systems provide guidance for the development of hydrogen fuel cell vehicles.

Weatherization and Intergovernmental

NREL analyzes the program's communications strategy and develops information outreach products for WIP and specific subprograms. NREL provides technology transfer technical outreach for Rebuild America and Energy Smart Schools. NREL also participates in providing technical assistance in identifying and developing energy policies that will reduce greenhouse gas emissions and contribute to development goals through accelerated deployment of renewable energy and energy efficiency technologies. In addition, NREL works cooperatively with the private sector.

Distributed Energy Resources

NREL conducts research and development of novel material, sensor and processing techniques for advanced desiccant systems for humidity control and improved air quality. NREL also performs analysis addressing regulatory and institutional barriers to distributed energy resources.

Building Technologies

NREL conducts research and development for the following activities in Building Technologies: Building America, and High Performance Buildings

Industrial Technologies

NREL supports the Best Practices program in communication activities and products. NREL supports overall Industry program analysis of the logic of individual program activities including the relationship between program goals, milestones and the budget formulation process for several areas including Industrial Materials of the Future, Aluminum and Metal Casting.

Biomass & Biorefinery Systems R&D

NREL is the lead laboratory for Biomass R&D. NREL also develops analytical methodologies (chemical and life-cycle that are used to facilitate industry commercialization, including economic assessment of technologies). NREL contributes to bio-based products tasks.

Federal Energy Management Program

NREL facilitates projects, develops guidelines and provides expert advice on sustainable and renewable facility designs, green power procurement, distributed energy resources, and alternative financing.

Program Management

Provides analytical support for crosscutting issues, such as market and benefit analyses.

Chicago Regional Office

Program Management funds the personnel and overhead costs for 18 FTE in the Chicago Regional Office (CRO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2)

administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). CRO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities. It also supports Fuel Cell Technologies and Biomass & Biorefinery R&D Programs.

Denver Regional Office

Program Management

Program Management funds the personnel and overhead costs for 21 FTE in the Denver Regional Office (DRO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2) administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). DRO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities. It also provides support to Biomass and Biorefinery Systems R&D.

Golden Field Office

Introduction

Golden Field Office is located in Golden, Colorado. It provides project management and procurement support for Vehicle Technologies, Fuel Cell Technology, Weatherization and Intergovernmental Activities, Biomass and Biorefinery Systems R&D, and Program Management.

Vehicle Technologies

Solicits, awards, and administers support services and research and development contracts, cooperative agreements, and grants. Awards and administers Engine and Emission Control cooperative agreements. Provides technical project management and administrative support for new contracts, cooperative agreements, and grants.

Fuel Cell Technology

The Golden Field Office provides procurement services and technical oversight of the research, development, and demonstration activities conducted by the recipients of Cooperative Agreements.

Weatherization and Intergovernmental Activities

The Golden Field Office (GO) provides funding for energy experts to serve on the industrial technology panels, and with the assistance of the DOE regional offices, awards grants, primarily to States.

Biomass and Biorefinery Systems R&D

The Golden Field Office administers contracts associated with bio-based products R&D and assists HQ with numerous procurement and project management activities.

Program Management

Provides program direction, guidance, and support. Serves as a central Project Management Office (PMO) to EERE. Activities previously performed at other Operations Offices are being consolidated at GFO.

Idaho Operations Office

Idaho National Engineering & Environmental Laboratory

Introduction

Idaho National Engineering Laboratory is located in Idaho Falls, Idaho. It is a multi-discipline laboratory providing support to Vehicle Technologies, Weatherization and Intergovernmental Activities, Industrial Technologies, and Biomass and Biorefinery Systems R&D.

Vehicle Technologies

Develops and assesses advanced oil by-pass filter concepts for heavy vehicles. Develops and assesses ultracapacitors for hybrid vehicles. Tests of high-power batteries and develops battery test procedures. Tests and simulates hybrid vehicle performance. Develops energy storage models for electric and hybrid vehicles (SIMPLEV). Develops and demonstrates spray forming process for rapid production on net-shape molds, dies, and related tooling for automotive components. Models slurry performing for fiber reinforced composites, NDE for cylinder liners, intelligent welding and spray forming of aluminum. Characterizes metallic structures produced by equal channel angular extrusion process. Field testing and evaluation of electric, hybrid and hydrogen light duty vehicles and infrastructure. Supports Federal Fleet acquisition reporting as required.

Weatherization and Intergovernmental Activities

Funding to INEEL supports technical analysis of Inventions and Innovations grant proposals.

Industrial Technologies

The Forest Products Industry provides critical support in project management and analysis as well as Computational Fluid Dynamics (CFD) modeling of an advanced black liquor spray atomization process. For the Steel Industry Vision provides technology support in the development of controlled thermal-mechanical processing (CTMP) of tubes and pipes for enhanced manufacturing performance and in the development and application of laser-assisted arc welding to steel.

Biomass and Biorefinery Systems R&D

INEEL provides biomass-related R&D services and support for the feedstock infrastructure development effort. This work is being conducted in close collaboration with ORNL and NREL.

Idaho Operations Office

Introduction

Idaho Operations Office is located in Idaho Falls, Idaho. It provides procurement support for Vehicle Technologies and Biomass & Biorefinery Systems R&D. Idaho Operations office solicits, awards, and administers research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations and provides contract administration for grants and cooperative agreements. This work is being conducted in close collaboration with ORNL and NREL. It provides support to Vehicle Technologies, Biomass & Biorefinery Systems R&D, and Program Direction.

Vehicles Technologies

Idaho Operations Office solicits, awards and administers research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations and provides contract administration for grants and cooperative agreements for university research for FreedeomCar.

Program Management

In FY 2003, Idaho Operations Office supports program implementation and project management. In FY 2004, those functions were transferred to the Golden Field Office.

Livermore Site Office

Lawrence Livermore National Laboratory

Introduction

Lawrence Livermore National Laboratory is located in Livermore, California. It is a multi-discipline laboratory providing support to Vehicle Technologies, Fuel Cell Technology, and Industrial Technologies.

Vehicle Technologies

Provides leadership and coordination in the application of advanced methods of conventional fluid dynamics to aerodynamic drag of heavy vehicle for increased energy efficiency. Performs research on ICE combustion using simulation and modeling to reduce NOx in lean-burn engines and develops microwave regeneration components and design tools for emission controls. Performs R&D to discover and develop next-generation emissions-control catalysts for lean burn engines and the development of technology for onboard generation of chemical reductants from diesel fuel. Performs studies of combustion under diesel and homogeneous charge compression ignition (HCCI) conditions using chemical kinetic modeling and other methods to determine means for increasing fuel efficiency, reducing emissions, and increasing peak output power. Research is directed at materials development and advanced automotive manufacturing concepts, such as metal treatment using Plasma Surface Ion Implantation (PSII) and development of low-cost aluminum sheet. Develops high-voltage, dielectric ultracapacitors based on nanostructure multilayer oxide materials. Develops aerogel-based NOx catalysts for CIDI engines. Nondestructive evaluation and in-line sensors for the design and product

optimization of cast light metals. Applies equal channel angular extrusion to the fabrication of amorphous metallic materials for magnet applications. Chemical kinetic modeling of in-cylinder combustion process of advanced HCCI engine technology as it applies to natural gas engines.

Fuel Cell Technology

Lawrence Livermore National Laboratory (LLNL) is constructing and testing hydrogen and carbon monoxide sensors, both for safety and for fuel stream monitoring in a fuel cell vehicles.

Industrial Technologies

Lawrence Livermore National Laboratory provides technology support to the Forest and Paper Products Vision in the development and testing of a Linescan camera system for imaging and measuring moisture content and in the development and testing of a guided acoustic wave monitoring to measure boiler corrosion to reduce boiler downtime and improve operating efficiency.

Los Alamos Site Office

Los Alamos National Laboratory

Introduction

Los Alamos National Laboratory is located in Los Alamos, New Mexico. It is a multi-discipline laboratory providing support to Vehicle Technologies, Fuel Cell Technology, and Industrial Technologies.

Vehicle Technologies

Performs research on ICE combustion using simulation and modeling to reduce NOx in lean-burn engines and developing microwave regeneration components and design tools for emission controls. Los Alamos is also performing R&D to discover and develop next-generation emissions-control catalysts for lean burn engines and the development of technology for onboard generation of chemical reductants from diesel fuel.

Fuel Cell Technology

Los Alamos National Laboratory (LANL) serves as the lead laboratory in research and development of fuel cell components, reduction of precious metal loading while maintaining performance, and characterization of the poisoning of fuel cell catalysts by impurities in air and fuel feeds. To facilitate heat rejection and improve CO tolerance of membrane electrode assemblies, LANL is leading a major effort to design, synthesize, and characterize membranes which operate at high temperatures, 120c for transportation applications and above 150c for stationary applications. Development of direct methanol fuel cells at LANL will accelerate high-volume manufacturing processes for fuel cells. LANL is developing CO sensors to allow optimization of operating efficiencies of fuel processors and PEM fuel cells with the use of control systems. LANL is characterizing the durability of fuel cell stacks operating on both hydrogen and on reformat (targets are 5,000 hours for transportation applications and 40,000 hours for stationary applications), since the durability of fuel cell stacks has not been demonstrated. LANL is also characterizing the effects of fuel composition on fuel processor performance.

Building Technologies

Los Alamos National Laboratory conducts research and development for activities in the Building Technologies program.

Industrial Technologies

Los Alamos National Laboratory (LANL) supports program work for the Chemical industry R&D area. The laboratory provides unique capabilities in theoretical scientific analysis modeling fluid flows and understanding chemical reactions and catalysis phenomena. LANL provided the computer analysis of industrial fluid flows, and the computer technology prepared for use by the civilian sector. LANL also supports the Industrial Materials of the Future activities in the development of new materials for membrane separation systems.

National Energy Technology Laboratory

Introduction

National Energy Technology Laboratory is located in Morgantown, West Virginia. It provides project management and procurement support to FreedomCAR, Fuel Cell Technology, Weatherization and Intergovernmental Activities, Distributed Energy Resources, and Building Technologies.

Vehicle Technologies

Awarded and administered Emission Control cooperative agreements. Lead an effort to develop a mechanism to remove sulfur from diesel fuel on board the vehicle and effectively reduce sulfur levels from 15 ppm to essentially zero.

Fuel Cell Technologies

National Energy Technology Laboratory (NETL) carries out research on diesel fuel processing, specifically looking at component modeling in cooperation with experimental diesel reforming efforts at other National Laboratories.

Weatherization and Intergovernmental Activities

National Energy Technology Laboratory (NETL) provides technology transfer technical outreach, grants management system development, and tools development for many WIP activities.

Distributed Energy Resources

National Energy Technology Laboratory (NETL) manages the university program that supports the advanced reciprocating engine program and performs in-house R&D for that program. NETL also provides project management and procurement support.

Building Technologies

National Energy Technology Laboratory (NETL) conducts research and development for activities in appliance standards and the Building Technologies competitive solicitation.

Biomass & Biorefinery Systems R&D

National Energy Technology Laboratory (NETL) conducts R&D and manages industry subcontracts for the Industrial Gasification activity.

Program Management

Program Management funds NETL to provide project management for Distributed Energy R&D activities in FY 2004.

Nevada Site Office

Introduction

Nevada Site Office is located in located in Las Vegas, Nevada. It provides technical and management assistance for the Hydrogen Technology Program. Nevada Site Nevada Site Office provides support to Vehicle Technologies.

Vehicle Technologies

Office provides technical and management assistance to develop an integrated hydrogen refueling station in Nevada, including coordination with the Department of Transportation.

NNSA Service Center

Lawrence Berkeley National Laboratory

Introduction

Lawrence Berkeley National Laboratory is located in Berkeley, California. It is a multi-discipline laboratory providing support to FreedomCAR, Fuel Cell Technology, Weatherization and Intergovernmental Activities, Distributed Energy Resources, Building Technologies, Industrial Technologies, and Federal Energy Management Program.

Vehicle Technologies

Conducts exploratory research in advanced battery technology, including development of new electrode and electrolyte materials and understanding of fundamental electrochemical phenomena. Develops device to measure particulate matter from engines. Develops nondestructive testing techniques for evaluation of aluminum and composite structures in manufacturing environments.

Fuel Cell Technology

Lawrence Berkeley National Laboratory (LBNL) develops electrocatalysts for membrane electrode assemblies with the goal of increasing understanding of fundamental electrochemical phenomena.

Weatherization and Intergovernmental Activities

Lawrence Berkeley National Laboratory (LBNL) provides technology transfer technical outreach for Rebuild America and EnergyStar.

Distributed Energy Resources

Lawrence Berkeley National Laboratory (LBNL) will perform analysis tasks to quantify benefits of distributed generation technologies to the customer, the system and the Nation.

Building Technologies

Lawrence Berkeley National Laboratory (LBNL) conducts research and development for the following activities in lighting, windows, appliance standards, analysis tools and design strategies and space heating and cooling.

Industrial Technologies

The Lawrence Berkeley National Laboratory (LBNL) supports technology delivery activities of the Best Practices program including assistance in facilitating Allied Partners with supplier industry organizations (e.g. Hydraulic Institute, Compressed Air and Gas Institute). The laboratory supports the tracking of Best Practices implementation results including the impact of training, software tools and other program delivery mechanisms on manufacturing plants.

Federal Energy Management Program

LBNL facilitates projects, develops guidelines and provides expert advice on the monitoring and verification protocols for energy projects savings, laboratory sustainable design principles, public benefit funds, and lighting.

Program Management

Provide analytical support for major crosscutting issues, such as market and benefit analyses.

National Nuclear Security Administrations Service Center (NNSA)

Introduction

NNSA Service Center in Albuquerque, New Mexico. It provides procurement support for EERE programs.

Vehicle Technologies

Solicits, awards, and administers research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations. Provides research in full scale aerodynamic stability tests for heavy vehicles.

Fuel Cell Technologies

NNSA administers some previously awarded Fuel Cell Technology Subprogram's Cooperative Agreements with recipients conducting research and development for advanced fuel cell materials and components.

Oak Ridge Operations Office

Oak Ridge Institute for Science and Education

Introduction

Oak Ridge Institute for Science and Education is located in Oak Ridge, Tennessee. It provides technical support for FreedomCAR and Vehicle Technologies. Oak Ridge Institute for Science and Education plans technical meetings and conducts peer reviews. In addition, it organizes, plans and conducts scientific workshops to engage industry with the scientific community in the national labs.

Vehicle Technologies

Organizing, planning and conducting scientific workshops to engage industry with the scientific community in the national labs.

Oak Ridge National Laboratory

Introduction

Oak Ridge National Laboratory is located in Oak Ridge, Tennessee. It is a multi-discipline laboratory providing support to FreedomCAR and Vehicle Technologies, Fuel Cell Technology, Weatherization and Intergovernmental Activities, Distributed Energy Resources, Building Technologies, Industrial Technologies, Biomass and Biorefinery Systems R&D, and Program Management.

Vehicle Technologies

Develops models to estimate cost of advanced hybrid and fuel cell vehicles to perform trade-off studies, and also develops models to predict emissions from advanced after-treatment devices. Conducts research to develop high thermal conductivity carbon foams for high performance truck and automobile radiators. Conducts analysis, technical support, testing and research on power electronic devices and electric machines. Conducts research and provides technical/project management support in propulsion and vehicle system materials. Develops material analytical techniques and material related solutions for automotive and heavy vehicle systems. Conducts research in internal combustion engine technologies, in-cylinder diagnostics (such as application of chaos theory and emission studies), and exhaust after treatment (including catalytic converter research, development, and testing). Develops an understanding of NOx adsorber processes affecting regeneration, desulfation, and degradation under real-world conditions. Provides detailed characterization and speciation of combustion and emission products. Using primarily laboratory reactors and some engine experiments, acquired kinetic data for the development of computer models of after treatment devices. Evaluates the toxicity of unregulated emissions that are present in the exhaust streams of engines operating on advanced fuels. Leads an effort to evaluate the fuel effects on selective catalytic reduction systems on diesel engines. Evaluates the critical fuel properties that effect near term emissions control devices for diesel engines. Determines the effects and the mechanism of lube oil suspended phosphorous on the poisoning of exhaust catalysts in diesel engines. Evaluates the benefits of the use of e-diesel fuels in combination with high exhaust gas re-circulation rates in diesel engines. Conducts analysis, technical support, testing and research on power electronic devices and electric machines.

Fuel Cell Technology

Oak Ridge National Laboratory (ORNL) is the primary lab for materials R&D aimed at reducing the weight and cost of fuel cell components. ORNL carries out R&D on bipolar plates, membrane characterization, hydrogen sulfide reduction, temperature sensors, and it develops high-thermal-conductivity graphite foam for fuel cell humidification and heat exchangers.

Weatherization and Intergovernmental Activities

ORNL provides a wide variety of technical and program analysis activities for WIP. Examples include: residential energy audit and advanced weatherization measure analysis, Rebuild America technology transfer technical outreach, policy analysis for EnergyStar, and market assessments of new technologies to Gateway partners.

Distributed Energy Resources (DER)

ORNL is the primary lab for DER technology development and end-use systems integration. ORNL conducts research and development in advanced materials and sensors for industrial gas turbines and microturbines, advanced reciprocating engines, thermally activated technologies, and combined heat and power (CHP). To conduct this research, ORNL leverages state-of-the-art, unique resources such as the High Temperature Materials Laboratory (HTML) User Center, the Building Technology User Center, and the CHP Integration User Center.

Building Technologies

ORNL is part of a national laboratory/industry/university consortium conducting research and development for the following activities in Building America, space heating and cooling, envelope and emerging technologies.

Industrial Technologies

In support of the Best Practices effort, Oak Ridge National Laboratory (ORNL) provides support to the Plant-Wide Assessments and technical assistance and also the tracking of program impacts. They also help in the development and delivery of software tools and training. ORNL is the primary laboratory supporting the Industrial Materials of the Future activities to develop advanced materials for industrial use that meet technical requirements identified by industry in the visions and technology roadmaps. ORNL's defense computational capabilities were applied in conjunction of the National Renewable Energy Laboratory in the analysis of high-temperature fluid flows.

Biomass and Biorefinery Systems R&D

Oak Ridge National Laboratory (ORNL) conducts gasification and other biomass technologies R&D.

Program Management

Provide analytical support for major crosscutting issues, such as market and benefit analyses.

Oak Ridge Operation Office

Introduction

Oak Ridge Operations Office is located in Oak Ridge, Tennessee. Solicits, awards, and administers research and development contracts, cooperative agreements, and grants with industry, academia, and other Government organizations. It provides support to Vehicle Technologies, Federal Energy Management and Program Management.

Vehicle Technologies

Provides procurement support for Vehicle Technologies. Performs contractual administration of competitively awarded cooperative agreement for projects to develop and demonstrate diesel engine emissions reduction technology and to develop components suitable for light truck engine development for Vehicle Technologies. Manages, collects data, and reports on field activities of the DOE sponsored feet testing of electric and hybrid vehicles.

Federal Energy Management

Oak Ridge National Laboratory facilitates projects, develops guidelines, and provides expert advise on combine heat and power systems, biomass opportunities, whole building design, and alternative financing.

Program Management

Provide analytical support for major crosscutting issues, such as market and benefit analyses.

Philadelphia Regional Office

Program Management funds the personnel and overhead costs for 18 FTE in the Philadelphia Regional Office (PRO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2) administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). PRO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities. It also provides support for energy projects involving states on behalf of Biomass & Biorefinery Systems R&D.

Richland Operations Office

Pacific Northwest National Laboratory

Introduction

Pacific Northwest National Laboratory is located in Richland, Washington. It is a multi-discipline laboratory providing support to FreedomCAR and Vehicle Technologies, Fuel Cell Technology, Weatherization and Intergovernmental Activities, Distributed Energy Resources, Building

Technologies , Industrial Technologies, Biomass and Biorefinery Systems R&D, Federal Energy Management Program and Program Management.

Vehicle Technologies

Conducts research on predictive cruise control for heavy vehicles to increase energy efficiency. Evaluates advanced energy storage materials. Develops experimental and analytical methods to measure and improve technologies to reduce exhaust emissions and studying materials for lean-burn, high-durability NOx sensors. Work includes the development of efficient and effective plasma assisted lean NOx reduction for both light- and heavy-duty diesel engines while minimizing vehicle fuel economy penalty. Works to facilitate the scale-up process for depositing Si/SiGe superlattices, materials used in the development of thermoelectric devices for recovering waste heat in diesel engines thus improving fuel efficiency. Develops energy efficient production for magnesium, titanium, polymer composite and glass components for advanced automotive and heavy vehicle designs. Studies materials for lean-burn, high-durability spark plugs. Develops environmentally friendly processes for the manufacture of planar thin film ceramic sensors. Creates a Northwest Alliance to develop lightweight materials processing technologies. Develops and tests a lightweight SUV frame prototype with performance equal to conventional steel components. Designs hybrid composite materials for weight critical heavy vehicle structures.

Fuel Cell Technology

Pacific Northwest National Laboratory (PNNL) develops compact, microchannel fuel reformer components. Microchannel technology offer heat rejection and mass transfer advantages allowing PNNL to reduce the size and weight of fuel processing components such as heat exchangers, steam reformers, water gas shift reactors, and preferential oxidation subsystems. PNNL is developing a model and a controller for solid oxide fuel cells to be used with APUs. Shock and vibration characteristics applied to SOFC stacks and APU units during operation are being developed in the model.

Weatherization and Intergovernmental Activities

Pacific Northwest National Laboratory (PNNL) provides technology transfer technical assistance for Gateway partners and tools and materials development, analysis tool development, training, and technical assistance related to new State building energy codes.

Distributed Energy Resources

Pacific Northwest National Laboratory (PNNL) is assisting in carrying out regulatory education and outreach. The lab is providing assistance in efforts to remove regulatory barriers to distributed generation.

Building Technologies

The Pacific Northwest National Laboratory (PNNL) conducts research and development activities for the following activities in building codes, appliance standards and emerging technologies.

Industrial Technologies

In support of the Industries of the Future (Specific) and (Crosscutting) activities Pacific Northwest National Laboratory provides key support to track past program impacts including the over 150 commercial technologies, and their energy and environmental impacts. Other efforts include the

evaluation of emerging technologies. The laboratory produces an Impacts report summarizing commercial and emerging technologies and past program results and methodologies. The laboratory also performs support to Mining, Aluminum, Sensors and Controls, Glass, Industrial Materials of the Future and Forest Products.

Biomass and Biorefinery Systems R&D

The Pacific Northwest National Laboratory conducts R&D in support of the development of the syngas platform and related products. Major program components include thermocatalysts for fuels and chemicals and wet biomass for syngas production.

Federal Energy Management Program

PNNL develops guidelines and provides expert advice on energy efficient buildings maintenance and operations, utility load management, utility restructuring, building commissioning, building diagnostic systems, and resource energy management.

Program Management

Provide analytical support for major crosscutting issues, such as market and benefit analyses.

Sandia Site Office

Sandia National Laboratories

Introduction

Sandia National Laboratories is located in Albuquerque, New Mexico. It is a multi-discipline laboratory providing support to FreedomCAR, Industrial Technologies, and Federal Energy Management Program.

Vehicle Technologies

Participates in the modeling and simulation for reduction of heavy vehicle aerodynamic drag. Conducts research on new, rugged high temperature film capacitors for power electronics. Conducts and evaluates electrode materials that would improve abuse tolerance of lithium based battery technologies. Performs abuse tests of various battery technologies. Conducts extensive fundamental research on piston engine combustion processes to reduce emissions formation while maintaining efficiency. Investigates optical and non-optical medium-duty HCCI engines and in an optically accessible light-duty gasoline engine. Developing laser diagnostics are to measure diesel particulate matter concentration, size, morphology, and metallic ash content, measurements vital to the successful development of robust diesel exhaust after treatment systems. Materials R&D to improve the performance of tires, engines, and automotive body structures. Analysis and laboratory demonstration of improved manufacturing techniques and instrumentation for forging, heat treatment, coating, welding, and other factory processes. Studies the in-cylinder combustion processes of fuel born oxygen in diesel fuels using laser induced incandescence observations.

Fuel Cell Technologies

The Sandia Site Office manages fuel cell research and development.

Industrial Technologies

Sandia's unique capabilities have been applied to the Chemical industry R&D activities. These capabilities include research on prototype chemical reactors, research on molecular properties using Sandia's unique computational capabilities, research on industrial separations membranes, and the development of an experimental fluid flow system used to measure properties of chemical reacting flows in greater detail than had previously been achieved. This experimental fluid flow research activity was carried in cooperation with LANL, the PNNL, four U.S. universities, and eight U.S. petroleum and chemical companies.

Federal Energy Management Program

SNL develops guidelines and provides expert advice on renewable technologies for military applications and on distributed generation

Program Management

Provides analytical support for crosscutting issues such as market and benefit analyses.

Seattle Regional Office

Program Management funds the personnel and overhead costs for 19 FTE in the Seattle Regional Office (SRO) in order to provide: (1) promotion of EERE programs at the local and regional levels; (2) administration of grants to, and cooperative agreements with, States and local governments (particularly the Weatherization Assistance Program and State Energy Program grants); and (3) administration and implementation of locally- and regionally-focused deployment activities, such as Clean Cities, Rebuild America, and the Federal Energy Management Program (FEMP). SRO will also occasionally receive small amounts of direct funding from individual R&D or deployment programs to perform specific tasks - such as managing a cooperative or inter-agency agreement, arranging a conference, or other locally-oriented activities.

Washington Headquarters

Office of Scientific and Technology Information (OSTI)

Introduction

Office of Scientific and Technical Information is located in Oak Ridge, Tennessee. It provides technical support for FreedomCAR and Vehicle Technologies and Distributed Energy Resources.

Vehicle Technologies

Disseminates heavy vehicle technical reports and literature. Assists in conducting industry/Government workshops in support of Multi-Year Program Planning efforts.

Distributed Energy Resources

Assists Distributed Energy technology development and end-use systems integration. Conducts research and development in advanced materials and sensors for industrial gas turbines and

microturbines, advanced reciprocating engines, thermally activated technologies, and combined heat and power (CHP). To conduct this research, OSTI leverages state-of-the-art unique resources.

Washington Headquarters

Introduction

Washington, D.C. is the headquarters for the Office of Energy Efficiency and Renewable Energy operations. The Headquarters operations provides specialized, technical expertise in planning, formulation, execution, and evaluation, in order to support the responsible guidance and management of the budget. It provides support to Vehicle Technologies, Fuel Cell Technologies, Weatherization and Intergovernmental, Distributed Energy Resources, Building Technologies, Industrial Technologies, Biomass & Biorefinery Systems R&D, Federal Energy Management Program, Program Management, and Energy Efficiency Science Initiative.

Vehicle Technologies

Funding Profile by Subprogram[a]

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Vehicle Technologies						
Vehicle Systems	13,485	14,335	14,335	13,883	-452	-3.2%
Innovative Concepts ..	1,590	494	494	500	+6	+1.2%
Hybrid and Electric Propulsion	41,996	45,002	45,002	51,821	+6,819	+15.2%
Advanced Combustion R&D	55,267	54,405	54,405	35,936	-18,469	-33.9%
Materials Technology	36,094	39,744	39,744	39,799	+55	+0.1%
Fuels Technology.....	19,164	16,494	16,494	6,800	-9,694	-58.8%
Technology Introduction	4,570	4,939	4,939	6,014	+1,075	+21.8%
Technical Program Mgmt Supt.....	2,005	2,095	2,095	1,903	-192	-9.2%
Biennial FreedomCAR Peer Review	0	494	494	0	-494	-100.0%
Total, Vehicle Technologies	174,171	178,002	178,002	156,656	-21,346	-12.0%

Public Law Authorizations:

P.L. 95-91, "U.S. Department of Energy Organization Act" (1977)
P.L. 102-486, “Energy Policy Act” (1992)

Mission

The mission of the Vehicle Technologies Program managed by the Office of FreedomCAR and Vehicle Technologies (FCVT) is to develop more energy efficient and environmentally friendly highway transportation technologies (for both cars and trucks) that will enable America to use significantly less petroleum. The long-term aim is to develop “leapfrog” technologies that through improvements in

[a] SBIR/STTR funding in the amount of $3,132,449 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $4,534,635 and $3,956,457 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

vehicle energy efficiency will provide Americans with continuing freedom of mobility and greater energy security, at lower costs and with lower impacts on the environment than current high efficiency vehicles. The program focuses its research and development investments specifically on potential technology improvements that have uncertain or long-term outcomes, yet have significant public benefit. The high risks associated with these projects make it unlikely that they would be pursued by industry alone.

Benefits

The Vehicle Technologies Program mission and activities contribute directly to EERE's and DOE's mission of improving National Energy and Economic Security by addressing the President's National Energy Policy call for reducing dependence on oil imports and modernizing conservation technologies and practices. President Bush observed that ". . . any effort to reduce (oil) consumption must include ways to safely make cars and trucks more fuel efficient. New technology is the best way to do so."[a] In fact highway vehicles alone account for 54 percent of total U.S. oil use, more consumption than U.S. domestic production. Cost competitive and more energy efficient vehicles will enable U.S. citizens and businesses to accomplish their daily tasks while reducing their consumption of gasoline and diesel fuels, thus reducing demand for petroleum, lowering carbon emissions, and decreasing energy expenditures. These changes can help make the Nation more secure and more prosperous while protecting the environment.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Vehicle Technologies Program supports the following goal:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Vehicle Technologies Program has one program goal which contributes to General Goal 4 in the "goal cascade". This goal is:

Program Goal 04.02.00.00: Vehicle Technologies. The Vehicle Technologies Program goal is to develop technologies that enable cars and trucks to become highly efficient, through improved power technologies and cleaner domestic fuels, and to be cost and performance competitive. Manufacturers and consumers can then use these technologies to help the Nation reduce both energy use and greenhouse gas emissions thus improving energy security by dramatically reducing dependence on oil.

[a] Remarks by President George W. Bush on Energy Efficiency, Feb. 25, 2002.

Contribution to Program Goal 04.02.00.00 (Vehicle Technologies)

The program contributes to General Goal 4, Energy Security, by developing technologies that can enable cars and trucks to become highly efficient by means of R&D that provides clean power technologies and improved domestic fuel specifications that work in concert with advanced power systems. In addition, the program R&D will focus on reducing the cost and improving other attributes of advanced vehicle technologies so that they will be both performance and cost competitive. The program activities presented below demonstrate key technology pathways that contribute to achievement of this goal.

- Vehicle Systems Subprogram and Materials Technologies Subprogram: Reduce heavy truck parasitic losses (e.g. aerodynamics, ancillary systems) from 39% of engine output in 1998 to 24% in 2006 and reduce the weight of a tractor-trailer from 23,000 pounds in 2003 to 18,000 pounds in 2010 (a 22% reduction), thereby increasing heavy truck fuel efficiency.
- Hybrid and Electric Propulsion Subprogram: By 2010, Hybrid and Electric Propulsion R&D activities will reduce the production cost of a high power 25kW battery for use in light vehicles from $3,000 in 1998 to $500 (with an intermediate goal of $750 in 2006) enabling cost competitive market entry of hybrid vehicles.
- Advanced Combustion Engine R&D Subprogram and Fuel Technology Subprogram: Improve the efficiency of internal combustion engines from 30 percent (2002 baseline) to 43 percent by 2010 for light-duty and from 40 percent (2002 baseline) to 55 percent by 2012 for heavy-duty applications while utilizing an advanced fuel formulation that incorporates a non-petroleum based blending agent to reduce petroleum dependence and enhance combustion efficiency.
- Materials Technology Subprogram: By 2006, Transportation Materials Technologies R&D activities will reduce the projected production volume cost of carbon fiber from $12 per pound in 1998 to $3 per pound.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.02.00.00 (Vehicle Technologies)					
Vehicle Systems (Heavy Vehicle Systems R&D Activity) and Materials Technologies (Lightweight Materials Technology Activity)					
Complete testing of baseline prototype, 50-volt high power lithium-ion battery modules for use in hybrid vehicles. (MET GOAL)	Complete testing of the 276-volt battery aimed at demonstrating an integrated system having thermal and electrical controls. (MET GOAL)	Reduced parasitic losses of heavy vehicle systems to 36 percent. (MET GOAL)	Reduced parasitic losses of heavy vehicle systems to 30 percent of total engine output and benchmark additional reductions through heavy truck electrification. (EXCEEDED GOAL)	Reduce parasitic loses to 27 percent of total engine output in a laboratory test.	Reduce parasitic energy loss to 25 percent of total engine output and reduce unloaded tractor-trailer weight to 22,000 pounds.
Hybrid and Electric Propulsion (Energy Storage Activity)					
N/A	Completed explorations of lithium-polymer and lithium ion battery technologies; lithium ion was selected as the most promising approach for continued development.	Completed development of second generation Lithium ion electrochemistry for hybrid vehicle power. (MET GOAL)	Reduced high power 25 kW estimated lithium ion battery cost to $1,180 per battery system. (EXCEEDED GOAL)	Reduce high power 25 kW light vehicle estimated lithium ion battery cost to $1,000 per battery system.	Reduce high power, 25kW, light vehicle, lithium ion battery cost to $900 per battery system.
Advanced Combustion Engine R&D (Combustion & Emission Control and Heavy Truck Engine activities) and Fuels Technology					
N/A	N/A	N/A	Demonstrated optimized emission control system that achieves 0.07 g/mile NO_x and 0.01 g/mile PM short-term performance in light duty vehicles. (MET GOAL)	Complete Light Truck activity with 35 percent fuel efficiency improvement over a gasoline powered light truck and Tier 2 emissions levels (0.07g/mile NO_x). Demonstrate 45 percent thermal efficiency for heavy-duty diesel engines while meeting EPA 2007 emission standards (1.2g/hp-hr NO_x).	Light vehicle combustion will reach 39 percent brake thermal efficiency and heavy vehicle combustion engines will be greater than 45 percent efficiency while meeting EPA 2007 emission standards (1.2 g/hp-hr NO_x).
Materials Technology (Lightweight Materials Technology activity)					
N/A	N/A	Fabricated a sport utility vehicle chassis component using carbon fiber in a low cost molding process that is suitable for high volume production. (NOT MET) Completion of their target was delayed due to an equipment failure requiring significant repairs. The target was rescheduled for completion in FY 2003.	Completed R&D on technologies, which, if implemented in high volume, could reduce the price of automotive-grade carbon fiber to less than $7/pound. (EXCEEDED GOAL)	Complete R&D on technologies which, if implemented in high volume, could reduce the price of automotive-grade carbon fiber to less than $5/pound.	Complete R&D on technologies, which, if implemented in high volume, could reduce the price of automotive-grade carbon fiber to less than $4.50/pound.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
				range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003).	range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004).

Means and Strategies

The Vehicle Technologies Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

The Department will implement the program through the following means:

- The program focuses its technology research and development investments specifically on areas that would not be pursued by industry alone due to high risks and uncertain or long-term outcomes. Program activities include research, development, demonstration, testing, technology validation, technology transfer, and education. These activities are aimed at developing technologies that could achieve: 1) significant improvements in vehicle fuel efficiency; and 2) displacement of oil by other fuels which ultimately can be produced domestically in a clean and cost-competitive manner.
- Fuel efficiency gains will be achieved through the introduction of more efficient technologies and lightweight materials. The use of advanced technologies will be more economically attractive through DOE research and development efforts that reduce their costs.
- Vehicles with advanced technologies include advanced combustion engines, hybrid internal combustion vehicles, and hybrid fuel cell vehicles. The penetration of these vehicles in the marketplace will be enhanced by DOE research and development that, for example, reduces high power battery costs and extends battery calendar life for hybrid vehicles, improves diesel and other combustion engines by making them more efficient and cleaner, and improves the power electronics and the electric motors needed for fuel cell and combustion hybrid vehicles.
- The 21st Century Truck Partnership has identified desirable technology goals in five general areas: engine systems, heavy-duty hybrids, parasitic losses, truck safety, and idling reduction. The partners are jointly developing technical roadmaps that outline the pathways for achieving long-range technology-specific R&D goals (including cost targets) and the milestones required to demonstrate progress. Each partner will consider these goals in implementing its respective R&D programs.

The Department will implement the program through the following strategies:

- For light vehicles the long-term strategy is clearly to perfect the technologies that will enable a timely transition to a transportation hydrogen economy. There are, however, significant gains in oil reduction possible from R&D to improve highway transportation technologies in the interim. Taking advantage of these interim opportunities to significantly reduce oil use (thus benefiting both our economy and our energy security) is a key outcome sought by both the FreedomCAR and 21st Century Truck Partnerships.
- The truck industry and government partners have developed a common vision -- "that our Nation's trucks and buses will safely and cost-effectively move larger volumes of freight and greater numbers of passengers while emitting little or no pollution and dramatically reducing the dependency on foreign oil." Ultimately, the partnership seeks safe, secure, and environmentally friendly trucks and buses that use sustainable and self-sufficient energy sources, thereby helping enhance America's global competitiveness.
- These mission strategies are accomplished by targeted Federal investments in technology research and development in strategic partnerships with auto manufacturers, heavy vehicle manufacturers, equipment suppliers, energy companies, other Federal agencies, State government agencies,

universities, national laboratories, and other stakeholders. These strategic partnerships facilitate the technical coordination of activities and attract cost sharing to provide leveraged benefits for the American taxpayer. Two partnerships represent the major crosscutting elements of the program, the FreedomCAR Partnership and the 21st Century Truck Partnership.

- In addition, the program invests in technical program and market analysis and performance assessments in order to direct effective strategic planning.

These strategies will result in significant cost savings and a significant reduction in the consumption of gasoline and diesel fuels, thus cost effectively reducing America's demand for petroleum, lowering carbon emissions, and decreasing energy expenditures.

The following external factors could affect the ability of the Vehicle Technologies Program to achieve its strategic goal:

- Cleaner and more energy efficient highway transportation technologies face several market barriers in gaining consumer acceptance and private investment from manufacturers. For example, most new vehicle buyers do not place a high value on fuel economy, a statistic that has not varied much for many years.[a] Surveys show that the average new vehicle buyer wants about a three year payback for making an incremental expenditure for more fuel efficient technologies. As a result, manufacturers have been reluctant to assume the risk required for the production and distribution of advanced vehicle technologies.
- For each vehicle type and class and for each region, a number of technologies compete against each other for vehicle sales. These include conventional gasoline, advanced combustion diesel, gasoline hybrids, diesel hybrids, gasoline fuel cell, hydrogen fuel cell, electric, natural gas, and alcohol. Factors such as the cumulative sales over time of the various technologies in the market for each type of light vehicle, vehicle and fuel prices, and consumer preferences will all affect results.
- Estimates for energy savings, oil savings, carbon emission reductions, and energy expenditure savings reflect EIA reference case assumptions about future energy markets. In the event oil prices are higher (or more volatile) than expected or if air quality, security, or other concerns result in changes in energy policy or encourage consumers to purchase more efficient vehicles, the goals and benefits could be affected.
- Results are sensitive to the assumptions about consumer preferences made in the model, especially with regard to vehicle purchase price. The potential for hybrid and other efficient vehicle sales to respond to local market conditions, such as State and local vehicle preferences (e.g., use on carpool lanes) will effect results.
- Timing of market entry of fuel cell vehicles.

In carrying out the program's mission, the Vehicle Technologies Program performs the following collaborative activities:

- The FreedomCAR Partnership is a collaboration with the U.S. Council for Automotive Research (USCAR). The USCAR member companies are Ford, General Motors and DaimlerChrysler corporations. The USCAR aim is to strengthen the technology base of the U.S. domestic automotive industry through cooperative, pre-competitive research. The "CAR" in FreedomCAR stands for Cooperative Automotive Research.

[a] Surveys by JD Power for 1980, 1983, 1985, and 1987 and by Opinion Research Corporation for 1996, 1998, and 2000.

- Since fuel cell technologies are a common element of both, the FreedomCAR Partnership is closely linked to the President's Hydrogen Fuel Initiative. The Secretary of Energy and senior executives of DaimlerChrysler, Ford, and General Motors announced the FreedomCAR Partnership on January 9, 2002, to develop the vehicle component technologies necessary to free the Nation's personal transportation system from petroleum dependence and from harmful vehicle emissions, without sacrificing freedom of mobility and freedom of vehicle choice. In early 2003, the President announced the Hydrogen Fuel Initiative which, along with the FreedomCAR Partnership, can help direct the Nation towards a hydrogen transportation economy and a secure, emissions-free energy future. Together these address the key technology and infrastructure barriers of hydrogen fuel cell vehicles. The initiatives aim to facilitate an industry decision to commercialize hydrogen-powered fuel cell vehicles by the year 2015. The Vehicle Technologies Program develops the vehicle component technologies (lightweight materials, energy storage, advanced internal combustion engines, electronic components, and hybrid electric drivetrains) needed for both hybrid electric fuel cell vehicles and more efficient hybrid combustion engine vehicles. Many of the technologies under consideration by the FreedomCAR Partners provide opportunity for the achievement of significant energy savings in the interim period.

FreedomCAR Partnership Budget

(dollars in millions)

	FY 2003 Appropriation	FY 2004 Appropriation	FY 2005 Request
Vehicle Technologies Portion	84,081	89,736	91,400
Fuel Cell Portion	46,638	65,187	77,500
Hydrogen Portion[b]	20,870	0	0
Total, FreedomCAR Partnership	151,589	154,923	168,900

- The FreedomCAR Partnership is being jointly developed and implemented by the FreedomCAR and Vehicle Technologies (FCVT) Program Office and the Hydrogen, Fuel Cells, and Infrastructure Technologies (HFCIT) Program Office. Funding for the FreedomCAR Partnership comes from both Programs. For example, the FVCT Program funds all of FreedomCAR's planned activities dealing with R&D on hybrid technologies, advanced combustion engines, light weighting materials and vehicle systems, as well as Partnership direction and support. Fuel cell related R&D such as polymer electrolyte fuel cells are funded by the HFCIT Program. Hydrogen production, storage, and infrastructure technologies needed to advance commercialization of fuel cell vehicles are now part of a larger and complementary Administration effort on hydrogen called the Hydrogen Fuel Initiative which involves partnering with energy companies. (See the HFCIT section.)
- In establishing technical directions and priorities, the program has obtained substantial inputs from energy and transportation experts from outside of DOE through interaction of government-industry-laboratory technical teams, independent project reviews with selected panelists, solicited review of DOE R&D plans, and critiques by organizations such as the National Academy of Sciences (NAS). The perspectives of these outside experts are extremely valuable in helping to assure that the program's research directions and priorities are aligned properly with the needs of auto and heavy

[b] After FY 2003, the Hydrogen Technology funding is reflected in the Hydrogen Fuel Intiative.

vehicle manufacturers, equipment suppliers, energy companies, other Federal agencies, State agencies, consumers, and other stakeholders.

- The FreedomCAR Partners have identified nine 2010 specific technology goals (one of which is jointly shared between FCVT and HFCIT) and timetables for government and industry R&D efforts, to measure progress in technologies that could enable reduced oil consumption and increased energy efficiency in light vehicles. This request fully supports FreedomCAR Partnership goals for Electric Propulsion Systems, Electric Drivetrain Energy Storage, and Material and Manufacturing Technologies. With regard to the two Internal Combustion Powertrain Systems goals, the request is commensurate with achievement of an estimated 43 percent efficiency in 2010.

FreedomCAR Partnership Goals

The Office of FreedomCAR and Vehicle Technologies has responsibility for these goals:

- Electric Propulsion Systems with a 15-year life capable of delivering at least 55 kW for 18 seconds and 30 kW continuous at a system cost of $12/kW peak.
- Internal Combustion Engine Powertrain Systems costing $30/kW, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards.
- Electric Drivetrain Energy Storage with 15-year life at 300 Wh with discharge power of 25 kW for 18 seconds and $20/kW.
- Material and Manufacturing Technologies for high volume production vehicles which enable/support the simultaneous attainment of: 50 percent reduction in the weight of vehicle structure and subsystems, affordability, and increased use of recyclable/renewable materials.
- Internal Combustion Engine Powertrain Systems operating on hydrogen with cost target of $45/kW by 2010 and $30/kW in 2015, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards. *(shared responsibility with HFCIT)*

The Office of Hydrogen, Fuel Cells, and Infrastructure Technologies has responsibility for these goals:

- 60 percent peak energy-efficient, durable direct hydrogen Fuel Cell Power Systems (including hydrogen storage) that achieves a 325 W/kg power density and 220 W/L operating on hydrogen. Cost targets are $45/kW by 2010 and $30/kW by 2015.
- Fuel Cell Systems (including an on-board fuel processor) having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards with a cost target of $45/kW by 2010 and $30/kW by 2015.
- Hydrogen Refueling Systems demonstrated with developed commercial codes and standards and diverse renewable and non-renewable energy sources. Targets: 70 percent energy efficiency well-to-pump; cost of energy from hydrogen equivalent to gasoline at market price, assumed to be $1.50 per gallon (2001 dollars).
- Hydrogen Storage Systems demonstrating an available capacity of 6 weight percent hydrogen, specific energy of 2.0 kWh/kg and energy density of 1.5 kWh/l at a cost of $4/kWh.
- Internal Combustion Engine Powertrain Systems operating on hydrogen with cost target of $45/kW by 2010 and $30/kW in 2015, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards. *(shared responsibility with FCVT)*

- The 21st Century Truck Partnership, Vehicle Technologies' other major crosscutting effort, has similar aims, but is focused on improving technologies for heavy vehicles. In November 2002, the Secretary of Energy announced the "New Vision for the 21st Century Truck Partnership" that focuses on improving the energy efficiency and safety of trucks and buses. The truck partnership involves key members of the heavy vehicle industry, truck original equipment manufacturers, hybrid propulsion developers, and engine manufacturers as well as other Federal agencies. Primarily due to hydrogen's low energy density when compared to diesel fuel, hydrogen fuel cells are not seen as a viable option for heavy commercial vehicles. They would not provide adequate driving range and would limit cargo carrying capacity. Therefore, the effort centers on research and development to:
  - improve engine systems
  - improve heavy-duty, hybrids, and truck safety
  - reduce parasitic and idling losses
  - validate and demonstrate these technologies.
- The 21st Century Truck Partnership will fund a cooperative effort between the heavy vehicle (trucks and buses) industry and major Federal agencies to develop technologies that will make our Nation's heavy vehicles more efficient, cleaner, and safer. The government agency participants are the Departments of Energy, Defense (represented by the U.S. Army), Transportation, and the Environmental Protection Agency. Industry partners are Allison Transmission, BAE Systems Controls, Caterpillar, Cummins, DaimlerChrysler, Detroit Diesel, Eaton Corporation, Freightliner, Honeywell International, International Truck and Engine, Mack Trucks, NovaBUS, Oshkosh Truck, PACCAR, and Volvo Trucks North America.

21st Century Truck Partnership Budget

(dollars in millions)

	FY 2003 Appropriation	FY 2004 Appropriation	FY 2005 Request
21st Century Truck Partnership	80.9	78.6	56.1

Validation and Verification

The Vehicle Technologies Program uses several program performance management methods to validate and verify its performance during the course of the program on an annual and ongoing basis, including: management standards; incorporation of goals; measurement and reporting from program contracts; peer reviewed roadmaps and activities; performance modeling and estimation; prototype testing; site visits; and annual program reviews.

Data Sources:	Program Reviews, Peer Reviews, Laboratory Tests, On-Road Tests, and Peer-Reviewed Model Baselines.
Baseline:	Parasitic losses for heavy trucks in 1998 (39 percent), weight of heavy trucks in 2003 (23,000 pounds), cost of hybrid batteries in 1998 ($3,000 for a high power 25kW battery), combustion efficiency in 2002 (30 percent for light vehicles and

40 percent for heavy vehicles), and carbon fiber costs in 1998 ($12 per pound).

Frequency: Biennial reviews for the FreedomCAR and the 21st Century Truck partnerships.

Data Storage: EE Strategic Management System.

Verification: Conduct a biennial review of the FreedomCAR Partnership by an independent third party, such as the National Academy of Sciences/National Academy of Engineering, to evaluate progress and program direction. The review will include evaluation of progress toward achieving the Partnership's 2010 technical goals and direction. Based on this evaluation, resource availability, and other factors, the FreedomCAR partners will consider new opportunities, make adjustments to technology specific targets, and set goals as appropriate.

Run vehicle simulation tests, conduct bench tests, run laboratory tests on the engine and vehicle dynamometers, run wind tunnel tests, and conduct on-road and track tests to evaluate the technology. Conduct fleets tests and undertake target performance review.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Request	FY 2005 Request	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.02.00.00, Vehicle Technologies					
Vehicle Systems	13,485	14,335	13,883	-452	-3.2%
Innovative Concepts	1,590	494	500	+6	+1.2%
Hybrid and Electric Propulsion	41,996	45,002	51,821	+6,819	+15.2%
Advanced Combustion Engines	55,267	54,405	35,936	-18,469	-33.9%
Materials Technologies	36,094	39,744	39,799	+55	+0.1%
Fuels Technology	19,164	16,494	6,800	-9,694	-58.8%
Technology Introduction	4,570	4,939	6,014	+1,075	+21.8%
Technical/Program Management Support	2,005	2,095	1,903	-192	-9.2%
Biennial FreedomCAR Peer Review	0	494	0	-494	-100.0%
Total, Program Goal 04.02.00.00, Vehicle Technologies	174,171	178,002	156,656	-21,346	-12.0%
Total, Vehicle Technologies	174,171	178,002	156,656	-21,346	-12.0%

The Vehicle Technologies (VT) Program is organized into subprograms that are described in the following sections. Nearly all of the subprograms are coordinated with the U.S. auto or trucking industries under the FreedomCAR or 21st Century Truck Partnerships, respectively.

Expected Program Outcomes

The Vehicle Technologies Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; enhance energy security by increasing the diversity of domestic fuel use; and provide greater energy security and reliability by reducing reliance on imported oil. In addition to these "EERE business-as-usual" benefits, realizing the Vehicle Technologies Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, oil savings, and natural gas savings that result from the realization of Vehicle Technologies Program goals are shown in the table below through 2050. These benefits are achieved by targeted Federal investments in technology research and development in partnership with auto manufacturers, heavy vehicle manufacturers, equipment suppliers, energy companies, other Federal agencies, State government agencies, universities, national laboratories, and other stakeholders. These partnerships facilitate the technical coordination of activities and attract cost sharing to provide leveraged benefits for the American taxpayer. Two partnerships represent the major crosscutting elements of the program, the FreedomCAR Partnership and the 21st Century Truck Partnership (21CT).

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future oil prices and consumer attitudes towards the fuel economy of their vehicles, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html. Final documentation estimated to be completed and posted by March 15, 2004. Uncertainties are larger for longer term estimates. The results shown in the long term benefits tables are preliminary estimates based on initial modeling of some of the possible program production technologies; nonetheless, they provide a useful picture of growing national benefits over time.

GPRA Benefits Estimates for the Vehicle Technology Program[a]

Mid-term benefits[b]

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	0.2	0.6	1.4	2.9
Carbon Emission Reductions (MMTCE)	4	13	27	53
Oil Savings (MBPD)	0.08	0.27	0.67	1.39
Energy Expenditure Savings (Billion 2001$)	6	8	26	55

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget.

[b] Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

Long-term benefits[a]

	2030	2040	2050
Primary Non-Renewable Energy Savings (Quads)	5.9	12.4	16.2
Carbon Emission Reductions (MMTCE)	117	241	317
Oil Savings (MBPD)	2.8	5.8	7.6
Energy System Cost Savings (Billion 2001$)	25	83	150

The vehicles in the model increase their market share over time as their incremental cost relative to conventional vehicles declines and as their efficiency relative to conventional vehicles increases. Some of the efficiency gains are attained by using lightweight materials while maintaining the safety of the vehicles. By 2025, about 1.4 million barrels per day (mbpd) of oil is projected to be saved as compared with the reference projection without these technologies. This accounts for about 6% of projected transportation oil use in 2025. By 2050, the projected oil savings grows to 7.6 mbpd, which is about 35% of the amount of oil use projected for transportation in that year. The primary non-renewable energy savings are expressed in quads of energy and they are nearly equal to the oil savings since oil is a non-renewable energy source. The energy expenditure savings (in the mid-term benefits) are the savings in fuel costs by vehicle users due to the increased efficiency of their advanced vehicles. The energy system cost savings (in the long-term benefits) includes the fuel cost savings by vehicle users and the incremental expenditures the vehicle users made to purchase their advanced vehicles. Carbon savings are based on the amount of carbon that the petroleum products saved would have released if they had been used.

[a] Long-term benefits were estimated utilizing the GPRA05 - MARKAL developed by Brookhaven National Laboratory (BNL). Results can differ among models due to differences in their structure. In particular, the two models estimate economic benefits in different ways, with the MARKAL model reflecting the cost of additional investments required to achieve reductions in energy bills.

Vehicle Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Vehicle Systems					
Heavy Vehicle Systems R&D					
Vehicle Systems Optimization	9,555	10,188	8,983	-1,205	-11.8%
Truck Safety Systems	397	394	100	-294	-74.6%
Total, Heavy Vehicle Systems R&D	9,952	10,582	9,083	-1,499	-14.2%
Ancillary Systems	1,100	1,185	1,300	+115	+9.7%
Simulation and Validation	2,433	2,568	3,500	+932	+36.3%
Total, Vehicle Systems	13,485	14,335	13,883	-452	-3.2%

Description

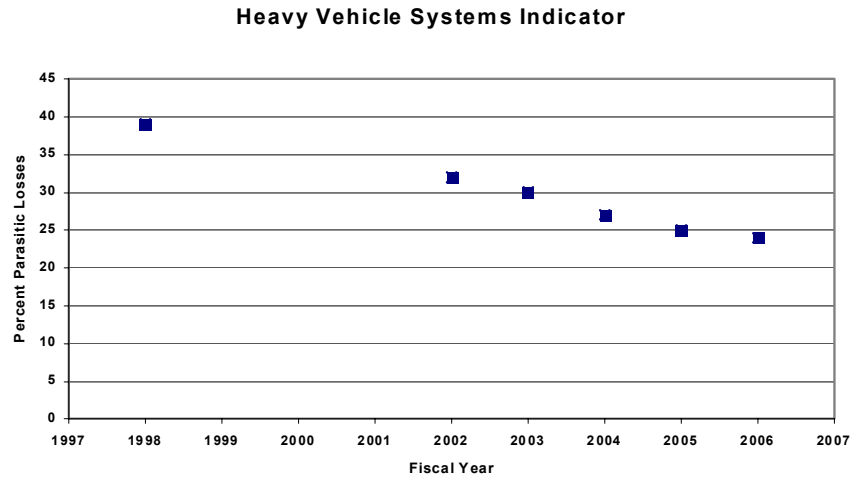
The Vehicle Systems subprogram funds R&D on advanced vehicle technologies and auxiliary equipment that could achieve significant improvements in fuel economy for light and heavy vehicles without sacrificing safety, the environment, performance, and affordability. This subprogram's funding contributes to both the FreedomCAR Partnership and the 21st Century Truck Partnership.

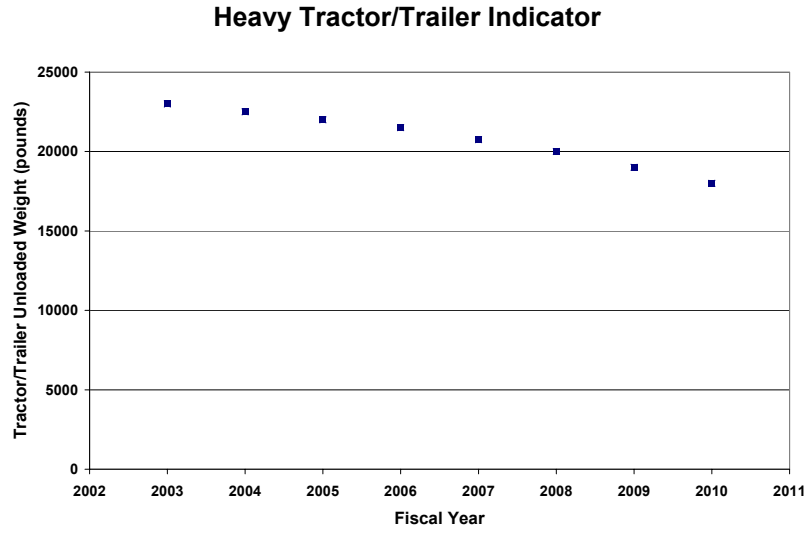
Benefits

The Vehicle Systems subprogram contributes to the VT program goal by addressing those system elements that, when resolved and adequately integrated into a vehicle's design, will accomplish improved system efficiency. For example, parasitic losses and vehicle weight in heavy trucks contribute to overall system inefficiencies. When appropriately addressed, improvements in these areas will add to the improvements that are achieved in the other activities.

A key objective for heavy trucks is to demonstrate a reduction in parasitic losses (e.g. aerodynamics, ancillary systems) from 39% of engine output in 1998 to 24% in 2006 and demonstrate the technical feasibility of reducing the weight of a tractor-trailer from 23,000 pounds in 2003 to 18,000 pounds in 2010 (a 22% reduction), thereby increasing heavy truck fuel efficiency.

Progress is indicated by measured parasitic losses (aerodynamics, cooling, compressed air) and truck weight. Actual and projected parameters for these two factors are shown graphically below:





Related milestones that will also contribute to meeting the VT program goal are:

- By 2005, demonstrate that a 14 percent increase in fuel efficiency for a fully loaded heavy truck can be achieved by removing belt-driven pumps, substituting electric turbo-compounding, and adding a more efficient air conditioning system.
- By 2005, complete technology requirements for a range of vehicle platforms to facilitate VT Program year 2030 vision of significantly reducing petroleum usage for transportation, based on fleet projections.
- By 2005, demonstrate stability and safety characteristics of tractor-trailers utilizing active airflow control.
- By 2005, construct and test prototype cooling system to achieve 8-10 percent increase in efficiency.
- By 2006, verify, using the National Renewable Energy Laboratory's Digital Functional Vehicle (DFV) modeling program, that developed light vehicle technologies will achieve vehicle-level performance and component cost objectives.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Heavy Vehicle Systems R&D	**9,952**	**10,582**	**9,083**

The Heavy Vehicle Systems R&D activity develops, in collaboration with heavy vehicle manufacturers and their suppliers, 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 powertrain and truck system integration to increase overall system energy utilization and efficiency. These objectives will be accomplished through two efforts, vehicle systems optimization and truck safety systems.

▪ **Vehicle Systems Optimization**	**9,555**	**10,188**	**8,983**

In FY 2005, negotiate contracts, initiate R&D on awards to competitive solicitations on Parasitic Energy Losses II (PEL-II) and on the Essential Power System for heavy vehicles (HV). Complete major phase of the system electrification project (from PEL-I, replacing belt and gear-driven devices with electrification of underhood components) with road tests of revenue bearing prototype vehicles. Complete test/evaluation of advanced filtration system for higher efficiency HV thermal management systems. With industry participation, equip a portion of five separately selected HV fleets with promising, off-the-shelf aero drag reduction devices, data log their fuel consumption in revenue bearing service, and provide all of the HV industry with validated data for the implementation of near term fuel saving technologies (up to 5 percent efficiency increase is projected). Validate commercial computational fluid dynamics codes for rapid, accurate prediction of aero drag coefficients to lessen the dependence on costly wind tunnel and on-road testing of new HV designs and components. Complete modeling of HV predictive cruise control energy saving methodology (up to 5 percent) and publicly present and publish results for broad dissemination to HV industry. (21CT, $8,983,000).

In FY 2003, funding for this effort was reduced by $194,153 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: NREL, PNNL, LLNL, SNL, NASA, USC, Cal. Tech., GTRI, ANL, Volvo, Great Dane, DOT, ATA, PACCAR, Freightliner, Kenworth, Mack, Peterbilt, International, Ricardo Engr., EMP, Cabot, MSU, Caterpillar, Tufts, General Electric, MIT, EPA, and others to be identified through competitive solicitations.*

▪ **Truck Safety Systems**	**397**	**394**	**100**

In FY 2005, complete the testing and characterization of lighter, more effective prototype size experimental brake components for heavy vehicles (PEL-I); with industry, assess potential for commercialization of the product (21 CT, $100,000). *Participants include: DOT, ORNL, Brunswick, GE, Knoor-Bremse, PACCAR, ATA, West Virginia University (WVU).*

Ancillary Systems	**1,100**	**1,185**	**1,300**

The Ancillary Systems activity seeks to reduce direct and indirect fuel consuming loads imposed on

(dollars in thousands)

FY 2003	FY 2004	FY 2005

internal combustion engines or fuel cell powered vehicles. These loads include those that negatively impact the fuel efficiency of a vehicle but do not propel the vehicle directly; the primary load in this category is the air-conditioning system.

In FY 2005, develop and demonstrate advanced ancillary load reduction technologies in a prototype system that if implemented fleet wide would reduce the 0.463 mbpd of gasoline used annually for mobile air-conditioning while reducing tailpipe emissions, and improving driver comfort and safety. Initiate planned effort to develop technologies for fuel cell vehicles, hybrid electric vehicles, and conventional vehicles that use propulsion system waste heat to provide vehicle cabin cooling – eliminating the need for fuel currently required for mobile air conditioners. Initiate industry collaborative testing to evaluate energy-efficient mobile air-conditioning systems with the validated thermal manikin, physiological model, and local and global thermal comfort psychological model. Work with industry and other government agencies to refine estimates of national fuel consumption for vehicle air-conditioning to include advanced mobile air conditioning compressors, expansion devices, heat exchangers, and other energy loss devices contributing to reduction in fuel economy or emissions levels. (FreedomCAR, $1,300,000). *Participants include: NREL, USCAR, other contractors.*

Simulation and Validation	**2,433**	**2,568**	**3,500**

The Simulation and Validation activity develops and validates models and simulation programs to predict the fuel economy and emissions of advanced vehicles. 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 R&D activities that could significantly reduce petroleum usage for transportation. The models are also used, in conjunction with "hardware-in-the-loop," to verify in the laboratory the achievement of these targets in the context of a vehicle system operating environment.

In FY 2005 apply vehicle systems analysis tools and methods to predict and optimize vehicle performance, set technical targets, and link the VT Program objectives of reduced fuel consumption with the technology-specific goals at the component level. Develop flexible, user-friendly tools to analyze and optimize sets of technical targets relative to their potential impact on U.S. transportation sector oil use. Develop technical targets to guide light and heavy vehicle R&D for a range of vehicle platforms found in the marketplace to help achieve VT's year-2030 vision of significantly reducing petroleum usage for transportation. Enable and accelerate new fuel-efficient automotive technologies (e.g., hybrid electric vehicles, fuel cells, and lightweight designs) by analyzing and possibly eliminating barriers through the use of advanced Computer Aided Engineering (CAE) modeling techniques and innovative design processes. Analyze heavy vehicle performance in terms of system and component technical targets and market performance expectations. (FreedomCAR, $3,500,000).

In FY 2003, funding for this effort was reduced by $122,728 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: NREL, ANL, ORNL.*

Total, Vehicle Systems	**13,485**	**14,335**	**13,883**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Heavy Vehicle Systems	
▪ **Vehicle Systems Optimization**	
Major segments of the aerodynamic drag reduction, essential power systems, energy efficient oil filtration, and underhood thermal management efforts will be reduced to focus on core activities for the reduction of parasitic energy losses in heavy vehicles that have more near-term potential.	-1,205
▪ **Truck Safety Systems**	
Funding request will complete prototype of experimental brake components.	-294
Total, Heavy Vehicle Systems	**-1,499**
Ancillary Systems	
In Ancillary Systems, determine candidate technologies for capturing waste heat and assess performance utilizing fuel cell waste heat to provide passenger climate comfort	+115
Simulation and Validation	
In Simulation and Validation, accelerate system optimization and target-setting process for heavy and medium trucks and refine fuel cell models to include extreme temperature operation	+932
Total Funding Change, Vehicle Systems	**-452**

Innovative Concepts

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Innovative Concepts					
Graduate Automotive Technology Education	500	494	500	+6	+1.2%
Cooperative Automotive Research for Advanced Technology	494	0	0	0	0.0%
Stimulate Truck Innovative Concepts and Knowledge	596	0	0	0	0.0%
Total, Innovative Concepts	1,590	494	500	+6	+1.2%

Description

The Innovative Concepts subprogram supports activities of both the VT and the HFCIT Programs. The Cooperative Automotive Research for Advanced Technology (CARAT) and the Stimulate Truck Innovative Concepts and Knowledge (STICK) activities, were designed to help small businesses and universities. The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs also aim to help small businesses. Each year, the VT Program contributes a portion of its appropriated funding to the SBIR and STTR programs in accordance with existing law.

Benefits

The Graduate Automotive Technology Education activity contributes to meeting the VT program mission by supporting the development of students with technical skills important to the technology pathways chosen to advance the improvement of vehicle efficiency and petroleum fuel displacement. Improving the resource base in this area will help assure the timeliness of R&D success as well as the efficient transfer of new technologies into the market.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Graduate Automotive Technology Education (GATE)	**500**	**494**	**500**

The Graduate Automotive Technology Education (GATE) activity aids in the development of interdisciplinary curricula to train the future workforce of automotive engineers. This is accomplished by setting up GATE Centers of Excellence at universities that have been competitively selected, establishing focused curriculum, and providing funds for research fellowships.

In FY 2005, competitively select new GATE Centers of Excellence and provide research fellowships for approximately 25 students for research in advanced automotive technologies, including fuel cell vehicles. Conduct GATE Forum with industry, universities, and government agencies to increase partnering opportunities. (FreedomCAR, $500,000). *Current participants include: Michigan Technological University, Ohio State University, Pennsylvania State University, University of California, Davis, University of Maryland, University of Michigan-Dearborn, University of Tennessee, Virginia Tech, West Virginia University.*

Cooperative Automotive Research for Advanced Technology (CARAT)	**494**	**0**	**0**

The Cooperative Automotive Research for Advanced Technology (CARAT) activity was designed to help small businesses and universities.

Instead of CARAT, VT will work through SBIR and STTR to involve similar types of small businesses and pursue comparable technical innovation topic areas; universities will be involved in the program through other competitive means.

No activities are planned during FY 2005.

Stimulate Truck Innovative Concepts and Knowledge (STICK)	**596**	**0**	**0**

The Stimulate Truck Innovative Concepts and Knowledge (STICK) activity was designed to help small businesses and universities.

Instead of STICK, VT will work through SBIR and STTR to involve similar types of small businesses and pursue comparable technical innovation topic areas; universities will be involved in the program through other competitive means.

No activities are planned during FY 2005.

Total, Innovative Concepts	**1,590**	**494**	**500**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Graduate Automotive Technology Education	
Minimum change.	+6
Total Funding Change, Innovative Concepts	**+6**

Hybrid and Electric Propulsion

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Hybrid and Electric Propulsion					
Energy Storage					
High Power Energy Storage	17,241	17,457	17,675	+218	+1.2%
Advanced Battery Development	2,403	1,481	1,500	+19	+1.3%
Exploratory Technology Research	1,923	4,469	9,525	+5,056	+113.1%
Total, Energy Storage	21,567	23,407	28,700	+5,293	+22.6%
Advanced Power Electronics	13,355	13,522	13,900	+378	+2.8%
Subsystem Integration and Development					
Light Vehicle Propulsion and Ancillary Subsystems	3,135	3,097	3,735	+638	+20.6%
Heavy Vehicle Propulsion and Ancillary Subsystems	3,939	4,976	5,486	+510	+10.2%
Total, Subsystem Integration and Development	7,074	8,073	9,221	+1,148	+14.2%
Total, Hybrid and Electric Propulsion	41,996	45,002	51,821	+6,819	+15.2%

Description

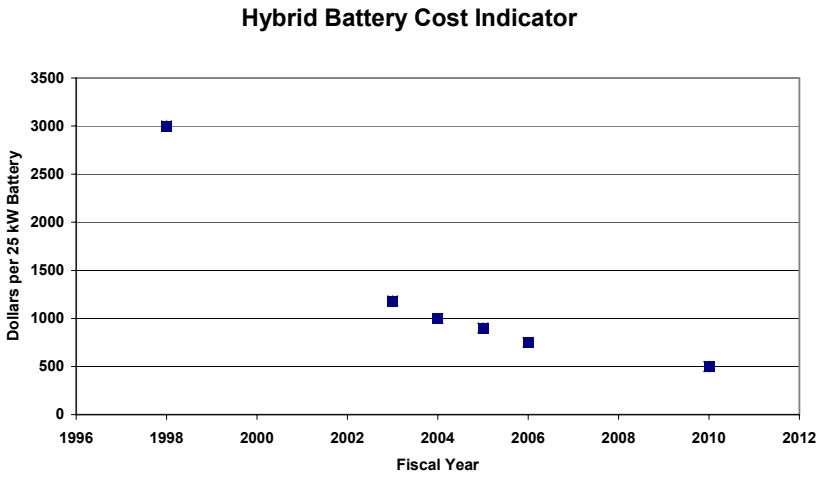
The Hybrid and Electric Propulsion subprogram funds research and development for both light and heavy vehicles. R&D efforts include research in energy storage systems, advanced power electronics and electric machines, and heavy hybrid system development and integration. There are three activities: Energy Storage, Advanced Power Electronics, and Subsystem Integration and Development.

Benefits

The Hybrid and Electric Propulsion subprogram supports achieving the VT program goal by addressing those technology elements important to the utilization of electric energy storage, electric drives, and energy recovery in new, more efficient vehicle designs.

A key objective of the Hybrid and Electric Propulsion R&D subprogram is to reduce, by 2010, the production cost of a high power 25kW battery for use in light vehicles from $3,000 in 1998 to $500 (with an intermediate goal of $750 in 2006) enabling cost competitive market entry of hybrid vehicles.

Progress is indicated by cost per 25kW battery system estimated for a production level of 100,000 battery systems per year. Actual and projected progress for this factor is shown graphically below:



A related milestone that will also contribute to meeting the VT program goal is:

- By 2005, define component requirements for heavy vehicle hybrid systems to guide component/system research efforts.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Energy Storage..... **21,567** **23,407** **28,700**

The Energy Storage activity supports long-term research, applied research, and technology development for both light and heavy 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 light vehicle energy storage is conducted with industry through the United States Advanced Battery Consortium (USABC). All of the cost-shared USABC subcontracts to develop advanced light vehicle batteries for hybrid and electric vehicles are awarded under a competitive process. Interagency coordination on advanced battery development is conducted through the government-sponsored Interagency Advanced Power Group.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

The Interagency Advanced Power Group (IAPG) brings together representatives from the Department of Energy, NASA, the Army, the Navy, and the Air Force to exchange information about government agency programs related to energy storage, generation, and conversion. The IAPG is managed by a Steering Committee of senior agency staff. Discussions are carried out through meetings of working groups that bring together technical experts on a regular basis. The Chemical Working Group covers batteries, fuel cells, and capacitors.

- **High Power Energy Storage** **17,241** **17,457** **17,675**

  In FY 2005, develop full-sized lithium ion cells using low cost, stable, high performance cathode materials based on abundant, low toxicity manganese oxide. Complete activities to develop low cost separator materials. Transfer technology to developers and suppliers for validation in laboratory cells and incorporation into full-size prototype cells, modules, and batteries. Initiate development of an advanced battery for use in fuel cell hybrid vehicles. Conduct benchmark testing and assessments of non-battery energy storage devices, such as ultracapacitors, flywheels, and thermoelectrics that might be applicable in hybrid vehicle systems. (FreedomCAR, $17,675,000).

  In FY 2003, funding for this effort was reduced by $317,334 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: USABC, ANL, BNL, INEEL, LBNL, SNL, Industrial contractors*.

- **Advanced Battery Development** **2,403** **1,481** **1,500**

  In FY 2005, conclude the initial development of high-energy lithium ion and lithium sulfur battery technologies by the USABC. Phase out effort to reduce cost of lithium ion batteries for EVs. Benchmark and assess emerging battery technologies. In FY 2003, funding for this effort was reduced by $79,625 for SBIR/STTR and transferred to the Science Appropriation. (FreedomCAR, $1,500,000). *Participants include: ANL, USABC, Industrial contractors.*

- **Exploratory Technology Research** **1,923** **4,469** **9,525**

  In FY 2005, explore energy storage systems that exhibit significant improvements over existing technologies for use in hybrid vehicles, including fuel cell hybrid vehicles. Develop and characterize novel anode and cathode materials and electrolytes that have higher energy capability, longer and more stable cycling characteristics, and are lower in cost. In particular, investigate multivalent and alloy based electrodes (such as Sn-based intermetallic alloys of Cu, Sb, and Mg), and anodes fabricated from higher purity metals, including pure Li metal. Develop diagnostic techniques to investigate and better understand life- and performance-limiting processes in lithium-based batteries. Develop and apply electrochemical models to understand failure mechanisms and the mechanisms of thermal runaway in lithium batteries.

  Re-evaluate, investigate, and develop solid polymer electrolytes with high room temperature conductivity and good mechanical strength and improved safety. Accelerate the development of low cost, abuse tolerant lithium sulfur battery technology. Explore novel electrochemical energy

storage technologies, specifically non-lithium based battery technologies such as Ca-based and Al-based chemistries. (FreedomCAR, $9,525,000). *Participants include: LBNL, BNL, ANL.*

Advanced Power Electronics **13,355** **13,522** **13,900**

The Advanced Power Electronics activity, which includes R&D on electric machines, develops low cost DC/DC converters and motor controllers, and motors that are needed for fuel cell and hybrid combustion vehicles. Supporting R&D on capacitors, magnets and thermal management complements the motor and electronics technology research and development.

In FY 2005, efforts are focused on advanced motors, DC/DC converters, low-cost permanent magnet materials, advanced thermal management systems, and motor controller systems to meet both light and heavy vehicle requirements. Initiate expanded thermal management R&D efforts in power electronics thermal management system. Test preliminary deliverables at national laboratories for conformance to specifications. Maintain close collaboration among researchers, device manufacturers, and users of the technologies of light and heavy vehicles. Initiate R&D for integrated inverter, motor, and thermal management system and transfer production prototype high temperature capacitor technology to industry. (FreedomCAR, $13,900,000).

In FY 2003, funding for this effort was reduced by $245,815 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Ames, ANL ORNL, NREL, SNL, Freedom-CAR partners, Heavy Hybrid Partners.*

Subsystem Integration and Development **7,074** **8,073** **9,221**

Subsystem Integration and Development supports work to validate achievement of technical targets for components and subsystems by emulating a vehicle operating environment for light and heavy vehicles using hardware-in-the-loop testing. This activity also benchmarks and characterizes advanced commercial vehicles and components to determine commercial progress against research performance goals. Data gathered are used to validate simulation models, which are used to predict fuel economy and emissions using advanced controls and configurations for hybrid vehicles. Heavy hybrid efforts support development of advanced, cost effective components and systems to improve fuel economy by at least 100 percent while meeting 2007 emission standards.

- **Light Vehicle Propulsion and Ancillary Subsystems** **3,135** **3,097** **3,735**

  In FY 2005, use hardware-in-the-loop (HIL) techniques to emulate fuel cell propulsion systems to determine systems interactions required for vehicle system integration (e.g., energy storage requirements for different fuel cell subsystem technologies and configurations). Enhance engine emission models to analyze the impact of emissions control on fuel economy. Conduct hardware studies using HIL to determine the impact of expected emission control requirements on fuel economy of advanced light duty hybrid systems. Validate, in a systems environment, performance targets for deliverables from the power electronics and energy storage technology research and development activities. (FreedomCAR, $3,735,000). *Participants include ANL and FreedomCAR*

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Partners.

- **Heavy Vehicle Propulsion and Ancillary Subsystems** **3,939** **4,976** **5,486**

  In FY 2005, in conjunction with industry teams selected in FY 2002 and FY 2003, develop efficient, cost-effective, next generation heavy hybrid components and systems in support of the 21CT. Research in advanced heavy hybrid systems will be directed at developing specific components (especially electric motors, system level energy management, energy storage systems, power electronics, and control systems), advanced powertrain systems, advanced system modeling, system level prototype development, and vehicle level prototypes. Apply advanced computer modeling and analysis to assist in component optimization and continued confirmation of industry performance projections. R&D activities in heavy hybrid vehicle test, protocols, procedures and equipment development, and power electronics for heavy hybrid vehicles will be increased. This effort will coordinate with other DOE programs where synergy exists, e.g. fuel cells, batteries, power electronics, and parasitic energy losses. (21CT, $5,486,000).

  In FY 2003, funding for this effort was reduced by $72,498 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: NREL; Eaton Corporation-Truck Components and its team of International Truck and Engine Corporation, Ricardo, Hitachi, Oshkosh Truck Corporation and its team of Rockwell Automation, Ohio State University, GM –Allison Transmission, ElectraStor and JME; Other Heavy Hybrid Partners.*

Total, Hybrid and Electric Propulsion	**41,996**	**45,002**	**51,821**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Energy Storage	
▪ **High Power Energy Storage**	
Funds will be used to conduct more benchmark testing of promising battery technologies	+218
▪ **Advanced Battery Development**	+19
▪ **Exploratory Technology Research**	
Conduct increased long term, high risk Exploratory Technology Research to advance lithium polymer batteries, lithium sulfur batteries and more fundamental storage concepts	+5,056
Total, Energy Storage	+5,293
Advanced Power Electronics	
In Advanced Power Electronics, investigate thermal management technologies for power inverters for HEV applications under the Power Electronics Project	+ 378
Subsystem Integration and Development	
▪ **Light Vehicle Propulsion and Ancillary Systems**	
In Light Vehicle Propulsion & Ancillary Systems, initiate testing of various fuel cell vehicles provided by the Office of Hydrogen, Fuel Cells and Infrastructure Technologies utilizing existing FCVT testing capabilities and resources to establish baseline performance figures for fuel cell vehicle overall and fuel efficiency	+ 638
▪ **Heavy Vehicle Propulsion and Ancillary Subsystems**	
In Heavy Vehicle Propulsion and Ancillary Subsystems, accelerate advanced heavy hybrid technologies R&D to include power electronics technologies R&D and vehicle test protocols, procedures and equipment. These additional activities will advance progress towards demonstrating fuel economy and petroleum savings in advanced heavy hybrid vehicles.	+510
Total, Subsystem Integration and Development	+1,148
Total Funding Change, Hybrid and Electric Propulsion	**+6,819**

Advanced Combustion Engine R&D

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Advanced Combustion Engine R&D					
Combustion and Emission Control	22,994	22,716	22,000	-716	-3.2%
Light Truck Engine	14,734	12,944	0	-12,944	-100.0%
Heavy Truck Engine	12,174	11,832	10,436	-1,396	-11.8%
Waste Heat Recovery	488	2,469	1,500	-969	-39.2%
Off-Highway Engine R&D	3,414	3,456	0	-3,456	-100.0%
Health Impacts	1,463	988	2,000	+1,012	+102.4%
Total, Advanced Combustion Engine R&D	55,267	54,405	35,936	-18,469	-33.9%

Description

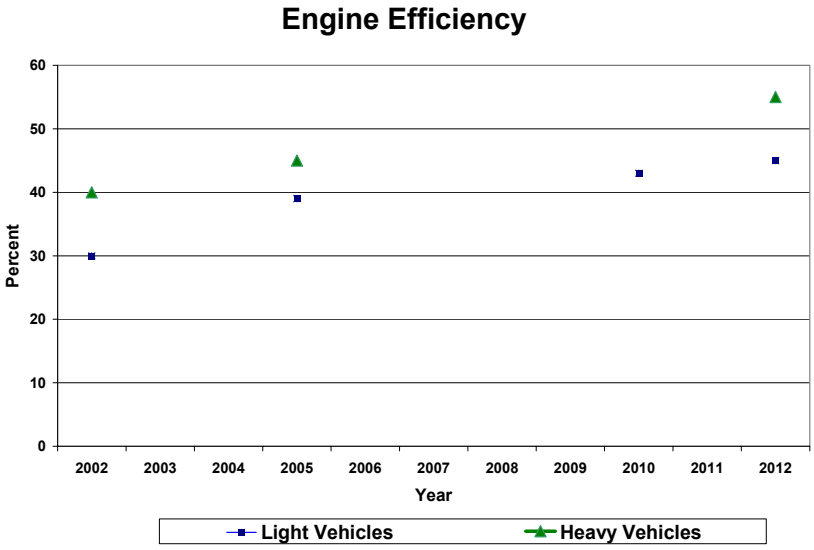
The Advanced Combustion Engine R&D subprogram focuses on removing critical technical barriers to commercialization of higher efficiency, advanced internal combustion engines in light-duty, medium-duty, and heavy-duty vehicles. The goals are to improve the efficiency of internal combustion engines for light-duty applications from to 45 percent by 2012, and for heavy-duty applications, to 55 percent by 2012, while meeting cost, durability, and emissions constraints. Research is conducted in collaboration with industry, national laboratories and universities, and in conjunction with the FreedomCAR and 21CT Partnerships. The Advanced Combustion Engine R&D subprogram includes Combustion and Emission Control R&D, Heavy Truck Engine R&D, Waste Heat Recovery R&D, and Health Impacts Research.

Benefits

The Advanced Combustion Engine R&D subprogram and Fuel Technology subprogram will contribute to the VT program goal by improving the drivetrain efficiency through development of more efficient combustion engines and through identification of fuel properties and components that make improved fuels possible that either make a more efficient system possible or that can displace petroleum based fuels. Improved efficiency and petroleum displacement both can directly reduce petroleum consumption.

The key objective is to improve the efficiency of internal combustion engines from 30 percent (2002 baseline) to an estimated 43 percent by 2010 and to 45 percent by 2012 for light-duty and from 40 percent (2002 baseline) to 55 percent by 2012 for heavy-duty applications while utilizing an advanced fuel formulation that incorporates a non-petroleum based blending agent to reduce petroleum dependence and enhance combustion efficiency.

Progress is indicated by efficiency of light- and heavy-duty internal combustion engines.



Detailed Justification

(dollars in thousands)

FY 2003	FY 2003	FY 2003
Combustion and Emission Control	**22,994**	**22,716**	**22,000**

The Combustion and Emission Control R&D activity supports the VT Program goal to enable energy-efficient, clean vehicles powered by advanced internal combustion engines using clean, hydrocarbon- and non-petroleum-based, and hydrogen fuels. Work focuses on developing technologies for light-, medium-, and heavy-duty Compression Ignition Direct Injection (CIDI) engines and is being transitioned to developing technologies for advanced engines operating in advanced combustion regimes that will further increase efficiency and reduce emissions to near-zero levels.

In FY 2005, increase emphasis on research in advanced combustion regimes that achieve efficiency goals for cars and trucks while maintaining cost and high durability with near-zero emissions.

Conduct optical laser diagnostics of in-cylinder combustion process for HCCI (Homogeneous Charge Compression Ignition), Low Temperature Combustion (LTC) and mixed-mode regimes. Release competitive solicitation and award competitive cooperative agreements for innovative component technologies to enable HCCI, LTC and mixed-mode regimes with high efficiency and near-zero emissions. Through simulation and experimentation, conduct R&D on advanced thermodynamic strategies that will enable engines to approach 60% thermal efficiency. Utilize laser-based, optical

diagnostics to conduct in-cylinder engine research focused on overcoming barriers to the development of high-efficiency, hydrogen-fueled IC engine technology in coordination with the HFCIT Program. Perform detailed chemical kinetic modeling of LTC and emissions processes, including fuel composition effects, to aid the development of advanced, high-efficiency IC engines using LTC and mixed-mode combustion regimes. Utilize X-rays from Advanced Photon Source to study near-fuel injection spray characteristics.

Terminate vehicle level testing and development at Cummins to reduce the fuel efficiency penalty of the NO_x adsorber and particulate matter (PM) filter emission control system from the current 5 to 7 percent to less than 2 percent. Develop efficient on-board reformers for generation of reductant needed to periodically restore catalyst function. This may enable the use of lean NO_x catalysts that require no additional energy input. Shift focus of GM cooperative agreement from high-volume screening of catalyst materials to engine-scale testing of most promising candidate materials. Terminate cooperative agreement with Ford for the development and vehicle integration of a Selective Catalytic Reduction system to achieve a less than one percent fuel economy penalty as compared to the current 3 to 5 percent. Through partnership with industry, develop a shared database of simulation codes for exhaust emissions control systems.

Engine/Emission Controls Integration: Shift focus of effort to reduce cost and improve durability of NO_x and PM sensors through cost shared CRADAs and cooperative agreements with automotive suppliers and universities, to enable closed loop control of fuel injection and emission control devices so that 120,000 mile goal can be achieved. (FreedomCAR, $13,500,000; 21CT, $8,500,000).

In FY 2003, funding for this effort was reduced by $423,224 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: SNL, LANL, ORNL, PNNL, LLNL, ANL, Ford, GM, DaimlerChrysler, Detroit Diesel, Cummins, Engelhard, ExxonMobil, Caterpillar, Mack, International, John Deere, GE, EMD, Delphi, Honeywell, University of Michigan, University of Wisconsin, catalyst manufacturers, other suppliers, other universities.*

Light Truck Engine	**14,734**	**12,944**	**0**

No activities are planned during FY 2005. Light truck engine R&D activities completed with FY 2004 funding.

In FY 2003, funding for this effort was reduced by $271,191 for SBIR/STTR and transferred to the Science Appropriation.

Heavy Truck Engine	**12,174**	**11,832**	**10,436**

The Heavy Truck Engine activity develops technologies for diesel engines, such as optimized fuel injection, emissions control, waste heat recovery systems, and reduced friction and pumping losses, with the goal of improving the thermal efficiency to 55 percent by 2012, (from the current 40 percent) while meeting Federal emissions standards.

In FY 2005, place more emphasis on improving engine efficiency to greater than 45 percent through the

utilization of advanced combustion regimes (HCCI, LTC and mixed-mode), which are capable of reducing engine-out emissions to near-zero levels. This approach will result in a reduced need for emission control equipment, which has a negative impact on fuel economy, cost and durability. Develop and integrate NO_x adsorbers, Selective Catalytic Reduction (SCR), sulfur traps and PM filters to reduce fuel economy penalty and the potential to meet the durability requirement of 435,000 miles for heavy vehicles while meeting EPA 2007 standards. Continue to optimize fuel injection and waste heat recovery systems, and reduce friction and pumping losses. Continue to evaluate emission control technologies from the Combustion and Emission Control R&D subprogram for the higher pressures, temperatures, and durability requirements of heavy duty diesel engines. (21CT, $10,436,000).

In FY 2003, funding for this effort was reduced by $224,071 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Caterpillar Inc., Cummins Engine Co., Detroit Diesel Corp., suppliers, national labs.*

Waste Heat Recovery (formerly Engine Boosting) **488** **2,469** **1,500**

The Waste Heat Recovery activity develops technologies to convert waste heat from engines to electrical energy to improve overall thermal efficiency and reduce emissions.

In FY 2005, integrate electric turbocompound unit with engine control system to produce 3 to 5 kilowatts (kW) for light-duty and up to 20kW for heavy-duty applications from engine waste heat. Combine turbocompounding with starter motor-alternator to improve vehicle fuel economy, increase low-speed torque, improve engine transient response, and reduce particulate emissions. Develop a Quantum Well thermoelectric generator to recovery up to 5 kilowatts of energy from engine waste heat. Identify innovative energy recovery technologies that can improve overall efficiency and conduct R&D towards feasibility demonstration. (21CT, $1,500,000).

In FY 2003, funding for this effort was reduced by $8,978 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Honeywell, Caterpillar, Hi-Z, PNNL.*

Off-Highway Engine R&D **3,414** **3,456** **0**

No activities are planned during FY 2005 so as to focus on other research opportunities having higher potential for energy savings.

In FY 2003, funding for this effort was reduced by $62,845 for SBIR/STTR and transferred to the Science Appropriation.

Health Impacts **1,463** **988** **2,000**

The Health Impacts activity evaluates the relative toxicity of emissions from new vehicle technologies developed to meet energy efficiency goals.

In FY 2005, initiate toxicity testing of metallic compounds in fuels and lubricants (man-made additives and trace metals in non-petroleum-based feedstocks) to provide feedback on new technologies, and complete comparative toxicity testing of emissions from natural gas fueled vehicles. (21CT,

(dollars in thousands)

FY 2003	FY 2003	FY 2003

$2,000,000). In FY 2003, funding for this effort was reduced by $26,934 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Lovelace Respiratory Research Institute, NIOSH.*

Total, Advanced Combustion Engine R&D	**55,267**	**54,405**	**35,936**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Combustion and Emissions Control	
In Combustion & Emissions Control, focus on the most promising avenues to advance HCCI, low temperature combustion and mixed-mode combustion regimes with high efficiency and near-zero emissions	-716
Light Truck Engine	
In Light Truck Engine, completed activity in FY 2004 and transitioned to private sector	- 12,944
Heavy Truck Engine	
In Heavy Truck Engine, consolidate research effort on improving engine efficiency to 50 percent through the utilization of advanced combustion regimes (HCCI, LTC, and mixed-mode) which are capable of reducing engine-out emission to near-zero levels	-1,396
Waste Heat Recovery	
In Waste Heat Recovery, consolidate development of turbocharger devices to recover waste heat from the engine and identify other innovative energy recovery devices to improve engine efficiency	-969
Off-Highway Engine R&D	
The Off-Highway Engine R&D activity is terminated to focus on other research opportunities having higher potential for energy savings..	-3,456
Health Impacts	
In Health Impacts, complete initial toxicology screening of heavy metals in emissions from combustion engines. Conduct research contributing to the Advanced	+1,012

	FY 2005 vs. FY 2004 ($000)
Collaborative Emissions Study (ACES) designed to elucidate deleterious health impacts emanating from proposed 2010 Energy Efficiency enhancing combustion engine emissions control technologies.....	
Total Funding Change, Advanced Combustion Engine R&D.....	**-18,469**

Materials Technology

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Materials Technology					
Propulsion Materials Technology					
Automotive Propulsion Materials	1,952	2,964	2,000	-964	-32.5%
Heavy Vehicle Propulsion Materials	5,705	5,778	5,000	-778	-13.5%
Total, Propulsion Materials Technology	7,657	8,742	7,000	-1,742	-19.9%
Lightweight Materials Technology					
Automotive Lightweight Materials	14,242	16,632	21,000	+4,368	+26.3%
Heavy Vehicle High Strength Weight Reduction Materials	8,731	8,839	7,799	-1,040	-11.8%
Total, Lightweight Materials Technology	22,973	25,471	28,799	+3,328	+13.1%
High Temperature Materials Laboratory	5,464	5,531	4,000	-1,531	-27.7%
Total, Materials Technology	36,094	39,744	39,799	+55	+0.1%

Description

The Materials Technologies subprogram supports the development of cost-effective materials and materials manufacturing processes that can contribute to fuel-efficient cars and trucks. This subprogram is a critical enabler for concepts developed in the FreedomCAR and 21st Century Truck Partnerships. The activity consists of three activities: Propulsion Materials Technology, Lightweight Materials Technology, and the High Temperature Materials Laboratory (HTML).

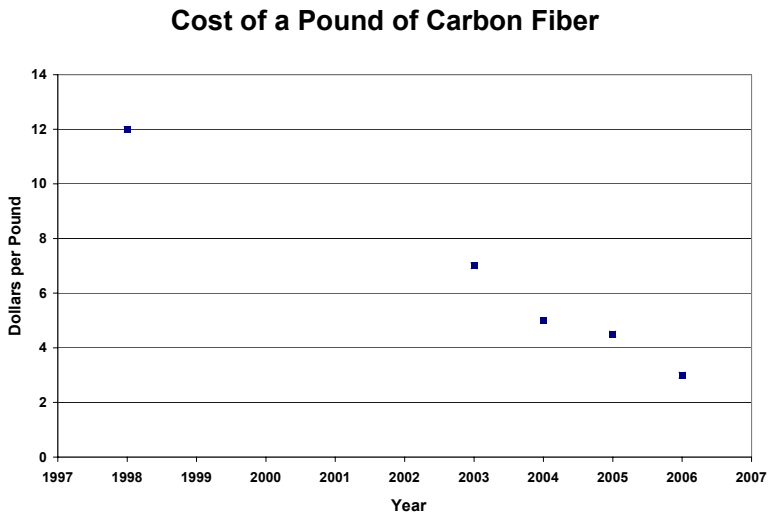
Benefits

The Materials Technology subprogram will contribute to the VT program goal by developing better, cost effective materials that will make lighter vehicle structures and more efficient power systems possible. Lighter vehicles (that provide comparable safety) require less energy to operate and thus

reduce the consumption of fuel. Likewise, better propulsion materials can make more efficient power systems possible thus also contributing to a vehicle's reduced energy consumption.

A key subprogram goal for the Transportation Materials Technologies R&D activity is to reduce the projected production volume cost of carbon fiber from $12 per pound in 1998 to $3 per pound by 2006.

Progress is indicated by cost of carbon fiber. Actual and projected progress for this factor is shown graphically below:



Related milestones that will contribute to the VT program goal are:

By 2005, develop and validate advanced Materials Technologies that will:

- Develop the technology to control the erosion and corrosion in heavy vehicle engines as a result of the use of Exhaust Gas Recirculation (EGR).
- Exhibit the performance, durability, reliability, safety, and cost effectiveness comparable to those of current heavy vehicle engines.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Propulsion Materials Technology	**7,657**	**8,742**	**7,000**

The Propulsion Materials Technology activity focuses on technologies that are critical in removing

(dollars in thousands)

FY 2003	FY 2004	FY 2005

barriers to electric drive, advanced combustion, and emissions control research activities.

- **Automotive Propulsion Materials**..... **1,952** **2,964** **2,000**

  In FY 2005, evaluate sensitivity, response time, and stability of prototype NO_x sensor and invite industrial partner to participate in further development. Make improvements to carbon foam production processes for improved cooling of electronics. Complete development of diesel fuel injectors with 50-micron orifices. (FreedomCAR, $2,000,000).

  In FY 2003, funding for this effort was reduced by $34,956 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: ORNL, LLNL, ANL, Industrial Ceramic Solutions.*

- **Heavy Vehicle Propulsion Materials**..... **5,705** **5,778** **5,000**

  In FY 2005, assess the viability of using titanium in engine components for higher efficiencies and lighter weight.

  Initiate characterization of new surface modification techniques to reduce friction/wear in engine component materials and increase engine efficiency. Assess viability of current concepts to enhance fracture toughness and/or to ductilize ceramics for advanced engine applications. Evaluate engine material substitution strategies for lighter weight, cost-effective, higher efficiency engines. Assess the capability of new analytic and simulation methods to characterize, formulate, and stabilize nano-size atomic clusters to achieve high potency, durable, cost-effective catalysts for controlling exhaust gas emissions. Characterize high strength, lightweight, wear resistant metal and ceramic matrix composites, and Cermets for applications in components of advanced high performance, efficient engines. Within the IEA Annex on Materials for Transportation, establish multilateral collaborative research on characterization of rolling contact fatigue, integrated surface modification of materials, and new applications of magnesium. (21CT, $5,000,000).

  In FY 2003, funding for this effort was reduced by $105,979 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: ORNL, LLNL, SNL, ANL, Industrial Ceramic Solutions.*

Lightweight Materials Technology..... **22,973** **25,471** **28,799**

Lightweight Materials Technology activity develops carbon fiber and metal composites to reduce vehicle weight while maintaining safety, performance, and reducing cost.

- **Automotive Lightweight Materials** **14,242** **16,632** **21,000**

  In FY 2005, conclude a major thrust that began in FY 2001, on aluminum alloys and carbon-fiber-reinforced polymer-matrix composites (CFRPMC), and enable new manufacturing-focused thrusts initiated in FY 2003 and FY 2004 respectively to reach mid-stream of their roughly five-year course.

  Metals: Complete development of a binder control system for stamping of aluminum sheet

components. Conclude initial development of corrosion/wear coatings for completed magnesium components. Design knowledge and product capabilities for cast magnesium structural components will be validated by full size component tests.
Composites: Conclude validation work on carbon-fiber rapid preforming technology and make a decision on future work. Part fabrication and cost, weight, and performance analysis for a CFRPMC-intensive body-in-white will be completed and a decision made on the course of future work.

Advanced Materials and Processes: Develop predictive models for dimensional control of welded assemblies and an understanding of the effect of strain-rate dependent materials on crash energy absorption capabilities. Complete evaluation of energy-absorption capabilities of prototype bonded and mechanically fastened structures. (FreedomCAR, $21,000,000).

In FY 2003, funding for this effort was reduced by $262,131 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: ANL, LBNL, LLNL, ORNL, PNNL, SNL, numerous companies and universities.*

- **Heavy Vehicle High Strength Weight Reduction Materials** **8,731** **8,839** **7,799**

In FY 2005, complete assembly of ultra-light 40 ft. stainless steel transit bus, insert drive train, and assess improvement of prototype vehicle performance parameters. Complete scale-up and evaluation of new magnesium casting process. Evaluate potential to produce wrought magnesium alloy sheet components to meet HV requirements, LWM and cost targets. Identify, characterize innovative, reliable, cost effective joining techniques for high performance LWM and dissimilar material joints. Emphasize joining of carbon composites to like and dissimilar structural materials. Determine impact of lower cost virgin titanium on its potential use in LWM structural applications on HVs.

Phase down Equal Channel Angular Extrusion efforts to focus only on fabricability of amorphous materials and metal matrix composites. Quantify/characterize effects of highway ice-clearing chemicals on corrosion of HV materials and components. (21CT, $7,799,000).

In FY 2003, funding for this effort was reduced by $160,699 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: American Trucking Associations, PACCAR, Freightliner, ALCOA, Caterpillar, DaimlerChrysler, Delphi, Volvo Autokinetics, ANL, LANL, INEEL, PNNL, MIT, ORNL.*

High Temperature Materials Laboratory **5,464** **5,531** **4,000**

The High Temperature Materials Laboratory (HTML) activity is an advanced materials R&D industrial user center located at the Oak Ridge National Laboratory. The HTML strives to maintain world class, state-of-the-art advanced materials characterization capabilities not available elsewhere and makes them available to U.S. industries for use in solving their materials problems. It develops cutting-edge analytical techniques to identify innovative materials for use in surface transportation applications. Projects include investigation of compositional crystallographic conditions of metals,

(dollars in thousands)

FY 2003	FY 2004	FY 2005

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 will be delivered and become fully operational in FY 2005. ACEM will be used to study and characterize advanced materials such as lean NO_x catalytic materials which will enable higher efficiency clean diesel engines to replace lower efficiency spark ignition engines in most automobiles, light trucks and SUVs.

In FY 2003, funding for this effort was reduced by $100,553 for SBIR/STTR and transferred to the Science Appropriation.

Total, Materials Technologies	**36,094**	**39,744**	**39,799**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Propulsion Materials Technology	
▪ **Automotive Propulsion Materials**	
Concentrate research efforts on the development of electric drive system materials and combustion and aftertreatment materials	-964
▪ **Heavy Vehicle Propulsion Materials**	
Curtail the R&D on reduction of engine friction by innovative surface modifications and in ductilization of ceramics for engine applications in order to focus R&D on conventional technologies that have more near-term potential.	-778
Total, Propulsion Materials Technology	-1,742
Lightweight Materials Technology	
▪ **Automotive Lightweight Materials**	
Increase emphasis on recycling, non-destructive evaluation and crash worthiness prediction. Expand efforts to develop advanced high-strength metals and processing technology. Enhance the competitiveness of carbon fiber by making it more recyclable	+4,368
▪ **Heavy Vehicle High Strength Weight Reduction Materials**	
Continue development of lightweight metallic and alloy components for energy efficient heavy vehicles that have better near-term applicability and phase down lightweight carbon composite technology and equal channel angular extrusion	-1,040

Total, Lightweight Materials Technology	+3,328
High-Temperature Materials Laboratory	
Complete final preparations for installation of the Aberration Corrected Electron Microscope. Support 20 full-time staff members.	-1,531
Total Funding Change, Materials Technology	**+55**

Fuels Technology

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Fuels Technology					
Advanced Petroleum Based Fuels	12,955	10,272	4,000	-6,272	-61.1%
Non-Petroleum Based Fuels & Lubricants					
Medium Trucks	1,314	1,284	0	-1,284	-100.0%
Heavy Trucks	1,409	1,383	0	-1,383	-100.0%
Fueling Infrastructure	1,204	1,185	0	-1,185	-100.0%
Renewable and Synthetic Fuels Utilization	0	395	2,800	+2,405	+608.9%
Total, Non-Petroleum Based Fuels & Lubricants	3,927	4,247	2,800	-1,447	-34.1%
Environmental Impacts	2,282	1,975	0	-1,975	-100.0%
Total, Fuels Technology	19,164	16,494	6,800	-9,694	-58.8%

Description

The Fuels Technology subprogram supports R&D that will provide vehicle users with fuel options that are cost competitive, enable high fuel economy, deliver low emissions, and contribute to petroleum displacement. It consists of two activities: Advanced Petroleum Based Fuels (APBF) and Non-Petroleum Based Fuels and Lubricants (NPBFL).

Benefits

The Fuels Technology subprogram will contribute to the accomplishment of the VT program goal by developing advanced fuel formulations that enable the development of advanced power systems that will operate at significantly higher efficiencies. It will also contribute to the displacement of petroleum fuels by non-petroleum based fuels. Non-petroleum based components can be introduced through a blending strategy.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Advanced Petroleum Based Fuels (APBF) **12,955** **10,272** **4,000**

The APBF activity develops petroleum-based fuels and lubricants that will enable extremely high efficiency engines for heavy vehicle applications. This effort employs the expertise and shared funding of the government, energy companies, and emission control and engine manufacturers. The goal is to identify fuel properties that can enable engines to operate in the highest efficiency mode while meeting the emissions standards.

In FY 2005, initiate efforts to determine base-fuel properties of most significance in advanced combustion regime engines through a competitively awarded teamed cooperative agreement with engine manufacturers and energy companies. This effort is in conjunction with the Advanced Combustion Engine's subprogram. Initiate development of predictive tools that relate molecular structure to ignition behavior and heat release of fuels in advanced combustion engines. This initial effort, to be conducted through experimentation and modeling, will support the development of fuels optimized for advanced combustion regimes and will contribute to the fundamental understanding of fuel effects on combustion. Terminate activities with West Virginia University's mobile emissions laboratory and activities associated with ReFuel Laboratory at NREL. (21CT, $4,000,000).

In FY 2003, funding for this effort was reduced by $280,709 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: NREL, ORNL, SNL, LLNL, NETL.*

Non-Petroleum Based Fuels & Lubricants (NPBFL) ... **3,927** **4,247** **2,800**

The NPBFL activity 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.

- **Medium Trucks** **1,314** **1,284** **0**

  In FY 2005, no efforts are planned. Work in this area has supported natural gas engine/vehicle systems development and the technology is considered mature and ready for commercialization. In FY 2003, funding for this effort was reduced by $30,155 for SBIR/STTR and transferred to the Science Appropriation.

- **Heavy Trucks** **1,409** **1,383** **0**

  In FY 2005, no efforts are planned. Work in this area has supported natural gas engine/vehicle systems development and the technology is considered mature and ready for commercial development. In FY 2003, funding for this effort was reduced by $31,845 for SBIR/STTR and transferred to the Science Appropriation.

- **Fueling Infrastructure** **1,204** **1,185** **0**

  In FY 2005, no efforts are planned. Work in this area has supported natural gas fueling infrastructure R&D and is considered mature and ready for commercialization.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2003, funding for this effort was reduced by $28,090 for SBIR/STTR and transferred to the Science Appropriation.

- **Renewable and Synthetic Fuels Utilization**..... **0** **395** **2,800**

  In FY 2005, evaluate the variance between commercially available biomass-based fuels in terms of molecular make-up, effect on engine performance, and effect on overall fuel when blended with petroleum based fuels. Initiate development of a specification for biomass-based fuels with enough detail to ensure that such fuels, when blended with petroleum-based feedstocks, will not impose any adverse effects on engine performance. (21CT, $2,800). *Participants include: NREL, ORNL, SNL.*

Environmental Impacts **2,282** **1,975** **0**

In FY 2005, no efforts are planned as work in this area is not considered to be within the mission of DOE.

In FY 2003, funding for this effort was reduced by $47,936 for SBIR/STTR and transferred to the Science Appropriation.

Total, Fuels Technology..... **19,164** **16,494** **6,800**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Advanced Petroleum Based Fuels	
In Advanced Petroleum Based Fuels, research into the sensitivity of emission control after treatment to sulfur will be completed. Further development in this area is within the capabilities of industry to complete without government assistance. Additionally, terminate all activities related to fuels for light duty vehicles, focusing instead on heavy-duty vehicles not expected to be operated on hydrogen. Terminate activities associated with the West Virginia University transportable emissions laboratory and activities associated with the ReFuel Laboratory at NREL.....	-6,272
Non-Petroleum Based Fuels and Lubricants	
▪ **Medium Trucks**	
No activity is planned. Work in this area has supported natural gas engine/vehicle systems development and the technology is considered mature and ready for commercialization	-1,284

- **Heavy Trucks**

  No activity is planned. Work in this area has supported natural gas engine/vehicle systems development and the technology is considered mature and ready for commercialization ..... -1,383

- **Fueling Infrastructure**

  No activity is planned. Work in this area has supported natural gas engine/vehicle systems development and the technology is considered mature and ready for commercialization ..... -1,185

- **Renewable and Synthetic Fuels Utilization**

  Initiate evaluation of properties and performance of commercially-available, biomass-based fuels in terms of molecular make-up, effect on engine performance, and effect on overall fuel when blended with petroleum based fuels. Initiate development of a specification for biomass-based fuels with enough detail to ensure that such fuels, when blended with petroleum-based feedstocks, will not impose any adverse effects on engine performance..... +2,405

Total, Non-Petroleum Based Fuels and Lubricants..... -1,447

Environmental Impacts

In Environmental Impacts, terminate all activities because the work is aligned with the mission of the Environmental Protection Agency ..... -1,975

Total Funding Change, Fuels Technology ..... **-9,694**

Technology Introduction

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technology Introduction					
Legislative and Rulemaking (formerly Energy Policy Act Replacement Fuels)					
State & Fuel Provider Fleet	750	746	1,000	+254	+34.0%
Private & Local Fleet	250	199	300	+101	+50.8%
Fuel Petitions	100	105	314	+209	+199.0%
Federal Fleets	500	507	700	+193	+38.1%
Regulatory Support	92	37	200	+163	+440.5%
Total, Legislative and Rulemaking (formerly Energy Policy Act Replacement Fuels)	1,692	1,594	2,514	+920	+57.7%
Testing and Evaluation					
Vehicle Evaluation	1,934	2,358	2,450	+92	+3.9%
Infrastructure Testing	50	98	50	-48	-49.0%
Total, Testing and Evaluation	1,984	2,456	2,500	+44	-1.8%
Advanced Vehicle Competitions	894	889	1,000	+111	+12.5%
Total, Technology Introduction	4,570	4,939	6,014	+1,075	+21.8%

Description

The Technology Introduction subprogram accelerates the adoption and use of alternative fuel and advanced technology vehicles to help meet national energy and environmental goals. This subprogram's efforts logically follow and complement successful research and by industry and government. The primary functions of Technology Introduction include legislative and rulemaking supporting the Energy Policy Act of 1992 (EPAct) alternative fuel and fleet activities; testing and evaluation of advanced technology vehicles; and advanced vehicle competitions. As identified in the National Energy Policy, consumer education and demonstration activities are critical to accelerating the use of advanced energy technologies.

Benefits

The Technology Introduction subprogram contributes to the VT program goal by accelerating the adoption and use of alternative fuels and advanced technology vehicles. These fuels and vehicles will reduce the consumption of petroleum based fuels thus contributing to achieving the program goal.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Legislative and Rulemaking (formerly Energy Policy Act Replacement Fuels)	**1,692**	**1,594**	**2,514**

The Legislative and Rulemaking activity consists of the State and Alternative Fuel Provider Regulatory Program, Fuel Petitions, Private and Local Government Fleet Regulatory Program, Federal Fleet requirements and the normal implementation of other EPAct requirements including reports and rulemaking, the analysis of the impact of other regulatory and pending legislative activities, and the implementation of legislative changes to EPAct as they occur. The fleet programs require selected covered fleets to procure light-duty alternative fuel vehicles annually as well as the Department's compliance with the Federal fleet requirements. The Department also reviews and processes petitions to designate new alternative fuels under EPAct.

- **State & Fuel Provider Fleet** **750** **746** **1,000**

  In FY 2005, encourage State fleets to use more alternative fuel in their light-duty vehicles.
  Participants include: NREL.

- **Private & Local Fleet** **250** **199** **300**

  In FY 2005, initiate EPAct Section 509 Report to Congress on the Secretary's recommendations for requirements and incentives to encourage the purchase and use of replacement fuels and alternative fuel vehicles.
  Participants include: NREL.

- **Fuel Petitions** **100** **105** **314**

  In FY 2005, complete review and evaluation of non-domestically produced Fischer Tropsch diesel. Issue a final determination of alternative fuel designation.
  Participants include: NREL, ANL, ORNL

- **Federal Fleets** **500** **507** **700**

  Added to the legislative and rule-making portion of Technology Introduction. In FY 2004, this effort was part of the Testing and Evaluation activity. In FY 2005, conduct an in-depth analysis of the successes and challenges in agency compliance. Encourage interagency partnerships with EPAct and Executive Order 13149 requirements. Expand the Federal Automotive Statistical Tool for greater analysis capacity.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Participants include: INEEL, NREL, GSA.

- **Regulatory Support** **92** **37** **200**

  In FY 2005, complete analysis and report to Congress on the EPAct replacement fuel goals.
  Participants include: NREL, ANL, ORNL.

Testing and Evaluation **1,984** **2,456** **2,500**

The Testing and Evaluation activity, in partnership with industry, validates the performance and emissions of near market-ready advanced technology vehicles and makes results available to engineers, government agencies, manufacturers, fleets, and consumers. The Department's testing program is recognized nationally and internationally for its objective testing and evaluation programs for alternative fuel vehicles, including electric vehicles.

- **Vehicle Evaluation** **1,934** **2,358** **2,450**

  In FY 2005, complete testing of hybrid electric medium-duty delivery truck. Complete initial evaluation of a light-duty hydrogen fueled internal combustion engine vehicle. Expand baseline performance and accelerated reliability testing of new hybrid electric vehicles. Expand data collection on fuel cell transit buses. Initiate evaluation of an additional heavy-duty truck idle reduction device. Initiate fleet evaluation of light duty fuel cell vehicles.
  Participants include: INEEL, NREL, ANL, FTA, APTA, DOT ORNL, EPA.

- **Infrastructure Testing** **50** **98** **50**

  In FY 2005, complete evaluation and analysis of infrastructure/vehicle/operator interface for high pressure hydrogen refueling.
  Participants include: INEEL, Other Federal Agencies.

Advanced Vehicle Competitions **894** **889** **1,000**

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 FY 2005, we will begin the first year of a three-year new competition, Challenge X, in partnership with General Motors. Selected teams will be challenged to integrate advanced vehicle technologies and appropriate fuels to develop an approach that minimizes use of petroleum fuel. Many students who graduate from these vehicle competitions go on to take jobs in the auto industry where they bring with them an unprecedented appreciation and understanding of advanced automotive technologies. (FreedomCAR, $1,000,000). *Past Participants include: California Polytechnic State University San Luis Obispo, Cornell University, Georgia Institute of Technology, Michigan Technological University, Ohio State University, Pennsylvania State University, Texas Tech University, University of Alberta, University of California-Davis, University of Idaho, University of Maryland, University of Tennessee, Knoxville, University of Wisconsin, Madison, Virginia Tech, West Virginia University.*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Total, Technology Introduction	**4,570**	**4,939**	**6,014**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Legislative and Rulemaking	
▪ **State & Fuel Provider Fleet**	
Assist States in developing compliance plans that increase alternative fuel use	+254
▪ **Private & Local Fleet**	
Initiate the development of EPAct Section 509 Report on recommendations for requirements or incentives for replacement fuels	+101
▪ **Fuel Petitions**	
Publish fuel petition submission guidelines and processes. Initiate fuel testing procedures at NREL	+209
▪ **Federal Fleets**	
Covers the additional cost needed to analyze and report the Federal compliance activities in the FY 2005 milestone year. This includes necessary upgrades to the FAST data collection system and additional training materials.	+193
▪ **Regulatory Support**	
Develop and propose changes to programs based on new technologies	+163
Total, Legislative and Rulemaking	**+920**
Testing and Evaluation	
▪ **Vehicle Evaluation**	
Expand the evaluation of advanced heavy truck idle reduction technologies, which have the potential to save every heavy truck that stops idling between 1,500 and 2,000 gal. of diesel/fuel annually.	+92
▪ **Infrastructure Testing**	
The evaluation of the interface between hydrogen fuel station dispenser, vehicle operator, and hydrogen-fueled internal combustion engine vehicle was successfully completed in FY 2004.	-48
Total, Testing and Evaluation	**+44**

	FY 2005 vs. FY 2004 ($000)
Advanced Vehicle Competitions	
Covers the additional cost for transitioning to a new competition with new schools and new sponsors.	+111
Total Funding Change, Technology Introduction	**+1,075**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support					
Technical/Program Management Support	2,005	2,095	1,903	-192	-9.2%
Total, Technical/Program Management Support	2,005	2,095	1,903	-192	-9.2%

Description

Consistent with other DOE programs under the jurisdiction of the Interior and Related Agencies Appropriations Committees, the Energy Conservation programs provide funding for Technical/Program Management Support. This includes activities such as research and development (R&D) feasibility studies; R&D option development and trade-off analyses; and technical, economic, and market evaluations of research. These activities provide important benefits directly to the VT Program described above and are therefore an integral part of the R&D program.

Benefits

Thorough sound analysis is necessary to support effective and efficient decisions, implementation, and management of the VT program's complex and challenging research program. Effective and efficient management actions will contribute to achieving the program goal by better managing R&D risk and by effective management of the R&D portfolio.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	**2,005**	**2,095**	**1,903**

In FY 2005, preparation of program strategic plan and operating plans; R&D feasibility studies and trade-off analyses; evaluations of the impact of new legislation on R&D programs; analyses of energy issues pertinent to the R&D program; identification of performance methodologies (including GPRA); data collection to assess program and project performance, efficiency, and impacts; and development of performance agreements with management. (FreedomCAR, $865,000; 21CT, $938,000).

Participants include: Sentech, Antares, QSS.

Total, Technical/Program Management Support	**2,005**	**2,095**	**1,903**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technical/Program Management Support	
Reduced need for technology program/management support due to increased efficiency and improved use of technology	- 192
Total Funding Change, Technical/Program Management Support	**-192**

Biennial FreedomCAR Peer Review

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Biennial FreedomCAR Peer Review					
Biennial FreedomCAR Peer Review	0	494	0	-494	-100.0%
Total, Biennial FreedomCAR Peer Review	0	494	0	-494	-100.0%

Description

Benefits

Collaboration with outside experts to gain their perspectives is extremely appropriate and productive in helping to assure that the program's research directions and priorities are properly aligned with the needs of auto manufacturers equipment suppliers, energy companies, other Federal agencies, State agencies, consumers, and other stakeholders. Thus the program mission is supported by this subprogram through the greater assurance that the programs R&D investments are well selected and effectively managed.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
Biennial FreedomCAR Peer Review	**0**	**494**	**0**

Conduct a biennial review of the FreedomCAR Partnership by an independent third party, such as the National Academy of Sciences/National Academy of Engineering, to evaluate progress and program direction. The review will include evaluation of progress toward achieving the Partnership's 2010 technical goals and direction. Based on this evaluation, resource availability, and other factors, the FreedomCAR partners will consider new opportunities, make adjustments to technology specific targets, and set goals as appropriate.

Conducted peer review in FY 2004; therefore no funds are requested in FY 2005. Funds are expected to be requested in FY 2006 for the next review.

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Total, Biennial FreedomCAR Peer Review	**0**	**494**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Biennial FreedomCAR Peer Review	
Conducted biennial peer review in FY 2004; therefore, no funds are requested in FY 2005	-494
Total, Biennial FreedomCAR Peer Review	**-494**

Fuel Cell Technologies

Funding Profile by Subprogram[a]

	FY 2003 Comparable Appropriation	FY 2004 comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs. Base	
					$ Change	% Change
Fuel Cell Technologies						
Transportation Systems	6,160	7,506	7,506	7,600	+94	+1.3%
Distributed Energy Systems	7,268	7,408	7,408	7,500	+92	+1.2%
Stack Component R&D	14,803	25,186	25,186	30,000	+4,814	+19.1%
Fuel Processor R&D	23,489	14,815	14,815	13,858	-957	-6.5%
Technology Validation	1,788	9,877	9,877	18,000	+8,123	+82.2%
Technical/Program Management Support	398	395	395	542	+147	+37.2%
Total, Fuel Cell Technologies	53,906	65,187	65,187	77,500	+12,313	+18.9%

Public Law Authorizations:

P.L. 93-275, "Federal Energy Administration Act" (1974)
P.L. 93-577, "Federal Non-Nuclear Energy Research and Development Act" (1974)
P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-413, "Electric and Hybrid Vehicle Research, Development and Demonstration Act" (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-238, Title III - "Automotive Propulsion Research and Development Act" (1978)
P.L. 96-512, "Methane Transportation Research, Development and Demonstration Act" (1980)
P.L. 100-494, "Alternative Motor Fuels Act" (1988)
P.L. 102-486, "Energy Policy Act" (1992)

Mission

The Fuel Cell Technologies Program is part of the overall integrated Hydrogen, Fuel Cells and Infrastructure Technologies Program (HFCIT) in DOE's Office of Energy Efficiency and Renewable Energy.[c] The mission of the integrated HFCIT Program is to research, develop, and validate fuel cell and hydrogen production, delivery, and storage technologies for transportation and stationary

[a] SBIR/STTR funding in the amount of $1,232,984 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $1,703,783 and $1,595,335 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

[c] The integrated HFCIT program receives funds from Energy Supply (for the Hydrogen Technology Program) and Energy Conservation (for the Fuel Cell Technologies Program) appropriations. This budget description is for the Fuel Cell Technologies portion of the integrated HFCIT Program.

applications. The program aims to have hydrogen from diverse domestic resources used in a clean, safe, reliable, and affordable manner in fuel cell vehicles, central station electric power production and distributed thermal electric and combined heat and power applications.

Benefits

The Fuel Cell Technologies Program is a key component of both the President's Hydrogen Fuel Initiative and the FreedomCAR Partnership, which allow the Nation to aggressively move forward to achieve the vision of a diverse, secure, and emissions-free energy future. To the extent that hydrogen is produced from domestic resources in an environmentally sound manner, the Fuel Cell Technologies Program will provide a significant environmental benefit for the nation. Research undertaken by the Fuel Cell Technologies Program is targeted to reduce the cost of transportation fuel cell systems by a factor of 10 and increase the efficiency while reducing the cost of stationary fuel cell systems. Together, the FreedomCAR Partnership and the Hydrogen Fuel Initiative will facilitate a decision by industry to commercialize hydrogen-powered fuel cell vehicles in the year 2015. Widespread commercialization of hydrogen-powered vehicles will support our national security interests by significantly reducing our reliance on foreign oil.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals, one each for defense, energy, science, and environmental aspects of the mission, plus seven general goals that tie to the strategic goals. The HFCIT program supports the following goals:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The HFCIT program has one program goal which contributes to General Goal 4 in the "goal cascade":

Program Goal 04.01.02.00: Fuel Cell Technologies. The Hydrogen, Fuel Cells and Infrastructure Technologies Program goal is to develop hydrogen production, storage, and delivery technologies to the point that they are cost and performance competitive and are being used by the Nation's transportation, energy, and power industries. As such, the Program will expand and make our clean domestic energy supplies more flexible dramatically reducing or even ending dependence on foreign oil.

Contribution to Program Goal 04.01.02.00 (Fuel Cell Technologies)

The Fuel Cell Technologies Program will contribute to General Goal 4, Energy Security, through its transportation systems/stack components/fuel processor R&D activities by developing transportation fuel cell systems, stack components and fuel processing technology to improve durability and performance and reduce cost to allow rapid commercialization in the light-duty vehicle market. Specifically, transportation fuel cell R&D activities will reduce the production cost of the hydrogen-fueled, 50 kW vehicle fuel cell power system from $275/kW in 2002 to $45/kW in 2010 at

production levels of 500,000 units per year (projected cost).

The program also contributes to General Goal 4, Energy Security through its distributed generation fuel cells/stack components/fuel processor R&D activities by increasing the electrical efficiency and reducing the cost of stationary fuel cell systems operating on natural gas or propane and through its technology validation activities by validating fuel cell performance and durability in real world conditions.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.01.02.00 (Fuel Cell Technology)					
Fuel Cell Technologies/Transportation Systems, Fuel Processor R&D, and Stack Component R&D					
There were no related targets	There were no related targets	$275/kW for a hydrogen-fueled 50kW fuel cell power system.	Achieved $225/kW for a hydrogen-fueled 50kW fuel cell power system.	Achieve $200/kW for a hydrogen-fueled 50 kW fuel cell power system.	DOE-sponsored research will reduce technology cost to $125/kW for a hydrogen-fueled 50kW fuel cell power system.
Fuel Cell Technologies/Distributed Energy Systems, Fuel Processor R&D, and Stack Component R&D					
There were no related targets	There were no related targets	35% efficiency at full power for natural gas or propane fueled 50kW stationary fuel cell system.	Achieved 30 percent efficiency at full power for a natural gas or propane fueled 50-250kW stationary fuel cell system.	Achieve 31 percent efficiency at full power for a natural gas or propane fueled 50-250kW stationary fuel cell system.	Achieve 32 percent efficiency at full power for a natural gas or propane fueled 50-250kW stationary fuel cell system.
Fuel Cell Technologies/Technology Validation					
No activity	No activity	No activity	Plan technology validation activity.	Industry contracts are awarded and initial vehicles delivered that support the 1,000 hour durability target.	Fuel Cell demonstration vehicles achieve 1,000 hours durability.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The Fuel Cell Technologies Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

The Fuel Cell Technologies Program will implement the program through the following means:

- Conduct research, development, and technology validation activities that address stationary, transportation, APU, and portable power applications and include fuel cell stack components, fuel processors, and balance-of-plant components.
- For transportation applications, focus R&D on critical requirements to support an industry decision in 2015 to enter into full scale commercialization, primarily focusing on lowering the high-volume system cost of fuel cells to $30/kW. Other significant criteria for transportation fuel cell commercialization include the need to have fuel cell technologies developed and validated that enable: (1) full performance over 5,000 hours of life; (2) 60 percent efficiency (hydrogen-fueled) at 1/4 rated power; and (3) operation in vehicles with comparable performance, safety, and reliability to the gasoline internal combustion engine.
- For stationary applications, focus R&D on critical requirements to support the industry decision to enter into commercialization as the fuel cell system cost falls below $1,500/kW over the next few years; with large markets being attained in the 2010 time frame when the fuel cell system costs are reduced to $400-800/kW (dependent on application) with 40,000 hours durability and 40 percent electrical efficiency operating on natural gas or propane.
- For distributed energy applications, work towards removing technical barriers to facilitate the near-term introduction of fuel cells in a variety of applications that include energy generation for buildings, uninterruptible power systems, and portable power devices such as consumer electronics.
- Demonstration and validation activities support the introduction of pre-commercial fuel cell vehicles and stationary systems to controlled user-groups such as utilities or military installations. These demonstrations validate technology performance in staged increments while providing the experience needed by both manufacturers and end-users to allow the eventual successful introduction of commercial products.
- Invest in technical program and market analyses and performance assessments in order to direct effective strategic planning.

The Fuel Cell Technologies Program will implement the program through the following strategies:

- Utilize the Multi-year Research, Development and Demonstration Plan, developed by the HFCIT Program. The Plan identifies barriers, technical targets, and schedule for carrying out the program mission. Focus on addressing the high risk, critical technology barriers as described in the Plan.
- Utilize the National Hydrogen Energy Roadmap, released in November 2002 by Energy Secretary Abraham. This document, developed by over 200 technical experts from public and private organizations, lays out research and development pathways, and serves as a guide to public and private investment in hydrogen and fuel cell technologies.
- Coordinate with the FreedomCAR Partnership, which was announced by the Secretary of Energy and senior executives of DaimlerChrysler, Ford, and General Motors in January 2002, and is a key

component of the President's FreedomCAR and Hydrogen Fuel Initiative.

- Coordinate with other DOE programs and with other Federal agencies involved in hydrogen and fuel cell-related research and development. (See list of collaborative activities below)
- Align the program to the goals of the Hydrogen Fuel Initiative. For mobile applications of fuel cells, program strategies are aligned with the FreedomCAR Partnership goals (see FreedomCAR Partnership goals below). The Hydrogen Fuel Initiative, along with the FreedomCAR Partnership, aims to facilitate an industry decision to commercialize hydrogen-powered fuel cell vehicles by the year 2015.
- Perform formal merit reviews, closely coordinated with those supported within the Hydrogen Technology program (under the Energy Supply appropriations), to evaluate projects which develop and demonstrate highly efficient, integrated hydrogen-powered fuel cell systems for stationary and transportation applications. The Merit Review evaluation incorporates the principles of the Administration's R&D investment criteria.
- Conduct cross-cutting analyses and focus on life cycle cost, emissions, and efficiency of transportation and stationary fuel cell systems in the near (2015), mid (2030), and long term (post 2050).

These means and strategies will result in improving energy security by increasing the generation of reliable, affordable, and environmentally sound hydrogen, adding to the diversity and security of the Nation's energy supply --- thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the Fuel Cell Technologies Program's ability to achieve its strategic goal:

- The sustainability of program funding over the long-term which is required for development of these technologies.
- Once a commercialization decision is made by industry in 2015, the price and availability of alternative technologies (such as gasoline hybrid vehicles) and conventional fuels that will compete with hydrogen-fueled vehicles will affect the market outcomes.
- Decisions on the nature and timing of supporting policy instruments to help stimulate end-use markets.
- Public acceptance and concerns regarding the safe use of hydrogen.

In carrying out the program's mission, the Fuel Cell Technologies Program performs the following collaborative activities:

- Collaborating with other DOE offices and Federal agencies, including closely coordinating vehicle related activities with the DOE's FreedomCAR and Vehicles Technologies Program.
- For activities that support transportation applications, cooperating with the U.S. Council for Automotive Research (USCAR) and energy companies. This collaboration, implemented through technical teams, provides a mechanism for developing requirements, industry consensus, and recommendations for program direction. These technical teams are composed of government and industry experts that meet on a periodic basis to review and provide guidance on projects.
- Coordinating on utility-scale fuel cell development, which is the responsibility of the DOE's Office of Fossil Energy (FE), as well as collaborating with the EERE Distributed Energy Program, the EERE Buildings Technologies Program, and the Office of Fossil Energy's Solid State Energy Conversion Alliance (SECA) research effort.

- Developing and publishing a comprehensive planning document, in collaboration with the Department's Offices of Science, Fossil Energy, and Nuclear Energy, Science and Technology (and with input by DOT).

Hydrogen Fuel Initiative (HFI)

(dollars in thousands)

Hydrogen Fuel initiative	FY 2005 Budget Request
EERE	172,825
FE	16,000
NE	9,000
SC	29,183
Total, DOE	227,008
DOT	832
Total, Hydrogen Fuel Initiative	227,840

- Conducting R&D and demonstration activities through competitive, cost-shared cooperative agreements with industry, as well as collaborating with national laboratories and universities.
- Through the Department's newly formed partnership with the energy industry, expand upon FreedomCAR's 2010 technology specific goals initially formed with the U.S. automotive industry partners. These additional technology goals will more specifically address hydrogen technology barriers.

FreedomCAR Partnership Goals

The Office of FreedomCAR and Vehicle Technologies has responsibility for these goals:

- Electric Propulsion Systems with a 15-year life capable of delivering at least 55 kW for 18 seconds and 30 kW continuous at a system cost of $12/kW peak.
- Internal Combustion Engine Powertrain Systems costing $30/kW, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards.
- Electric Drivetrain Energy Storage with 15-year life at 300 Wh with discharge power of 25 kW for 18 seconds and $20/kW.
- Material and Manufacturing Technologies for high volume production vehicles which enable/support the simultaneous attainment of: 50 percent reduction in the weight of vehicle structure and subsystems, affordability, and increased use of recyclable/renewable materials.
- Internal Combustion Engine Powertrain Systems operating on hydrogen with cost target of $45/kW by 2010 and $30/kW in 2015, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards. *(Shared responsibility with HFCIT)*

The Office of Hydrogen, Fuel Cells, and Infrastructure Technologies has responsibility for these goals:

- 60 percent peak energy-efficient, durable direct hydrogen Fuel Cell Power Systems (including hydrogen storage) that achieves a 325 W/kg power density and 220 W/L operating on hydrogen. Cost targets are $45/kW by 2010 and $30/kW by 2015.
- Fuel Cell Systems (including an on-board fuel processor) having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards with a cost target of $45/kW by 2010 and $30/kW by 2015.
- Hydrogen Refueling Systems demonstrated with developed commercial codes and standards and diverse renewable and non-renewable energy sources. Targets: 70 percent energy efficiency well-to-pump; cost of energy from hydrogen equivalent to gasoline at market price, assumed to be $1.50 per gallon (2001 dollars).
- Hydrogen Storage Systems demonstrating an available capacity of 6 weight percent hydrogen, specific energy of 2.0 kWh/kg and energy density of 1.5 kWh/l at a cost of $4/kWh.
- Internal Combustion Engine Powertrain Systems operating on hydrogen with cost target of $45/kW by 2010 and $30/kW in 2015, having a peak brake engine efficiency of 45 percent, and that meet or exceed emissions standards. *(Shared responsibility with HFCIT)*

Validation and Verification

To validate and verify program performance, the Fuel Cell Technologies Program will conduct internal and external reviews and audits. These programmatic activities are subject to continuing review by, for example, the Congress, the General Accounting Office, the Department's Inspector General, the U.S. Environmental Protection Agency, and state environmental agencies. Specific milestones, go/no-go decision points, and technical progress are systematically reviewed through the HFCIT program's merit review process. The table below summarizes validation and verification activities:

Data Sources: Merit Review and Peer Evaluation of R&D and Program Peer Reviews are conducted.

Baselines: The following are the key baselines used in Fuel Cell Technology program:

- transportation systems/ stack component/ fuel processor R&D (2002): $275/kW cost
- distributed energy systems/ stack component/ fuel processor R&D (2002): 29% electrical efficiency.[a, b]
- technology validation (2003, laboratory): 1,000 hours durability of fuel cell vehicle systems.

[a] Efficiency target met for 2002 based on PEM fuel cell systems with combined heat and power (efficiency defined as total energy realized by the fuel cell system, electrical and thermal, divided by the lower heating value of the input fuel). In FY 2003, the efficiency target was redefined to be based on the electrical efficiency, defined as the ratio of dc output energy to the lower heating value of the input fuel.

[b] The change of the stationary fuel cell systems power level from 50kW to a range of 50-250kW reflects an update of technical targets (HFCIT multi-year program plan, draft) to encompass a range of stationary power systems as a better representation of industry plans to develop power plants of various power ratings.

Frequency: GPRA Benefits are estimated annually, Merit Review and Peer Evaluation of R&D projects are conducted annually, and Program Peer Review is conducted biennially.

Data Storage: EE Strategic Management System.

Verification: Evaluation -- Merit reviews and peer evaluations by energy, hydrogen, and fuel cell experts from outside of the U.S. Department of Energy are used to ensure that the directions and priorities of the program are focused on appropriate long term research. The program conducts peer review meetings and supports the development of industry-driven technology roadmaps.[a] These efforts are used to focus the program's investments on activities that are within the Federal Government's role and that address top priority needs.

The National Laboratories receive direct funds for hydrogen and fuel cell technology research and development of a very high risk and basic nature, based on their capabilities and performance. Hydrogen and fuel cell industry experts review each laboratory and industry project at the annual Merit Review and Peer Evaluation meeting. Projects are evaluated based on the following criteria: 1) Relevance to overall DOE objectives and the degree the project supports the President's Hydrogen Fuel Initiative; 2) Approach to performing the research and development; 3) Technical Accomplishments and Progress toward project and DOE goals; 4) Technology Transfer/Collaborations with Industry/Universities/Laboratories; and 5) Approach and relevance of proposed future research. Principles of the Administration R&D investment criteria for research have been incorporated into this evaluation. The review panel also evaluates the strengths and weaknesses of each project, and recommends additions to or deletions from the scope of work. The program organization facilitates supplier-customer relationships to ensure that R&D results from federally sponsored laboratories are transferred to industry suppliers and that industry supplier developments are made available to automakers, energy industry and stationary power producers.

[a] See the following reports. Fuel Cell Report to Congress, Feb. 2003. A National Vision of America's Transition to a Hydrogen Economy, March 2002. National Hydrogen Energy Roadmap, November 2002. FreedomCAR Fuel Cell Technical Roadmap, HFCITP Multi-Year Research, Development and Demonstration Plan (Draft).

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.01.02.00, Fuel Cell Technologies					
Transportation Systems	6,160	7,506	7,600	+94	+1.3%
Distributed Energy Systems	7,268	7,408	7,500	+92	+1.2%
Stack Component R&D	14,803	25,186	30,000	+4,814	+19.1%
Fuel Processor R&D	23,489	14,815	13,858	-957	-6.5%
Technology Validation	1,788	9,877	18,000	+8,123	+82.2%
Technical/Program Management	398	395	542	+147	+37.2%
Total, Program Goal 04.01.02.00, Fuel Cell Technologies	53,906	65,187	77,500	+12,313	+18.9%
Total, General Goal 4 (Fuel Cell Technologies)	53,906	65,187	77,500	+12,313	+18.9%

Expected Program Outcomes

The Fuel Cell Technologies Program pursues its mission through integrated activities designed to improve the energy efficiency, flexibility, and productivity of our energy economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; enhance energy security by increasing the production and diversity of domestic fuel supplies; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the Fuel Cell Technologies Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates for energy savings, energy expenditure savings carbon emission reductions, oil savings, and natural gas savings that result from the realization of the integrated Hydrogen, Fuel Cells and Infrastructure Technologies Program goals are shown in the tables below through 2050, reflecting the increasing availability of commercial fuel cells and hydrogen sources. When hydrogen-powered fuel cell vehicles are introduced in substantial numbers and fuel cells reach the mass consumer market for electronics and other stationary applications, the oil savings and other benefits to the Nation are expected to be significant. Achievement of the program goals could result in mid-term oil savings of 0.4 million barrels per day (MBPD) in 2025 (based on the GPRA05-NEMS model) and in the long term ramp up to savings of 6 MBPD in 2050 (based on preliminary estimates using the GPRA05–MARKAL model).

The full long-term potential for renewable-based hydrogen is not reflected in this FY05 benefits analysis. Further improvements in the analysis for renewable-based hydrogen technology are underway. In addition, these estimates do not include an assessment of the role of policy measures in facilitating the development of the infrastructure necessary to provide hydrogen at refueling stations nationwide, or in

stimulating consumer demand for hydrogen fuel cell vehicles.

FY 2005 GPRA Benefits Estimates for Hydrogen, Fuel Cells and Infrastructure Technologies Program[a]

Mid-term benefits[b]

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	ns	0.1	0.1	0.5
Energy Expenditure Savings (Billion 2000$)	ns	0.3	1	5
Carbon Emission Réductions (MMT)	ns	1	4	12
Oil Savings (MBPD)	ns	ns	0.1	0.4
Natural Gas Savings (Quads)[c]	ns	ns	-0.13	-0.42

Long-term benefits[d]

	2030	2040	2050
Primary Non-Renewable Energy Savings (Quads)	2.8	6.4	9.2
Energy System Cost Savings (Billion 2000$)	16	51	79
Carbon Emission Reductions (MMT)	54	105	138
Oil Savings (MBPD)	2.0	4.3	6.2
Natural Gas Savings (Quads)	-0.56	-0.09	0.40

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget.

[b] Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

[c] Although these results show a small negative impact on natural gas demand in the short and mid-term, an analysis by the Office of Energy Efficiency and Renewable Energy (EERE) of its entire research and deployment portfolio indicates that by 2020 the industrial, buildings, and other portions of this EERE portfolio will be freeing up significant natural gas demand to more than offset the estimated small impacts on natural gas of the HFCIT program during the early phases of the transition to a hydrogen economy. In the long term, the program is targeting more renewable-based hydrogen.

[d] Long-term benefits were estimated utilizing the GPRA05 - MARKAL developed by Brookhaven National Laboratory (BNL). Results can differ among models due to differences in their structure. In particular, the two models estimate economic benefits in different ways, with the MARKAL model reflecting the cost of additional investments required to achieve reductions in energy bills.

Transportation Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Transportation Systems					
Transportation Systems	6,160	7,506	7,600	+94	+1.3%
Total, Transportation Systems	6,160	7,506	7,600	+94	+1.3%

Description

Transportation Systems conducts R&D and analysis activities that address key barriers to fuel cell systems for transportation applications. Key systems level barriers include attainment of extremely low cost and high durability technical targets. Because of the strong level of industry development of complete systems, this activity does not develop complete, integrated systems. The activity supports the development of individual component technology critical to systems integration as well as systems level modeling activities that serve to guide R&D and integration activities, benchmark systems progress, and explore alternate systems configurations on a cost-effective basis. Other activities of Transportation Systems include studies that appraise 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 vehicle Auxiliary Power Units (APU's) for automotive or 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, actuators, heat exchangers and water management devices. The Transportation Systems activity will include competitively selected R&D projects that include significant industry cost share.

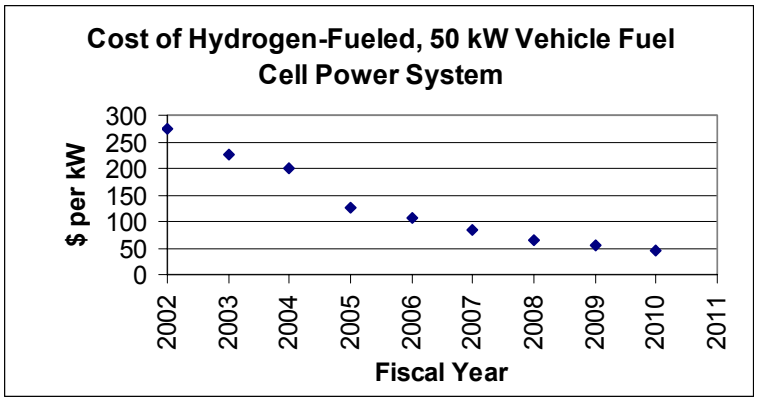
Benefits

Transportation Systems R&D supports the HFCIT Program's mission by improving performance and durability, while lowering the cost of vehicle-specific components, materials, and operating strategies that enable the widespread use of fuel cells in transportation. The improvements will help to accelerate commercialization of fuel cells by making them competitive with conventional technologies so that the potential benefits of energy security and environmental quality can then be realized.

Research activities[a] will reduce the cost of the hydrogen-fueled, 50 kW vehicle fuel cell power systems as indicated below.[b]

[a] Activities include research in transportation systems, stack component R&D and Fuel Processor R&D.

[b] Cost of 50kW vehicle fuel cell power systems estimated for production rate of 500,000 units yearly and includes fuel cell stack, balance of plant, and hydrogen storage.



Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Transportation Systems **6,160** **7,506** **7,600**

In FY 2005, annual performance improvements will be measured and shown to meet year 2005 performance targets of 500 W/L system power density, 500 W/kg system specific power, 60 percent efficiency (direct hydrogen fuel cell system) at 25 percent power, and more than 2,000 hours durability in a direct hydrogen fuel cell system (excluding hydrogen storage). Evaluate system cost and trade-off analyses to include the scenarios for an ambient pressure system and for high temperature operation (120EC). Complete test and evaluation of fuel cell system sensors (CO, H_2, NH_3, H_2S, temperature, pressure, relative humidity, etc.) in full-scale systems. Test and evaluate compact humidifiers/heat exchangers in full scale systems. Evaluate prototype fuel cell systems for auxiliary power in trucks to support the 21st Century Truck initiative. Continue R&D projects to demonstrate feasibility of fuel cells for portable power applications in terms of performance, cost, and durability. Conduct testing and evaluation of a turbocompressor which meets established pressure-ratio turndown requirements in a full-scale fuel cell system, and competing air management technologies. *Participants include: Mechanology, UTC Fuel Cells, TIAX, Honeywell, SAE, NREL, LLNL, PNNL, ANL, LANL.*

Total, Transportation Systems **6,160** **7,506** **7,600**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Transportation Systems	
Increase supports research in Auxiliary Power Units for heavy vehicle applications…	+94
Total Funding Change, Transportation Systems	**+94**

Distributed Energy Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Distributed Energy Systems					
Distributed Energy Systems	7,268	7,408	7,500	+92	+1.2%
Total, Distributed Energy Systems	7,268	7,408	7,500	+92	+1.2%

Description

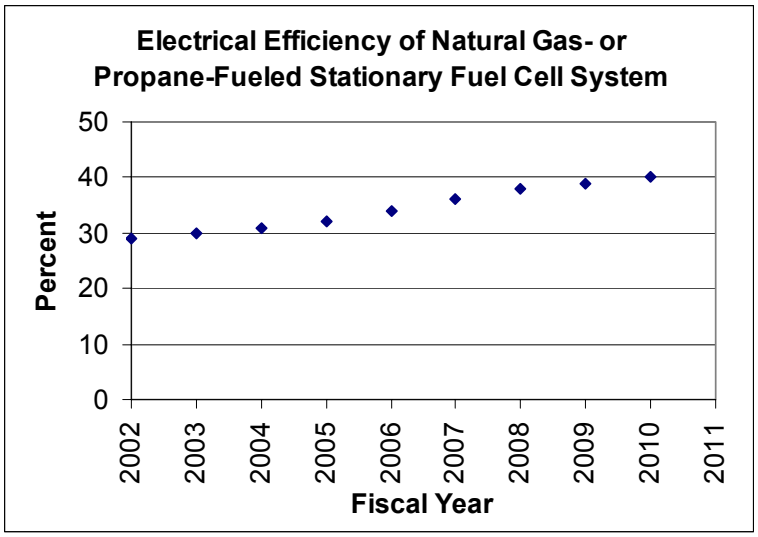
This subprogram activity develops high-efficiency Polymer Electrolyte Membrane (PEM) fuel cell power systems as an alternative power source to grid-based electricity for buildings and other stationary applications. The Distributed Energy Systems activity focuses on overcoming the barriers to stationary 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. This activity also will take advantage of the synergy between transportation systems and distributed energy systems, particularly in the areas of developing improved materials for high temperature membranes, improving fuel cell component durability, and water thermal management. The Distributed Energy Systems activity will include competitively selected R&D projects that include significant industry cost share.

Benefits

Distributed Energy Systems R&D supports the HFCIT Program's mission by focusing on overcoming barriers to stationary fuel cell systems, including improving durability and performance, while lowering cost, to enable the widespread use of fuel cells in distributed energy applications. The improvements will help to accelerate commercialization of fuel cells by achieving an ultimate durability requirement of 40,000 hours, making fuel cells competitive with conventional technologies.

Research activities will improve the electrical efficiency of natural gas or propane fueled stationary fuel cell systems. Specifically, stationary fuel cell R&D activities will increase the electrical efficiency of natural gas or propane fueled 50-250kW stationary fuel cell systems from 29 percent in 2002 to 40 percent in 2010[a] as indicated in the performance indicator graph below.

[a] The change of the stationary fuel cell systems power level from 50kW to a range of 50-250kW reflects an update of technical targets (HFCIT multi-year program plan, draft) to encompass a range of stationary power systems as a better representation of industry plans to develop power plants of various power ratings.



Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Distributed Energy Systems	**7,268**	**7,408**	**7,500**

In FY 2005, conduct development of market-driven integrated stationary fuel cell systems (including fuel cell stack, air and thermal management system, and power grid interface) to make progress toward achieving 2010 efficiency, cost, and durability targets. Perform research and development of materials for high temperature membranes and continue to improve Polymer Electrolyte Membrane (PEM) fuel cell stack durability to ultimately achieve the 40,000 hour durability target by 2010.[a] Develop critical balance of plant components for stationary fuel cells. Conduct stationary fuel cell demonstrations to show potential energy saved, emissions reduced, and economic potential. Continue research and development of water and thermal management systems for stationary fuel cells and combined heat and power applications. Perform economic analysis of stationary fuel cell market. In FY 2003, this activity was reduced by $182,984 for SBIR/STTR and these funds transferred to the Science Appropriation. *Participants include: ANL, IdaTech, UTC Fuel Cells, Plug Power, and Batelle.*

Total, Distributed Energy Systems	**7,268**	**7,408**	**7,500**

[a] 2003 status for stationary fuel cell systems is 6,000 hours durability.

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Distributed Energy Systems	
Increase supports development of high efficiency Polymer Electrolyte Membrane Fuel Cell Power Systems as an alternative to grid-based electricity for buildings.	+92
Total Funding Change, Distributed Energy Systems	**+92**

Stack Component R&D

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Stack Component R&D					
Stack Component R&D	14,803	25,186	30,000	+4,814	+19.1%
Total, Stack Component R&D	14,803	25,186	30,000	+4,814	+19.1%

Description

Collaborative research and development efforts with industry, National Laboratories and academia focus on the most critical technical hurdles for Polymer Electrolyte Membrane (PEM) fuel cell stack components for both stationary and transportation applications. Critical technical hurdles include cost, durability, efficiency and overall performance of components such as the polymer electrolyte membranes, oxygen reduction electrodes, advanced catalysts, bipolar plates, etc. The success of these research and development efforts will assist the industry in making their decision regarding commercialization of fuel cells. In previous years, the program supported efforts to integrate fuel cell systems and develop full-scale fuel cell stacks; however, a programmatic shift came about because industry now has the capability to carry out systems integration efforts on their own. Technical targets established at the component level support the FreedomCAR Partnership technical targets for transportation fuel cells and industrial targets for stationary fuel cells. Component research and development activities for these two applications are synergistic. Transportation fuel cell components depend on the early market success of stationary fuel cells to establish the component manufacturing facilities, while stationary fuel cells benefit from the investment of the automotive manufacturers, which are motivated by large transportation markets.

Benefits

Stack Components R&D supports the HFCIT Program's mission by focusing on overcoming critical technical hurdles at the *component level* to improve overall fuel cell performance and durability, while lowering cost. Addressing these hurdles at the component level supports the industrial effort to integrate the fuel cell system and develop full-scale fuel cell stacks. The research that brings down the inherent cost to produce and operate fuel cells while maintaining performance and durability characteristics comparable to or better than conventional technology will ultimately help get fuel cells into the marketplace so that national energy and environmental benefits can be realized.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Stack Component R&D	**14,803**	**25,186**	**30,000**

In FY 2005, demonstrate 120°C membrane with areal resistance of < 0.1 ohm-cm^2 in membrane electrode assembly (MEA)/single cell to allow high operating voltage of the fuel cell, maximizing system efficiency. Increase efforts to synthesize and characterize polymers and proton-conducting membranes which operate at a temperature of 120°C for transportation applications and ≥150ºC for stationary applications. Develop increased understanding of proton conduction and membrane degradation in high-temperature polymer membrane systems. Fabricate membranes with non-aqueous proton-conducting phases for stationary fuel cell membranes for operation at T>120°C. Investigate membranes capable of functioning at low hydration levels, preventing membrane dry-out under high temperature operation and simplifying the overall system by reducing or eliminating water management issues.

Verify reproducibility, both the physical properties and the performance, of full-size MEAs in high-volume manufacturing processes. Develop improved understanding of the nature of local structure in catalyst layer. Design, synthesize, and evaluate alternative catalyst formulations and structures (to reduce or eliminate precious metal loading) for both CO tolerance and oxygen reduction. Investigate new catalyst systems (such as those with Iron-Nickel-Carbon, Tungsten Carbide, or hydrogenase enzyme catalytic sites) which demonstrate the potential to perform at least as well and cost at least 50% less than those which contain conventional precious metal catalysts. Investigate biomimetic complexes as an alternative to Platinum, and implement advances in quantum chemistry, combinatorial synthesis and in situ characterization to identify promising non-Platinum catalyst systems. Demonstrate catalyst durability of >2000 hours (2005 target for fuel cell stack systems). Investigate and develop alternative bipolar plate materials/coatings that are low-cost, lightweight, corrosion-resistant, and impermeable. Demonstrate low-cost, high performance components to meet FreedomCAR Partnership fuel cell stack system 2005 target of $100/kW and durability target of >2,000 hours while increasing power density. Develop an advanced cost-driven membrane technology that is not fully fluorinated, tolerates a strong oxidizing environment, and operates at conventional temperature and operating conditions. Develop cell component durability diagnostics and accelerated tests to establish and improve MEA stability, and to establish the role of changes to the hydrophilic and hydrophobic nature of components in cell durability. Develop platinum recycling technology applicable to MEA's. Support the Los Alamos Fuel Cell National Resource Center to address technology barriers through R&D and the requisite facilities and instrumentation improvements. *Participants include: UTC Fuel Cells, 3M, DeNora, Superior Micropowders, Englehard, Atofina Chemicals, DuPont, Plug Power, Ion Power, Ballard, U. of South Carolina, LANL, ANL, LBNL, ORNL, BNL.*

Total, Stack Component R&D	**14,803**	**25,186**	**30,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Stack Component R&D	
Increase supports development of advanced membrane technology to increase performance at high temperature, reduce humidification requirements, improve durability and tolerance to feed gas impurities and lower cost for both stationary and transportation applications. Develop increased understanding of proton conduction and membrane degradation in high-temperature polymer membrane systems. Develop program for cost reduction of catalyst-coated membranes using nonprecious metal catalysts and ultra-low platinum built upon non-oxidizing substrates.....	+4,814
Total Funding Change, Stack Component R&D	**+4,814**

Fuel Processor R&D

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Fuel Processor R&D					
Fuel Processor R&D	23,489	14,815	13,858	-957	-6.5%
Total, Fuel Processor R&D	23,489	14,815	13,858	-957	-6.5%

Description

The program is pursuing the development of fuel processors for transportation, stationary, APU, and portable power applications. Fuel processing technology is fuel flexible and capable of reforming fuels such as gasoline, methanol, ethanol, natural gas and propane into hydrogen. Distributed generation fuel cells could be fueled by natural gas, propane, or renewable fuels while auxiliary power units in trucks will likely be fueled by diesel or propane.

Benefits

Fuel Processor R&D supports the HFCIT Program's mission by developing the subsystem that aids the widespread use of fuel cell power technology by making the fuel source flexible. Because an extensive hydrogen fueling infrastructure does not currently exist, fuel cells could operate on more conventional fuels such as gasoline, natural gas, and diesel and reap some of the environmental and efficiency advantages until hydrogen becomes more readily available. Even in a future hydrogen economy, the option of using a diversity of fuels to produce energy will be a significant contributor to energy independence.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
Fuel Processor R&D **23,489**	**14,815**	**13,858**

In FY 2005, increase the emphasis on developing compact, efficient fuel processing technology for natural gas, propane or renewably fueled stationary fuel cells. Develop diesel or propane fuel processing technology for Auxiliary Power Unit (APU) applications. Redirect on-board fuel processing activities based on the results of the FY 2004 go/no-go evaluation and, if applicable, focus transportation on-board fuel processing efforts on systems that meet 2005 technical targets of 78 percent efficiency, 700 W/L, 700 W/kg, less than 1 minute start-up, and less than Tier 2 Bin 5 emissions. For all applications, develop advanced water-gas shift catalysts and reactor design that

(dollars in thousands)

FY 2003	FY 2004	FY 2005

meet requirements for space velocity. Develop fuel processor catalysts (reforming, preferential oxidation, desulfurization, etc.) having higher activities, greater durability, lower cost, and that enable lower reactor operating temperatures. Develop efficient, compact heat exchangers for fuel processor systems. Verify and improve fuel processor model and system analysis. Use data collected from the Technology Validation projects to feed back into technology development. In FY 2003, this activity was reduced by $1,050,000 for SBIR/STTR and these funds were transferred to the Science Appropriation. *Participants include: Nuvera, University of Michigan, Catalytica, Texaco Energy Systems, ANL, LANL, and PNNL.*

Total, Fuel Processor R&D	**23,489**	**14,815**	**13,858**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Fuel Processor R&D	
The net reduction reflects the decrease in mortgages for on-board fuel processing R&D and an increase in stationary reforming, auxiliary power reforming and fundamental fuel processing R&D based on the recommendations of the on-board fuel processing go/no-go decision	-957
Total Funding Change, Fuel Processor R&D	**-957**

Technology Validation

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technology Validation					
Technology Validation.....	1,788	9,877	18,000	+8,123	+82.2%
Total, Technology Validation	1,788	9,877	18,000	+8,123	+82.2%

Description

The Technology Validation activity of the Fuel Cell program will be implemented in close coordination with the Hydrogen Infrastructure Validation activity (funded through the Energy Supply appropriation). These two activities together make up the Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project. This project is a 50/50 cost shared effort between the government and industry and will include automobile manufacturers, energy companies, suppliers, universities, and State governments. The validation effort will be an important opportunity to validate component R&D in a systems context under real-world operating conditions, and for industry to gain experience in the safety, maintenance and fueling of hydrogen fueled vehicles. By operating these vehicles in a controlled manner, all participating parties will be able to quantify the performance and durability, document any problem areas, and provide valuable information to researchers to help refine and direct future R&D activities related to fuel cell vehicles.

Benefits

In order for the automotive, utility, and fuel industries to make commercialization decisions by 2015, integrated vehicle and infrastructure systems need to be validated and individual component targets need to be met under real-world operating conditions. This activity supports HFCIT's mission by providing critical statistical data that fuel cell vehicles can meet efficiency and durability targets, storage systems can efficiently meet 300+ mile range requirements and fuel costs are less than for existing gasoline vehicles. Technology Validation also provides information so that standards can be written and vehicle and infrastructure safety can be demonstrated.

Research activities will improve the durability of fuel cell vehicle systems operated under real-world conditions. Specifically, the program validates the performance and vehicle interfaces of hydrogen fuel cell vehicles to demonstrate an increase in durability from approximately 1,000 hours in 2003 (laboratory) to 2,000 hours by 2008 in a vehicle fleet (2000 hours is equal to approximately 50,000 vehicle miles).

	2004	2005	2006	2007	2008
Durability	Initiate	1,000 hours			2,000 hours

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technology Validation	**1,788**	**9,877**	**18,000**

In FY 2005, continue the Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project to collect data on first generation vehicles. The validation project is collecting data to validate performance, reliability, durability, maintenance requirements, environmental benefits and to develop a better understanding of vehicle and infrastructure interface issues of hydrogen fueled vehicles. By 2008, this activity will demonstrate the ability of hydrogen fuel cell vehicles to operate for 2,000 hours under real-world conditions. Data collected will be provided to a systems analysis group that will initiate a modeling effort to determine the composite system efficiency of state-of-the-art and future fuel cell vehicles. For hydrogen-fueled vehicles, continue the evaluation of advanced storage systems, advanced hydrogen vehicle development, and advanced fueling interface and safety devices by collecting appropriate data in the Validation Project. Participation in the California Fuel Cell Partnership will be continued. Field evaluations of distributed fuel cell systems under real world conditions to validate system durability and performance will continue in coordination with the hydrogen infrastructure validation activity. *Participants include: Automobile manufacturers, utilities, energy providers, suppliers, universities, States, NREL, ANL, California Fuel Cell Partnership members and others.*

Total, Technology Validation	**1,788**	**9,877**	**18,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technology Validation	
Increase supports demonstrations to validate performance, durability, and reliability of fuel cell systems and to aid in managing risk in the early commercialization period through data gathering and analysis of vehicle performance and subsequent refocusing of R&D efforts. In combination with the infrastructure validation effort being carried out under the Hydrogen Technologies Program (Energy Supply appropriation), will also characterize an understanding of vehicle and infrastructure interface issues	+8,123
Total Funding Change, Technology Validation	**+8,123**

Technical/Program Management

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management					
Technical/Program Management.....	398	395	542	+147	+37.2%
Total, Technical/Program Management	398	395	542	+147	+37.2%

Description

Technical/Program Management activities include preparation of program strategic and operating plans; evaluation of the impact of new legislation on R&D programs; identification and application of performance methodologies (including GPRA); and data collection to assess program and project performance, efficiency and impacts on accomplishing the mission.

Benefits

Technical/Program Management activities support the HFCIT Program's mission by preparing program plans, tracking program progress, and evaluating impacts of legislation on the program. Program planning, performance monitoring, decision support, program control implementation, and change control, are all important aspects of this activity to support and optimize complex pathway decisions needed for the overall program to achieve its goals.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management	**398**	**395**	**542**

In FY 2005, representative activities will include preparation of program, strategic plans, and operating plans; evaluation of the impact of new legislation on R&D programs; identification of performance methodologies (including GPRA); data collection to assess program and project performance, efficiency and impacts; and development of performance agreements with management.

Total, Technical/Program Management	**398**	**395**	**542**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technical/Program Management	
Increase reflects a consolidation into this activity of Information Technology investments	+147
Total Funding Change, Technical/Program Management	**+147**

Weatherization and Intergovernmental Activities

Funding Profile by Subprogram[a]

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Weatherization and Intergovernmental Activities						
Weatherization Assistance Grants...	223,537	227,166	227,166	291,200	+64,034	+28.2%
State Energy Program Grants	44,708	43,952	43,952	40,798	-3,154	-7.2%
State Energy Activities.....	5,265	2,324	2,324	2,353	+29	+1.2%
Gateway Deployment.....	40,645	35,170	35,170	29,716	-5,454	-15.5%
Total, Weatherization and Intergovernmental Activities.....	314,155	308,612	308,612	364,067	+55,455	+18.0%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-618, "Energy Tax Act" (1978)
P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)
P.L. 95-620, "Power plant and Industrial Fuel Use Act" (1978)
P.L. 96-294, "Energy Security Act" (1980)
P.L. 100-12, "National Appliance Energy Conservation Act" (1987)
P.L. 100-615, "Federal Energy Management Improvement Act" (1988)
P.L. 102-486, "Energy Policy Act" (1992)

Mission

The mission of the Weatherization and Intergovernmental Activities Program (WIP) is to develop, promote, and accelerate the adoption of energy efficiency, renewable energy, and oil displacement technologies and practices by a wide range of customers, including State and local governments,

[a] SBIR/STTR funding in the amount of $284,799 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $0 and $0 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

weatherization agencies, communities, companies, fleet managers, building code officials, technology developers, Native American tribal governments, and international agencies. WIP implements the President's National Energy Policy (NEP) recommendations for rapid deployment of clean energy technologies and energy efficient products into the marketplace and addresses the Presidential commitment to increase funding for the Weatherization Assistance Program by $1.4 billion over ten years.

Benefits

The Office of Weatherization and Intergovernmental Activities Program contributes directly to DOE's Energy Strategic Goal 4 by addressing the President's National Energy Policy call for reducing demand for fuels and peak loads on constrained electricity system and modernizing conservation technologies and practices. The Weatherization Assistance Grants provide affordable energy for low-income residents. The State Energy Program Grants, along with State Energy Activities, assist states in developing emergency energy plans and to foster clean, reliable, and diverse energy supplies. Gateway Deployment provides information and technical and financial assistance to improve efficiency in building, transportation, and industrial market sectors, reducing demand for fuels and reducing the strain on our electricity grid by reducing peak demand for electricity. The organization of activities within this program are established to address implementation obstacles by providing the American public and international entities with an integrated deployment approach to help remove technical, financial, and availability hurdles. The combination of these activities under one program provides a cohesive process for delivery and management by lower-level subprogram elements that focus on energy technology applications for buildings, transportation, and industrial markets.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Weatherization and Intergovernmental Activities program supports the following goals:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Weatherization and Intergovernmental Activities program has three program goals which contribute to General Goal 4 in the "goal cascade":

Program Goal 04.09.00.00: (Weatherization). The goal of the Weatherization Assistance Program is to increase the energy efficiency of dwellings occupied by low-income Americans, thereby reducing their energy costs, while safeguarding their health and safety. DOE works directly with States and local governments, which contract with local governmental or non-profit agencies to deliver weatherization services.

Program Goal 04.10.00.00: (State Energy Program Grants). The State Energy Program Grants goal is to strengthen and support the capabilities of States to promote energy efficiency and to adopt renewable energy technologies, helping the nation achieve a stronger economy, a cleaner environment and greater energy security.

Program Goal 04.11.00.00: (Intergovernmental Activities). The goal of Intergovernmental Activities is to fund activities that facilitate the movement of energy efficient and renewable energy products into the market place and the integrated deployment of efficiency and renewable resources to communities and customers.

Contribution to Program Goal 04.09.00.00 (Weatherization)

The Weatherization and Intergovernmental Activities Program contributes to General Goal 4 by accelerating the adoption of clean, efficient and domestic energy technologies through efficient intergovernmental demonstration and delivery of cost-effective energy technologies.

Contribution to Program Goal 04.10.00.00 (State Energy Program Grants)

The State Energy Program Grants contribute to this goal by supporting the capabilities of States to implements activities that promote energy efficiency and adopt renewable energy technologies. The State Energy program (SEP) grants, among other activities, fund the development and maintenance of energy emergency planning at the State and local levels, a critical security benefit. The State Energy Program has recently taken steps to better quantify the energy benefits of the program activities including savings and emissions reductions.

Contribution to Program Goal 04.11.00.00 (Intergovernmental Activities)

Intergovernmental Activities contribute to this goal by accelerating the adoption of clean, efficient, and domestic energy technologies through addressing implementation obstacles. This will provide the American public and international entities with an integrated deployment approach to help remove technical, financial, and availability hurdles, thus helping to assure energy reliability and strengthen America's competitive position and national energy security.

Annual Performance Targets and Results

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.09.00.00: (Weatherization)					
Weatherization Assistance Grants					
Weatherized 74,316 homes, with DOE funds.	Weatherized 77,697 homes, with DOE funds.	Weatherized 105,000 homes, with DOE funds.	Weatherized 93,750 homes, with DOE funds.	Weatherize 94,450 homes, with DOE funds.	Weatherize 104,230 homes, with DOE funds, and support the weatherization of approximately 100,000 additional homes with leveraged funds.
Cumulative total of 2.4 million homes weatherized with DOE funds.	Cumulative total of 2.5 million homes weatherized with DOE funds.	Cumulative total of 2.6 million homes weatherized with DOE funds.	Cumulative total of 2.7 million homes weatherized with DOE funds.	Cumulative total of 2.8 million homes will be weatherized with DOE funds.	
Cumulative total of 4.8 million homes weatherized with DOE and leveraged funds.	Cumulative total of 5.0 million homes weatherized with DOE and leveraged funds.	Cumulative total of 5.1 million homes weatherized with DOE and leveraged funds.	Cumulative total of 5.3 million homes weatherized with DOE and leveraged funds.	Cumulative total of 5.4 million homes will be weatherized with DOE and leveraged funds.	
Program Goal 04.10.00.00: (State Energy Program Grants)					
State Energy Program Grants					
Achieved an annual energy cost savings of 39,195,000 source Btu's and $242,205,000 in annual energy cost savings.	Achieved an annual energy cost savings of 44,460,000 source Btu's and $274,740,000 in annual energy cost savings.	Achieved an annual energy cost savings of 52,065,000 source Btu's and $321,735,000 in annual energy cost savings.	Achieved an annual energy savings of 53,308,360 source Btu's and $323,238,840 in annual energy cost savings for each $1 of funding by awarding $44,708,000 in grants to States and Territories for use in building, transportation, industrial energy efficiency and renewable energy projects and emerging energy planning.	Achieve an annual energy savings of 52,406,930 source Btu's and $317,772,960 in annual energy cost savings by awarding $43,952,000 in grants to States and Territories.	Achieve an annual energy savings of 10,199,500 source Btus and $64,460,840 in annual energy cost savings with DOE funds. Achieve an annual energy savings of 36,514,210 source Btus and $230,769,807 in annual energy cost savings with leveraged funds.
Program Goal 04.10.00.00: (State Energy Program Grants)					
State Energy Activities					
N/A	N/A	Awarded cooperative agreements with state organizations under a competitive solicitation to accelerate the adoption of new energy-efficient technologies. These projects conducted applied research and field test projects through an integrated buildings approach in a range of technology areas, such as daylighting, indoor air quality, and thermal distribution. The results of these efforts were communicated to researchers,	Closeout Cooperative Agreement with States for industrial research and development.	No activities.	No activities.

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		engineers, facility managers, and others to promote continued technology improvement, and commercial application.			
Program Goal 04.11.00.00: (Intergovernmental Activities)					
Gateway Deployment					
N/A	Established 40 new Rebuild America community partnerships and assisted these communities to retrofit 80 million square feet of floor space in K-12 schools, colleges, public housing, state and local governments.	Established 40 new Rebuild America community partnerships and assisted these communities to retrofit 80 million square feet of floor space in K-12 school, colleges, public housing, and State and local governments.	Assisted over 450 new and existing *Rebuild America* community partnerships to upgrade 80 million square feet of floor space in K-12 schools, college, public housing, and State/local governments.	Assist over 500 new and existing *Rebuild America* community partnerships to upgrade 70 million square feet of floor space in K-12 schools, colleges, public housing, and State/local governments, reducing the average energy used in these buildings by 18%.	Help *Rebuild America* community partnerships to upgrade 60 million square feet of floor space in K-12 schools, colleges, public housing, and State/local governments, reducing the average energy used in these buildings by 18%.
Gateway Deployment/Energy Efficiency Information and Outreach					
N/A	Received 3,196,400 hits on BTS internet pages.	Received 3,500,000 hits on BTS internet pages.	3,800,000 hits on WIG internet pages.		
	Assisted 53,300 consumers through EERE information clearinghouse	Assisted 58,000 consumers through EERE information clearinghouse	Assist 64,000 consumers through EERE information clearinghouse.		
	Distributed 107,400 direct mail and newsletter pieces.	Distributed 118,000 direct mail and newsletter pieces.	Distribute 120,000 direct mail and newsletter pieces.		
Gateway Deployment/Building Codes Training and Assistance					
Provided technical assistance to States resulting in 9 States adopting upgraded 1999 and 1998 model commercial or residential building energy codes.	Provided technical assistance to States resulting in 9 States adopting upgraded 1999 and 2000 model commercial or residential building energy codes.	Provided technical assistance to States resulting in 4 States adopting upgraded 1999 and 2000 model commercial or residential building energy codes.	Provided technical assistances to States which resulted in 4 States adopting upgraded 2001 and 2003 model commercial or residential building energy codes.	Provide technical assistance to States resulting in 4 States adopting upgraded 2001 and 2003 model commercial or residential building energy codes.	Provide technical assistance to States resulting in 4 States adopting upgraded 2001 and 2003 model commercial or residential building energy codes.
Trained 4,000 architects, engineers, builders and code officials to implement the above codes.	Trained 4,000 architects, engineers, builders and code officials to implement the 1999 IECC and the above codes.	Trained 2,000 architects, engineers, builders and code officials to implement the above codes.	Trained 2,000 architects, engineers, builders and code officials to implement the above codes and upgraded the 2004 model commercial code.	Train 2,000 architects, engineers, builders and code officials to implement the above codes and upgraded 2004 model commercial code.	
Gateway Deployment/Clean Cities					
N/A	Support the annual acquisition on 12,000 alternative fuel vehicles in the Federal fleet.	Achieve 151,000 alternative fuel vehicles in operation in Clean Cities.	180,000 alternative fuel vehicles (AFV's) in operation in Clean Cities.	Clean Cities will conduct 7 major workshops, award $6 million in special project funding, and report a total of 180,000 number of alternative fuel vehicles in operation in clean cities. Achieving these outcomes will result in an estimated displacement of 153 million gallons of petroleum based fuels.	Clean Cities will conduct 7 major workshops, award $3.5 million in special project funding, and report a total of 198,000 number of alternative fuel vehicles in operation in clean cities. Achieving these outcomes will result in an estimated displacement of 168 million gallons of petroleum based fuels.
			40 coalitions are self-sustaining.		

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Gateway Deployment/Energy Star					
Recruited five utility partners to promote ENERGY STAR products; an additional 500 retail stores to promote Energy Star products; and 40 window partners to promote ENERGY STAR Window.	Recruited 400 new ENERGY STAR partners, bringing the total number of stores marketing ENERGY STAR appliances up to 6,500.	Recruited 500 additional retail stores, five addition manufacturers bringing the total number of stores marketing ENERGY STAR appliances to 7,000.	Recruited 500 additional retail stores, 5 additional utilities and 10 additional manufacturers. Complete draft domestic hot water heaters specification. Commenced coordination with Weatherization activities.	Recruit 500 additional retail stores, 5 additional utilities and 10 additional manufacturers. Add domestic hot water heaters to the program. Begin work on a Commercial Window Specification. Expand room air-conditioner program to include heating cycle. Continue outreach to non-English speaking communities and Weatherization activities.	Recruit 500 additional retail stores, 5 additional utilities and 10 additional manufacturers. Complete draft Commercial Window specification. Begin update of Residential Window specification. Expand coordination with all gateway activities.
Gateway Deployment/NICE[3]					
Provided funding to 8 State/industry partnerships for the initial demonstration of energy efficiency technologies, which facilitate their use in other industrial facilities	Provided funding to 10 State/industry partnerships for the initial demonstration of energy efficiency technologies, which facilitate their use in other industrial facilities	Provided funding to 8 State/industry partnerships for the initial demonstration of energy efficiency technologies, which facilitate their use in other industrial facilities	Provide incremental funding to 8 State/industry partnerships for the initial demonstration of energy efficiency technologies, which facilitate their use in other industrial facilities.	Continue program closeout initiated in FY 2003.	
			Demonstrate a particle shearing device in the forest products industry that will save 1.71 million KWh annually by 2010	No Activity.	
			Initiate the testing of a lost foam casting process that will save 2.3 trillion Btu by 2010.	No Activity.	
Gateway Deployment/Inventions and Innovation					
Provided leveraged funding to 27 inventors and small businesses to develop their meritorious energy efficiency technologies.	Provided leveraged funding to 40 inventors and small businesses to develop their meritorious energy efficiency technologies inventors and small businesses.	Provided leveraged funding to 18 inventors and small businesses to develop their meritorious energy efficiency technologies inventors and small businesses.	Provided incremental funding to 20 inventors and small businesses to develop their meritorious energy efficiency technologies.		
			Demonstrated an efficient and environmentally benign technology for papermaking to potentially reduce electrical energy for papermaking by up to 30 percent and also improve paper quality.		
			Demonstrated an industrial fuel cell micro-generator that will save 2.1 trillion Btu by 2010.		
Gateway Deployment/International Market Development					
N/A	N/A	Two cities provided technical	Technical assistance provided to	No activity.	

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		assistance to facilitate their engagement in sustainable energy planning.	2 additional cities to facilitate their engagement in sustainable energy planning.		
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The Weatherization and Intergovernmental Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

The Weatherization and Intergovernmental Program uses several means and program, policy, management and market based strategic approaches to achieve its program goals. Collaboration with States, agencies, and a variety of customers is integral to the investments, means and strategies planned.

WIP will implement the program through the following means:

- Weatherization Assistance Program Grants will reduce the energy costs of low-income households by providing cost-effective energy efficiency improvements while ensuring the health and safety of the people served. Priority is given to the elderly, persons with disabilities, families with children, and households that spend a disproportionate amount of their income on energy bills (utility bills make up 15 to 20 percent of household expenses for low income families, compared to five percent or less for all other Americans).
- State Energy Program Grants will provide financial assistance through formula grants to States, enabling State governments to target their own high priority energy needs and expand clean energy choices for their citizens and businesses.
- Gateway Deployment will achieve energy efficiency gains in building, transportation, and industrial market sectors by providing technical information and financial support to States, local governments, companies, fleet managers, building code officials, technology developers, Native American tribal governments, and international agencies.

WIP will implement the program through the following strategies:

- The Weatherization Assistance Program will utilize a cost-effective combination of energy-saving measures selected for each home based on a comprehensive audit. This activity will provide State formula grants to weatherize approximately 118,900 low-income homes[a], saving $1.30 in energy costs for every dollar invested over the life of the measures (based on current EIA energy price data). Ninety percent of the total WAP funding will be allocated to the States as operating funds for this purpose, i.e. for labor, materials, equipment, administrative systems, etc.
- SEP will assist State energy offices with energy planning, which includes allowing States to tailor energy efficiency programs to local needs and to leverage non-Federal resources to supplement Federal assistance. Forty-seven State energy offices have been able to leverage their Federal formula grant funding, in program year 2003 at the rate of $4 in non-Federal funding for each Federal dollar spent and, for some activities, as much as $13 to $14 in non-Federal funding for each Federal dollar. The activity includes a component that engages States in helping achieve Energy Efficiency and Renewable Energy technology program goals through approximately 180 competitive grants using program-directed funds. Provide technical assistance to State partners in areas such as utility restructuring, newly developed energy efficiency technologies, and urban/regional planning for sustainability.

[a] The Weatherization Assistance Program (WAP) operates on a reporting cycle that does not correspond with the fiscal year cycle. Homes weatherized results/target is based on States' program years not the Federal fiscal year. Actual number of homes completed in FY 2005 will be 104,230.

- Gateway Deployment will utilize an integrated deployment approach to provide technical, financial, and information to customers through efficient intergovernmental demonstration and delivery of cost-effective energy technologies. This includes forming partnerships with municipal governments, fleet managers, and companies as well as working closely with State energy offices, and regional offices to deploy EERE technologies. Rebuild America accelerates energy efficient improvements in existing buildings through community-level partnerships and focuses on K-12 schools, colleges and universities, State and local governments, public and multi-family housing, and commercial buildings. Clean Cities supports public-private partnerships that deploy alternative fuel vehicles and build supporting infrastructure. Clean Cities works with local businesses and governments to guide them through the process, including goal-setting, coalition building, and securing commitments. Inventions and Innovations provides grants to inventors for energy saving technologies. Codes and Advanced Building Practices develops core resource materials and provides financial and technical assistance to States to upgrade and implement their minimum building energy codes. Energy Star was introduced by the Environmental Protection Agency in 1992 as a voluntary labeling program designed to identify and promote energy efficient products, with the goal of reducing carbon dioxide emissions. Through its partnership with more than 7,000 private and public sector organizations, Energy Star delivers the technical information and tools that organizations and consumers need to choose energy-efficient solutions and best management practices.

These means and strategies will result in significant cost savings and a significant reduction in the consumption of gasoline, electricity, diesel fuels and natural gas and increase the substitution of clean fuels ad power – cost effectively reducing America's demand for energy, lowering carbon emissions, and decreasing energy expenditures --- thus putting the taxpayers' dollars to more productive use.

The following external factors could affect WIP's ability to achieve its strategic goal:

- partner cost share
- partner participation rates
- fuel price volatility
- local codes/standards

In carrying out the program's mission, the WIP program collaborates with several groups on its key activities including:

- The Weatherization Assistance Program works with a network of approximately 970 local weatherization agencies. WAP leverages funds provided through the Health and Human Services Low Income Home Energy Assistance Program (LIHEAP).
- SEP works closely with all 50 States, DC and territories.
- Within Gateway Deployment Rebuild America develops partnerships with local governments. Clean Cities works with fleet managers, local businesses and governments. Building Codes Training and Assistance works with national, regional, and State building code officials and stakeholders to help building owners, builders and the design community understand the building science, benefits, and techniques for going significantly beyond code with added value strategies. Energy Star entered a partnership with the Environmental Protection Agency in 1996 and works with more than 4000 retailers to label Energy Star qualified appliances and energy efficient products.

Validation and Verification

To validate and verify program performance, the Weatherization and Intergovernmental Activities Program will conduct internal and external reviews and audits. These programmatic activities are subject to continuing review by, for example, the Congress, the General Accounting Office, the Department's Inspector General, the U.S. Environmental Protection Agency, and state environmental agencies. The table below summarizes validation and verification activities.

Data Sources:	EIA Annual Energy Review (AER); Commercial Building Energy Consumption Survey (CBECS); Residential Energy Consumption Survey (RECS); and Annual Energy Outlook (AEO). U.S. DOC Current Industrial Reports (CIR). Various trade publications. Information collected directly from WIP performers or partners.
Baselines:	Energy savings are based on market penetration of technologies after the year 2000. Savings are relative to what energy consumption would have been in the absence of this additional market penetration. State Energy Program baseline assumes annual cost savings of 0.25 million source BTUs and annual cost savings of $1.58 for every dollar of funding. Each dollar in SEP Federal funding leverages $3.58. Estimates do not include benefits from public benefit funds.[a]
Frequency:	Complete revalidation of assumptions and results can only take place every 3 to 4 years, due to the reporting cycle of two critical publications; CBECS and RECS; however, updates of most of the baseline forecast and WIP program outputs will be undertaken annually.
Data Storage:	EIA and DOC data sources are publicly available. Trade publications are available on a subscription basis. WIP program output information is contained in various reports and memoranda.
Verification:	Calculations are based on assumptions of future market status, equipment or technology performance, and market penetration rates. These assumptions can be verified against actual performance through technical reports, market surveys and product shipments.

Program Assessment Rating Tool (PART)

Weatherization . The Weatherization Assistance Program (WAP) is working to address recommendations raised in the OMB FY 2004 Program Assessment Rating Tool (PART). WAP has adopted an efficiency performance metric of the increased benefit-cost ratio of energy efficiency improvements. The Program conducts periodic meta-evaluations of national program performance based on State-level program evaluations and generates national benefit-cost ratios based on the meta-evaluations results. WAP is undertaking the preliminary work needed for conducting another comprehensive national evaluation of the program anticipated for FY 2006 authorization and appropriation. In the interim, the program works with Oak Ridge National Laboratory to ensure the validity and application of individual evaluations results.

The FY 2005 PART recognized that the program has a very clear purpose, strong planning and management. The PART also found that the program coordinates effectively with other related government programs in its efforts to meet interrelated Departmental goals and still achieve its goals of a favorable benefit-cost ratio and other performance goals. While the PART recognized the program has met its planned targets for the number of homes weatherized, PART assessment of the program's recent Inspector General audit resulted in lower program accountability scoring, though it acknowledged program management actions are underway to address the findings.

[a] Estimating Energy and Cost Savings and Emissions Reductions for the State Energy Program Based on Enumeration Indicators Data ORNL/CON-487 January 2003.

The net result was that the Weatherization program maintained its overall score of 82 and its rating of Moderately Effective.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.09.00.00, Weatherization	223,537	227,166	291,200	+64,034	+28.2%
Program Goal 04.10.00.00, State Energy Programs	49,973	46,276	43,151	-3,125	-6.8%
Program Goal 04.11.02.00, Intergovernmental Activities	40,645	35,170	29,716	-5,454	-15.5%
Total, General Goal 4 (Weatherization and Intergovernmental Activities)	314,155	308,612	364,067	+55,455	+18.0%

Expected Program Outcomes

The Weatherization and Intergovernmental Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; enhance energy security by increasing the production and diversity of domestic fuel supplies; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the programs goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, oil savings, natural gas savings, and displaced need for electricity capacity additions that result from the realization of the Intergovernmental Program goals are shown in the table below through 2025. These results do not include benefits for the tribal and international intergovernmental activities, nor do they reflect the potential for this program to change long term consumer efficiency and renewable buying patterns.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html Final documentation estimated to be completed and posted by March 15, 2004.

GPRA Benefits Estimates for the Weatherization and Intergovernmental Activities Program[a]

Mid-Term Benefits

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	0.4	0.7	0.9	1.1
Energy Expenditure Savings (Billion 2001$)	5	8	11	17
Carbon Emission Reductions (MMTCE)	8	13	19	24
Oil Savings (MBPD)	0.0	0.0	0.1	0.1
Natural Gas Savings (Quads)	0.19	0.29	0.29	0.23
Total Displaced Need for New Electric Capacity (GW)	6	11	11	13

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget. Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

Weatherization Assistance Grants

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Weatherization Assistance Grants					
Weatherization Assistance	220,184	223,759	286,832	+63,073	+28.2%
Training and Technical Assistance	3,353	3,407	4,368	+961	+28.2%
Total, Weatherization Assistance Grants	223,537	227,166	291,200	+64,034	+28.2%

Description

The Department of Energy administers Weatherization Assistance Grants by providing technical assistance and formula grants to State and local weatherization agencies throughout the United States. This support improves the energy savings per home and helps States spend non-Federal funding effectively through uniform technical assistance. A network of approximately 970 local agencies provide trained crews to perform weatherization services for eligible low-income households in single-family homes, multifamily dwellings, and mobile homes. Of the homes weatherized annually, 49% 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 (utility bills make up 15 to 20 percent of household expenses for low income families, compared to five percent or less for all other Americans). 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 and a combination of those energy-saving measures are installed.

Benefits

Weatherization Assistance Grants contributes to the WIP program goal by reducing the energy cost burden to low-income families who pay a disproportionate amount of household income on energy bills. Since 1976, the Weatherization Assistance Subprogram has helped five million American families reduce their energy bills and increase the comfort and safety of their homes resulting in average annual cost savings of $219 per household.[a] Weatherization makes homes more energy efficient, which reduces energy bills, thus improving the financial self-sufficiency for many low-income families. Weatherization also provides many non-energy benefits to recipient households and their communities for example; it helps stabilize the housing stock in low-income neighborhoods and supports approximately 8,000 technical jobs in local home energy businesses. In addition to the DOE funds, the Department of Health and Human Services (HHS) provides funding for Weatherization through its Low-Income Home Energy Assistance Program.

[a] Metaevaluation of National Weatherization Assistance Program Based on State Studies, 1993-2002 ORNL/CON-488, February, 2003.

Weatherization Assistance Funding for 2003

(dollars in thousands)

	Source of Non- Federal Funds	2003 Federal DOE Funds	2003 Non-Federal Funds
Alabama		2,369,467	0
Alaska	Alaska Housing Finance Corp (State)	1,654,010	3,000,000
Arizona	SWG, APS, TEO, and Citizens (utilities)	1,337,811	575,782
Arkansas	Entergy funds - additional measures.	2,037,924	50,000
California		6,194,298	0
Colorado	EXCEL Energy - utility	5,392,269	2,650,500
Connecticut	Utility Funds	2,467,223	3,406,075
Delaware	Utility Funds	566,413	267,000
Dist. Columbia	Electric Universal Service Funds	639,535	1,632,500
Florida	State Document and Stamp Tax	1,926,603	2,000,000
Georgia	Utility Funds	2,881,713	800,000
Hawaii	Utility Funds	201,817	24,000
Idaho	Utility Funds	1,942,446	400,000
Illinois	State Supplemental Energy Assistance	13,626,752	7,200,000
Indiana		6,446,380	0
Iowa	Utility Funds	4,909,622	2,247,970
Kansas		2,490,486	0
Kentucky		4,447,778	0
Louisiana		1,704,207	0
Maine		3,019,464	0
Maryland	Utility Funds	2,610,513	1,100,000
Massachusetts	Utility Funds	6,443,615	17,000,000
Michigan		14,945,804	0
Minnesota	Utility Conservation Program	9,697,019	3,200,000
Mississippi		1,622,678	0
Missouri	2001 State Utilicare, 2002 Utilities funds	5,907,364	1,765,000
Montana	Northwestern Energy and BPA	2,479,562	1,438,000

(dollars in thousands)

	Source of Non- Federal Funds	2003 Federal DOE Funds	2003 Non-Federal Funds
Nebraska		2,454,529	0
Nevada	Housing Trust Fund	822,740	2,240,000
New Hampshire	Utility Low Income EE Programs	1,485,091	250,000
New Jersey		5,021,242	0
New Mexico	State Funds	1,879,685	400,000
New York	Leveraged Non-Federal, Utilities, Owner Invest.	19,845,850	8,000,000
North Carolina		4,092,266	0
North Dakota		2,457,438	0
Ohio	Utility SBC Program	13,519,954	8,000,000
Oklahoma	Leveraged Non-Federal, Utilities, Owner Invest.	2,550,481	20,000
Oregon	BPA Low-Income Wx; IOU Deregulation Wx	2,776,678	6,463,562
Pennsylvania	Utility funds administered by local agencies	14,470,659	0
Rhode Island	Electric and Gas Utilities	1,138,338	700,000
South Carolina	Project Share - South Carolina EGC	1,747,662	64,183
South Dakota	Utility Funds	1,886,628	24,014
Tennessee		4,114,844	0
Texas	Investor-Owned Utility Systems Benefit Funds	5,486,260	8,051,842
Utah	Gas Utility, Electric Utility, TANF, State Funds	2,044,411	566,000
Vermont	Weatherization Trust Fund	1,258,083	4,237,713
Virginia		3,952,654	0
Washington	BPA; Energy Matchmakers	4,467,742	7,410,000
West Virginia	AEP Electric Utility, Natural gas utility	3,160,763	375,000
Wisconsin	Public Benefits Utility Funds	8,431,303	26,560,413
Wyoming		1,156,365	0
Total, Grants		220,184,439	122,119,554
Training and Technical Assistance		3,353,061	0
Total		223,537,500	122,119,554

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Weatherization Assistance	**220,184**	**223,759**	**286,832**

This activity will provide State formula grants to enable the Weatherization of 118,900 low-income homes, saving $1.30 in energy costs for every dollar invested over the life of the measures (based on current EIA energy price data).[a] Ninety percent of the total WAP 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, with $23,615,000 allocated to States for that purpose.

Training and Technical Assistance	**3,353**	**3,407**	**4,368**

DOE will fund training and technical assistance activities that can be more cost-effectively performed at national/regional levels, to support effective program operations by the network of State and local Weatherization agencies. DOE will conduct analysis, measure and document program performance, and promote (e.g. through pilot programs, publications, training programs, workshops and peer exchange) the application of advanced techniques and collaborative strategies to continually improve program effectiveness. *Participants will include: Oak Ridge National Laboratory, D&R, TBD.*

Total, Weatherization Assistance Grants	**223,537**	**227,166**	**291,200**

[a] The Weatherization Assistance Program (WAP) operates on a reporting cycle that does not correspond with the fiscal year cycle. Homes weatherized results/target is based on States' program years not the Federal fiscal year. Actual number of homes completed in FY 2005 will be 104,230.

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Weatherization Assistance Grants	
▪ **Weatherization Assistance**	
Increase meets the President's commitment to increase support to this program.	+63,073
▪ **Training and Technical Assistance**	
Increase meets the President's commitment to increase support to this program. Program will undertake a preliminary assessment for the new National Evaluation	+961
Total Funding Change, Weatherization Assistance Grants	**+64,034**

State Energy Program Grants

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
State Energy Program Grants					
State Energy Program Grants	44,708	43,952	40,798	-3,154	-7.2%
Total, State Energy Program Grants	44,708	43,952	40,798	-3,154	-7.2%

Description

The State Energy Program Grants (SEP) mission is to provide financial assistance through formula grants to States, enabling State governments to target their own high priority energy needs and expand clean energy choices for their citizens and businesses. This program was created by Congress in 1996 by consolidating two other efforts — the State Energy Conservation Program, and the Institutional Conservation Program.

State Energy Program Grants is the only Federally-funded, State-based program administered by DOE that provides resources directly to the States. 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 oil produced outside the U.S. State Energy Offices are also instrumental in administering public benefits funds and energy emergency preparedness.

Benefits

State Energy Program Grants contribute to WIP's deployment goals by supporting the capabilities of States to implement activities that promote energy efficiency and adopt renewable energy technologies. The State Energy Program Grants, among many other activities, fund the development and maintenance of energy emergency planning at the State and local levels, a critical security benefit. State Energy Program Grants has recently taken steps to better quantify the energy benefits of the program activities including savings and emissions reductions.[a] The study concluded that the program achieves an annual energy cost savings of 1.17 million source Btu's and $7.23 in annual energy cost savings for each $1 of funding by providing grants, technical advice, and oversight to 50 States, District of Columbia, and 5 Territories for energy efficiency programs. The program is currently focused on supporting the implementation of SEP Strategic Plan for the 21st Century, which is addressing key goals of market transformation and collaboration with environmental and economic development interests.

[a] Estimating Energy and Cost Savings and Emissions Reductions for the State Energy Program Based on Enumeration Indicators Data ORNL/CON-487 January 2003.

The program will award Special Project State Grants to States on a competitive, cost-shared basis to help deploy end-use sector technologies in the following EERE programs (shown here for information, only; these amounts are funded in the indicated individual programs):

EERE Program	FY 2002	FY 2003	FY 2004 (Estimate)	FY 2005 (Estimate)
Clean Cities (Weatherization and Intergovernmental Program)	$4,680	$5,763	$6,000	$6,000
Codes and Standards (Weatherization and Intergovernmental Program)	$1,989	$1,744	$1,650	$1,650
Rebuild America (Weatherization and Intergovernmental Program)	$2,851	$2,763	$3,700	$3,700
Residential Deployment (Weatherization and Intergovernmental Program)	$0	$482	$0	$0
Wind Energy	$812	$470	$250	$250
Solar Energy Technologies	$951	$223	$250	$250
Industrial Technologies	$3,000	$1,996	$2,000	$2,000
Hydrogen Energy	$1,125	$300	$0	$0
Geothermal Technologies Program	$313	$294	$500	$500
Federal Energy Management Program	$500	$485	$400	$400
Distributed Energy and Electric Reliability	$1,424	$1,500	$800	$800
Building America (Building Technologies)	$300	$399	$450	$450
Zero Energy Homes (Building Technologies)	$282	$0	$0	$0
Biomass Program	$600	$556	$500	$500
Subtotal, EERE Funding for New Awards	$18,827	$16,975	$16,500	$16,500
Funding of Prior Year Hydrogen Projects	0	$2,050	$1,200	$0
Total Funding	$18,827	$19,025	$17,700	$16,500

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
State Energy Program Grants	**44,708**	**43,952**	**40,798**

Provide grants to 50 States, DC, and territories for energy efficiency programs. Support implementation of SEP plan for the 21st century, addressing key goals of market transformation and collaboration with environmental and economic development interests. Provide technical assistance and training to develop State level capabilities to form collaborative partnerships and conduct evaluation of the impact of state energy efficiency and renewable energy programs nationwide. *Participants include: States, Data Tree, National Renewable Energy Laboratory (NREL), and Oak Ridge National Laboratory (ORNL).*

Total, State Energy Program Grants	**44,708**	**43,952**	**40,798**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
State Energy Program Grants	
The decrease reflects efforts to work with States to leverage funding opportunities to a greater extent	-3,154
Total Funding Change, State Energy Program Grants	**-3,154**

State Energy Activities

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
State Energy Activities					
Cooperative Program with States	2,928	0	0	0	0.0%
Planning and Evaluation Support for State and Local Grant Programs	2,337	2,324	2,353	+29	+1.2%
Total, State Energy Activities	5,265	2,324	2,353	+29	+1.2%

Description

The State Energy Activities Subprogram complements the State Energy Grants Program activities. Cooperative agreements with States provide assistance for energy-related applied research, development, and field testing, which are excluded from the State Energy Program enabling legislation. Ten planning and evaluation projects will allow for additional technical assistance to States in support of State Energy Assistance and for necessary information management, planning, analysis, and evaluation projects on the formula grant programs.

Benefits

State Energy Activities contribute to WIP deployment goals by supporting State Energy Grants Program activities. This assistance allows States to implement planning and analysis for grants related energy efficient and renewable energy technology research, development, and field-testing, thus improving program effectiveness.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Cooperative Program with States	**2,928**	**0**	**0**

Congress provided funding for this program in FY 2004 within Program Management. No activities planned for FY 2005.

Planning and Evaluation Support for State and Local Grant Programs	**2,337**	**2,324**	**2,353**

Provide technical assistance to State partners in areas such as utility restructuring, newly developed energy efficiency technologies, and urban/regional planning for sustainability. Continue to foster strengthened partnerships between EERE end-use sector offices and the States through activities that support the successful implementation of the Special Projects State Grants. Support evaluation study to assess impacts of the State Energy Grants Program at the State level and nationwide. Support program oversight, provide State Energy Advisory Board support, and respond to Congressionally mandated

(dollars in thousands)

FY 2003	FY 2004	FY 2005

reporting requirements such as reports on energy codes and standards and EPACT mandated reporting. In FY 2003, this activity was reduced by $52,657 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Atlanta Regional Office (RO), Boston RO, Chicago RO, Denver RO, Philadelphia RO, Seattle RO, ORNL, NREL, Data Tree.*

Total, State Energy Activities	**5,265**	**2,324**	**2,353**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Planning and Evaluation Support for State and Local Grant Programs	
The increase supports ongoing efforts	+29
Total Funding Change, State Energy Activities	**+29**

Gateway Deployment

Funding Schedule

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Gateway Deployment					
Rebuild America	11,034	10,003	8,826	-1,177	-11.8%
Energy Efficiency Information and Outreach	2,267	1,392	1,200	-192	-13.8%
Building Codes Training and Assistance	4,569	4,445	4,800	+355	+8.0%
Clean Cities	10,924	10,973	7,000	-3,973	-36.2%
Energy Star	4,173	3,654	5,000	+1,346	+36.8%
National Industrial Competitiveness through Energy, Environment, and Economics	2,670	0	0	0	0.0%
Inventions and Innovations	3,776	4,318	2,500	-1,818	-42.1%
International Market Development	646	0	0	0	0.0%
Technical/Program Management Support	586	385	390	+5	+1.3%
Total, Gateway Deployment	40,645	35,170	29,716	-5,454	-15.5%

Description

The mission of Gateway Deployment is to develop, promote, and accelerate the adoption of energy efficiency, renewable energy, and oil displacement technologies and practices by a wide range of customers, including State and local governments, communities, companies, fleet managers, building code officials, technology developers, Native American tribal governments, and international agencies.

Gateway Deployment is an organizational and deployment activity established in 2004 to accomplish effective delivery of the full menu of efficiency and renewable resources aligned with clear community and customer focus. The activity focuses on the end user needs, rather than individual EERE programs. It provides easier access to EERE's vast array of technologies and resources to ensure these are part of the economic solutions for communities across the country. Through an integrated information and outreach approach, Gateway Deployment facilitates "one-stop" access to a variety of specialized technical and financial assistance through activities such as Rebuild America, Energy Efficiency Information and Outreach, Building Codes Training and Assistance, Clean Cities, Energy Star, Inventions and Innovations, and International Market Development. States and EERE regional offices are the key implementing entities for solutions and customer service.

Benefits

Gateway Deployment contributes to WIP deployment goals by providing information and technical and financial assistance to improve efficiency in building, transportation, and industrial market sectors. As of the end of 2002, with a cumulative Federal investment of $60 million, Rebuild America partnerships have renovated more than 528 million square feet of floor space, saving building owners more than $131 million each year with a cumulative saving of $1.5 billion through private investment for energy-efficiency improvements in excess of $600 million.[a] Another 570 million square feet of projects have progressed beyond the planning stage. Building Codes Training and Assistance activities have resulted in energy savings of nearly $700 million per year, have improved the energy efficiency of nearly 3 billion square feet of new commercial floor space and nearly 4 million new households, and every $1 spent by the activity has yielded between $50 and $60 dollars in energy cost saving.[b] Clean Cities coalitions have grown to approximately 80 coalitions that all have made significant commitments to use alternative fuels. By encouraging the use of alternative fuel vehicles, Clean Cities helps enhance energy security and environmental quality at both the national and local levels. Clean Cities have been increasing their AFVs at a growth rate of approximately 17% per year, and projects similar progress in the future. Growth in non-Clean Cities is almost non-existent. Based on the support of both DOE and EPA, Energy Star has successfully delivered energy and cost savings across the country, saving businesses, organizations, and consumers more than $5 billion a year.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Rebuild America	**11,034**	**10,003**	**8,826**

This program will: help 530 new and existing partnerships upgrade an additional 70 million square feet of floor space in schools and commercial buildings and State and local government-owned facilities; continue providing design assistance for new construction in mature market sectors, e.g. schools, colleges, State and local government buildings; provide existing partnership base with access to information on energy solutions to broader needs, e.g. wastewater treatment plants; overcome information barriers by providing web-based training, decision tools, and case studies that increase the market demand for energy efficient products, and project development and financing services; apply whole-buildings and holistic technology research to Rebuild America building energy projects; partner with national organizations, manufacturers, utilities, and the energy service industry to leverage resources; continue to provide comprehensive EERE technologies to K-12 priority market sector. Incorporate affordable housing support extension of Building America, and Energy Star home improvement activities. (Includes $2,000 for the State Energy Program Special Project State Grants). *Participants include: ORNL, PNNL, LBNL, National Association of State Energy Officials, National Association of Energy Service Companies*

Energy Efficiency Information and Outreach	**2,267**	**1,392**	**1,200**

Information-outreach is essential to overcome information barriers in the marketplace and to allow consumers and businesses to make informed purchasing decisions. Activities will result in packaged information on appropriate

[a] As reported by Rebuild Partnerships. Information available on website: http://rebuild.org.
[b] Estimating the Impact of Commercial Building Energy Codes From 1990 to the Present: David Belzer and Mark Halverson Pacific Northwest National Laboratory August 21, 2003.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

EERE technologies for key market segments, e.g. consumers, homeowners, and school officials. Outreach will include use of Web based tools, media outlets and business communication channels to leverage effectiveness.

Building Codes Training and Assistance **4,569** **4,445** **4,800**

The program will: provide technical and financial assistance to States to update and implement their energy codes to meet the 2001 edition of Standard 90.1 for commercial buildings and the 2003 edition of the International Energy Conservation Code for residential buildings; train approximately 2,000 code officials, designers, and builders to implement these codes. Update and improve core materials and code compliance software to reflect recent changes in the model energy codes and emerging energy efficiency technologies; and work with 3-5 pilot States, builder organizations, and financial institutions to provide package combining builder training, Energy Star promotion and financing for new and existing homes.

Clean Cities **10,924** **10,973** **7,000**

In support of Energy Policy Section 505, this program will: continue to focus alternative fuel efforts in selected niche markets, especially school, airport, and municipal bus fleets; facilitate, through DOE regional offices, local coalition market development, training, and grants management; continue limited use of technical assistance teams to help address technical niche market issues raised by local Clean Cities coalitions; develop strategies for incorporating alternative fuels into the local homeland security planning initiative; continue platform development of alternative fuel school buses in anticipation of pending energy legislation and EPA funding opportunities. The program will continue efforts to provide targeted niche market assistance and training to coalitions about market opportunities in the school bus, transit, and municipal fleet markets. *Participants include: NREL, and Others.*

Competitive Grants: In support of EPACT Sections 302 and 409, the program will issue State grants and other public/private partnership grants to competitively fund projects that support infrastructure development, vehicle use in niche markets; provide $3 million for 20 Special Project State Energy Grants. Of that, about $0.10 million will be for Energy Smart School bus projects. *Participants include: States.*

Education and Outreach: In support of the National Energy Policy recommendation to expand consumer education and EPACT Section 405, the Program will: sponsor the 11th Annual Clean Cities Conference to showcase commercially available AFVs and advanced technology vehicles; publish case studies of successful alternative fuel niche market applications; and continue building alliances to promote fuel efficient advanced technology vehicles.

International Coordination: Conduct trade missions to showcase U.S. alternative fuel products to build markets abroad. *Participants include: NETL, Other.*

In FY 2003, this activity was reduced by $113,523 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Argonne National Laboratory (ANL), National Renewable Energy Laboratory (NREL), Oak Ridge National Laboratory (ORNL), and the Government Printing Office (GPO).*

Energy Star Program **4,173** **3,654** **5,000**

Expand consumer interest in energy efficient appliances, finalizing the commercial Energy Star window specification and begin revision of residential window criteria, in consensus with industry. This funding will result in the following impacts: Promote energy-efficiency upgrade path for the homes of middle-income families. Increase market share for Energy Star appliances to 19 percent by 2005 and 22 percent by 2010, compared to 15

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005

percent in 2001. By 2010 increase market share for Energy Star windows to 55 percent, compared to 25 percent in 2001. *Participants include: ORNL, D&R, Navigant, RPI, ROs, NETL, MEEA, CEE, EPA.*

NICE[3]	**2,670**	**0**	**0**

No activity. In FY 2003, this activity was reduced by $48,023 for SBIR/STTR and transferred to the Science Appropriation.

Inventions and Innovation	**3,776**	**4,318**	**2,500**

Fund up to 13 grants to independent inventors and small technology-based businesses. Continue to provide assistance to small businesses and independent inventors to develop skills in technology commercialization. Review progress of projects initiated in FY 2004, determine and provide the funding requirements for project completion. Test a Multi-Rotor-Micro-Particle Generator that will mechanically create the most stable smallest particle emulsions known today. Test a high energy-density double-layer capacitor energy storage for photovoltaic systems.

In FY 2003, this activity was reduced by $70,596 for SBIR/STTR and transferred to the Science Appropriation.

International Market Development Program	**646**	**0**	**0**
▪ **Asian Pacific Economic Cooperation (APEC)**	**581**	**0**	**0**

Activities of this program will continue, funded within the Energy Supply appropriations request, as proposed in FY 2004.

▪ **Energy and Environment Technology Centers (EETIC)**	**65**	**0**	**0**

In FY 2005, no activities are planned. The U.S. canceled its membership in an international energy technical information center in FY 2003.

Technical/Program Management Support	**586**	**385**	**390**

Representative activities will include preparation of program, strategic plans, and operating plans; R&D feasibility studies and trade-off analysis; evaluation of the impact of new legislation on R&D programs; analysis of energy issues pertinent to the R&D program; development of communication tools; identification of performance measures and methodologies (including GPRA); data collection to assess program and project performance, efficiency and impacts; and development of performance agreements with management.

Total, Gateway Deployment	**40,645**	**35,170**	**29,716**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Rebuild America	
Outreach and education efforts to be performed by consolidated outreach and communications office. Less technical assistance required for mature and successful sectors.	-1,177
Energy Efficiency Information and Outreach	
Consolidate efforts towards achieving greater collaborative partner support	-192
Building Codes Training and Assistance	
Improve distance learning to assist States to update their code with improved lighting criteria. . . .	+355
Clean Cities	
Clean Cities will facilitate partnerships between DOE and other Federal agencies to leverage resources that will assist with deployment of expanded transportation technology portfolios.	-3,973
Energy Star	
Expand managed products and activities with schools, retail buildings, health care facilities, and homes	+1,346
Inventions and Innovations	
Program will provide full leveraged support for projects with the most potential for success.. . . .	-1,818
Technical/Program Management Support	
Increase reflects projected needs of refocused efforts this element supports.	+5
Total Funding Change, Gateway Deployment	**-5,454**

Distributed Energy Resources

Funding Profile by Subprogram[a]

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Distributed Energy Resources						
Distributed Generation Technology Development	39,796	40,413	40,413	32,689	-7,724	-19.1%
End-Use System Integration and Interface	19,732	20,086	20,086	19,861	-225	-1.1%
Technical/Program Management Support	526	524	524	530	+6	+1.1%
Total, Distributed Energy Resources	60,054	61,023	61,023	53,080	-7,943	-13.0%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (1975)
P.L. 94-385, "Energy Conservation and Production Act" (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)

Mission

The mission of the Distributed Energy Resources (DER) Program is to strengthen America's aging 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. By 2015, the Distributed Energy Resources Program will develop and deploy a diverse array of high efficiency integrated distributed generation and thermal energy technologies at market competitive prices so that homes, businesses, industry, communities, and electricity companies elect to use them.

[a] SBIR/STTR funding in the amount of $1,080,067 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $1,400,251 and $1,215,780 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

Benefits

The Distributed Energy Resources Program supports DOE's mission of advancing the national, economic, and energy security of the United States. The program will help protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy. Distributed energy technologies can expand the use of our Nation's aging electricity power infrastructure, relieve congestion on transmission and distribution systems, increase supplies during periods of peak demand, support the transition from traditional monopoly regulation to more competitive markets and reduce environmental emissions, including greenhouse gases. Additionally, consumers should have a choice between installing on-site generation and/or electricity provided by central station generators. Consumers (or third party owners such as utilities) install these systems to reduce their energy costs, enhance energy security and/or improve the reliability and quality of energy services they receive from the local utility. Distributed energy devices can sustain "mission-critical" operations when grid-connected power is not available or not sufficient. Local utilities are looking to distributed energy systems to improve the utilization of distribution assets by reducing the peak or altering the shape of energy demand. One of the recent benefits to come from this research is the Mercury 50, manufactured by Solar Turbines Inc. announced as a commercial product offering in 2004. This turbine was developed under the Advanced Turbine Systems Program at DOE. The Mercury 50 demonstrated 40% efficiency and emissions of less than 9 parts per million (ppm). Other major benefits that have come from this research program have included the development of a melt desulfurization process that produced critical alloy materials with six times better material properties at one-sixth the cost, and operation of a single ceramic combustion liner for over 14,000 hours in an industrial gas turbine which was a world record for the industry.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission plus seven general goals that tie to the strategic goals). The DER program supports the following goals:

Energy Strategic Goal, General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The DER program has one program goal which contributes to General Goal 4 in the "goal cascade":

Program Goal 04.59.00.00: Distributed Energy Resources. The Distributed Energy Resources Program goal is to develop and facilitate market adoption of a diverse array of cost competitive integrated distributed generation and thermal energy technologies in homes, businesses, industry, communities, and electricity companies, increasing the efficiency of electricity generation, delivery, and use, improving electricity reliability, and reducing environmental impacts.

Contribution to Program Goal 04.59.00.00: (Distributed Energy Resources)

Work in Distributed Generation Technology Development contributes to Program Goal 04.59.00.00 by advancing the development of more efficient, low emission distributed power generation technologies. Work within the End-Use Systems Integration and Interface area contributes to this Program Goal by combining efficient power generation technologies with thermally activated heating and cooling applications that further enhance on-site efficiency. The combination of on-site distributed generation and the use of waste heat improves the energy security of the power grid while reducing consumption of precious domestic fossil energy supplies.

The subprogram activities presented below demonstrate key technology pathways that contribute to achievement of these benefits:

- By 2008, the DER Program will contribute to the program goal by completing development and testing of a portfolio of distributed generation and thermally activated technologies that show an average 25 percent increase in efficiency (compared to 2000 baseline) and/or NO_x emissions less than 0.15 lbs/MWh.
- By 2008, the DER Program will contribute to the program goal by demonstrating the feasibility of integrated systems; these systems will achieve 70 percent efficiency and customer payback in less than 4 years, assuming commercial-scale production.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.59.00.00 (Distributed Energy Resources)					
Distributed Energy Resources/Distributed Generation Technology Development					
Demonstrated two advanced industrial turbine system engines at end-user sites.	Completed 5,000 durability, performance, and emissions testing of the Mercury 50 Advanced Turbine System engine.		Completed 4,000 hour field test of ceramic composite shroud components to demonstrate performance and emission benefits to a gas turbine.	Complete final design and initiate field testing of low emission technology with less than 7 ppm NO_x.	Demonstrate NO_x emission levels of 0.25 lbs/MWh from catalytic-combustion.
			Completed the 12 Beta field test units of high efficiency natural gas-fired heat pump (60 percent better than pulse combustion furnace) and install at field test sites hosted by major U.S. Gas Utilities. Contracted with three companies to support research on demonstrating a 5 percent increase in efficiency for an advanced microturbine.	Complete and demonstrate heating coefficient of performance of 1.4 for commercial introduction of a thermally activated system (approximately 40 percent more efficient than a conventional heating system) Demonstrate 6 percentage point increase in efficiency for an advanced reciprocating engine.	
Distributed Energy Resources/End-Use Systems Integration and Interface					
		Demonstrated a microturbine package (highly efficient for reducing peak loads) at a university site.		Complete final design and initiate field testing and evaluation of a complete, fully functional integrated CHP system consisting of a turbine, absorption chiller and control system.	Complete a case study on a CHP installation that uses heat from a microturbine to provide plate tank heating and sludge drying at an industrial facility, contributing to the PART long-term measure of developing a 70 percent efficient CHP integrated system. Complete and document two DER/CHP demonstration projects within the high tech industry, contributing to the PART long-term measure of developing a 70 percent efficient CHP integrated

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
					system.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The Distributed Energy Resources Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

The Distributed Energy Resources Program uses several means (processes, technologies, and resources), and program, policy, management and market-based strategic approaches to achieve its program goals. Significant external factors outside the control of the program are important to achieving the program goals and intended impacts. Collaboration with industry and experts are integral to the investments, means and strategies planned and to addressing the external factors.

The Department will implement the program through the following means:

- By advancing performance and reducing technology cost of integrated energy systems including: increasing ceramic durability, completing an organic rankine cycle heat utilization system, improving the efficiency and emissions of combustion systems, and improving advanced controls.
- By supporting the integration of distributed energy technologies on the distribution system and at customer's sites to achieve the maximum efficiency, reliability, power quality and load management.

The Department will implement the program using the following strategies:

- Investigate responsive load issues to help customers understand load management.
- Develop standards for siting/permitting/interconnection procedures.
- Work to develop rate and cost transparency in the generation and delivery of electricity (including fair and reasonable standby/backup rates)
- Expand utility business strategies to include distributed technologies as a tool to support the distribution system
- Recognize the value of heating/cooling in combined heat and power systems.

These strategies will result in significant cost savings and a significant improvement in the utility's load demand profile from large blocks of central generation and transmission and distribution investments.

The following external factors could affect the Distributed Energy Resources program's ability to achieve its strategic goal:

- The state of the economy for the electric sector including utilities, transmission and distribution companies, electric suppliers, and manufacturers.
- The state of the economy to give consumers the ability to finance distributed energy technologies.
- Utility rate structure and regulatory environment that will stifle customers' ability to choose and install distributed energy systems in a timely and cost-effective manner.
- The pace of development in alternative energy supply technology.
- The price of energy inputs, primarily natural gas.
- The ability of technologies to be fuel flexible.

In carrying out the program's mission, the Distributed Energy Resources program performs the following collaborative activities:

- The program operates a comprehensive set of research development and demonstration partnerships including competitively awarded cost-shared projects.
- Federal partnerships include participation with the Federal Energy Management Program (FEMP) to promote and install distributed energy systems at Federal facilities.
- The program supports Hydrogen, Fuel Cells, and Infrastructure Technologies Program by developing technologies that can use hydrogen based fuels for electricity generation or cooling, heating and power applications.
- The program coordinates with the Industrial Technologies Program and Building Technologies Program to identify co-funding projects that involve the use of distributed energy systems in manufacturing plants and commercial buildings.
- The program works with the State Energy Program to increase awareness, promote benefits, and remove barriers to distributed energy.
- Small businesses are supported through the Small Business Innovation Research program.
- The program partners with the U.S. Environmental Protection Agency (Interagency Agreement) on education and outreach efforts to address environmental siting and permitting of combined heat and power (CHP) and other distributed energy devices through the EPA CHP Partnership.
- The program also partners (leveraging cost share and technical reviewers) with the California Energy Commission and the New York State Energy Research and Development Authority on distributed generation and CHP research.

Validation and Verification

To validate and verify program performance, DER conducts internal and external reviews and audits. DER's programmatic activities are subject to continuing review by Congress (National Research Council *Energy Research at DOE: Was it Worth it?*), the General Accounting Office, the Department's Inspector General. The U.S. Combined Heat and Power Association (USCHPA), the Gas Turbine Association (GTA), and Engine Manufacturing Association (EMA) are representative of the distributed energy industry and provided reviewers and recommendations on the current and future direction of the DER program in the last Distributed Energy Peer Review held Dec 2003. The next programmatic peer review will be held in the Fall 2005.

Data Sources: The Energy Information Administration's (EIA) Annual Energy Review and Annual Energy Outlook, EIA Form 860 data analyzed by the Resource Dynamics Corporation, Merit Review and Peer Evaluation of R&D, and engineering and economic modelling

Baselines: The following are the key baselines used in the Distributed Energy Resources program (for the year 2000, unless otherwise noted):

- Industrial Turbines emissions: 0.35 (lb/MWh)
- Microturbines emissions: 0.7 (lb/MWh)
- Reciprocating Engines emissions: 3.1 (lb/MWh)
- Industrial Turbines efficiency: 39% (2001)

- Microturbines efficiency: 26%
- Reciprocating Engines efficiency: 36%

Frequency: GPRA benefits are estimated annually, Merit Review and Peer Review projects are evaluated annually, and Program Peer Review is conducted annually.

Data Storage: EE Strategic Management System.

Verification: A trade association working group reviews DER data. The EIA uses and verifies the REPIS database. The November 2001 Distributed Energy Resources Peer Review verified the distributed generation data. Merit reviews and peer evaluations by experts from outside of the U.S Department of Energy are used to evaluate individual project and overall program efforts. The National Academy of Sciences also conducts program peer reviews. These efforts are used to focus the program's investments on activities that are within the Federal Government's role and that address top priority needs.

Within these peer reviews, DER experts review each project. Principles of the Administration R&D investment criteria for research been incorporated into this evaluation. The panel also evaluates the strengths and weaknesses of each project and recommends additions or deletions to the scope of work. The program organization facilitates supplier-customer relationships to ensure that R&D results from federally sponsored efforts are transferred to industry suppliers and that industry supplier developments make their way to the energy market.

Program Assessment Rating Tool (PART)

PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The DER Program has incorporated feedback from OMB into the FY 2005 Budget Request and has taken or will take the necessary steps to continue to improve performance.

The FY 2005 PART review included strong ratings for purpose, planning, and management. These ratings reflect the commitment of EERE program management at all levels to the basic management and planning principles of the President's Management Agenda including the criteria scored in the PART and the implementation of the EERE reorganization employing those principles. The PART recommended that the program develop performance measures to account for outreach activities and that the program focus R&D funding on systems integration while decreasing emphasis on component technology R&D that is within industry's capability. The PART also recommended that the Department develop a consistent framework to analyze the costs and benefits of its R&D investments to inform budget decisions. These efforts are underway.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.59.00.00, Distributed Energy Resources					
Distributed Generation Technology Development	39,796	40,413	32,689	-7,724	-19.1%
End-Use Systems Integration and Interface	19,732	20,086	19,861	-225	-1.1%
Technical Program Management Support	526	524	530	+6	+1.1%
Total, Program Goal 04.59.00.00, Distributed Energy Resources	60,054	61,023	53,080	-7,943	-13.0%
Total, Distributed Energy Resources	60,054	61,023	53,080	-7,943	-13.0%

Expected Program Outcomes

The DER Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy, as well as providing opportunities for local development of domestic renewable resources. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; enhance energy security by increasing the production and diversity of domestic fuel supplies; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the DER Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, natural gas savings, and distributed electricity capacity additions that result from the realization of DER Program goals are shown in the table below through 2025. Not all kilowatt hours (kWh) of electricity have equal value to consumers. Market experience suggests that at least a portion of consumers are willing to pay more for electricity that is more reliable, of higher quality, locally controllable, available during emergency, or cleaner. As a result, these benefit estimates are likely based on an underestimate of the demand for these products under baseline market assumptions. In addition, these estimates do not account for the synergies between improved DER technologies and end-use applications of those technologies being developed by other EERE programs.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html. Final documentation is estimated to be completed and posted by March 15, 2004.

FY 2005 GPRA Benefits Estimates for the Distributed Energy Resources Program[a]

Mid-Term Benefits

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	0.03	0.08	0.23	0.38
Energy Expenditure Savings (Billion 2001$)	2	3	7	11
Carbon Emission Reductions (MMTCE)	1	6	10	15
Natural Gas Savings (Quads)	-0.06	-0.30	-0.35	-0.50
Program Specific Electric Capacity (GW)	14	35	48	64

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget. Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

Distributed Generation Technology Development

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Distributed Generation Technology Development					
Industrial Gas Turbines	4,769	3,950	3,000	-950	-24.1%
Microturbines	6,955	6,914	7,000	+86	+1.2%
Advanced Reciprocating Engines	11,792	13,828	9,000	-4,828	-34.9%
Technology Based – Advanced Materials and Sensors	7,925	8,155	8,279	+124	+1.5%
Fuel Flexibility	745	0	250	+250	
Thermally-Activated Technologies	7,610	7,566	5,160	-2,406	-31.8%
Total, Distributed Generation Technology Development	39,796	40,413	32,689	-7,724	-19.1%

Description

The mission of the Distributed Generation Technology Development subprogram is to improve the energy and environmental performance of distributed technologies so that the Nation can have more energy choices to achieve a more flexible and smarter energy system. The Technology Development area focuses on a portfolio of electricity generation technologies as well as heat utilization technologies and focuses on efficiency, emissions, RAMD (reliability, availability, maintainability and durability) and cost targets.

Benefits

This subprogram provides the high-risk R&D on component technology development such as combustion, materials, component design, thermal recovery cycles and failure analysis to develop the next generation high-efficiency, low emission technologies for industrial gas turbines, microturbines, and reciprocating engines as well as thermally activated technologies. The program is developing a better understanding of fluid dynamics, the combustion and flame stability process, heat/mass transfer, materials processing and system design. Balancing the need for near-zero emissions, high-efficiency and low-cost is a challenge that goes beyond incremental improvements. By improving the efficiency of thermally activated systems and advancing the efficiency and emissions characteristics of these power generation technologies, the Distributed Generation Technology Development subprogram provides the building blocks necessary to develop advanced integrated systems envisioned in the Program Goal. Indicators of progress toward achieving this goal include measures of emissions and efficiency, as set out below:

Expected Results (verified by rig or prototype engine results)

	Actual				Expected				
	2000	2001	2002	2003	2004	2005	2006	2007	2008[a]
Emissions (lb/MWh)									
Industrial Turbines	0.35	0.35	0.35	0.35	0.30	0.25	0.20	0.20	0.15
Microturbines.....	0.7	0.7	0.7	0.4	0.4	0.3	0.30	0.3	0.15
Reciprocating Engines[b]..	3.1	3.1	3.1	3.1	1.5	1.5	1.5	0.75	0.75
Efficiency (% LHV- Low Heating Value)									
Microturbines.....	26	28	28	33	33	35	35	35	37
Reciprocating Engines...	36	38	38	38	43	44	44	46	47
Industrial Turbines[c]		39							N/A

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Industrial Gas Turbines..... **4,769** **3,950** **3,000**

Industrial gas turbines are used in many industrial and commercial applications ranging from 1MW to 20MW. A key effort in the Industrial Gas Turbine research has been to enhance the efficiency and environmental performance of gas turbines for applications up to 20MW. The focus of this effort is to advance materials research, such as composite ceramics and thermal barrier coatings, which will continue to improve performance and durability. This builds upon previous research to test and demonstrate innovative high temperature materials such as prime reliant coatings and silicon nitride ceramics. Efficiency gains can be achieved with materials like ceramics, which allow a significant increase in engine operating temperature. Low emissions technology research and development will improve the combustion system by greatly reducing the NO_x and CO produced without negatively impacting turbine performance. This emissions work will follow previous research to develop methods to measure, verify very low emissions levels and model these impacts. The goal of the activity is to achieve less than 0.15 lb/MWh in NO_x emissions. These technologies use techniques to control the conditions for combustion so that NO_x is not formed in the first place. Additional testing

[a] Goal – Phase II of program.

[b] Out of exhaust – no after treatment.

[c] Previous EERE research has yielded an improvement from 28% in 1992 to 39% in 2001. Therefore, the program has focused Gas Turbine research on emissions improvements.

and validation on recent breakthroughs (i.e., catalytic combustion) will allow these important systems to move forward.

Research will test cost effective low emissions technologies to verify emissions of less than 5 ppm NO_x (approximately 0.25 lb/MWh) and component life in advanced gas turbines. Research and development will continue on low emissions technologies with the more stringent goal of 3 to 5 ppm NO_x (less than 0.15 lb/MWh). Continue efforts to lower the manufacturing costs and increase the durability of ceramics, catalytic combustion systems, and combustor designs for gas turbines. Continue R&D and testing to demonstrate innovative high temperature materials such as coatings, ceramics, and ceramic composites for combustor liners, shrouds, blades and vanes in gas turbines to improve endurance levels beyond 8,000 hours. Modify material systems to improve durability and life. Investigate additional components (such as shrouds and injector tips) to improve efficiency and/or emission reduction. Research technology attributes will be compared to competing technologies to assess and quantify expected benefits and market acceptance. In FY 2003, this activity was reduced by $198,500 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Alzeta, Argonne National Laboratory (ANL), Catalytica, California Energy Commission, General Electric Power System Composites (GEPSC), General Electric Corporate Research & Development, Goodrich Corporation, Oak Ridge National Laboratory (ORNL), Precision Combustion, Inc., Siemens Westinghouse, Solar Turbines, United Technologies Research Center (UTRC), and Honeywell Engines and Systems.*

Microturbines	**6,955**	**6,914**	**7,000**

Microturbines are a new type of combustion turbine for use in distributed energy generation applications. About the size of a refrigerator, microturbines produce 25 to 500 kW of energy and can be located on sites with limited space for power production. Waste heat recovery can be used in combined cooling, heating, and power (CHP) systems with the potential to achieve energy efficiency levels greater than 70 percent. Microturbines offer many advantages over other technologies for small-scale power generation, including the ability to provide reliable backup power, provide power for remote locations, and peak shave. Other advantages include less maintenance and longer lifetimes because of a small number of moving parts, compact size, lighter weight, greater efficiency, lower emissions, and quicker starting. Microturbines also offer opportunities to use waste fuels such as landfill gas. The microturbine research will lead a national effort to design, develop, test, and demonstrate a new generation of microturbines for DER applications that are cleaner, more affordable, reliable, and efficient than products that are currently available. The goal of the microturbine research is to achieve 37 percent efficiency with less than 7 ppm NO_x (approximately 0.15 lb/MWh) at a competitive cost, by 2008.

Building on previous design work, research will fabricate and rig-test subsystems such as recuperators, turbine, combustor, turbine hot section, generator, and power electronics to improve efficiency, reliability, and durability to go beyond the intermediate design target of 33 percent efficiency in FY 2004. Research will take these subsystems and integrate them into microturbine system and initiate rig testing of modified engine systems as well as a field evaluation of a 33 percent efficient system. Utilizing previous design verification work, the program will begin to verify advanced microturbine goals of 40 percent electrical efficiency and single digit emissions (ppm) through advancements in the organic rankine cycle, and ceramics. Research will continue on fuel flexibility while still meeting environmental targets. Research technology readiness and advancements with respect to current state of the art and end use applications. *Participants: Argonne National Laboratory (ANL), Capstone Turbine Corporation, California Energy Commission,*

Honeywell Engines and Systems (ES), Ingersoll-Rand, Oak Ridge National Laboratory (ORNL), Solar Turbines, Southern California Edison (SCE), United Technologies Research Center (UTRC), and General Electric Corporate Research & Development

Advanced Reciprocating Engines **11,792** **13,828** **9,000**

Gas-fired reciprocating engines offer a wide range of power generation at an economical cost over other technologies. With their operating flexibility, reciprocating engines can be used for many purposes, such as, local power grid and substation support, peak-shaving, remote power, on-site generation, combined cooling, heating, and power (CHP) applications, high-density electric loads, standby power, and as mechanical drives used for compressors and pumps in industrial, commercial, institutional, and residential applications. The Advanced Reciprocating Engine System (ARES) will lead a national effort to design, develop, test, and demonstrate a new generation of gas-fired reciprocating engines for Distributed Energy applications that are cleaner, more affordable, reliable, and efficient than products that are commercially available today. The goal of the research is to achieve a 47 percent efficient reciprocating engine system with less than 0.15 lb/MWh of NO_x emissions at a competitive cost by 2008.

Research in the ARES program requires high risk research to meet the program goals and will focus on critical component design to meet Phase 2 targets of 45 percent efficiency and 0.15 lb/MWh of NO_x. The program will build on the initial designs, research, and testing from Phase I. With assistance and guidance from industry, universities, and laboratory research, the effort will develop and integrate critical component to the engine platform, designed in Phase I, to include advanced air handling system, improved turbochargers, improved spark plugs, improved cylinder re-design that will enhance combustion efficiency. Advanced design and development of a laser ignition system will improve combustion efficiency, reliability, durability and cost-effectiveness. Investigation of the viability of a novel Homogeneous Charge Compress Ignition (HCCI) combustion system, that will increase engine efficiency and reduce NO_x considerably, will be developed and tested with a closed loop controller. To meet NO_x emissions standards development of improved catalysts and after treatment technologies for emission controls will be a priority. Research environmental issues, modeling and fuel flexibility technology impacts. In FY 2003, this activity was reduced by $130,223 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Argonne National Laboratory (ANL), Caterpillar, Colorado State University, Cummins Engine Co., Inc, Los Alamos National Laboratory (LANL), Massachusetts Institute of Technology, Michigan Technological University, National Energy Technology Laboratory (NETL), Northwestern University, Oak Ridge National Laboratory (ORNL), Ohio State University, Pacific Northwest National Laboratory (PNNL), Purdue University, Sandia National Laboratory (SNL), University of Southern California (USC), University of Tennessee, University of Texas at Austin, Waukesha Engine, Dresser, Inc., and West Virginia University*

Technology Based – Advanced Materials and Sensors.. **7,925** **8,155** **8,279**

Advanced materials, such as ceramics and thermal barrier coatings, are some of the key enabling technologies for stationary industrial gas turbines, microturbines and reciprocating engines to improve the efficiency. Engineered ceramics, such as ceramic matrix composites offer all of the advantages of ceramics-resistance to heat, corrosion, erosion, and chemical activity-while adding strength and thermal shock resistance that conventional ceramics do not demonstrate. Advanced microturbines will require improved high-temperature performance and reliability from their recuperators in order to achieve higher efficiency. Researchers are working with microturbine manufacturers and materials

suppliers to develop metallic alloys with more oxidation/corrosion resistance and tensile/creep strength at higher temperatures must be developed. This research provides long-term R&D in the area of materials, sensors, information technologies, power electronics, combustion modeling and assessments of cross-cutting impacts and benefits of the developments of distributed generation systems and end-use applications.

Following on material properties research, advanced materials such as ceramics, coatings and high temperature metals will be developed for components in the hot section, recuperator, exhaust, and valve train. Methods will be developed to improve material environmental resistance and fabrication technologies to produce cost effective high quality engine parts will be developed. In FY 2003, this activity was reduced by $276,676 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Allegheny Ludlum, Argonne National Laboratory (ANL), Capstone Turbine Corporation, Connecticut Reserve Technology, LLC, Cummins Engine Co., Inc, Haynes International, Honeywell Engines and Systems, Ingersoll-Rand, Kennametal Inc., General Electric Power System Composites (GEPSC), and Oak Ridge National Laboratory (ORNL), Poco Graphite, Inc., Saint-Gobain Ceramics and Plastics, University of Dayton Research Institute (UDRI), United Technologies Research Center (UTRC), and Solar Turbines.*

Fuel Flexibility	**745**	**0**	**250**

The fuel flexibility research was originally performed to develop ultra-low emissions combustion technologies for oil based fuels that could be applied to distributed generation and cooling. Based on the research conducted in FY 2003 to improve the environmental performance of oil combustion systems, no further activity will be conducted in the area of oil heat. All oil heat activities have been transferred to the Building Technologies Program.

New efforts will be focused on the use of alternative or opportunity fuels such as anaerobic digester gas, industrial waste gas, landfill gas, well head gas in distributed generation technologies. Crosscutting issues such as fuel combustion dynamics, fuel processing and clean-up prior to combustion and corrosion issues will be investigated. A market study and assessment will be conducted to prioritize the technical research issues. *Participants: TBD.*

Thermally-Activated Technologies	**7,610**	**7,566**	**5,160**

Thermally-Activated Technologies (TAT) use the recoverable heat from gas-fired systems and rejected/waste heat from industrial processes or electricity generation. TAT provide important keys for achieving the overall efficiency benefits of distributed energy technologies by converting natural gas, exhaust, or rejected heat into useful energy services like heating, cooling, humidity control, thermal storage, or bottoming cycles. TAT are the essential building blocks for CHP integrated systems, which are widely recognized as the next wave of energy-efficient power generation devices that will transform central power station electric power generation into discrete, economical, reliable, and secure distributed power generation. The TAT effort facilitates research, development, testing, and integration of advanced heating, cooling, dehumidification, and refrigeration equipment.

TAT research will focus on implementing activities in accordance with the Thermally Activated Technology Roadmap developed in 2003 that will enable recovery and use of thermal energy to level utility load profiles and improve output-based efficiency and emissions. Funding will be completed for the Ambian heat pump technologies and the "hi-cool" refrigeration contracts. All solid desiccant research activities will be completed at ORNL. Research also will be completed on the anthrax surrogate capture work with liquid desiccants. Liquid desiccant technologies have been proven at National Renewable Energy Laboratory to capture and eliminate anthrax type airborne particles.

Following on more basic desiccant and absorption research, undertake efforts to reduce cost and improve performance of desiccant systems at NREL for humidity control and indoor air quality as it relates to energy consumption.

Research will continue on advanced humidity sensors. New awards will be initiated in the areas of heat/mass transfer and low-grade temperature utilization. Research novel cycles and materials, compact TAT design concepts, and cost reduction of absorption chiller technologies that can benefit advanced integrated CHP systems. Feasibility studies on TAT technologies and systems for residential heat/cooling CHP systems (if proven potentially viable), will be transferred to the packaged CHP systems integration activity. *Participants: Ambian Climate Technologies,, Carrier Corporation, Gas Technology Institute (GTI), Georgia Tech Research Institute (GTRI), Kathabar, Inc., Mississippi State University, Munters, National Renewable Energy Laboratory (NREL), Oak Ridge National Laboratory (ORNL), Trane, Rocky Research, University of Central Florida, York International, and United Technologies Research Center (UTRC).*

Total, Distributed Generation Technology Development	**39,796**	**40,413**	**32,689**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Industrial Gas Turbines	
Support for hydrogen-related activities is transferred to the Hydrogen program. Several low emission technology demonstrations will be completed in FY 2004	-950
Microturbines	
This increase is the result of general reductions authorized against this program in FY 2004. Initial Congressional authorizations would hold this budget flat	+86
Advanced Reciprocating Engines	
Reduces scope in industrial contracts that are perceived to be within industry's capability	-4,828
Technology Based – Advanced Materials and Sensors	
This increase will support additional activities in developing ceramic matrix composites .	+124
Fuel Flexibility	
A new effort will be focused on the use of alternative fuels, primarily gases.	+250
Thermally Activated Technologies	
Complete existing efforts on heat pumps and refrigeration	-2,406
Total Funding Change, Distributed Generation Technology Development	**-7,724**

End-Use System Integration and Interface

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
End-Use System Integration and Interface					
Distributed Energy Systems Applications Integration					
Distributed Energy Systems Applications Integration	8,284	7,246	7,861	+615	+8.5%
Congressionally Directed Activity, Distributed Energy Systems Applications Integration	0	988	0	-988	-100.0%
Subtotal, Distributed Energy Systems Applications Integration	8,284	8,234	7,861	-373	-4.5%
Cooling, Heating and Power Integration	11,448	11,852	12,000	+148	+1.2%
Total, End-Use System Integration and Interface	19,732	20,086	19,861	-225	-1.1%

Description

Distributed energy devices provide utilities and consumers with more choices and control over how their energy needs are met, and are essential for more openly competitive electricity and natural gas markets to flourish. The focus of the End-Use Integration and Interface activities is to develop highly-efficient integrated energy systems that can be replicated across an end-use sector which will help demonstrate a R&D objective or address a technical barrier.

Benefits

This subprogram develops the knowledge base and technologies necessary to integrate energy systems efficiently in end-use applications. The focus is on heat/mass transfer, air/fluid flows, optimizing performance, adaptive controls for building load management, and sensors/communications technologies for use with building energy systems. The End-Use System Integration and Interface subprogram integrates the technologies developed in the Distributed Generation Technology Development subprogram into the efficient packaged systems envisioned in the Program Goal. An indicator of the progress toward achieving this goal is the number of successful integrated system demonstrations, on the following chart:

Expected Results

	Actual				Expected				
	2000	2001	2002	2003	2004	2005	2006	2007	2008[a]
# Successful[b] Demonstrations ..	0	0	1	1	1	2	2	2	3

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
Distributed Energy Systems Applications Integration	**8,284**	**8,234**	**7,861**
▪ **Distributed Energy Systems Applications Integration** . .	**8,284**	**7,246**	**7,861**

This activity facilitates acceptance of distributed energy resources (DER) in end-use sectors by forming partnerships with industry consortiums in the commercial building, merchant stores, light industrial, supermarkets, restaurants, hospitality, healthcare and high-tech industries. In high-tech industries such as telecommunications, commercial data processing and internet services, the use of electronic data and signal processing have become a cornerstone in the US economy. These industries represent a high potential for DER due to the ultra-high reliability and power quality requirements and related large cooling loads. Projects include development of decision and design tools and integration of DER technologies at customer sites to meet power and thermal needs and quantify value (such as energy and emissions benefits, installation and retrofit costs and high efficiency, reliability, etc.). Results from assessments are disseminated as information and education materials among the industries, utilities and States.

Research will continue to strengthen partnerships with industry consortia (commercial building, education facilities, light industrial, supermarkets, restaurants, hospitality, and health care industries) and identify promising applications for distributed energy/CHP technologies to meet power and specialized thermal needs. Building upon research initiated last year work will be undertaken to: 1) quantify the energy and emissions benefits and installation and retrofit costs, and other benefits; 2) research integration issues and recommend improvements; and 3) correlate data to analytical models and tools for end use customers. Building upon previous research to design integrated distributed energy systems, efforts will begin field testing of these systems and validate anticipated benefits and replicability with industry consortiums. Research will be completed on data centers documenting the integration issues, operation and benefits. Research will continue on systems for the hospitality industry. R&D issues in using distributed energy as a technology option for upgrading and supporting the distribution system to improve capacity and work with the distribution system to resolve technical issues will be evaluated. *Participants: American Gas*

[a] Goal.

[b] A successful demonstration is defined as an integrated CHP project that demonstrates a 70 percent overall efficiency.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Association, Bowman Power, Capstone Turbine Corporation, Energy Solutions Center, Exergy Partners, Gas Technology Institute (GTI), New York State Energy Research and Development Authority (NYSERDA), National Accounts Energy Alliance, Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), and Sure Power Corporation.

▪ **Congressionally Directed Activity, Distributed Energy Systems Application Integration**	**0**	**988**	**0**
National Accounts Energy Alliance (FY 2004 $987,640).			
Total, Distributed Energy Systems Applications Integration	**8,284**	**8,234**	**7,861**
Cooling, Heating and Power (CHP) Integration	**11,448**	**11,852**	**12,000**

Cooling, Heating and Power Integration (CHP) reduces energy costs and emissions by using energy resources more efficiently. In conventional conversion of fuel to electricity, over two-thirds of the energy input is discarded as heat to the environment and not used for productive purposes. CHP makes greater use of fuel inputs by utilizing the discarded heat with system potential efficiencies from 60 to 80 percent. The industry's CHP Program goal, which DOE is supporting, is to double the capacity of CHP in the United States to 92 GW by 2010 and develop and test CHP packages for integration into overall building system design. Using the viable heat energy rejected from the making of electricity, high efficiencies can be achieved and package technologies can be integrated and optimized for end-use application. By capturing and using this rejected heat energy, these packaged systems could achieve efficiencies greater than 70 percent. The National CHP Roadmap will be used to guide the program's activities in the areas of raising awareness, eliminating barriers and developing technologies and markets. Research and development is focused on the integration of prime movers such as turbines, microturbines, and reciprocating engines with thermally activated technologies (chillers, dehumidification, etc) for plug-and-play integrated CHP systems. This work includes the development of necessary controls for seamless integration into buildings systems.

Activities will support the CHP technology roadmap through the development of CHP analytical tools and the maintenance of regional technical assistance centers. Activities will include projects that examine the benefits of CHP, develop analytic tools, develop case studies and lessons learned that can benefit future CHP installations, collect relevant data on CHP installations, and analyze emissions data and emissions credits for CHP and propose guidance for future standards. The data and information from these activities will be disseminated at the national and regional levels to aid in the installation of CHP facilities. These projects will increase awareness of and confidence in CHP technologies including their benefits in efficiency and emissions.

Building on previous research, the DER Program will continue the effort to design and develop seven industry cost Integrated Energy System projects. Following previous fabrication activities, will undertake testing of critical components, interface needs, controls, heat exchangers, and distribution systems. Research will investigate alternate applications and methods of heat recovery from reciprocating engines cooling-jacket water and flue gas. Systems will use advanced absorption chillers and desiccants in a variety of building applications for system efficiencies approaching 80 percent. In FY 2003, this activity was reduced by $474,668 for SBIR/STTR and transferred to the Science

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Appropriation. *Participants: American Council for an Energy Efficient Economy (ACEEE), American Gas Association (AGA), Broad USA, Burns & McDonnell, Capstone Turbine Corporation, Carrier Corporation, Distributed Utility Associates. Energy and Environmental Analysis, Inc. (EEA), Energetics, Energy Concepts Co., LLC, Exergy Partners, Gas Technology Institute, Honeywell Laboratories, I C Thomasson Associates, Inc., Ingersoll-Rand, International District Energy Association (IDEA), Northeast-Midwest Institute (NEMW), NiSource, Oak Ridge National Laboratory (ORNL), Resource Dynamics, Solar Turbines, TIAX, Trane, United Technologies Research Center (UTRC), University of Maryland, University of Chicago – Illinois, California Energy Commission, University of California-Berkley, University of California- Irvine, San Diego State University, New York State Energy Research and Development Authority (NYSERDA), Pace University, University of Massachusetts-Amherst, Rutgers University, West Virginia University, US Combined Heat and Power Association, Washington State University, and Waukesha Engine, Dresser, Inc.*

Total, End-Use System Integration and Interface	**19,732**	**20,086**	**19,861**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Distributed Energy Systems Applications Integration	
▪ **Distributed Energy Systems Applications Integration**	
The increase will fund additional system integration activities selected from the FY 2004 general solicitation supporting the hospitals, hotels, schools, and grocery sectors	+615
▪ **Congressionally Directed Activity, Distributed Energy Systems Applications Integration**	
Complete Congressionally-directed activity and focus on activities contributing to program goals	-988
Total, Distributed Energy Systems Applications Integration	-373
Cooling, Heating and Power Integration	
Complete testing of one combined heat and power system at a end-user facility	+148
Total Funding Change, End-Use System Integration and Interface	**-225**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support					
Technical/Program Management Support	526	524	530	+6	+1.1%
Total, Technical/Program Management Support	526	524	530	+6	+1.1%

Description

The addition of distributed energy resources as a power choice is a complex issue. This task forms the technical foundation that assists and guides the DER research activities to ensure relevance to the market. Markets, technology advances, and regulations are dynamic, and this task continually monitors available information and adjusts the program direction as necessary to be responsive.

Benefits

The technical/program management subprogram provides the analysis framework and technical support to meet the requirements of Department's planning process, Congress, GPRA, and PART (planning, management and purpose). This subprogram also analyzes program gaps and new R&D opportunities. This planning and management analysis is necessary to keep the program's research agenda on target to meet the Program Goal, in the face of dynamic market and technology developments.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	**526**	**524**	**530**

The DER Program will undertake activities which are an integral part of the distributed generation technology development and end-use systems integration. Activities will include preparation of program strategic plans, multi-year plans, technology roadmaps, and operating plans, peer reviews and technical workshop/conferences specific to Distributed Energy Resources Technology Development and End-Use Systems Integration, technical data collection and methodology to support DER performance goals, DER technology assessments and market status. The funds will be split proportionally between the needs of the Distributed Generation Technology Development activity and the End-Use Systems Integration and Interface activity. *Participants include: Energetics*.

Total, Technical/Program Management Support	**526**	**524**	**530**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technical/Program Management Support	
No significant change	+6
Total Funding Change, Technical/Program Management Support	**+6**

Building Technologies

Funding Profile[a]

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Building Technologies						
Residential Buildings Integration	12,133	13,067	13,067	18,932	+5,865	+44.9%
Commercial Buildings Integration	4,386	4,440	4,440	4,995	+555	+12.5%
Emerging Technologies	30,564	29,997	29,997	25,057	-4,940	-16.5%
Equipment Standards and Analysis	9,635	10,387	10,387	7,800	-2,587	-24.9%
Oil Heat Research for Residential Buildings	0	494	494	0	-494	-100.0%
Technical/Program Management Support	1,609	1,481	1,481	1,500	+19	+1.3%
Total, Building Technologies	58,327	59,866	59,866	58,284	-1,582	-2.6%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-618, "Energy Tax Act" (1978)
P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)
P.L. 95-620, "Power Plant and Industrial Fuel Use Act" (1978)
P.L. 96-294, "Energy Security Act" (1980)
P.L. 100-12, "National Appliance Energy Conservation Act" (1987)
P.L. 100-357, "National Appliance Energy Conservation Amendments" (1988)
P.L. 100-615, "Federal Energy Management Improvement Act" (1988)
P.L. 102-486, "Energy Policy Act" (1992)

[a] SBIR/STTR funding in the amount of $1,048,982 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $765,388 and $735,330 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

Mission

The mission of the Building Technologies Program ("BT") is to develop technologies, techniques and tools for making residential and commercial buildings more energy efficient, productive, and affordable. The portfolio of activities includes efforts to improve the energy efficiency of building components and equipment, and their effective integration using whole-building-system-design techniques, the development of building codes and equipment standards, and integration of renewable energy systems into building design and operation.

Benefits[a]

The Building Technologies Program supports DOE's goal to improve energy security by developing reliable, affordable and environmentally sound technologies that significantly reduce the energy consumption and peak electrical demands of residential and commercial buildings, which account for about two thirds of the electric energy consumption in the Nation, thereby enhancing the reliability and efficiency of the Nation's energy supply infrastructure, and therefore reducing potential grid failures at period of system peak demand.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Building Technologies program supports the following goal:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

Program Goal 04.04.02.00: Building Technologies. The Buildings Technologies Program goal is to develop cost effective tools, techniques and integrated technologies, systems and designs for buildings that generate and use energy so efficiently that buildings are capable of generating as much energy as they consume.

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[a] Benefits estimates are annual (not cumulative) and reflect expected additional market adoption of efficient technologies or renewable energy resources due to the technology and market improvements being developed by EERE's programs activities from FY 2005 to the benefit year or to activity completion (whichever is nearer). These estimates do not include those efficiency and renewable improvements developed by program activities to date, or those improvements that would be expected to occur in the absence of future absent these program efforts. These estimates assume business-as-usual expectations regarding future energy markets and current policies; differences in future energy market conditions or policies would result in different levels of benefits. A summary of the methods, assumptions, sensitivities, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html. Final documentation estimated to be completed and posted by March 15, 2004.

Contribution to Program Goal 04.04.02.00 (Building Technologies)

The Building Technologies Program has one program goal that contributes to General Goal 4 in the "goal cascade":

Key technology pathways that contribute to achievement of these benefits include:

- Residential Buildings Integration R&D Activities: provide the energy technologies and solutions that will catalyze 70 percent reduction in energy use of new prototype residential buildings that when combined with onsite energy technologies result in Zero Energy Homes (ZEH)[a] by 2020 and 20 percent reduction in energy use of existing homes. By 2010, five design packages that can achieve an average of 40 to 70 percent reduction in whole house energy use and 20 percent reduction in existing buildings will be developed. Performance indicators include the number of: subsystem technological solutions developed, researched, and evaluated; design packages developed, researched, and evaluated against Zero Energy benchmark for homes; design packages developed and number of existing homes retrofitted to achieve 20% or more improvement in energy efficiency; project and demonstration homes developed in the Building America (BA) program; building code change proposals developed and submitted to code development bodies; and upgrades of Federal building codes completed.
- Commercial Buildings Integration R&D Activities: By 2010, develop five to seven technology packages that can achieve an average of 50 percent reduction in the purchased energy use in new, small commercial buildings relative to the International Energy Conservation Code (IECC) or 30 percent reduction in energy use in existing small commercial buildings. Performance indicators include the number of: technology packages developed, researched, and evaluated against 50 percent reduction of energy use in new buildings or 30 percent reduction in existing buildings; building code change proposals developed and submitted to code development bodies; upgrades of Federal building standards issued.
- Emerging Technologies (ET) Activities: accelerate the introduction of highly-efficient technologies and practices for both residential and commercial buildings. The ET activities support the net Zero Energy Building (ZEB)[a] goal through research and development of advanced lighting, building envelope, windows, space conditioning, water heating and appliance technologies. Without advanced components developed in the Emerging Technologies activities, this goal will not be met. The performance indicators include the number of potentially market viable technologies demonstrated and patents awarded.
- Equipment Standards and Analysis: Increase minimum efficiency levels of buildings and equipment through codes, standards, and guidelines that are technologically feasible, economically justified, and saves significant energy. By 2010, issue 13 formal proposals, consistent with enacted law, for enhanced product standards and test procedures. Performance indicators include: product standards and test procedures proposed/issued; and analyses completed for labeling and Energy Star update and expansion to include new products.

[a] The Zero Energy Building (ZEB) (referred to as Zero Energy Homes (ZEH) in the residential sector) research initiative is bringing a new concept to homebuilders across the United States. A Zero Energy Home combines state-of-the-art, energy efficient construction and appliances with commercially available renewable energy systems such as solar water heating and solar electricity. This combination can result in a net zero energy consumption. A ZEH, like most houses, is connected to the utility grid, but can be designed and constructed to produce as much energy as it consumes on an annual basis. With its reduced energy needs and renewable energy systems, a ZEH can, over the course of a year, give back as much energy to the utility as it takes.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.04.02.00 (Building Technologies)					
Residential Buildings Integration					
In partnership with Building America, developed more than 2,000 highly energy-efficient, environmentally sound, and cost-effective houses and disseminate results to builders of 15,000 other houses through PATH. (NEARLY MET GOAL)	With Building America Partners, completed 3,000 energy-efficient environmentally sound high performance homes. (EXCEEDED GOAL)	Building America completed 1,700 homes in Fiscal Year 2002, bringing the total number of homes built through the program to more than 5,350. More homes were built than the original goal due to increased program success, increased program efficiency, increased builder participation, and reduced lead times to house completion. (MET GOAL)	Pursued six promising technological solutions considering regional and housing type differences targeting 40 percent reductions in residential space conditioning, hot water, and lighting loads. Based on Building America systems research results, developed regional Building System Performance Packages for five climate zones describing “best practice” systems that reduced space conditioning energy use by 30 percent. Completed at least 800 highly resource-efficient, cost-effective project homes through the Building America consortia, bringing the total number of homes built through the program to more than 5,300. Developed retrofit best practices guidelines and seven case studies for existing residential buildings. Issued a proposal to upgrade Federal Residential Building codes.	Initiate 5 design packages that provide promising technological solutions considering regional and housing type differences targeting 40 - 50 percent reductions in residential space conditioning loads, compared to IECC 2000, through Building America Consortia. Strategies to reduce the major loads, including energy used for hot water, lighting and clothes dryers will also be investigated.	Complete 3 design technology packages for new residential buildings that are 30 percent more efficient than the whole-house Building America benchmark. Analyze and develop code change proposals that are expected to result in a cost-effective improvement in energy efficiency in residential buildings of approximately five percent.
Commercial Buildings Integration					
N/A	N/A	All supporting documents for commercial codes including the draft Notice of Proposed Rule are in the General	Facilitated a 10 percent increase in commercial building designs that have meaningful consideration of		Complete assessments of technology and market opportunities, optimization methods and design

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		Counsel's office of DOE for concurrence. Preliminary concurrence from various agencies and FEMP has been obtained. Federal code staff work has been completed; significant comment response and redesign and timing of review currently underway by general counsel may result in delay for publication by one quarter. (NOT MET) The draft framework from the High Performance Building Roadmap was tested multiple times with actual building design projects in FY 2002. Draft guides for achieving low-energy commercial buildings are being reviewed, and final guidelines are to be published in early FY 2003. (MET GOAL)	energy efficiency by developing improved design tools, including code compliance tools, and completing six research assisted design case studies in cooperation with industry. Completed preliminary development of wireless control systems for 2 different types of HVAC systems and began long-term operational evaluation. Issued a proposal to upgrade Federal Commercial Building codes		strategies and, with substantial input from designers, building owners and others, establish programmatic pathways to achieve 50% or better energy performance in significant numbers of buildings, enabling development of design technology packages for new commercial buildings. Analyze and develop code change proposals that are expected to result in a cost-effective improvement in energy efficiency in commercial buildings of approximately five percent
Emerging Technologies					
N/A	WINDOW 5 was released and approved by NFRC; algorithms were adopted as an International Standards Organization (ISO) standard. (MET GOAL) Completed Phase I field demonstrations of heat pump water heaters, with utility partners. (MET GOAL)	Seven research areas were completed. Specific research projects include: energy performance of insulated, unvented attics; development of low cost wood shear panels; energy impacts of ICS (Integral Collector Storage) solar domestic hot water preheat systems; evaluation of mixing performance of residential mechanical ventilation systems; development of high performance affordable housing; evaluation and mitigation of moisture problems in manufactured housing; evaluation of dehumidification systems for residential buildings; and evaluation of low energy buildings with onsite power	Implemented research plan for development of practical and efficient solid-state devices for general illumination. Developed 1 lighting control system that can reliably be utilized to reduce peak demand loads while minimizing the disruption to occupants. Completed investigation of 5 methods to increase the optimum selection of equipment components for air conditioning and heat pumps. Field tested 3 approaches to	Complete a solicitation and award five or more competitively based research awards for cost-shared research on technology (such as substrate materials and light extraction) to contribute to the goal of 160 Lumens/watt (lpw) & $11/klm of white light from solid-state devices with industry, national labs, and universities.	Select five new competitively based research awards for cost-shared research on technology (such as optical materials and device structures) to achieve 50 lpw of white light from solid-state devices with industry, national labs, and universities. Complete a thermodynamic study of emerging refrigerants. Based on study results, make go/no-go decision on initiation of first stage development of a laboratory prototype, high efficiency residential 1-ton air-conditioning and heat pump unit that uses a novel approach to the vapor

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		generation systems. (MET GOAL) WINDOW version 5.1 was released to Industry on October 2, 2002 at a NFRC meeting. A Simulation Training Manual and an improved optics database editor (allows for the formulation of advanced glazings including laminated glass) were also released with Windows. An improved heat transfer model, THERM 5.0, was also released. The suite of programs allows for heat transfer modeling of new designs that promote energy efficient product development at significantly lower cost than conventional prototype development. (MET GOAL) Concluded field demonstrations of heat pump water heaters with utility partners. Data was collected from 16 units over a year. Data analysis was performed and a draft report was produced in June. (MET GOAL)	retrofit space-conditioning systems in existing homes to improve energy efficiency. Developed a prototype leak-tight duct system. Field-tested radiant enhanced gas water heater. Analyzed and field tested affordable automatically controlled integrated system using outside air for cooling and warm attic air for ventilation. Completed development of the two-dimensional hydrothermal model and material property measurements. Completed WINDOW 5.2, for basic retrofit product – National Fenestration Rating Council (NFRC) rating & labeling- begin algorithm development for complex retrofit/new products and high performance products. Released EnergyPlus Version 1.1 building energy efficiency design tool.		compression refrigeration cycle and has the potential for a SEER of over 20. Complete a prototype dynamic window that will have a solar heat gain coefficient range of 0.05 to 0.6 and will meet ASTM durability standards for cycling in a high temperature, high ultraviolet light environment.
Equipment Standards and Analysis					
	Issued three proposals for upgrades and three upgrades to appliance standards and test procedures. (MET GOAL)	Two proposals for appliance standard upgrades have resulted in Final Rules. The Residential Central Air Conditioner and Heat Pump, and the Final Rule for Dishwasher Test Procedure for Non-Sensor type machines were issued in the Federal Register in May	Conducted 4 rulemakings to amend appliance standards and test procedures: Residential Furnaces, Boilers, and Mobile Home Furnaces; Electrical Distribution Transformers; Commercial Unitary Air-Conditioners and Heat Pumps; Residential Niche	Prepare for DOE issuance up to 4 rules to amend appliance standards and test procedures for some of the following products: Residential Furnaces, Boilers, and Mobile Home Furnaces; Electrical Distribution Transformers; Commercial Unitary Air-	Develop for DOE issuance up to 4 rules, consistent with enacted law, to amend appliance standards and test procedures that are economically justified and will result in significant energy savings. Develop final rule regarding energy conservation standards for

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		2002. (MET GOAL)	Product Air-Conditioners.	Conditioners and Heat Pumps; and Residential Niche Product Air-Conditioners and Heat Pumps.	electric distribution transformers and commercial unitary air conditioners and heat pumps.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The Building Technologies Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

While the need for increased energy efficiency in building design and operation is clear, from a national perspective, both in terms of economic and strategic terms, the marketplace has not been fully capable of responding. This failure is due both to market structure (fragmentation) and a host of barriers to the development and adoption of cost-effective energy efficient technologies. BT's challenge is to bring the appropriate strategies to bear to address these needs, while designing programs that give appropriate consideration to this marketplace and the barriers presented to energy efficiency.

The Building Technologies Program has identified six portfolio strategies to achieve its mission:

- Accelerate the introduction of highly-efficient technologies and practices through research and development;
- Modernize the R&D portfolios to ensure that the most promising, revolutionary, technologies and techniques are being explored, and align the Residential and Commercial Integration subprograms to a vision of zero net energy buildings;
- Use a "whole buildings" approach to energy efficiency that takes into account the complex and dynamic interactions between a building and its environment, among a building's energy systems, and between a building and its occupants. This approach has achieved energy savings of 30 percent beyond those obtainable by focusing solely on individual building components, such as energy-efficient windows, lighting, and water heaters. (Building Science Corporation, Final Report: Lessons Learned from Building America Participation, February 1995 – December 2002, February 2003, NREL/SR-550-33100);
- Enable integration of energy efficiency and renewable energy technologies and practices;
- Increase minimum efficiency levels of buildings and equipment through codes, standards, and guidelines that are technologically feasible and economically justified; and
- Appropriately exit those technologies that are sufficiently mature or proved to the marketplace, and close efforts where investigations prove to be technically or economically infeasible ("off ramps").

The Residential Buildings Integration subprogram focus on improving the efficiency of the approximately 1.3 million new homes built each year and the 100 million existing homes, including multifamily units — this will be accomplished through research, development, demonstrations, and technology transfer strategies. The strategies include efforts to improve the energy efficiency of residential energy uses such as space heating and cooling, ventilation, water heating, lighting, and home appliances. It includes support for the development of residential building codes and standards to enable application of whole building design techniques. These activities support efforts to develop strategies to integrate solar energy applications and other renewable technologies into buildings and the concept for Zero Energy Buildings.

The Commercial Buildings Integration subprogram addresses opportunities in new commercial buildings ($254 billion annual capital construction and $113 billion renovation) by working with

competitively selected industry groups on cost-shared projects that accelerate the development and adoption of new building technologies and design practices, and address the need for commercial building codes. It includes technology development efforts to validate energy efficiency designs and practices, improve sensors and controls, and develop more energy efficient ventilation systems. It also includes efforts to improve commercial building codes and standards and supports the net Zero Energy Buildings goal.

The strategy of the Emerging Technologies subprogram is to include R&D and technology transfer of energy-efficient products and technologies for both residential and commercial buildings. These efforts address high-impact opportunities within the multitude of building components such as lighting, building envelope technologies including advanced windows, and new designs for appliances, and analysis tools and design strategies. Efficiency advances for this equipment will support the Zero Energy Buildings goal.

The Equipment Standards and Analysis subprogram leads to improved efficiency of appliances and equipment by conducting analyses and developing standards that are technologically feasible and economically justified, under the Energy Policy and Conservation Act, as amended (EPCA). Analysis performed under this program will support related program activities such as ENERGY STAR, to ensure a consistent methodology is used in setting efficiency levels for each related program.

The management strategy for developing affordable net Zero Energy Buildings requires a high level of coordination with other programs in the Office of Energy Efficiency and Renewable Energy. These include the Solar Energy Technology Program and the Distributed Energy Resources Program. In addition, the Biomass Program, Wind and Hydropower Technologies Program, Geothermal Technologies Program, and Hydrogen, Fuel Cells and Infrastructure Technologies Program have important technologies to contribute. The Building Technologies Program also invests in technical program and market analysis and performance assessment in order to direct effective strategic planning.

These means and strategies will result in significant cost savings and a significant reduction in the consumption of energy cross build fuel types—increase the substitution of clean fuels—cost effectively reducing America's demand for energy, lowering carbon emissions, and decreasing energy expenditures—thus putting taxpayers' dollars to more productive use.

There are a number of external factors affecting the Building Technologies Program ability to achieve its strategic goals which need to be addressed. For example, there are several factors that interfere with the private sector making R&D investments in energy efficient building technologies. These include a fragmented industry comprised of thousands of builders and manufacturers, none of which has the capacity to sustain research and development activities over multi-year periods. Another factor is the compartmentalization of the building professions, in which architects and designers, developers, construction companies, engineering firms, and energy services providers do not typically apply integrated strategies for siting, construction, operations, and maintenance. (Scott Hussell, Amy Wong, Ari Houser, Debra Knopman, Mark Bernstein, RAND Corporation: *Building Better Homes: Government Strategies for Promoting Innovation in Housing,2003*). This fragmentation and compartmentalization of the buildings industries means there is a need for a facilitator to build consensus on research directions and priorities, industry-wide codes and standards, technology transfer, and education, outreach, and information exchange.

In carrying out the program's mission, Building Technologies Program collaborates with several groups on its key activities. Partnerships and cost share arrangements with industry and other Federal agencies become critical management tools which can build a critical mass to address these barriers. The program's management strategy involves four key elements: a customer-focused, team-based

organization for greater accountability and improved results; collaboratively developed technology roadmaps to provide for a more integrated, customer driven R&D portfolio; greater competition in project solicitations to increase innovation and broaden research participation; and increased peer review to assure scientifically sound approaches. The program has developed six related road maps: High Performance Commercial Buildings, Windows, Lighting (which includes specific roadmaps on solid state lighting), Building Envelope, Appliances and Controls, and Zero Energy Homes, now part of the conservation budget that are being updated and incorporated into the R&D portfolio.

Validation and Verification

To validate and verify program performance, the Building Technologies Program will conduct internal and external reviews and audits. These programmatic activities are subject to continuing review by, for example, the Congress, the General Accounting Office, the Department's Inspector General, the U.S. Environmental Protection Agency, and state environmental agencies. The table below summarizes validation and verification activities.

Data Sources:	EIA Annual Energy Review (AER); Commercial Building Energy Consumption Survey (CBECS); Residential Energy Consumption Survey (RECS); and Annual Energy Outlook (AEO). U.S. DOC Current Industrial Reports (CIR). Various trade publications. Information collected directly from Building Technologies performers or partners.
Baselines:	The following are key baselines used in the Building Technology Program ▪ Residential Buildings Energy Use Intensity Index (2000): 1 (Building America Benchmark) ▪ Commercial Buildings Energy Use Index (1980): 1 (Energy Information Administration) ▪ Solid State Lighting (2003): 30 Lumens/watt efficacy ▪ Windows (2003): 0.33 to 0.5 U-value (varies by region) ▪ Residential Heating and Cooling (2003): 6.8 HSPF and 10 SEER
Frequency:	Complete revalidation of assumptions and results can only take place every three to four years, due to the reporting cycle of two crucial publications: CBECS and RECS. However, updates of most of the baseline forecast and BT program outputs will be undertaken annually.
Data Storage:	EIA and DOC data sources are publicly available. Trade publications are available on a subscription basis. BT program output information is contained in various reports and memoranda.
Verification:	Calculations are based on assumptions of future market status, equipment or technology performance, and market penetration rates. These assumptions can be verified against actual performance through technical reports, market survey and product shipments.

Program Assessment Rating Tool (PART)

The FY 2004 PART review of the Building Technologies Program contained a recommendation to

redirect existing funding for lighting R&D towards high-risk, high-payoff technologies that support the Department's proposed Solid State Lighting Initiative. In response to this recommendation, DOE issued a solicitation, through the National Energy Technology Laboratory, seeking projects to significantly reduce energy use in buildings by targeting appliances and water heaters, building envelopes, lighting, and space conditioning. Seven of the thirteen projects selected are lighting projects, including solid state lighting projects. Another PART recommendation suggested the development of adequate long-term and annual performance measures, and the Building Technologies program is developing multi-year program plans and annual operating plans that will include these measures.

The FY 2005 PART recognized the program's improvements, finding that the program has a clear purpose and improved management, citing its prioritization process in its standards activities and increasing focus on longer term R&D. However, work remains on addressing needed improvements in performance measures. The net result was that the program's overall score remained relatively constant and its rating remained adequate.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Request	FY 2005 Request	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.04.02.00					
Residential Buildings Integration.....	12,133	13,067	18,932	+5,865	+44.9%
Commercial Buildings Integration	4,386	4,440	4,995	+555	+12.5%
Emerging Technologies	30,564	29,997	25,057	-4,940	-16.5%
Equipment Standards and Analysis ..	9,635	10,387	7,800	-2,587	-24.9%
Oil Heat Research for Residential Buildings.....	0	494	0	-494	-100.0%
Technical/Program Management Support.....	1,609	1,481	1,500	+19	+1.3%
Total, Program Goal 04.04.02.00	58,327	59,866	58,284	-1,582	-2.6%
Total, Building Technologies	58,327	59,866	58,284	-1,582	-2.6%

Expected Program Outcomes

The Building Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the Building Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, oil savings, natural gas savings, and the reduced need for electricity capacity additions that result from the realization of Building Program goals are shown in the table below through 2050. In addition to the types of benefits quantified above, building efficiency and renewable technologies often provide non-energy benefits, such as improved lighting quality and building occupant productivity. The benefits estimates reported in this table do not include any expected acceleration in the deployment of these new technologies due to the unique field partnerships that provide the basis for the Residential Building Integration R&D, or synergies with the EPA Energy Star Home program.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html Final documentation estimated to be completed and posted by March 15, 2004. Uncertainties are larger for longer term estimates. The results shown in the long term benefits tables are preliminary estimates based on initial modeling of some of the possible

program production technologies; nonetheless, they provide a useful picture of growing national benefits over time.

FY 2005 GPRA Benefits Estimates for the Buildings Program[a]

Mid-Term Benefits[b]

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	0.3	0.7	1.1	2.0
Energy Expenditure Savings (Billion 2001$)	4	10	16	27
Carbon Emission Reductions (MMTCE)	6	13	22	43
Oil Savings (MBPD)	0.02	0.03	0.04	0.08
Natural Gas Savings (Quads)	0.15	0.33	0.54	0.78
Total Displaced Need for New Electric Capacity (GW)	5	10	21	36

Long-Term Benefits[c]

	2030	2040	2050
Primary Non-Renewable Energy Savings (Quads)	2.3	2.3	2.8
Energy System Cost Savings (Billion 2001$)	23	34	45
Carbon Emission Reductions (MMTCE)	43	43	50
Oil Savings (MBPD)	0.1	0.2	0.2
Natural Gas Savings (Quads)	1.12	1.54	1.82
Total Displaced Need for New Electric Capacity (GW)	46	48	53

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget.

[b] Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

[c] Long-term benefits were estimated utilizing the GPRA05 - MARKAL developed by Brookhaven National Laboratory (BNL). Results can differ among models due to differences in their structure. In particular, the two models estimate economic benefits in different ways, with the MARKAL model reflecting the cost of additional investments required to achieve reductions in energy bills.

Residential Buildings Integration

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Residential Buildings Integration					
Research and Development: Building America	11,558	12,484	18,342	+5,858	+46.9%
Residential Building Energy Codes	575	583	590	+7	+1.2%
Total, Residential Buildings Integration	12,133	13,067	18,932	+5,865	+44.9%

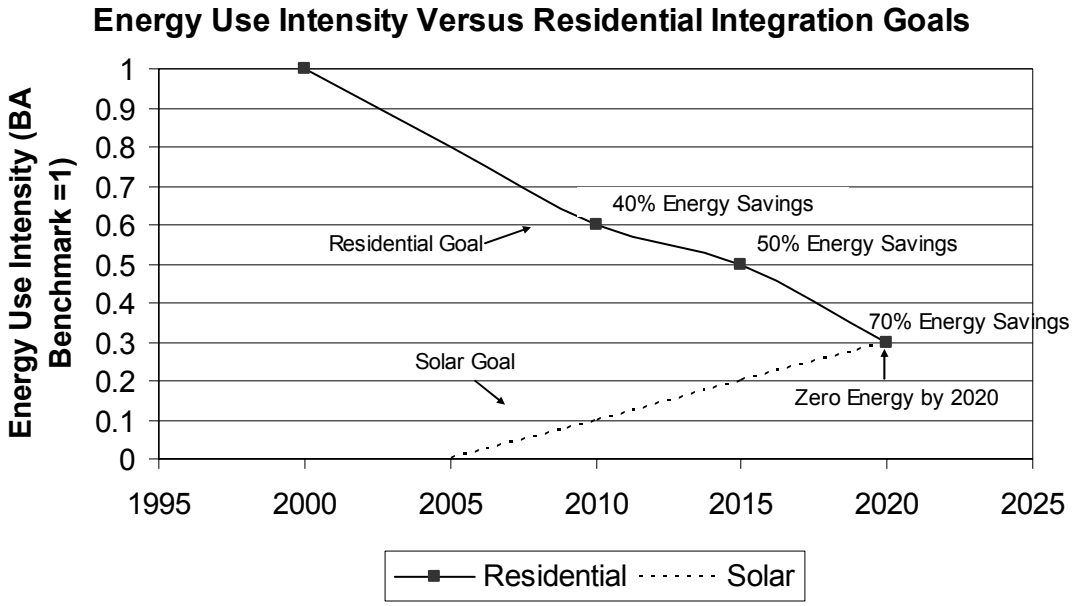
Description

The long-term goal of the Residential Buildings Integration subprogram is to develop cost effective designs for houses that produce as much energy as they use on an annual basis.

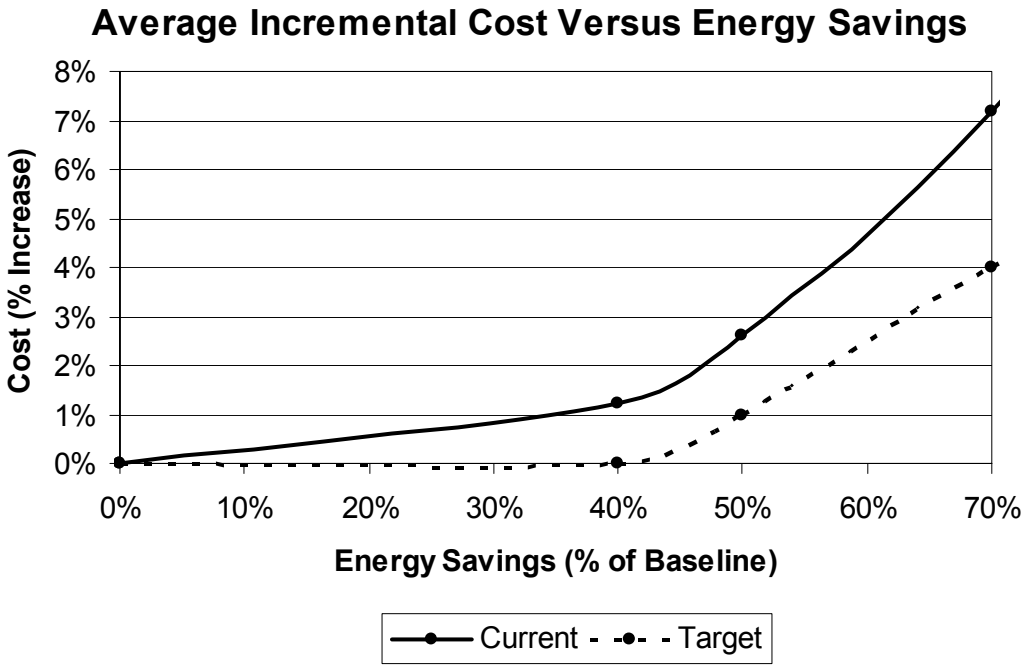
Benefits

Research will focus on finding ways to reduce the total energy use in a new home by 40 to 70 percent. This improvement in energy efficiency when coupled with research to integrate onsite renewable energy supply systems into the homes will result in marketable net zero energy designs. During FY 2005, in partnership with designers, builders and component manufactures, the Residential Buildings Integration subprogram will focus research on development and evaluation of practical strategies to reduce whole house energy use in new homes by 40 to 70 percent and also evaluate the application of these strategies in existing homes to achieve savings of 20 percent.

The following graphs show the progress, and targets, towards reaching the Residential Buildings Integration goal of achieving the technical capability to produce net Zero Energy Buildings by 2020, as well as the required cost targets needed if the research is to be adopted by the industry. The baseline for the Energy Use Intensity measure is the Building America Research Benchmark Definitions. The BA benchmark was developed for tracking and measuring the success of the Residential Building Integration goals. The Residential Building Integration goals are designed to achieve levels of conservation in residential buildings that will be complemented by renewable energy from the Solar Program to produce zero energy buildings in 2020. (Building America, Building America Research Benchmark Definition, Version 3.1, November 11, 2003, National Renewable Energy Laboratory.)



The goals of the Residential Building Integration program not only involve achieving conservation at the 40 to 70 percent levels, but also specify cost targets that will allow for market adoption. An optimization analysis determined the portfolio of technologies that could achieve each level of conservation for the lowest added cost. For lowest levels of conservation, the incremental cost is near the target cost, but for high levels of conservation the incremental cost far exceeds the target. In addition to developing new technologies, cost reduction research and development will be crucial to reaching high levels of conservation and the goal of net zero energy buildings. The average incremental costs for each Residential Integration goal are captured in the graph below along with the target costs.



Related indicators of progress include:

- By 2007, develop 5 regional Builder System Performance Packages to incorporate cost-effective "best practice" systems that reduce spacing conditioning energy use by 40 to 70 percent.
- Development and testing of 5 promising technological solutions required to reduce whole house energy use by 50 percent in the different climate regions of the U.S. and for different housing types.
- Design, construct and test research houses having whole house energy savings of a least 40 percent with 20 builders from the Building America Consortia.
- Validate the performance of at least 300 houses, representing the five climate zones that were constructed to meet this performance goal.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Research and Development: Building America **11,558** **12,484** **18,342**

In FY 2005, conduct systematic research on conservation technologies that will contribute to marketable designs for net zero energy homes (ZEH). The research plan for Building America involves development and field testing of subsystems having the energy use efficiency with renewable energy technologies and performance required for ZEH; construction and evaluation of prototype homes using a combination of these subsystems, built under the careful supervision of the Building America scientists and engineers; construction of entire developments which apply these design strategies to confirm that they can be replicated by builders and trades people and still achieve the same level of performance as the prototype homes; and finally documentation of the design strategies for general use.

Subsystem research: Pursue research, development and testing of 5 promising technological solutions required to reduce whole house energy use by 50 percent in the different climate regions of the U.S. and for different housing types. The primary areas of research include: continued evaluation of cooling equipment that effectively manages humidity in homes to ensure comfort and minimize mold problems; field testing of efficient heating and cooling distribution and ventilation systems required to maintain a comfortable and healthy home; research on efficient lighting system designs that are aesthetically pleasing; and development of whole house controls to optimize the use of energy in the home and reduce peak demand.

Prototype and production homes: Work with 20 builders from the Building America Consortia to design, construct and test research houses having whole house energy savings of a least 40 percent based on the lessons learned from research conducted in FY 2003 and FY 2004. Conduct system engineering evaluations to validate the performance of at least 300 houses, representing the five climate zones that were constructed to meet this performance goal. Develop designs for homes that use 70 percent less energy through the full integration of renewable energy systems with efficient

house designs.

Existing homes research: Leverage research being conducted by States and other organizations to improve the performance of existing homes. Test 5 system approaches to improve energy efficiency in existing buildings with a target of reducing overall energy use by 20 percent.

Documentation: Develop 5 regional Builder System Performance Packages to incorporate cost-effective "best practice" systems that reduce spacing conditioning energy use by 40 percent. In addition to builders' guides, work with the different segments of the housing and construction industry to develop documentation designed to communicate the value and benefits of the high performance homes and to define the methods that builders can use to easily build homes that meet the Energy Star criteria and to take advantage of the proposed residential energy tax credit. Prepare case studies of results from the first generation net Zero Energy Homes constructed and monitored in FY 2003 and FY 2004. Develop Remodeler System Performance Packages that describe "best practice" system retrofits for existing buildings for each climate region that show home owners ways to take advantage of the existing homes energy tax credit and maximize energy savings. In FY 2003 this activity was reduced by $208,068 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include ConSol, Building Science Corporation, Steven Winter Associates, IBACOS, Inc., NREL, ORNL, FSEC and Others TBD*

Residential Building Energy Codes

In FY 2005, develop revisions to the International Energy Code Council (IECC) 2006 Edition (building energy codes standard); the National Fire Protection Association (NFPA) and the National Fenestration Rating Council (NFRC) to promote window assemblies that would be more cost-effective and energy efficient than under the IECC 2003 (FY 2004 $261,735). Evaluate emerging technologies and develop appropriate revisions to the residential building codes that will support the inclusion of systems engineering approaches enabling the cost-effective design, construction, and operation of Zero Energy Homes. In FY 2003, this activity was reduced by $10,951 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include: PNNL, and others TBD.*

Total, Residential Building Energy Codes	**575**	**583**	**590**
Total, Residential Buildings Integration	**12,133**	**13,067**	**18,932**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Residential Buildings Integration	
Research and Development: Building America	
Accelerate research and development activities to improve whole-house energy efficiency by 40-50 percent, develop whole house controls to optimize energy use and reduce peak demands and allow full integration of renewable energy technologies required to achieve net zero energy home goals	+5,858
Residential Building Energy Codes	
No significant change	+7
Total Funding Change, Residential Buildings Integration	**+5,865**

Commercial Buildings Integration

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Commercial Buildings Integration					
Research and Development	3,858	3,905	4,454	+549	+14.1%
Commercial Building Energy Codes	528	535	541	+6	+1.1%
Total, Commercial Buildings Integration	4,386	4,440	4,995	+555	+12.5%

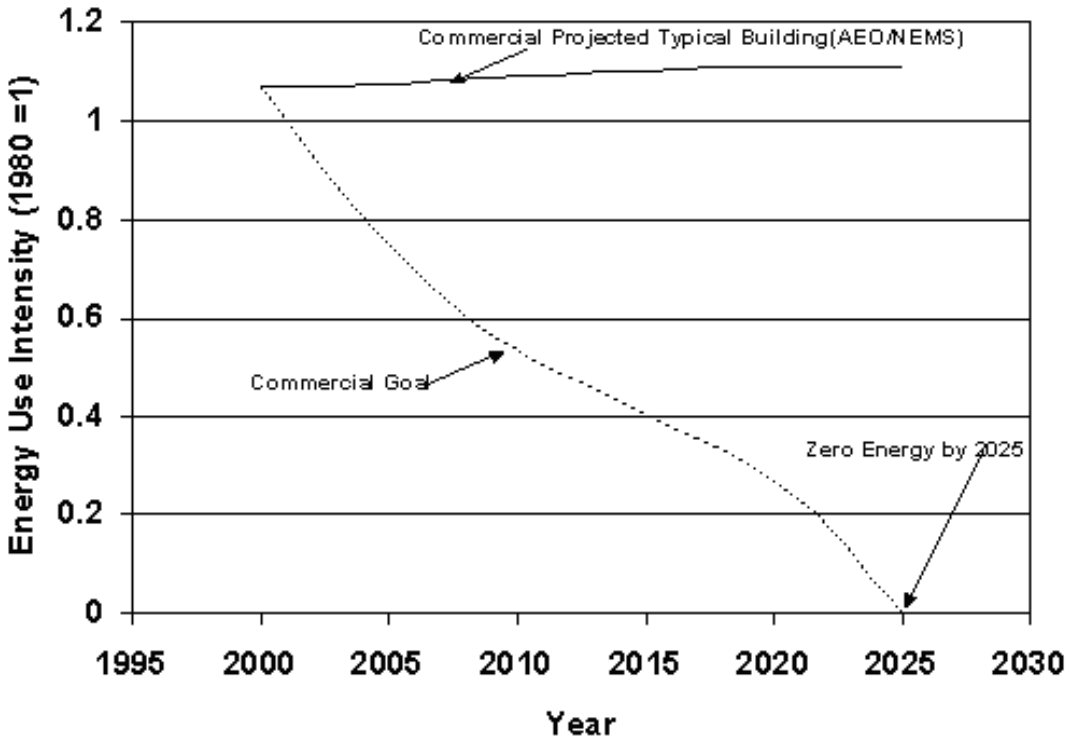
Description

The long-term goal of the Commercial Buildings Integration subprogram is to develop cost effective designs for commercial buildings such that they produce as much energy as they use on an annual basis. Research will focus on finding ways to reduce the total energy use in a commercial building by 60 to 70 percent. This improvement in energy efficiency when coupled with research to integrate onsite renewable energy supply systems into the commercial building will result in marketable net zero energy designs. During FY 2005, in partnership with designers, builders and component manufactures, the Commercial Buildings Integration subprogram will focus research on development and evaluation of practical strategies to reduce building energy use in new small commercial buildings by 50 percent and by 20 percent in existing small commercial buildings.

Benefits

The Commercial Building Integration sub-program will improve energy security by reducing energy consumption and peak electrical demands of commercial building.

The following graph conceptually illustrates the progress, and targets, towards reaching the Commercial Buildings Integration goal of achieving the technical capability to produce net Zero Energy Buildings by 2025.



Analytical assessments completed in FY 2005 will define the pathway more definitively, across the wide range of commercial building types and climates.

Related indicators of progress include:

- Identify integrated packages of technologies from simulation optimization studies of small commercial buildings in multiple climates throughout the U.S.
- Identify potential partners to document and test the packages with 50 percent lower energy use in new construction and 30 percent lower use in existing buildings.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
Research and Development **3,858**	**3,905**	**4,454**

In FY 2005, technology assessment activities will be completed and the focus will begin to shift to developing packages of cost-effective technologies for small commercial buildings to reach 50 percent, 75 percent, or zero net energy. These packages will build on the knowledge gained from completing the intensive case studies of six high performance buildings in FY 2003 and 2004, completing the broad-based assessments of technology and market opportunities, system optimization methods and design strategies begun in FY 2004 and continuing work with designers, developers and

(dollars in thousands)

FY 2003	FY 2004	FY 2005

owners of high performance buildings. Begin to develop integrated packages of technologies from simulation optimization studies of small commercial buildings in multiple climates throughout the U.S. Begin to determine the technology advancements required for routinely creating zero energy buildings within 20 years. Identify potential partners to test the packages with 50 percent lower energy use in new construction and 30 percent lower use in existing buildings. Continue research projects on advanced whole building control devices and systems as identified in the research plan developed with industry in FY 2003. Complete two field evaluation projects to establish the technical viability of two key wireless technologies which could enable cost effective retrofit of existing buildings with state-of-the-art control systems.

In collaboration with a manufacturer, complete field testing and monitoring of a manufacturer's prototype improved ventilation and air conditioning system for portable school classrooms that will reduce energy use by 25 percent. Collaborate with manufacturers to develop standard test procedures and ventilation rate measurement and control systems to reduce ventilation energy use by 40 percent. In FY 2003, this activity was reduced by $69,662 for SBIR/STTR and transferred to the Science appropriation. *Participants will include: LBNL, National Institute of Standards & Technology (NIST), NREL, PNNL, University of California, and others TBD.*

Commercial Building Energy Codes	**528**	**535**	**541**

In FY 2005, begin developing a series of code change proposals that will make it easier for code officials to accept newer technologies in support of the 2025 goal of marketable zero energy commercial buildings. Develop revisions to the IECC 2006 Edition/ASHRAE Standard 90.1 – 2004 including energy efficient revisions to the NEPA and NERC to promote energy efficient window assemblies. Coordinate efforts with the Federal commercial codes activities to ensure that private sector and Federal codes work together to develop consistent and more stringent codes. Sponsor 3-5 workshops to develop new ideas and mechanisms for code change proposals that can be realistically adopted into code. Provide technical assistance to states and local government as well as Federal agencies to accelerate the adoption of energy efficient building codes. Begin active discussions with code organizations to form joint task groups that will develop and produce advanced building guidelines to achieve energy savings in new construction of 30 percent beyond current code in 2005. In FY 2003, this activity was reduced by $9,499 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include: PNNL and others TBD.*

Total, Commercial Buildings Integration	**4,386**	**4,440**	**4,995**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Research and Development	
Increase to enable design package development for small commercial buildings	+549
Commercial Building Energy Codes	
No significant change	+6
Total Funding Change, Commercial Buildings Integration	**+555**

Emerging Technologies

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Emerging Technologies					
Lighting R&D	9,982	11,402	12,500	+1,098	+9.6%
Space Conditioning and Refrigeration R&D	5,580	5,337	3,000	-2,337	-43.8%
Appliances and Emerging Technologies R&D	1,703	1,980	1,755	-225	-11.4%
Building Envelope R&D	8,041	8,190	5,000	-3,190	-38.9%
Analysis Tools and Design Strategies	3,032	3,088	2,802	-286	-9.3%
Technology Road Maps	2,226	0	0	0	0.0%
Total, Emerging Technologies	30,564	29,997	25,057	-4,940	-16.5%

Description

The long-term goal of the Emerging Technologies subprogram is to develop cost effective technologies, e.g., lighting, windows, and space heating and cooling, for residential and commercial buildings. Research will focus on finding technologies to support the residential and commercial building goal to 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 will result in marketable net zero energy designs.

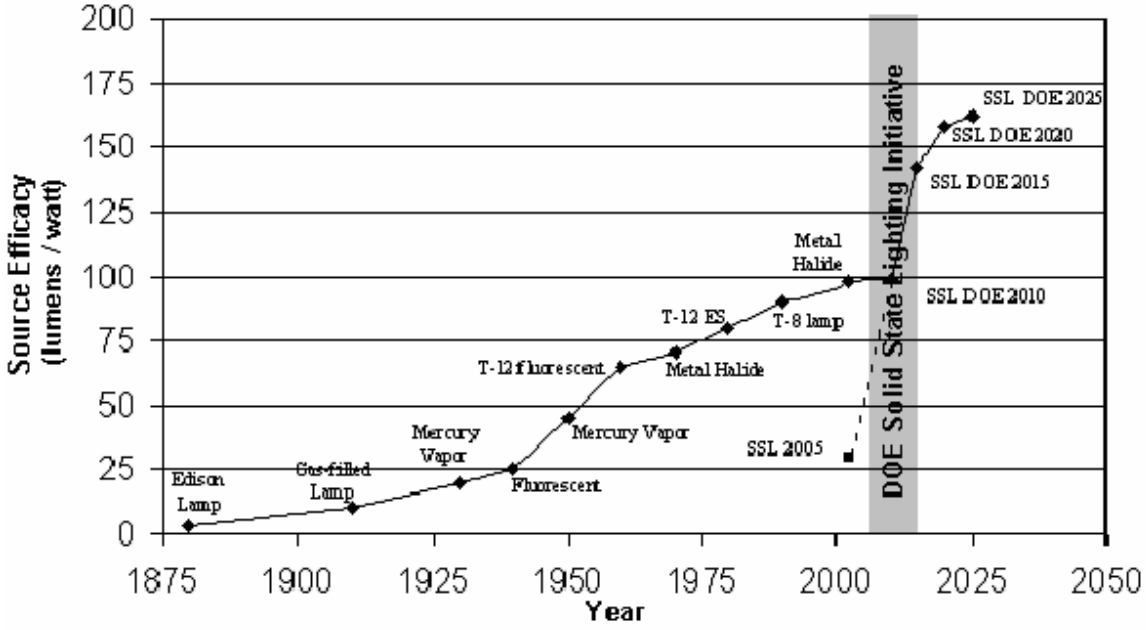
Specifically, we will focus on:

- Solid state lighting, which have long term efficiencies that have the potential to approach 200/lpw, compared to most conventional technologies maximum efficiencies in the 85 to 115 range.
- Advanced windows, which have the potential to move from a net energy loss to a net energy provider by incorporating advanced insulation materials and technologies that enable dynamic control of thermal and tight transmittance performance.

Benefits

The Emerging Technologies sub-program improves energy security through support of the technology development needs of the Residential Integration and Commercial Integration sub-programs, and as well as the need for replacement technologies in the existing building stock.
The two graphs below are examples of critical technologies required to reduce whole building energy use, both new and existing, and represent areas of major focus in Emerging Technologies. The lighting graph is illustrative of the efficacy improvement possible.

Electric Lamp White Light Efficacy Improvement



Characteristics	(calendar year) 1985	2003	2005	2010
Whole Window Thermal Performance (U-Value)	0.4	0.33-0.5	0.3	0.17
Solar Control (Solar Heat Gain Coefficient) (in winter)	.04	.03	0.6 to gain heat	0.6 to gain heat
Solar Control (Solar Heat Gain Coefficient) (in summer)	.04	.03	0.05 to reject heat	0.05 to reject heat

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Lighting R&D	**9,982**	**11,402**	**12,500**

In FY 2005, implement the solid state lighting research activities resulting from the FY 2003 solicitation to develop and deploy projects for general illumination that could achieve energy efficiencies upwards of 70 percent through creation of a technical foundation to revolutionize the energy efficiency, appearance, visual comfort, and quality of lighting. Solid state lighting can capture at least a 50 percent electricity peak demand reduction in commercial buildings' lighting load, while continuously saving energy during all operating hours. These activities will focus on several areas: quantum efficiency, lifetime, performance, packaging, infrastructure, and first cost. The R&D plan will be updated to reflect recent achievements in science/engineering and build on results of DOE-

funded projects, such as light emitting diodes (LEDs) for spot source lighting, and organic LEDs for general lighting. Solid State Lighting Funding of $10.2 million is requested in FY 2005.

Perform light source research on technology breakthroughs for conventional types of lamps to improve efficiency by 20 to 50 percent. Produce high-value outcomes such as: high-performance multi-photon phosphors, non-mercury containing fluorescent lamps, or advanced high intensity discharge lighting with dimming and quality of light controls.

In close collaboration with the Commercial Buildings activity, develop lighting system technologies, strategies, and guidelines, which support optimum building performance and ZEB goals. Develop solutions to overcome technological barriers to widespread use of lighting control systems in commercial buildings including daylight harvesting controls and load shedding capabilities. These solutions will enable a 20 to 30 percent electricity peak demand reduction in a commercial building's lighting load. Demonstrate the impact of lighting quality and also spectral power distribution (wavelength) on occupant satisfaction and performance producing additional reasons for building owners to invest in energy efficiency and high quality lighting. In FY 2003, this activity was reduced by $245,217 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include: LBNL, Lighting Research Center, NETL, universities and others that are competitively selected.*

Space Conditioning and Refrigeration R&D.....	**5,580**	**5,337**	**3,000**

In FY 2005, focus research on space conditioning technology applications that will reduce peak electric demand in residential and commercial buildings by 50 percent for new construction and 30 percent for existing buildings. Based on a thermodynamic study of emerging refrigerants, complete development of a laboratory prototype, high efficiency residential 1-ton air-conditioning and heat pump unit that uses a novel approach to the vapor compression refrigeration cycle and has the potential for a Seasonal Energy Efficiency Rating (SEER) of over 20. Investigate the impact of desiccants and thermal storage systems for peak air conditioning electric demand reduction. Other research and development activities include: a novel refrigeration cycle, a leak tight duct system, integrated options for improved space conditioning and domestic hot water and increased HVAC air distribution system efficiency.

Building integrated controls based on low-cost sensors, advanced control logic, and communications has the market potential to save almost 0.3 Quads of energy per year according to recent studies of Heating, Ventilation, Air Conditioning and Refrigeration (HVAC&R) technology opportunities. New technologies in this area could enable real-time pricing, controls responsive to weather forecasting, and make HVAC&R systems that satisfy user needs in ways that both save energy and increase comfort. Research and development is timely because of opportunities to leverage advances in communication including wireless and the internet to enable intelligent communications and controls at low cost. To pursue these opportunities, prototype equipment diagnostic systems with remote monitoring capability will be investigated to quantify the performance benefits of timely maintenance. In FY 2003, this activity was reduced by $137,068 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include: BNL, LBNL, NIST, ORNL, Academia, manufacturers and others that are competitively selected.*

Appliances and Emerging Technologies R&D	**1,703**	**1,980**	**1,755**

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2005, focus new project development on products with highest potential to contribute to building energy reduction. Investigate opportunities to speed commercial introduction of new solid-state lighting products. Continue developing public-private partnerships to improve the cost and performance attributes of selected products by late-stage engineering and development; establish the viability and reliability of products by engineering field evaluations and lab testing as input to design improvements; verify the cost-performance of products as applied in buildings by field demonstration; and support market development of technology by procurement actions with large volume buyers and manufacturers.

Conclude field demonstrations of heat pump water heaters (HPWH), commercial unitary air conditioners, and reflector compact fluorescent lamps (CFLs). In cooperation with manufacturers, electric utility industry, large volume buyers and other industry partners, co-develop and implement projects to speed commercial introduction and uptake of (1) CFL recessed downlights, (2) HPWHs, (3) unitary air conditioners, (4) and reflector CFLs. Initiate the second national efficient residential fixture lighting design competition in cooperation with American Lighting Association. In FY 2003, this activity was reduced by $41,806 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include: ORNL, PNNL, Dawnbreaker, and others TBD.*

Building Envelope R&D	**8,041**	**8,190**	**5,000**

- Thermal Insulation and Building Materials **3,166** **3,224** **0**

  In FY 2005, Thermal Insulation and Building Materials activities are suspended due to advanced state of technologies, which are being demonstrated in the Residential Integration sub-program. In FY 2003, this activity was reduced by $77,753 for SBIR/STTR and transferred to the Science Appropriation.

- Window Technologies **4,875** **4,966** **5,000**

  In FY 2005, competitive research, cost-shared with industry, will be conducted to further improve product performance, manufacturer yields, and fundamental manufacturing processes of electrochromic devices that have successfully passed rigorous laboratory durability and field tests. This will pave the way for a range of competing products in the market place with greater market appeal through uniform coatings, high reliability, and reduced cost.

  Competitive fundamental science research will be conducted to develop the second generation of materials, chemical applications, and processes that can offer "leap frog" reductions in cost while maintaining a high level of reliability and durability with a broad range of optical properties. The second generation of dynamic windows should enter the market in the 2010 to 2015 timeframe, with full market transformation occurring in the commercial market around 2020. It is believed that fundamental science breakthroughs will be needed to reach price points that will allow for full market transformation.

  Limited exploratory research will be conducted to pursue highly insulating windows and daylighting technologies. Promising technologies and applications will be further characterized and investigated to lay the foundation for future R&D as funds become available after completing higher priority dynamic window research. Several promising projects may be awarded competitively to industry to market these technologies at affordable prices within the next 5 to 10

years. Highly insulated windows can drastically reduce heating loads in colder climates that account for about 2 quads annually. The development of daylighting technologies that deliver natural light deeper into commercial spaces have the potential to save approximately 1 quad of energy annually.

Technology support research will be conducted to assist the windows industry to rate, label and promote highly efficient fenestration products on the market. The suite of software design and rating tools, Windows 6.0 and associated programs, will be completed for use by manufacturers and adoption by NFRC to rate complex glazing systems. Such glazing systems are widely available in the commercial buildings market, but currently cannot be rated by a simulation tool that reduces cost to manufacturers and encourages the introduction of highly efficient systems. Basic maintenance of existing technical support tools for the residential market will be maintained, including support for the NFRC labeling and rating process. In FY 2003, this activity was reduced by $119,774 for SBIR/STTR and transferred to the Science Appropriation. (Item of Congressional Interest: National Administration Rating Council, funded at $265,000 in FY 2003, $265,000 in FY 2004, and $265,000 in FY 2005). *Participants will include: LBNL, Florida Solar Energy Center, ORNL, University of Massachusetts, University of Minnesota, PNNL, CA Energy Commission, NFRC, Alliance to Save Energy, NREL, and a variety of other performers based on competitive awards.*

Analysis Tools and Design Strategies	**3,032**	**3,088**	**2,802**

In FY 2005, research, develop, and implement new EnergyPlus simulation software modules which enable development and compliance with current and near-term building energy standards incorporating new building energy efficiency technologies, such as displacement cooling and ventilation, integrated building systems, and equipment control systems and strategies, multispeed heating and cooling equipment and fans, and hybrid heating and cooling systems and equipment. Identify and prioritize builder, designer, operator, and researcher needs for natural and mechanical ventilation and air flow modeling capabilities. Provide technical support to the 15 private sector interface developers and the more than 50 organizations currently developing new EnergyPlus modules. Work with developers of the two major HVAC design sizing programs to incorporate Energy Plus into their software. Work with the International Alliance for Interoperability to ensure that building thermophysical and energy characteristics are embedded in release 3X of their Industry Foundation Classes (IFCs). Update EnergyPlus utilities to reflect IFC extensions and updates. Working with the Commercial and Residential teams, identify and prioritize the simulation capabilities necessary for the 50 percent, 75 percent energy reduction, and net zero energy building levels. In FY 2003, this activity was reduced by $74,466 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Florida, Solar Energy Center, GARD Analytics, LBNL, J. Neymark Associates, NREL, Oklahoma State University, University of Illinois, and others TBD.*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technology Road Maps	**2,226**	**0**	**0**
In FY 2005, roadmapping activities will continue to be implemented within the different program areas. In FY 2003, this activity was reduced by $54,718 for SBIR/STTR and transferred to the Science Appropriation. *Participants: National Energy Technology Lab (NETL), other national laboratories and industry partners TBD.*			
Total, Emerging Technologies	**30,564**	**29,997**	**25,057**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Lighting R&D	
Expand research on solid state lighting activities targeting a new technological paradigm of efficiency for general illumination, up to 90 percent more efficient than today's light sources	+1,098
Space Conditioning and Refrigeration R&D	
Reduce near term projects on heat pump water heaters and unitary air conditioners; Emphasize high risk longer term project at lower levels of effort in order to better align space conditioning R&D to residential and commercial integration activities.	-2,337
Appliances and Emerging Technologies R&D	
Completed heat pump water heater field validations in FY 04	-225
Building Envelope R&D	
Suspends thermal insulation research due to advanced state of technologies, which are being demonstrated in the Residential Integration sub-program.	-3,190
Analysis Tools and Design Strategies	
Less funding is required due to the delaying of the incorporation of Zero Energy Buildings capability until required field validation is completed.	-286
Total Funding Change, Emerging Technologies	**-4,940**

Equipment Standards and Analysis

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Equipment Standards and Analysis					
Equipment Standards and Analysis	9,635	10,387	7,800	-2,587	-24.9%
Total, Equipment Standards and Analysis	9,635	10,387	7,800	-2,587	-24.9%

Description

The goal of the Equipment Standards and Analysis subprogram is to develop minimum energy efficiency standards that are technologically feasible and economically justified. During FY 2005, the Equipment Standards and Analysis subprogram will focus on completing energy efficiency standards rulemakings for three priority products: electric distribution transformers; commercial central air conditioners and heat pumps; and residential furnaces.

Benefits

The table shows the progress of statutorily mandated Equipment Standards over the years, as well as anticipated future standards.

	(original standard)		(first update)		(second update)	
Equipment	Date	Effective Date	Final Rule	Effective Date	Final Rule	Effective Date
Residential Products						
Refrigerators and Freezers	1987	1990	1989	1993	1997	2001
Room Air Conditioners	1987	1990	1997	2000		
Central Air Conditioners	1987	1992	2001	2005		
Clothes Dryers	1987	1988	1991	1994		
Clothes Washers	1987	1988	1991	1994	2001	2004
Dishwashers	1987	1988	1991	1994		
Water Heaters	1987	1990	2001	2004		
Furnaces	1987	1992	In Process			
Electric Cooking Products	1987	1990	1998	1998		
Pool Heaters	1997					

Equipment	(original standard) Date	(original standard) Effective Date	(first update) Final Rule	(first update) Effective Date	(second update) Final Rule	(second update) Effective Date
Commercial Products						
Fluorescent Lamp Ballasts	1988	1990	2000	2004		
ASHRAE Products	2001	2003/2004[a]				
Unitary AC/HP	In Process					
Electric Distribution Transformers	In Process					
HID (Determination)	In Process					
Small Electric Motors (Determination)	In Process					

Related indicators of progress include:

- In 2004, conduct Advance Notice of Proposed Rulemaking workshops for distribution transformers, residential furnaces and boilers and commercial unitary air conditioners and heat pumps.
- Complete analysis for HID determination.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
Equipment Standards and Analysis	**9,635**	**10,387**	**7,800**

In FY 2005, develop final rules regarding energy conservation standards for electric distribution transformers and commercial unitary air conditioners and heat pumps 65-135 and 135-240 kBtu/h and residential furnaces. Continue to develop test procedures and initiate standard rulemaking for torchieres, ceiling fans and commercial refrigerator products (reach-in refrigerators/freezers, vending machines/beverage merchandiser). Continue to implement a plan based on analyses that propose to add new products to the lighting and appliance standards program as well as other approaches such as tax incentives and ENERGY STAR labeling to improve and promote the efficiency of appliances and equipment.

Initiate standards rulemakings on products as identified in the prioritization process. Review existing test procedures to ensure that they remain current with advancing technology and measurement of standby power consumption. Ensure compliance to standards through follow-up inquiries, random audits, and investigations of noncompliance allegations. In FY 2003, this activity was reduced by 74,466 for SBIR/STTR and transferred to the Science Appropriation. *Participants will include:*

[a] Central Water Cooled AC, Water Source HP, Evaporatively Cooled AC

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
LBNL, NIST, NREL, PNNL, and others TBD.			
Total, Equipment Standards and Analysis	**9,635**	**10,387**	**7,800**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Equipment Standards and Analysis	
Resources commensurate with current needs to achieve energy efficiency improvements associated with various rulemakings	-2,587
Total Funding Change, Equipment Standards and Analysis	**-2,587**

Oil Heat Research for Residential Buildings

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Oil Heat Research for Residential Buildings					
Oil Heat Research for Residential Buildings.....	0	494	0	-494	-100.0%
Total, Oil Heat Research for Residential Buildings	0	494	0	-494	-100.0%

Description

The goal of the Oil Heat Research for Residential Buildings subprogram is to develop ultra-low emissions combustion technologies for oil-based fuels that could be used in residential building applications.

Benefits

Based on the completion of research to improve the environmental performance of oil combustion systems in FY 2004, no further activities will be performed in the Oil Heat Research for Residential Buildings subprogram in FY 2005.

Detailed Program Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Oil Heat Research for Residential Buildings

In FY 2003, $745,000 was appropriated for the Oil Heat Research for Residential Buildings subprogram as part of the Fuel Flexibility subprogram under the Distributed Energy and Electric Reliability Program. No funds are requested in FY 2005 as projects are completed. *Participants include: None.*

Total, Oil Heat Research for Residential Buildings.....	**0**	**494**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Oil Heat Research for Residential Buildings	
Oil heat research will be completed in FY 2004	-494
Total Funding Change, Oil Heat Research for Residential Buildings	**-494**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support					
Technical/Program Management Support	1,609	1,481	1,500	+19	+1.3%
Total, Technical/Program Management Support	1,609	1,481	1,500	+19	+1.3%

Description

The Technical/Program Management Support subprogram provides analytic support to aid the Program to achieve its net Zero Energy Building goals.

Benefits

This is accomplished by identifying research priorities through R&D feasibility studies and trade-off analyses. During FY 2005, the Technical/Program Management Support subprogram will focus on developing a ranking process for trading-off component research with building system research.

Detailed Program Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	**1,609**	**1,481**	**1,500**
In FY 2005, provide critical technical and program management support services including support for multi-year planning; strategic planning; feasibility studies and trade-off analyses; data collection to assess program and project performance; peer reviews of projects and program portfolio and management; evaluation of the impact and conducting analyses for new legislation on R&D programs such as tax credits; and analysis and assessments of past program impacts and performance. *Participants include: PNNL, and others TBD.*			
Technical/Program Management Support	**1,609**	**1,481**	**1,500**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technical/Program Management Support	
No significant changes	+19
Total Funding Change, Technical/Program Management Support	**+19**

Industrial Technologies

Funding Profile by Subprogram[a]

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Industrial Technologies						
Industries of the Future (Specific)	59,293	47,247	47,247	22,409	-24,838	-52.6%
Industries of the Future (Crosscutting)	33,533	39,904	39,904	31,900	-8,004	-20.1%
Technical Program Management Support	3,998	5,917	5,917	3,793	-2,124	-35.9%
Total, Industrial Technologies.....	96,824	93,068	93,068	58,102	-34,966	-37.6%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-618, "Energy Tax Act" (1978)
P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)
P.L. 95-620, "Powerplants and Industrial Fuel Use Act" (1978)
P.L. 96-294, "Energy Security Act" (1980)
P.L. 100-12, "National Appliance Energy Conservation Act" (1987)
P.L. 100-615, "Federal Energy Management Improvement Act" (1988)
P.L. 101-218, "Renewable Energy and Energy Efficiency Technology Competitiveness Act" (1989)
P.L. 101-549, "Clean Air Act Amendments" (1990)
P.L. 102-486, "Energy Policy Act" (1992)

Mission

The mission of the Industrial Technologies Program (ITP) is to improve 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. This effort will be achieved by partnering with industry, its equipment manufacturers, and its many stakeholders to reduce our Nation's

[a] SBIR/STTR funding in the amount of $1,741,367 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $2,318,190 and $1,444,646 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

reliance on foreign energy sources, reduce environmental impacts, increase the use of renewable energy resources, and improve energy efficiency and competitiveness.

Benefits

ITP develops, manages, and implements a balanced portfolio that addresses industry requirements throughout the technology development cycle. Research and development, particularly high-risk, high-return R&D, is conducted to target efficiency opportunities in manufacturing processes and crosscutting energy systems. Validation and verification of technology benefits through intermediate-term pilot and demonstration phases help emerging technologies gain commercialization and near-term adoption. Dissemination of energy-efficiency technologies and practices is accomplished through a variety of technology delivery mechanisms. These activities help accelerate industry understanding, acceptance, and implementation of efficiency advances as industry starts reaping the benefits of proven technologies, system management decision tools, training, and strategic partnerships. The Industrial Technologies Program estimates that, in 2001, it directly contributed to industrial energy savings of over 296 trillion Btus[a] savings worth over $1.9 billion[b]. By 2002, the program helped develop more than 160 commercialized industrial technologies. Cumulative tracked energy savings from 1990 to 2002 are estimated to be over 2,650 trillion Btus. These technology successes are the result of the "industry pull" designed into the Industries of the Future strategy.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Industrial Technologies program supports the following goal:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Industrial Technologies program has one program goal which contributes to General Goal 4 in the "goal cascade":

Program Goal 04.60.00.00: Industrial Technologies. The Industrial Technologies Program goal is to partner with our most energy-intensive industries in strategic planning and energy-specific RD&D to develop the technologies needed to use energy efficiently in their industrial processes and cost-effectively generate much of the energy they consume. The result of these activities will save feedstock

[a] See April 2003 Impacts report at http://www.pnl.gov/impacts/pdfs/03impacts_intro.pdf

[b] Constant 2001 dollar values for energy savings shown in this budget are based upon Energy Information Administration data for 2001 as well as preliminary estimates for 2002 and 2003. Average industrial energy prices per million Btu were $ 6.44 in 2001, $5.44 in 2002, and a forecast of $5.70 for 2003. Source: based on AEO 2002, Table A-3, available at www.eia.doe.gov/oiaf/archive/aeo02/supplement/sup_t2t3.pdf.

and process energy, create domestic supply, improve the environmental performance of industry, and help America's economic competitiveness.

Contribution to Program Goal 04.60.00.00 (Industrial Technologies)

Between 2002 and 2020, contribute to a 30 percent decrease in energy intensity (Btu per unit of industrial output as compared to 2002) in the energy-intensive Industries of the Future (a potential savings of 3.7-4.5 quads above projected baseline efficiency improvements); between 2004 and 2010, commercialize over 10 industrial energy-efficiency technologies through RD&D partners.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.60.00.00 (Industrial Technologies)					
Industries of the Future (Specific)					
		Commercialized 10 new energy efficiency technologies in partnership with the most energy-intensive industries.	In FY 2003, commercialized 4 new technologies in partnership with the most energy-intensive industries. In FY 2003, turned over 25 percent of projects in the RD&D portfolio.	Commercialize 4 new technologies in partnership with the most energy-intensive industries.	Commercialize 3 new technologies in partnership with the most energy-intensive industries.
Industries of the Future (Specific and Crosscutting)					
	Commercialized 10 new technologies from both the nine vision industries as well as the crosscutting programs. Helped industry save 262 trillion Btu of energy worth $1.6 billion.		In FY 2003, helped industry save more than 180 trillion Btu of energy worth approximately $1 billion.		
Industries of the Future (Crosscutting)					
	Supported Industrial Assessment Centers at 26 participating universities that conducted 650 combined energy, waste, and productivity assessments.		FY 2003 Milestone: 6200 energy-intensive U.S. plants applied EERE technologies and services averaging a 5 percent improvement in energy productivity per plant.	An additional 600 (leading to a cumulative 6800) energy intensive U.S. plants will apply EERE technologies and services averaging a 5 percent improvement in energy productivity per plant.	An additional 200 (leading to a cumulative 7000) energy intensive U.S. plants will apply EERE technologies and services averaging a 7 percent improvement in energy productivity per plant.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The Industrial Technologies Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

DOE partners with the most energy-intensive industries working with individual companies, trade associations, and professional groups to develop and apply advanced technologies and practices that reduce energy consumption. These industries and departmental investments in programs represent the greatest opportunity to save energy and improve environmental performance in a cost-effective manner.

DOE invests in pre-competitive and high-risk RD&D that individual companies are unable to undertake without government support focusing on industrial materials, combustion and sensors and controls and requiring a 50 percent cost-share from industry.

The *Industries of the Future* strategy engages partners in key phases of the program. Technology visions and roadmaps are developed by industry and other stakeholders to define their long-term goals, technology challenges, and research priorities. ITP uses these roadmaps to match industry's technology needs with Federal energy efficiency priorities in planning the Federal research agenda. ITP implements its research and technology development program through cost-shared projects with multiple industrial and academic partners. Sharing project costs (industrial partners typically contribute 50 percent) leverages public investment with private resources, increases access to scientific capabilities, increases industry commitment to achieving R&D success, shortens the technology development and commercialization cycle, and facilitates technology delivery. ITP activities include both industry-specific R&D and activities that cut across industrial boundaries.

The Management Strategy focuses on energy losses reducing the energy requirements of industry while stimulating economic productivity and growth. ITP invests in next-generation manufacturing concepts that will produce dramatic energy and environmental benefits providing large public benefits. These Grand Challenges typically require high-risk, high-return R&D such as an entirely new processing route to achieve much lower energy use than current processes. Beginning in FY 2005, ITP will shift a portion of its R&D portfolio to focus on multi-industry Grand Challenges for next-generation manufacturing and energy systems technologies.

These means and strategies could result in significant cost savings and a significant reduction in the consumption of energy across fuel types—increase the substitution of clean fuels and power—cost effectively reducing American's demand for energy, lowering carbon emissions, and decreasing energy expenditures---thus putting the taxpayers' dollars to more productive use.

The following external factors could affect IT's ability to achieve its strategic goal:

- Rate of market growth
- Industry profit margins
- Capital investment requirements

- Foreign competition
- Energy supply markets and prices
- Safety and environmental regulations

In carrying out the program's mission, the IT program collaborates with several groups on its key activities including high energy intensity public-private industry partnerships: The *National Energy Policy*[a] encourages energy efficiency programs that are modeled as public-private partnerships. The Industrial Technologies Program has used this partnership model for the past eight years to bring together the strengths of business and government to solve increasingly complex and difficult efficiency problems. These partnerships also help to disseminate and share best energy management practices in factories throughout the United States. ITP's established public-private partnerships help to facilitate new efforts as well, particularly the President's Climate VISION (Climate Voluntary Innovation Sector Initiatives: Opportunities Now) initiative to encourage reductions in industrial greenhouse gas emissions.

Validation and Verification

To validate and verify program performance, the Industrial Technologies Program will conduct internal and external reviews and audits. These programmatic activities are subject to continuing review by, for example, the Congress, the General Accounting Office, the Department's Inspector General, the U.S. Environmental Protection Agency, and state environmental agencies. The table below summarizes validation and verification activities.

Data Sources: Energy intensity is calculated from the Energy Information Administration's (EIA's) Manufacturing Energy Consumption Survey (MECS) and Department of Commerce data. The number of technologies and their energy savings is ascertained through interviews with technology developers and suppliers. Energy savings for the technical assistance programs are estimated based upon past reported participant data.

Baselines: The following are the key baselines used in ITP:

- Industrial energy intensity (2002) 14,000 BTU/$1996 value of shipments of energy intensive industry output.
- Commercialized technologies (base line year for count of commercialized technologies is 2004)

Frequency: EIA/MECS collects energy intensity data once every 4 years, and ITP makes annual estimates based upon data from annual Department of Commerce surveys. ITP collects data on energy savings and technologies commercialized annually.

Data Storage: Energy intensity information is contained on EIA's computers. Data on energy savings and technologies commercialized are stored in ITP's Impacts Database and are available on the internet at ITP's website: www.eere.energy.gov/industry.html. Data on R&D portfolio turnover is based upon information contained in ITP's information system database.

[a] See National Energy Policy report of the National Energy Policy Development Group (May 2001), P. 4-12.

Verification: ITP uses prospective and retrospective peer reviews to evaluate project performance and to adjust support. To verify program performance and results, ITP tracks all technologies commercialized (and the extent of their use) by industry. ITP also provides EIA quality control and outside peer review of the Manufacturing Energy Consumption Survey. Industry representatives review data on energy savings and technologies commercialized. ITP has conducted several reviews of the impacts of several technical programs and assistance programs have been reviewed several times. The National Research Council periodically conducts independent reviews of ITP programs.

Funding by General and Program Goals

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Request	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.60.00.00, Industrial Technologies					
Industries of the Future (Specific)	59,293	47,247	22,409	-24,838	-52.6%
Industries of the Future (Crosscutting)	33,533	39,904	31,900	-8,004	-20.1%
Technical/Program Management Support	3,998	5,917	3,793	-2,124	-35.9%
Total, Program Goal 04.60.00.00, Industrial Technologies	96,824	93,068	58,102	-34,966	-37.6%
Total, Industrial Technologies	96,824	93,068	58,102	-34,966	-37.6%

Expected Program Outputs

The Industry Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the Industry Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, oil savings, natural gas savings, and reduced need for electricity capacity additions that result from the realization of Industry Program goals are shown in the table below through 2025.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html Final documentation estimated to be completed and posted by March 15, 2004.

FY 2005 GPRA Benefits Estimates for the Industrial Technologies Program[a]

Mid-Term Benefits[b]

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads)	0.5	0.9	1.6	2.0
Energy Expenditure Savings (Billion 2001$)	5	10	17	16
Carbon Emission Reductions (MMTCE)	9	18	30	41
Oil Savings (MBPD)	0.1	0.1	0.1	0.2
Natural Gas Savings (Quads)	0.19	0.39	0.71	0.63
Total Displaced Need for New Electric Capacity (GW)	3	2	8	15

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget.

[b] Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

Performance Indicators	Actual		Planned					
	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09
Annual number of technologies commercialized	10	4	4	4	TBD	TBD	TBD	TBD
Annual energy savings from Industrial Program activities in partnership with industry	276	180	220	220	TBD	TBD	TBD	TBD
Number of new Allied Partners	20	20	20	20	TBD	TBD	TBD	TBD
Cumulative number of energy-intensive plants impacted by the program	N/A	6,200	6,800	7,000	7,200	7,800	8,400	9,000
Number of internet information page views (million)	5.3	6	6.2	6.4	TBD	TBD	TBD	TBD

Over the past 30 years, industry has shown a remarkable ability to improve energy efficiency, greatly increasing economic output without a corresponding increase in energy use. Yet an expanding economy will increase industrial energy demand. The Energy Information Administration (EIA) projects industrial energy use will grow by over 30% from 2001 to 2025, even with assumed efficiency gains and an economic shift to less energy-intensive industries. Reducing energy intensity–the amount of energy used to produce a given amount of industrial product–is the key to increasing energy efficiency in industry without impeding economic growth. Because there are significant gaps between current energy use and practical minimum energy use for most industrial processes, the industrial sector will continue to offer excellent opportunities to improve energy efficiency in the United States over the next 25 years.

If energy use per unit of output (energy intensity) in the ITP partner industries continued at 2002 levels, these industries would be using almost 22 quads by 2010. However, by 2010, partner industries are expected to reduce their energy use by 1.3 quads through business-as-usual efficiency improvements (EIA projection of 0.75 percent annually), and, concurrently, activities sponsored by the Industrial Technologies Program aim to help these industries lower energy use by up to an additional 0.9 to 1.9 quads. See Figure 1. By 2020, partner industries could be reducing their energy use by 3.3 quads (from a 26.2 quad level using 2002 energy intensities) through business-as-usual efficiency improvements, and by an additional 3.7 to 4.5 quads as a result of ITP activities.

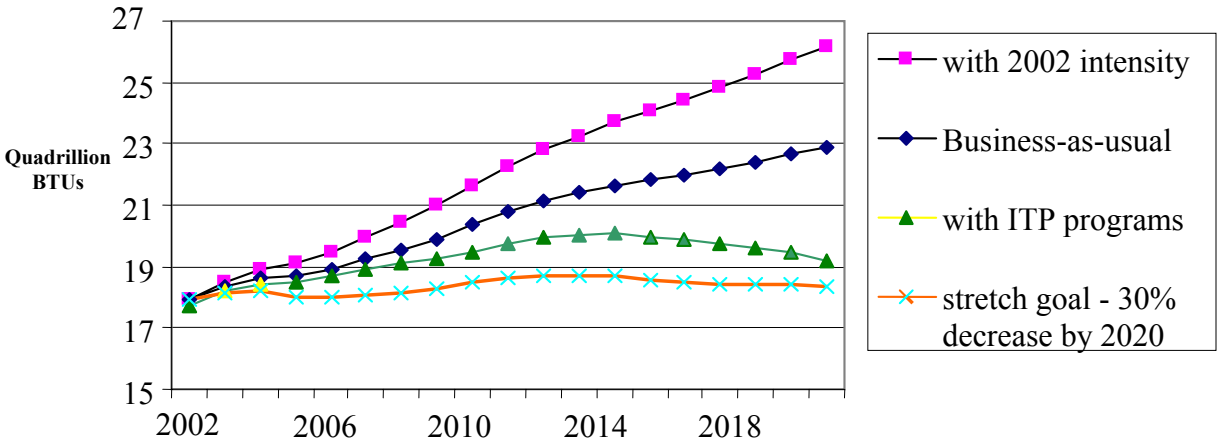


Figure 1: Energy Intensity Target

Industries of the Future (Specific)

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Industries of the Future (Specific)					
Forest and Paper Products Industry	10,488	8,021	3,000	-5,021	-62.6%
Steel Industry	10,083	6,685	3,767	-2,918	-43.6%
Aluminum Industry	7,908	6,583	2,704	-3,879	-58.9%
Metal Casting Industry	5,228	4,052	2,000	-2,052	-50.6%
Glass Industry	4,462	3,301	1,763	-1,538	-46.6%
Chemicals Industry	14,079	13,184	7,075	-6,109	-46.3%
Mining Industry	5,484	4,694	1,400	-3,294	-70.2%
Supporting Industries	1,561	727	700	-27	-3.7%
Total, Industries of the Future (Specific)	59,293	47,247	22,409	-24,838	-52.6%

Description

The Industries of the Future (Specific) supports cost-shared research, development, and demonstration (RD&D) of advanced technologies to improve the energy intensity and environmental performance of America's energy-intensive and waste-intensive industries. To provide the best value and optimum use of public investments, this activity focuses on a few basic materials processing industries that can achieve the highest returns on Federal investments.

Benefits

Key domestic industries will employ partner co-developed and tested industrial efficiency technologies that reduce their energy consumption and competitive position preserving domestic economic benefits while reducing cost, saving energy and improving environmental performance.

Detailed Program Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Forest and Paper Products Industry	**10,488**	**8,021**	**3,000**

By 2010, in partnership with industry, the goal of the Forest and Paper Products activity is to implement advanced water removal technologies in papermaking resulting, in an energy efficiency improvement of 10 percent in paper production compared to conventional industry practices.

In FY 2005, conduct energy bandwidth studies to determine which energy intensive areas have the greatest potential to achieve significant energy savings as a method to fund a smaller number of larger projects that have high energy savings potentials.

Continue to support voluntary efforts by the American Forest & Paper Association and other industry organizations to improve their energy efficiency and environmental performance through the industry's Agenda 2020. The collaborative activities 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. In FY 2003, this activity was reduced by $188,635 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: The American Forest and Paper Association and their member companies, National Laboratories, the Institute of Paper Science and Technology, Pulp and Paper Education and Research Alliance members and partners, and others*.

Steel Industry	**10,083**	**6,685**	**3,767**

By 2010, in partnership with industry, the goal of the Steel activity is to develop a commercially ready technology that will cut the use of energy intensive coke as a feedstock in the steelmaking process.

In FY 2005, continue those activities with the highest long-term national energy saving potential such as the Mesabi Nugget iron making pilot demonstration, a new iron-making technology that uses a rotary hearth furnace to turn iron ore fines and pulverized coal into iron nuggets of similar quality as blast furnace pig iron. This process requires less energy, capital, and operating costs than existing pig iron technology. Participate in Grand Challenge solicitation with focus on cokeless ironmaking. Complete the steel industry highly variable load electric power grid impact study begun in FY 2003.

Continue to support voluntary efforts by the American Iron and Steel Institute and the Steel Manufacturers' Association and other industry organizations to improve their energy efficiency and environmental performance. The collaborative activities 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. In FY 2003, this activity was reduced by $181,298 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: American Iron and Steel Institute (member and associate member companies), Steel Manufacturers Association (member and associate member companies), national laboratories, universities and other companies.*

Aluminum Industry	**7,908**	**6,583**	**2,704**

By 2010, the goal of the Aluminum activity is to develop with the aluminum industry advanced technologies, such as carbothermic aluminum reduction, and inert anodes and wettable cathodes that would result in significant net energy savings in primary aluminum production.

Based upon a feasibility study to be completed in FY 2004, participate in Grand Challenge solicitation

with focus on an alternative reduction technology to produce aluminum with over 30% energy savings and a potential of 32-38 percent reduction in greenhouse gas emissions related to energy consumption. Part of the portfolio will consist of projects to improve energy efficiency in secondary aluminum processing (rolling & forming) with an emphasis on reducing scrap and minimizing re-melting of scrap. Complete evaluation for energy efficient isothermal melting technology begun in FY 2001. Continue existing projects that help improve energy efficiency and environmental performance that industry would not undertake without Federal support. In FY 2003, this activity was reduced by $142,227 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: The Aluminum Association, Alcoa, Century Aluminum, Commonwealth Aluminum, and SECAT.*

Metal Casting Industry **5,228** **4,052** **2,000**

In partnership with industry, the goals of the Metal Casting activity are to enable major technical advances in the metal casting industry, to implement new design techniques and practices, to increase yield, and to reduce energy use and generation of scrap.

In FY 2005, develop and verify a model for new radiographic standards in the advanced melting technology area. Develop and validate semi-quantitative pattern signatures for lost foam pattern quality control in the innovative casting process area. These tools will be used to validate lost foam pattern tooling design software. Develop guidelines for die casting die cooling line placement and cooling line geometry for low stress die designs. Participate in Grand Challenge solicitation with focus on advanced melting.

Continue to work with over 320 cost-sharing industry partners in 35 States. Research areas include qualitative visualization tools for die design; extension of the life of permanent molds for aluminum permanent mold castings; analysis of risering techniques and methods for improving yield for steel casters; and identification of lost foam process control procedures. In FY 2003, this activity was reduced by $94,028 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: Cast Metals Coalition, including American Foundry Society, Steel Founder's Society of America, and North American Die Casting Association , Ohio State University, University of Michigan, Case Western Reserve University, Pacific Northwest National Laboratory (PNNL), Oak Ridge National Laboratory (ORNL), Iowa State University, University of Alabama, Worcester Polytechnic Institute (WPI), and University of Iowa*.

Glass Industry **4,462** **3,301** **1,763**

In partnership with industry, the goal of the Glass activity is to develop advanced glass technologies that will reduce the gap between actual melting energy use (more than 11 million Btu to melt a ton of glass as measured in 1996) and the theoretical minimum (2.5 million Btu per ton) by 50 percent by 2020. An analysis of the progress to date toward this goal will be conducted as data from the 2002 Manufacturing Energy Consumption Survey is released.

In FY 2005, begin fabrication of pilot-scale submerged combustion melter. Assess quality of glass produced from plasma melting process. Participate in Grand Challenge solicitation with focus on next generation melter.

Continuing research areas include oxy-fuel fired front-end systems, advanced glass process

technology, and feedstock measurement and control technology. In FY 2003, this activity was reduced by $80,249 and the funds transferred to the Science Appropriation for SBIR/STTR.

Participants include: Glass Manufacturing Industry Council, PPG Industries, Owens Corning, Johns Manville, Schott Glass Technologies, Gas Technology Institute, Plasmelt, Eclipse/Combustion Tec, Praxair, BOC Gases, Fenton Art Glass, Certain Teed, Osram Sylvania, Energy Research Company, Alfred University-Center for Glass Research, and the States of Ohio and Pennsylvania.

Chemicals Industry **14,079** **13,184** **7,075**

In partnership with industry, the goal of the Chemicals activity is to develop separation and new process chemistry technologies that will increase energy efficiency by up to 30 percent by 2020, compared to conventional 1998 technologies. An analysis of the progress to date toward this goal will be conducted as data from the 2002 Manufacturing Energy Consumption Survey is released.

Beginning in FY 2004, project focus areas include reaction engineering and separations and the development of tools to assess the economic viability and energy efficiency of chemical industry technologies. Cross-cutting technologies such as sensors and materials for the chemical industry will continue to be supported by the cross-cutting program areas in ITP and EERE.

In FY 2005, begin research efforts in the areas of separations, reactions, and enzymatic processes. Participate in Grand Challenge solicitation with focus on distillation technologies. In FY 2003, this activity was reduced by $284,032 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: American Chemical Society, American Institute of Chemical Engineers, Chemical Manufacturers Association, Council for Chemical Research, Praxair, Air Products, Honeywell, Reaction Engineering, Argonne Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories, Dupont, Dow Chemical, Fluent, Aspen Technology, BP Chemicals, OLI Systems, Washington University, Shell International, University of Texas at Austin, Gas Technology Institute, General Electric, TDA Research, and Aspen Technology.*

Mining Industry **5,484** **4,694** **1,400**

By 2010, in partnership with industry, the goal of the Mining activity is to develop mining technologies that can reduce the energy intensity required to crush a short ton of rock by 20-30 percent from its 1998 baseline. An analysis of the progress to date toward this goal will be conducted as data from the 2002 Manufacturing Energy Consumption Survey is released. In FY 2005, develop wear-resistant component applications for the Fibrous Monolithic composites to reduce downtime and energy use.

Complete the materials coating projects begun in FY2001 to improve wear resistance for high wear crushing and grinding applications. In FY 2003, this activity was reduced by $98,627 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants included: National Mining Association*, *major mining and mineral processing companies, equipment manufacturers, universities, and national laboratories including Stolar Horizon, Advanced Ceramic Research, University of Utah, University of Alaska, University of Arizona, Montana Tech, Michigan Tech, W. Virginia State University, Virginia Tech, Transtech, Pacific Northwest National Energy Laboratory, Albany Research Laboratory, Los Alamos National Laboratory, Sandia National Laboratories, Idaho National*

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Energy Laboratory, Consolidated Coal, Phelps Dodge Copper Corp., the Florida Institute of Phosphate Research, Caterpillar Corp. and the Fuel Cell Institute.			
Supporting Industries.....	**1,561**	**727**	**700**

By 2010, in partnership with industry, the goal of the Supporting Industries activity is to substantially reduce the energy consumption of material forming and finishing processes and powder metal parts and components manufacturing. Potentially, according to estimates in project proposals, 32 trillion Btu/yr. can be saved by 2020.

In FY 2005, projects will define a new program management approach to identify supporting industries with the greatest potential for energy savings.

Continue development and testing of high temperature carburizing process, integrated aluminum casting model, control algorithm for high efficiency sintering of powder metal components, and the pulsed gas metal-arc welding (GMAW) process.

In partnership with industry, continue to assist efforts to reduce energy consumption in carburizing processes, in heat treatment of castings, welding processes and powder metal sintering processes for the pulsed GMAW welding processes. In FY 2003, this activity was reduced by $28,084 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: Forging Ind. Assoc. (FIA), Lincoln Elec. Co., Worcester Polytech. Inst. (WPI), Oak Crest Institute of Science, Center for Heat Treating Excellence (CHTE), Air Products and Chemicals, Boycote Thermal Processing, Caterpillar, Deere & Co., Eclipse, GMC, Houghton Int'l, Ipsen Int'l, AMCAST Ind. Corp., ALCOA, UES Software, Kolene Corp., Pratt & Whitney, Surface Combustion, Timken Co., Boeing Co., and several universities and national labs.*

Total, Industries of the Future (Specific)	**59,293**	**47,247**	**22,409**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Forest and Paper Products	
The funding level will allow continuation of existing projects and initiation of a number of new research projects funded. Energy bandwidth studies are expected to identify energy-intensive areas within the industry with the greatest potential to achieve significant energy savings as a means to fund a smaller number of larger projects in the future. Request level commensurate with current targets.	-5,021
Steel	
The funding level will allow new research projects in the area of cokeless ironmaking. The larger number of projects formerly funded will be replaced by a focused Grand Challenge in this area. Request level commensurate with current targets.	-2,918
Aluminum	
The funding level will allow continuation of existing projects funding for new research in alternative reduction systems. The larger number of projects formerly funded will be replaced by a focused Grand Challenge in this area. Request level commensurate with current targets.	-3,879
Metal Casting	
The funding level will support new radiographic standards in advanced melting at a level commensurate with current targets.	-2,052
Glass	
Research on the next generation of melters is postponed in accordance with current targets and priorities.	-1,538
Chemicals	
Research in the area of distillation is postponed in accordance with current targets and priorities.	-6,109
Mining	
The scope of FY 2005 solicitations and timing of the completion of the current projects will be adjusted in accordance with current targets and priorities.	-3,294
Other: Supporting Industries	-27
Total Funding Change, Industries of the Future (Specific)	**-24,838**

Industries of the Future (Crosscutting)

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Industries of the Future (Crosscutting)					
Industrial Materials of the Future	13,328	12,542	11,000	-1,542	-12.3%
Combustion	1,952	1,975	1,600	-375	-19.0%
Gasification Programs	0	4,939	0	-4,939	-100.0%
Robotics	0	1,975	0	-1,975	-100.0%
Sensors and Automation	3,683	3,728	3,100	-628	-16.8%
Industrial Technical Assistance	14,570	14,745	16,200	+1,455	+9.9%
Total, Industries of the Future (Crosscutting)	33,533	39,904	31,900	-8,004	-20.1%

Description

The Industries of the Future (Crosscutting) activities work with industrial partners and suppliers to conduct cost-shared RD&D on technologies that have potential applications across many partner industries. ITP also develops and provides the tools and technical assistance needed by industry to expedite the adoption of energy-efficiency, and clean manufacturing technologies, focusing on three primary areas that offer major improvements in energy efficiency and emissions reduction: (1) *advanced industrial materials* that can reduce energy use, lower emissions, increase component life, improve product quality, optimize process operating conditions, and reduce downtime; (2) *high-efficiency, clean combustion* technologies; and (3) *advanced sensors and automation* that can increase process efficiency and productivity even in high temperature and harsh environments.

Benefits

Crosscutting IOF technologies provide the means for development of broad benefit technologies that are not within practical developmental reach of an industry to be developed and deployed across industry and sectors proving economic, energy and environmental benefits nationally.

Detailed Program Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Industrial Materials of the Future **13,328** **12,542** **11,000**

In partnership with industry, the goals of the Industrial Materials of the Future activity are to conduct R&D to develop new materials consistent with the needs identified in the IOF visions and technology roadmaps and reduce energy use by more than 200 trillion Btu (compared to conventional technology) in 2020.

In FY 2005, focus areas will include degradation resistance, where advanced coatings and materials will be developed for protection of industrial components and systems from wear, corrosion and oxidation; thermophysical databases and modeling, where data acquisition of materials mechanical, thermal, and chemical properties for use in modeling and simulations will be performed for materials property optimization to save energy; and materials for engineering components, where advanced materials will be developed and optimized for use in specific industrial processes and equipment. The goal of these efforts is to improve materials properties for in-service performance and to develop appropriate fabrication methods for various applications.

Work will continue on the development of materials for advanced tooling for molds and dies, materials for energy systems, advanced joining methods, and materials for chemical separations. In FY 2003, this activity was reduced by $280,802 for SBIR/STTR and transferred to the Science Appropriation. *Participants include: Alon Surface Technologies, Air Products, Caterpillar, Inc., Carpenter Technologies, General Aluminum Manufacturing Company, Michigan Technological University, Materials Technology Institute, RSP Tooling, LLC, Solar Turbines, Special Metals Corporation, Starfish Systems, Inc., West Virginia University, SECAT, Weyerhauser Company*

Combustion **1,952** **1,975** **1,600**

By 2010, in partnership with industry, the goal of the Combustion activity is that packaged boilers with thermal efficiencies 10-12 percent higher than conventional technology and with single digit ppm NOx emissions be commercially available.

In FY 2005, begin field evaluation of a package boiler capable of greater than 94 percent efficiency and less than five ppm NOx emissions. Participate in Grand Challenge solicitation with focus on superboiler.

Continue research on and initiate field evaluation of a prototype ultra-high efficiency, low emission refinery process heater.
In FY 2003, this activity was reduced by $35,104 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include the Gas Technology Institute, Southern California Gas, Cleaver-Brooks, TIAX, Callidus Technologies, and ExxonMobil.*

Gasification Programs..... **0** **4,939** **0**

In FY 2003, Congress provided $13,793,025 for this activity, which is shown within the Biomass and Biorefinery R&D Systems program. In FY 2004, this activity continues to be managed by that program.

Robotics	**0**	**1,975**	**0**

FY 05 research efforts in this area will be combined with the activities in the Sensors and Automation area.

Sensors and Automation	**3,683**	**3,728**	**3,100**

By 2010, in partnership with industry, the goal of the Sensors and Automation activity is to develop the technology necessary to move from batch production to a continuous process using new sensor systems, starting with the recently completed demonstration of the technology in the aluminum industry in 2003.

In FY 2005, initiate research in the areas of advanced sensor technology, affordable wireless technology, next generation control automation, and improved information processing.

R&D projects resulting from a FY 2003 solicitation will be continued. These are expected to include advancing energy-saving industrial wireless sensors beyond the prototype phase, control systems which reduce energy use by incorporating output from on-line and real-time sensors and use multivariate mathematical techniques to generate product property data not obtainable from routine measurement, and a "whole plant" optimization control system, including robotics.

In FY 2003, this activity was reduced by $66,242 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include: General Electric Global Research, Honeywell International, The Timken Co., Energy Research Co., Quantum Magnetics, American Air Liquide, Tecnar Automation, Air Products and Chemicals Co., Gas Technology Institute, Oak Ridge National Laboratory, Sandia National Laboratories, Tennessee Technological University, Penn State University*.

Industrial Technical Assistance	**14,570**	**14,745**	**16,200**
▪ **Industrial Assessment Centers**	**6,533**	**6,612**	**7,700**

By 2010, the goals of the Industrial Assessment Centers (IAC) activity (begun in 1976 as the Energy Analysis and Diagnostic Center program) are to have completed over 14,500 Industrial Assessment Audits, trained over 2,900 engineering students, and provided technical assistance to over 10,000 plants to save over 600 trillion Btu of energy by deploying a portfolio of assessments, tools, training, and operational practices. Through 2003, 11,566 audits have been conducted, training 3,188 students, and improving energy use at 11,103 plants, with an estimate of energy savings of over 700 trillion Btus.

In FY 2005, the Industrial Assessment Center (IAC) activity will enter phase II of integrating the overall Best Practices (BP) tools and training into the IAC activity. In the ongoing Phase I, either the Director or Assistant Director at each of the 26 IAC Centers would be certified as a Qualified Specialist in one of the BestPractice energy management software tools. In Phase II, Center Directors certified as qualified specialists in the BP software will become certified as training instructors and will additionally pursue specialist training in additional tools.

Provide energy, waste, and productivity training to over 150 engineering students at 26 participating universities and help them continue to provide a nationwide cadre of experienced and trained engineering alumni. Fully implement the student certification program and provide approximately 150 graduating students with credentials important to them in their further graduate studies and/or in their careers in industry.

Centers will continue to utilize more proactively the BP software tools in their assessment "tool kits" and will continue to develop and replicate innovative implementation strategies to increase energy savings recommendations and to promote the adoption of those recommendations by client companies. Replication strategies will be developed to help client companies better promote energy savings recommendations made by the IAC's to other facilities within their corporate structures. Emphasis will continue to be placed on student training and student activities including student participation in professional and technical conferences and on licensing opportunities.

In FY 2003, this activity was reduced by $117,496 and the funds transferred to the Science Appropriation for SBIR/STTR. *Participants include 26 IAC universities plus one IAC manager (Rutgers University*): *Colorado State University, Loyola Marymount University, Syracuse University, University of Illinois at Chicago, University of Louisiana at Lafayette, Oklahoma State University, Iowa State University , North Carolina State University, University of Massachusetts at Amherst, Mississippi State University, University of Miami, University of Florida, Oregon State University, San Francisco State University, Texas A & M University, San Diego State University, Lehigh University ,Georgia Institute of Technology, University of Utah, University of Wisconsin-Milwaukee, University of Michigan, University of Dayton, West Virginia University, Bradley University, Arizona State University, and University of Texas at Arlington*.

- **Best Practices** **8,037** **8,133** **8,500**

In FY 2005, the development of Best Practices software tools and related training activities such as workshops continue to be a key strategy for increasing energy efficiency in manufacturing plants. Partnering with trade and technical associations and development of specialists qualified in the use of Best Practices software tools have contributed to the use of these tools in the end-user community. Although this strategy has been very successful with significant energy savings, there is a need to improve existing software tools, create new software tools, and to explore other ways to expand the use of software tools. Since it is difficult for plant personnel to attend one or two-day training workshops, distance-learning options will be explored. Several options are available including web-based systems that are either self-paced or instructor-led, CD-ROMS, and live web casts. Based on input from the manufacturing community and other interested parties, a distance learning process will be developed and beta tested.

Continue technical assistance to plant sites, enabling their use of industrial process application tools relevant to motor, pump, process heating, steam and compressed air systems emphasizing system-level improvements. In collaboration with industry, complete development of fan assessment tool and update other tools, as necessary.

Continue efforts to replicate plant-wide assessment results from prior awards in industrial facilities with similar process lines. Complete efforts to increase Allied Partners to 100 companies, support industries and trade associations. Use Allied Partnerships to facilitate replication of the entire Best Practices portfolio.

In FY 2003, this activity was reduced by $144,543 and the funds transferred to the Science Appropriation for SBIR/STTR.

Total, Industries of the Future (Crosscutting)	**33,533**	**39,904**	**31,900**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Industrial Materials of the Future	
Reduce support for materials for engineering components commensurate with current targets and priorities	-1,542
Combustion	
Reduce support for ultra-high efficiency, low emission refinery process heaters commensurate with current targets and priorities.	-375
Gasification Programs	
No funding is requested for this activity	-4,939
Robotics	
FY05 research efforts in this area will be combined with the activities in the Sensors and Automation area	-1,975
Sensors and Automation	
Reduce support for affordable wireless technology commensurate with current targets and priorities	-628
Industrial Technical Assistance	
This increase will permit increased activity in the dissemination of energy-efficiency technologies and practices to help accelerate industry understanding, acceptance, and implementation of efficiency advances	
▪ **Industrial Assessment Centers**	
Restoration of this program to former funding levels is viewed as a priority due to its high level of benefits per dollar spent. A transfer of funding from the Industrial Materials of the Future research	+1088
▪ **Best Practices**	
This program has very high benefits per dollar spent. A transfer of funding from the Industrial Materials of the Future research	+367
Total, Industrial Technical Assistance	**+1,455**
Total Funding Change, Industries of the Future (Crosscutting)	**-8,004**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support					
Technical/Program Management Support.....	3,998	5,917	3,793	-2,124	-35.9%
Total, Technical/Program Management Support	3,998	5,917	3,793	-2,124	-35.9%

Description

Technical/Program Management activities include preparation of program strategic and operating plans; evaluation of the impact of new legislation on R&D programs; identification and application of performance methodologies (including GPRA); and data collection to assess program and project performance, efficiency and impacts on accomplishing the mission.

Benefits

The technical/program management subprogram provides the analysis framework and technical support to meet the requirements of Department's planning process, Congress, GPRA, and PART (planning, management and purpose). This subprogram also analyzes program gaps and new R&D opportunities. This planning and management analysis is necessary to keep the program's research agenda on target to meet the Program Goal, in the face of dynamic market and technology developments.

Detailed Program Justification

(dollars in thousands

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support.....	**3,998**	**5,917**	**3,793**

In FY 2005, provide critical technical and program management support services including support for multi year planning; strategic planning; analysis of program activities to support efforts to refocus work to achieve greater program impacts; peer reviews of R&D programs and program portfolios and management; and analysis and assessments of past program impacts and performance. *Participants include PNNL, NREL, Energetics, Inc., BCS, Inc., and Rand Corporation.*

Total, Technical/Program Management Support.....	**3,998**	**5,917**	**3,793**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Technical/Program Management Support	
Funding level reflects consolidation of solicitations and projects within ITP.	-2,124
Total Funding Change, Technical/Program Management Support	**-2,124**

Biomass and Biorefinery Systems R&D

Funding Profile by Subprogram[a]

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[b]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Biomass and Biorefinery Systems R&D						
Utilization of Platform Outputs	8,960	7,110	7,110	8,280	+1,170	+16.5%
Industrial Gasification	14,279	0[c]	0	0	0	0%
Technical Program Management Support	811	396	396	400	+4	+1.0%
Total, Biomass and Biorefinery Systems R&D	24,050	7,506	7,506	8,680	+1,174	+15.6%

Public Law Authorizations:

P.L. 93-577, "Federal Non-nuclear Energy Research and Development Act" (1974)
P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-618, "Energy Tax Act" (1978)
P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)
P.L. 95-620, "Powerplants and Industrial Fuel Use Act" (1978)
P.L. 96-294, "Energy Security Act" (1980)
P.L. 100-12, "National Appliance Energy Conservation Act" (1987)
P.L. 100-615, "Federal Energy Management Improvement Act" (1988)
P.L. 101-218, "Renewable Energy and Energy Efficiency Technology Competitiveness Act" (1989)
P.L. 101-549, "Clean Air Act Amendments of 1990"
P.L. 101-575, "Solar, Wind, Waste, and Geothermal Power Production Incentives Act" (1990)
P.L. 102-486, "Energy Policy Act" (1992)
P.L. 106-224, "Biomass Research and Development Act" (2000)

[a] SBIR/STTR funding in the amount of $545,000 was transferred to the Science appropriation in FY 2003. Estimates for SBIR/STTR budgeted in FY 2004 and FY 2005 are $189,153 and $220,248 respectively.

[b] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

[c] $4,939 for Industrial Gasification was appropriated for the Industrial Technologies Program whereas the Biomass Program continues to be responsible for the management of this activity.

Mission

The mission of the Biomass and Biorefinery Systems R&D Program ("Biomass Program") is to partner with U.S. industry to foster research and development on advanced technologies that will transform our nation's biomass resources into affordable, and domestically-produced biofuels, biopower, and high-value bioproducts, which will diversify our domestic liquid energy resource and increase our economic and energy security.

The Program receives funds from both the Energy Supply and the Energy Conservation appropriations. Energy Supply-funded activities focus primarily on developing advanced technologies for producing transportation fuels and power from biomass feedstocks. Energy Conservation-funded activities focus on developing advanced technologies for more energy efficient industrial processes and co-production of high-value industrial products.

Benefits

The Program's research focus will provide benefits in three areas[a]: Feedstock Infrastructure, for reducing the cost of collecting and preparing raw biomass[b]; 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 co-produce liquid and gaseous fuels, chemicals and materials, and heat and power, and on integrating those technologies and processes in biorefinery configurations.

The next generation of biorefinery[c], being developed by the program and U.S. industry, will produce value-added chemicals and materials together with fuels and/or power from non-conventional, lower cost feedstock such as agricultural and forest residues and other biomass materials. Using our diverse biomass resources in future biorefineries will accelerate economic development and increase energy supply options and energy security.

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

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[a] The Benefits discussion covers the entire Program, including both Energy Conservation-funded and Energy Supply-funded activities. Energy Supply funds Platforms Research and Development and Feedstock Infrastructure. Energy Supply also funds Utilization of Platform Outputs activities that are complementary to Utilization of Platform Outputs work funded by Energy Conservation.

[b] Biomass includes agricultural crops and trees, wood and wood wastes and residues, plants, grasses, residues, fibers, and animal wastes, municipal solid wastes, and other waste materials.

[c] Biorefineries are processing facilities that extract carbohydrates, oils, lignin, and other materials from biomass, convert them into multiple products such as transportation fuel, chemicals, and materials. Corn wet and dry mills, and pulp and paper mills are examples of existing biorefinery facilities that produce some combination of food, feed, power, and industrial and consumer products.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Biomass Program supports the following goals:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The Biomass Program has one program goal which contributes to General Goal 4 in the "goal cascade":

Program Goal 04.08.02.00: Biomass. Develop biorefinery-related technologies to the point that they are cost- and performance-competitive and are used by the Nation's transportation, energy, chemical and power industries to meet their market objectives. This helps the Nation by reducing fossil energy consumption, our dependence on foreign oil, and greenhouse gas emissions, while also expanding domestic energy supplies and improving the Nation's energy infrastructure.

Contribution to Program Goal 04.08.02.00 (Biomass)

The Program directly supports General Goal 4, Energy Security; the goals and recommendations of the President's National Energy Policy, the Biomass R&D Act of 2000 and the Farm Security and Rural Investment Act of 2002.

The Biomass Program will contribute to General Goal 4 by establishing the technical and market potential of at least three new commodity-scale chemicals and/or materials by 2010. The Energy and Water Development activities will provide synergy to the Interior activities as a result of their focus on platforms for sugars, synthesis gas and pyrolysis oils.

Indicators of progress toward achieving those benefits include:

- By 2005, establish the technical and market potential of a new biobased product.
- Through 2010, establish the technical and market potential of at least three new commodity-scale chemicals and/or materials.

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.08.02.00 (Biomass)					
Utilization of Platform Outputs R&D: Products Development					
When this activity was part of OIT, OIT did not break out bio-based products in FY 2000.	Demonstrated advanced electro-deionization separation technology for product purification at a pilot scale in trials at a Tate & Lyle's high fructose corn syrup plant.	Cargill Dow LLC started up the first full-scale PLA plastic manufacturing facility (300 million lbs./yr.) based on corn sugar as the feedstock.	In partnership with industry, complete pilot scale demonstration of two new biobased product technologies for economic, technical, and product performance. A 2-cycle engine oil derived from soy oil is commercialized for the emerging bioproducts industry. (DOE terminated the support because the contractor did not perform on a timely basis.)	Complete validation of one new biobased product technology, with long-term potential of greater than 2 billion lbs./yr. sales, at the pilot scale for economic, technical, and product viability in partnership with industry. With industry partners, a new biobased product technology advances to scale-up with partners' intention to commercialize in a new industrial biorefinery by FY 2008. The biorefinery will be at pilot scale.	Establish the technical and market potential of a new biobased products.
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	

Means and Strategies

The Biomass Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

America's diverse biomass resources, and favorable climates offer many opportunities for using domestic, sustainable biomass to meet our needs for fuel, power and products made from plants and plant-derived resources. The program focuses on industrial biorefineries that co-produce fuels and/or power along with high-value chemicals and materials by forming R&D partnerships to advance processing and conversion technologies, improve the efficiency and effectiveness of harvesting, storage and handling of biomass feedstock, and condition markets by increasing consumer awareness of, and acceptance for bio-based products, fuels and power.

The strategy consists of improving the cost-competitiveness of biomass technologies (including feedstock collection and storage subsystems) through research, development, and partnerships with industry, USDA, farmers, states and local communities. The program uses competitive solicitations to attract innovation and ensure investment value for industry's and universities' contracts; manages National Laboratory research to overcome technical barriers, and coordinates biomass activities at a local level through the State and Regional Partnership Activity. Funding for public-private collaborative R&D is made on a cost shared basis; managed by a series of objectives and milestones; and reviewed under the industrially developed "stage gate" process for moving each project through an independent review "gate", from a less costly stage (such as preliminary paper studies) to a more costly stage (such as bench scale experiments). Technical oversight of the R&D portfolio and planning and analysis for the program is based at DOE Headquarters, and individual project management is provided by field office staff. Finally, the Program conducts analysis and performance assessments in order to direct effective strategic planning.

These means and strategies will result in improving energy security by increasing the generation of reliable, affordable and environmentally sound biobased energy, adding to the diversity and economic security of the Nation's energy supply --- thus putting the taxpayers' dollars to more productive use.

In carrying out the program's mission, the Biomass Program collaborates with several groups on its key activities including:

- Partnerships with industry, USDA, farmers, states and local communities.
- Program decisions about research directions and priorities are guided by the Biomass Technical Advisory Committee and the Biomass R&D Board established under the Biomass R&D Act of 2000.
- The Program also relies on input from peer reviews, several of which have been completed in the last three years.

External factors affecting performance include availability of conventional fossil resources, consumer acceptance, and the cost of competing technologies. The market penetration rate of bio-based technologies is a function of technical breakthrough, price trends of coal, oil and natural gas, and policy factors.

Validation and Verification

To validate and verify program performance, the Biomass Program will conduct internal and external reviews and audits. These programmatic activities are subject to continuing review by, for example, the Congress, the General Accounting Office, the Department's Inspector General, the U.S. Environmental Protection Agency, and state environmental agencies. The table below summarizes validation and verification activities.

Data Sources:	The Renewable Fuels Association's production statistics; the National Renewable Energy Laboratory's Renewable Electric Plant Information System (REPIS); the Energy Information Administration's (EIA) Annual Energy Review, Renewable Energy Annual and Annual Energy Outlook; the Gas Technology Institute Survey of Distributed Resources; EIA Form 860 data analyzed by the Resource Dynamics Corporation. Individual projects develop production cost and quantity estimates for sugar, syngas, ethanol, and other fuels and chemicals.
Baselines:	The following is the Energy Conservation-related key baseline now used in the Biomass Program: one newly developed, industrially viable biobased product (2003)
Frequency:	GPRA Benefits are estimated annually. Independent evaluation of R&D projects are performed according to schedule per the "stage gate" process for moving each project through an independent review "gate", from a less costly stage (such as preliminary paper studies) to a more costly stage (such as bench scale experiments). Program Peer Reviews are conducted annually.
Data Storage:	EE Strategic Management System, and other computer-based data systems.
Verification:	Various trade associations review the data and the modeling processes (e.g. REPIS renewable and Distributed Energy Resources), and the EIA verifies the REPIS database. Stage-Gate, peer and program reviews of technology development and economic modeling efforts are independently conducted by personnel from industry, academia and governmental agencies other than the U.S. Department of Energy. These efforts help to focus the program's investments on activities that are within the Federal government's role and that address top priority needs. The National Laboratories receive direct funds for technology research and development, based on their capabilities and performance. Advisory panels consisting non-Federal and industry experts review each laboratory and industry project at scheduled Stage-gate Reviews and Peer Evaluation of R&D. Projects are evaluated based on the following criteria: 1) Relevance to overall DOE objectives; 2) Approach to performing the research and development; 3)

Technical accomplishments and progress toward project and DOE goals; 4) Technology transfer/collaborations with industry/universities/laboratories; and 5) Approach and relevance of proposed future research. OMB's R&D investment criteria have been incorporated into this evaluation. The panels also evaluate the strengths and weaknesses of each project, and recommend additions to or deletions from the scope of work. The program organization facilitates relationships to ensure that Federal R&D results are transferred to industry.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.08.02.00, Biomass and Biorefinery Systems R&D					
Utilization of Platform Outputs R&D	7,967	7,110	8,280	+1,170	+16.5%
Industrial Gasification	14,279	0	0	0	0.0%
Technical Program Management Support	811	396	400	+4	+1.0%
Total, Program Goal 04.08.02.00, Biomass and Biorefinery Systems R&D	23,057	7,506	8,680	+1,174	+15.6%
All Other					
Congressionally Directed, Utilization of Platform Outputs R&D/ Regional Bio-based Products Consortium	993	0	0	0	0.0%
Total, All Other	993	0	0	0	0.0%
Total, General Goal 4 (Biomass and Biorefinery Systems R&D)	24,050	7,506	8,680	+1,174	+15.6%

Expected Program Outcomes

The Biomass Program pursues its mission through integrated activities designed to increase the use of domestic renewable resources and contribute towards improved energy productivity of our economy. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce several EPA-criteria pollutants and other pollutants; enhance energy security by increasing the production and diversity of domestic fuel supplies; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the Biomass Program goals would provide the technical potential to reduce conventional energy use even further if warranted by future energy needs.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, oil savings, and natural gas savings that result from the realization of Biomass Program goals are shown in the table below through 2050. The level of cellulosic ethanol production expected as a result of realizing the program goals is also reported through 2025.

These estimates are a conservative initial effort at assessing the benefits of the Biomass Program activities and likely significantly underestimate the benefits from integrated biorefinery production options that are yet to be modeled. In addition, these estimates do not yet address some of the more fundamental technologies being developed in the Integrated Biorefinery and Bioproducts processes.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html Final documentation is estimated to be completed and posted by March 15, 2004. Uncertainties are larger for longer term estimates. The results shown in the long term benefits tables are preliminary estimates based on initial modeling of some of the possible program production technologies; nonetheless, they provide a useful picture of growing national benefits over time.

FY 2005 GPRA Benefits Estimates for Biomass Program[a]

Mid-Term Benefits[b]

	2010	2015	2020	2025
Cellulosic Ethanol Production (Million Gallons per year)	90	300	710	1,410
Primary Non-Renewable Energy Savings (quads)	0.04	0.06	0.09	0.15
Carbon Emission Reductions (mmtce)	1	1	1	3
Energy Expenditure Savings (Billion 2001$)	ns	ns	1	2
Oil Savings (MBPD)	0.012	0.015	0.019	0.027
Natural Gas Savings (quads)	0.01	0.02	0.02	0.04

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget. These estimates are a conservative initial effort at assessing the benefits of the Biomass Program activities and likely significantly underestimate the benefits from integrated biorefinery production options that are yet to be modeled. In addition, these estimates do not yet address some of the more fundamental technologies being developed in the Integrated Biorefinery and Bioproducts processes.

[b] Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case. The cellulosic ethanol production estimates were derived from the Ethanol Long Range Systems Analysis Spreadsheet (ELSAS) model. "ns" stands for "not significant."

Long-Term Benefits[a]

	2030	2040	2050
Primary Non-Renewable Energy Savings (Quads)	0.4	0.7	1.2
Energy System Cost Savings (Billion 2001$)	3	2	0
Carbon Emission Reductions (MMTCE)	4	11	23
Oil Savings (MBPD)	0.03	0.18	0.36
Natural Gas Savings (Quads)	0.3	0.3	0.4

[a] Long-term benefits were estimated utilizing the GPRA05 - MARKAL developed by Brookhaven National Laboratory (BNL). Results can differ among models due to differences in their structure. In particular, the two models estimate economic benefits in different ways, with the MARKAL model reflecting the cost of additional investments required to achieve reductions in energy bills.

Utilization of Platform Outputs

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Utilization of Platform Outputs					
Utilization of Platform Outputs	7,967	7,110	8,280	+1,170	+16.5%
Congressionally Directed Activity, Regional Bio-based Products Consortium	993	0	0	0	0.0%
Total, Utilization of Platform Outputs	8,960	7,110	8,280	+1,170	+16.5%

Description

The Utilization of Platform Outputs R&D subprogram consisted of the following activity in the FY 2004 budget request: Advanced Biomass Technology R&D - Products Development. Utilization of Platform Outputs R&D is one of three major subprograms of the biomass program. The other two subprograms (funded by Energy and Water Development) are Feedstock Infrastructure, and Platforms Research and Development, i.e., development of technologies for producing low cost sugar, syngas and pyrolysis oils. As R&D proceeds in collaboration with industry, the program will continue to leverage and coordinate with efforts in other EERE and DOE programs, USDA, and other agencies.

Benefits

Bio-based products with high market value will increase the profitability of future industrial biorefineries whose other major products may be fuels for the transportation sector and/or other sectors, including hydrogen. Producing a slate of bio-based chemicals would also add a dimension of seasonal flexibility to the biorefineries in view of the seasonal nature of biomass harvesting.

Indicators of progress toward achieving those benefits include:

	2003	2005	2010	2015
Cumulative number of bio-based products for which the technical and market potential is established	1	2	4	6

- By 2005, establish the technical and market potential of a new biobased products (the cumulative number will be two in FY 2005, including the bio-based product shown in the FY 2003 column).
- Through 2010, establish the technical and market potential of at least three new commodity-scale chemicals and/or materials (the cumulative number will be four in FY 2010, including the bio-based

product shown in the FY 2003 column).

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Utilization of Platform Outputs	**8,960**	**7,110**	**8,280**
▪ **Utilization of Platform Outputs R&D**	**7,967**	**7,110**	**8,280**

In FY 2005, Utilization of Platform Outputs R&D will continue to focus on projects to develop processes for the production of chemicals and materials that can be integrated into biorefineries. Projects with industrial partners will focus on novel separations technologies, bio-based plastics, novel products from oils, and lower cost and energy use in biomass harvesting, pre-processing and storage. Additional work with industry, universities and the national laboratories will focus on improvements to increase the efficiency of individual process steps, e.g., catalysis, separations, etc. The Program will continue collaborative efforts with stakeholders in validating the sustainability of biobased products. In FY 2003, $239,000 for SBIR/STTR was transferred to the Science Appropriation. Participants include: *National Corn Growers Association, Iowa Corn Promotion Board, American Soybean Association / United Soybean Board, American Forest and Paper Association, National Association of Land-Grant Colleges, Cargill, ADM, Dow Chemical Co., Dupont, Cargill Dow LLC, Metabolix, B/MAP, Vertec Biosolvents, Amalgamated Research Inc., Ashland Chemical, Arkenol, CNH, Castor Oil Inc., USDA Western Regional Laboratory, PNNL, INEEL, ANL, NREL, and a wide array of colleges and universities.*

▪ **Congressionally Directed Activity, Regional Bio-based Products Consortium**	**993**	**0**	**0**

Bio-Based Products Consortia.

Total, Utilization of Platform Outputs	**8,960**	**7,110**	**8,280**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 Request
Utilization of Platform Outputs	
Funding level is commensurate with achieving bio-based products targets	+1,170
Congressionally Directed Activity, Regional Bio-based Products Consortium	
No funds are requested because funds are being allocated to other activities more closely aligned with the Program's goal.	0
Total Funding Change, Utilization of Platform Outputs	**+1,170**

Industrial Gasification

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Industrial Gasification					
Industrial Gasification.....	14,279	0	0	0	0
Total, Industrial Gasification.....	14,279	0	0	0	0

Description

In FY 2003, Utilization of Platform Outputs R&D also included Industrial Gasification, i.e., new technologies for the integrated production of power from solid wood waste and black liquors from the pulping processes.

Benefits

Successful technology development would enable paper mills to reduce their net energy requirements while decreasing waste discharges through increased power generation from the waste streams.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Industrial Gasification.....	**14,279**	**0**	**0**
In FY 2004, $4,939,000 for Industrial Gasification was appropriated for the Industrial Technologies Program whereas the Biomass Program continues to be responsible for the management of this activity. In FY 2003 this activity was reduced by $306,000 for SBIR/STTR and transferred to the Science Appropriation.			
Total, Industrial Gasification.....	**14,279**	**0**	**0**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support	811	396	400	+4	+1.0%
Total, Technical/Program Management Support	811	396	400	+4	+1.0%

Description

Technical/Program Management Support focuses on strategic and operating plans, feasibility studies, trade-off analyses, and evaluation of program performance. As information related to new R&D data, new governmental policies and industry initiatives are available, this needs to be incorporated into ongoing analytic, planning and evaluation activities.

Benefits

These efforts support EERE management's overall objectives of increasing program efficiency and targeting future resources to the most productive program efforts.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	**811**	**396**	**400**

In FY 2005, update strategic and operating plans, feasibility studies, trade-off analyses, and evaluation of program performance. Perform analysis of environmental emissions and energy use for each step of the production and utilization cycle for bio-based products. Document efficiency and sustainability benefits of products derived from biomass. *Participants include National Renewable Energy Laboratory, Oak Ridge National Laboratory and various universities.*

Total, Technical/Program Management Support	**811**	**396**	**400**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 Request
Technical/Program Management Support	+4
No significant changes	
Total Funding Change, Technical/Program Management Support	**+4**

Federal Energy Management Program

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation[a]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Federal Energy Management Program						
Project Financing	7,839	8,126	8,126	7,450	-676	-8.3%
Technical Guidance and Assistance	7,825	8,140	8,140	7,900	-240	-2.9%
Planning, Reporting and Evaluation	2,751	2,571	2,571	2,550	-21	-0.8%
Technical Program Management Support	884	879	879	0	-879	-100.0%
Total, Federal Energy Management Program	19,299	19,716	19,716	17,900	-1,816	-9.2%

Public Law Authorizations:

P.L. 94-163, “Energy Policy and Conservation Act” (EPCA) (1975)
P.L. 94-385, “Energy Conservation and Production Act” (ECPA) (1976)
P.L. 95-91, “DOE Organization Act” (1977)
P.L. 95-619, “National Energy Conservation Policy Act” (NECPA) (1978)
P.L. 100-615, “Federal Energy Management Improvement Act" (1988)
P.L. 102-486, "Energy Policy Act" (1992)

Mission

The mission of the Federal Energy Management Program (FEMP) is to promote energy security, environmental stewardship and cost reduction through energy efficiency and water conservation, the use of distributed and renewable energy, and sound utility management decisions at Federal sites.

[a] Programs in the Energy Conservation appropriation were reduced by .59 percent as required by the Omnibus Appropriation Bill.

Benefits

FEMP supports the mission of the Office of Energy Efficiency and Renewable Energy by improving the energy efficiency and productivity of Federal Government buildings and by bringing clean, renewable technologies to Federal facilities. FEMP supports DOE's goals of protecting our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy to Federal facilities. These activities fulfill the statutory requirements of the National Energy Conservation Policy Act (NECPA); provisions under the Energy Policy Act of 1992 (EPACT); and Executive Order 13123 (Efficient Energy Management). Accomplishing this mission contributes to several national energy and environmental priorities. The President's National Energy Policy calls for America to modernize conservation efforts, increase energy supplies, "accelerate the protection and improvement of the environment, and increase our Nation's energy security." It directs heads of executive departments and agencies to "take appropriate actions to conserve energy use at their facilities to the maximum extent consistent with the effective discharge of public responsibilities."

More detailed, integrated and comprehensive economic, energy and energy security benefits estimates are provided in the Expected Program Outcomes section at the end of the program level budget narrative.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission plus seven general goals that tie to the strategic goals. The FEMP program supports the following goals:

Energy Strategic Goal

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options and improving energy efficiency.

The FEMP program has one program goal that contributes to General Goal 4 in the "goal cascade":

Program Goal 04.13.02.00: FEMP. The Federal Energy Management goal is to provide technical and financial assistance to Federal agencies and thereby lead the Nation by example in use of energy efficiency and renewable energy. Through the Federal Government's own actions, FEMP's target is to increase Federal renewable energy use to 2.5% of total Federal electrical energy use by 2005, and reduce energy intensity in Federal buildings by 30 percent by 2005 (relative to the 1985 statutory baseline level of 138,610 Btus per gross square foot). By 2010, the target is to further reduce energy intensity in federal buildings by 35 percent (relative to the 1985 statutory baseline level).

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Program Goal 04.13.02.00 (Federal Energy Management Program)					
Project Financing					
Completed one nationwide Solar technology Super-Energy Savings Performance Contract (Super ESPC) for use by all agencies, bringing the total number of technology Super-ESPCs to four.	Achieved $121 million in private sector investment through Super ESPCs.	Achieved $97 million in private sector investment through Super ESPCs.	Achieved $252 million in private sector investment through Super ESPCs, contributing to national energy security.	Will achieve between $35 and $55 million in private sector investment through Super ESPCs, contributing to national energy security.	Will achieve between $60 and $100 million in private sector investment through Super ESPCs which will result in about a 0.2 percent annual reduction in energy intensity. These projects are cost-effective, resulting in a positive net present value gain for the tax payer.
Technical Guidance and Assistance					
					Will provide technical and design assistance for 60 federal projects which include energy efficiency, renewable energy, O&M, Distributed Energy Resources, Combined Heat and Power, SAVEnergy Audits, ALERTS and water conservation projects. These projects are cost-effective, because the technologies applied in these projects have been shown to be cost-effective by the supporting EREE programs.
Provided technical and design assistance for 43 energy efficiency and renewable energy projects.	Provided technical and design assistance for 106 energy efficiency and renewable projects including distributed energy resources projects.	Provided technical and design assistance for 90 energy efficiency, renewable energy, and water conservation projects; four were large-scale distributed energy resources and and/or combined heat and power projects.	Provided technical and design assistance for 53 energy efficiency, renewable energy, and water conservation projects; 10 were large-scale distributed energy resources and combined heat and power projects. Reported the resulting impacts achieved through the end of FY 2001.	Will provide technical and design assistance for 60 energy efficiency, renewable energy, O&M, DER/CHP, and water conservation projects.	

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Provided 28 SAVEnergy Audits.	Provided 40 SAVEnergy Audits and industrial facilities assessments. Completed 25 Assessment of Load and Energy Reduction Techniques (ALERT) assessments to shave anticipated peak demand and general energy consumption by 10 percent.	Provided at least 60 energy assessments including ALERTS, SAVEnergy Audits, industrial facility assessments, and operation and maintenance assessments that identified energy and cost saving opportunities	Provided 56 energy assessments including ALERTS, SAVEnergy Audits, industrial facility assessments and operation and maintenance assessments to identify energy and cost saving opportunities.		
	Trained 5500 Federal energy personnel in best practices.	Trained 6200 Federal energy personnel in best practices supporting National Energy Policy education goals.	Trained 6700 Federal energy personnel in best practices supporting National Energy Policy education goals.	Will train 4,000 Federal energy attendees in energy management best practices supporting National Energy Policy education goals.	Will train 4,000 Federal energy attendees in energy management best practices supporting National Energy Policy education goals.
		Published initial listing of products that use minimal standby power by December 31, 2001, in accordance with E.O. 13221.	Integrated information on standby power into Defense Logistics Agency and General Services Administration's product schedules in accordance with E.O. 13221.		
Management of Funds					
				Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing annual program uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing annual program uncosteds by 10 percent in 2005 relative to the program uncosted baseline (2004) until the target range is met.

Means and Strategies

The FEMP Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

FEMP helps Federal agencies take advantage of energy management opportunities in building construction, renovation, retrofit, operations and maintenance; energy consuming product and equipment procurement; and utility service acquisition and utility load management.

FEMP employs a variety of means and strategies to assist agencies in realizing energy, environmental and cost savings potentials, including:

- interagency coordination committees,
- direct technical assistance,
- education and training,
- information and outreach programs, and
- assistance in accessing alternative private sector funding.

These means and strategies will result in significant cost savings and a significant reduction in energy use at Federal facilities -- thus putting the taxpayers' dollars to more productive use.

The following external factor could affect FEMP's ability to achieve its strategic goal:

- The legal authority for implementing energy savings performance contracts expired in September 2003. The timing of reinstatement will significantly impact FEMP's work on alternative financing.

The following collaborations help FEMP achieve its goals:

- FEMP hosts a number of working groups with its Federal agency partners to ensure that agencies are focused on the Congressionally mandated energy efficiency and renewable energy goals, that they develop strategies for obtaining the resources required to achieve these goals and that they share information on best energy management practices.

Validation and Verification

To validate and verify program performance, the FEMP Program will conduct internal and external reviews. These programmatic activities are subject to continuing review by, for example, the Congress, and the Department's Inspector General. The table below summarizes validation and verification activities.

Data Sources:	Agencies submit annual reports documenting energy use, cost, gross square footage, and exempt facilities. The reports are supplemented by FEMP's tracking and reporting and are submitted each year to Congress.
Baselines:	Federal energy management goals are measured from the 1985 baseline for standard buildings (138,610 Btu/square foot) and the 1990 levels for energy intensive buildings (The 1990 levels vary for each federal agency). Goals are expressed in BTU per gross square foot and are not normalized for other factors.
Frequency:	Annual.
Data Storage:	FEMP maintains a database of reported information. Agencies maintain their own, more detailed data.
Verification:	External audits are conducted each year. Reporting anomalies are identified and resolved during the annual reporting cycle.

Funding by General and Program Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.13.02.00, FEMP					
Project Financing	7,839	8,126	7,450	-676	-8.3%
Technical Guidance and Assistance	7,825	8,140	7,900	-240	-2.9%
Planning Reporting and Evaluation	2,751	2,571	2,550	-21	-0.8%
Technical/Program Management Support	884	879	0	-879	-100.0%
Total, Program Goal 04.13.02.00, FEMP	19,299	19,716	17,900	-1,816	-9.2%
Total, FEMP	19,299	19,716	17,900	-1,816	-9.2%

Expected Program Outputs

FEMP pursues its mission through integrated activities designed to improve the energy efficiency of, and renewable energy usage by, the Federal government. We expect these improvements to reduce susceptibility of federal agencies to energy price fluctuations and to lower their energy bills; reduce EPA criteria and other pollutants in the cities where agency operations are located; and enhance energy security by increasing the flexibility of local energy demand.

Estimates of annual non-renewable energy savings, energy expenditure savings, and carbon emission reductions that result from the realization of FEMP's goals are shown in the table below through 2025. In addition to these "EERE business-as-usual" benefits, realizing the FEMP goals would provide the technical potential to reduce conventional energy use by the federal government even further if warranted by future energy needs.

The assumptions and methods underlying the modeling efforts affect the estimated benefits, and results could vary if external factors, such as future energy prices, differ from the baseline case assumed for this analysis. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html Final documentation estimated to be completed and posted by March 15, 2004.

FY 2005 GPRA Benefits Estimates for FEMP [a]

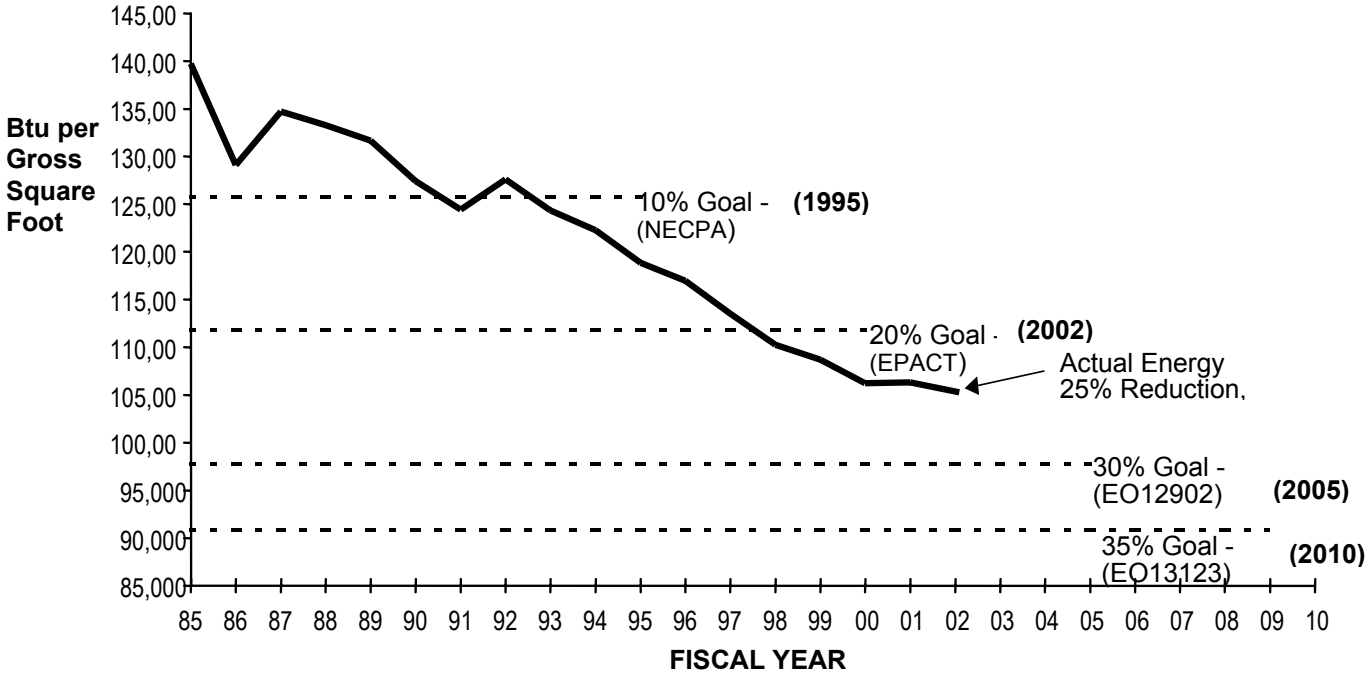
Mid-term benefits

	2010	2015	2020	2025
Primary Non-Renewable Energy Savings (Quads).....	0.03	0.04	0.05	0.07
Energy Expenditure Savings (Billion 2001$).....	0.2	0.3	0.5	0.6
Carbon Emission Reductions (MMTCE).....	1	1	1	1

Various factors can account for the reduction in energy intensity. These include FEMP activities, Federal Appliance Standard, efficiency improvements independent of Federal programs, changes in Federal building stock, and the type of fuel used in Federal Buildings. In addition to the benefits quantified here, improved Federal energy management increases the ability of the Federal Government to manage its energy loads during emergencies and facilitates coordination of Federal energy use with local authorities in the event of local energy supply constraints or emergencies. By helping large Federal facilities quickly reduce their peak demand, FEMP benefited California and other western States during past electricity shortages. The specific impacts of the FEMP program are illustrated in the graphic below entitled "Building Energy Reduction," the Federal Government reduced its site energy intensity (Btu per gross square foot) at Federal facilities by 25.0 percent in 2002 compared to 1985 levels.

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits associated with program activities from FY 2005 to the benefit year or to program completion (whichever is nearer), and are based on program goals developed in alignment with assumptions in the President's Budget. Mid-term program benefits were estimated utilizing the GPRA05-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2003 Reference Case.

Building Energy Reduction



Project Financing

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Project Financing					
Energy Savings Performance Contracts	6,059	6,367	5,950	-417	-6.5%
Utilities Program.....	1,780	1,759	1,500	-259	-14.7%
Total, Project Financing	7,839	8,126	7,450	-676	-8.3%

Description

FEMP developed its alternative financing programs to 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 at no net cost to taxpayers. 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 including lighting upgrades, new heating and ventilation systems, and improved control systems.

Benefits

These alternative financing mechanisms for energy efficiency and renewable energy projects have and will continue to vastly improve the energy efficiency of Federal facilities. These projects save on the energy bills of Federal facilities and are implemented at no net cost to the taxpayer. By providing a means for Federal agencies to implement renewable energy and energy efficiency technologies, these financing mechanisms help reduce the emissions associated with power usage at Federal facilities and promote the use of clean alternatives to conventional technologies. The investment of millions of dollars through alternative financing vehicles helps develop the energy efficiency and renewable technology industries, and supporting industries are buttressed by this economic activity.

FEMP facilitated over $250 million in Energy Savings Performance Contract (ESPC) investment in FY 2003, in part due the fact that the legislative authority for ESPCs was expected to, and did, expire at the end of FY 2003. Given this push to finish projects in FY 2003, as well as the fact that the ESPC authority is not expected to be reinstated until mid-FY 2004, FEMP reduced its investment targets for FY 2004 to between $35 and $55 million in private sector investment. After the authority is reinstated, FEMP expects agency interest and involvement in ESPCs to slowly ramp back up its level of activity to pre-FY2003 levels.

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Energy Savings Performance Contracts (ESPCs) **6,059** **6,367** **5,950**

Deliver FEMP services to award Super ESPC delivery orders, which will include communications and outreach, identifying and screening projects, preparing delivery orders, reviewing and evaluating proposals, reviewing and documenting projects. Will conduct workshops to help prepare agency technical, contracting, budget, legal, administrative, and management personnel to use the Super ESPC contracting vehicle. Will assist agencies to implement Super ESPC delivery orders with estimated value between $60 and $100 million. Because the legislative authority for ESPCs expired at the end of FY 2003, FEMP reduced its investment targets for FY 2004 to between $35 and $55 million in private sector investment. FEMP estimates other Federal agency reimbursements at $600,000 in FY 2005. *Participants include: Lawrence Berkley National Lab (LBNL), National Renewable Energy Lab (NREL), Pacific Northwest National Lab (PNNL), Oakridge National Lab (ORNL), National Energy Technology Lab (NETL), McNeil Technologies, and Aspen Systems.*

Utilities Program **1,780** **1,759** **1500**

Lead the Federal Utility Partnership Working Group (FUPWG) and establish strategic partnerships with targeted utilities which have both a large concentration of Federal customers and a commitment to assist those customers. Use these partnerships to leverage private sector resources and expertise to assist in the early adoption of EERE technologies at Federal sites. Track Federal Utility Energy Services Contracting (UESC) projects and provide support through: workshops for Federal agencies, development and distribution of guidance documents, and direct assistance for projects. Enable Federal decision-makers to make well informed decisions regarding energy project implementation and commodity purchases; provide information, communications, outreach, training, and technical assistance on the impacts of utility restructuring, including energy cost, security, and reliability. *Participants will include: LBNL, NETL, NREL, PNNL, ORNL.*

Total, Project Financing **7,839** **8,126** **7,450**

Explanation of Funding Changes

	FY 2004 vs. FY 2005 ($000)
Energy Savings Performance Contracts	
Because this program is becoming more efficient, we are able to streamline our efforts but still meet our program goal. For example, FEMP has determined that it is not necessary at this time, because of activity consolidation, to create any new Technology Specific Energy Savings Performance Contracts. We have found that we can achieve similar benefits through a fuller utilization of our baseline Super ESPC in a way that continues to meet our agency customers' needs	-417
Utilities Program	
Because this program is mature, we are able to find areas to streamline our efforts.....	-259
Total Funding Change, Project Financing.....	**-676**

Technical Guidance and Assistance

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical Guidance and Assistance					
Direct Technical Assistance	5,800	6,165	6,000	-165	-2.7%
Training and Information	2,025	1,975	1,900	-75	-3.8%
Technical Guidance and Assistance	7,825	8,140	7,900	-240	-2.9%

Description

Technical assistance helps agencies to take advantage of innovative technologies and training opportunities. FEMP assists Federal energy managers identify, design, and implement new construction and facility improvement projects. FEMP provides unbiased, expert technical assistance in areas such as energy and water audits for buildings and industrial facilities, peak load management; and new technology deployment, including combined heat and power and distributed energy technologies. FEMP also provides analytic software tools to help agencies choose the most effective energy and water project investments. To learn from the experts first-hand, Federal employees and others can enroll in FEMP's training programs in such areas as project financing, life-cycle costing, O&M, and sustainable design. In addition, FEMP helps agencies acquire the most energy efficient and water conserving products through procurement training, product efficiency recommendations, communications and outreach, and assisting agencies in amending their guide specifications to incorporate requirements for energy efficient products.

Benefits

Technical Guidance and Assistance supports FEMP's mission by helping agencies implement projects and practices that reduce energy costs, improve air quality, and promote the use of water conservation, energy efficiency and renewable energy. FEMP's direct project assistance allows agencies to consider cost-saving and energy-saving practices as they design new buildings and renovate existing ones. FEMP's technical information guides federal agencies as they make purchasing decisions, utility management decisions, and other choices that affect their energy use.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Direct Technical Assistance	**5,800**	**6,165**	**6,000**

In FY 2005, FEMP will provide support for at least 40 agency projects to identify energy and cost saving opportunities in the design, review, and implementation of energy efficiency, water conservation, operations and maintenance, Distributed Energy Resources/Combined Heat and Power (DER/CHP), and renewable projects, including facility construction and renovation. FEMP will provide agencies 20 energy assessments including SAVEnergy Audits, ALERTS and industrial facility assessments that identify energy and cost saving opportunities.

FEMP will continue to develop technical information and assistance to help agencies deploy these technologies on a broader basis and conduct communications and outreach activities. These projects demonstrate leading-edge technologies with energy and cost savings. FEMP will assist agencies in identifying low-cost/no-cost improvements to their operation and maintenance of energy systems, and FEMP will continue to provide training and technology assessments. *Participants include: LBNL, NREL, PNNL, ORNL, Sandia National Laboratories (SNL), McNeil Technologies.*

Training and Information	**2,025**	**1,975**	**1,900**

FEMP will provide technical information and tools and train over 4,000 attendees to enable agency action on a greater number of projects than FEMP can assist directly to meet statutory Federal energy and water savings goals. FEMP develops and publishes technical information products. FEMP will help agencies acquire the most energy efficient and water conserving products through procurement training, communications and outreach, and assisting agencies in amending their guide specifications to incorporate requirements for energy efficient products. FEMP will publish revised or new product energy efficiency recommendations, and coordinate energy efficiency criteria with the EPA/DOE Energy Star program, Consortium for Energy Efficiency (CEE) and others. FEMP will maintain essential software such as the Building Life Cycle Cost tool that implements requirements for Life Cycle Costing project analysis. *Participants will include: LBNL, NETL, NREL, PNNL, ORNL, SNL, McNeil Technologies.*

Total, Technical Guidance and Assistance	**7,825**	**8,140**	**7,900**

Explanation of Funding Changes

	FY 2004 vs. FY 2005 ($000)
Direct Technical Assistance	
Request will fund direct technical assistance projects and comprehensive energy assessment commensurate with current targets	-165
Training and Information	
Reduced need for funding for training because of collection of registration fees from private sector attendees	-75
Total Funding Change, Technical Guidance and Assistance	**-240**

Planning, Reporting, and Evaluation

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Planning, Reporting, and Evaluation					
Planning, Reporting, and Evaluation	2,751	2,571	2,550	-21	-0.8%
Total, Planning, Reporting, and Evaluation	2,751	2,571	2,550	-21	-0.8%

Description

FEMP will continue targeting services at key emerging opportunities in the Federal sector. FEMP will promote building energy security through the whole building design approach in the Federal community. FEMP will facilitate one or two meetings with senior Federal energy officials and provide support for the Federal Energy Management Advisory Committee. FEMP will collect and publish data for the Annual Report to Congress, respond to inquiries and provide support to ensure accuracy in reporting and analysis of trends. FEMP will conduct awareness campaigns and Federal awards program.

Benefits

Through planning, reporting and evaluation, FEMP evaluates the effectiveness of its programs in the past and plans the design of its programs for the future in a way that provides the most benefit for the taxpayer's dollar. By making FEMP's programs more effective, these activities help ensure that FEMP's investments lead to the greatest possible reductions in energy costs, improvements in air quality, and promotion of water conservation, energy efficiency and renewable energy technologies.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Planning, Reporting and Evaluation	**2,751**	**2,571**	**2,550**

Following up on EERE's implementation of its strategic plan, FEMP will continue targeting services at key emerging opportunities in the Federal sector. FEMP will promote building energy security through the whole building design approach in the Federal community. FEMP will facilitate one or two meetings with senior Federal energy officials and provide support for the Federal Energy Management Advisory Committee. It will collect and publish data for the Annual Report to Congress, respond to inquiries and provide support to ensure accuracy in reporting and analysis of trends. FEMP will conduct awareness campaigns and Federal awards program. *Participants will include: LBNL, NETL, NREL, PNNL, ORNL, SNL, McNeil Technologies.*

Total, Planning, Reporting and Evaluation	**2,751**	**2,571**	**2,550**

Explanation of Funding Changes

	FY 2004 vs. FY 2005 ($000)
Planning, Reporting and Evaluation	
No significant change	**-21**
Total Funding Change, Planning, Reporting and Evaluation	**-21**

Technical/Program Management Support

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical/Program Management Support					
Technical/Program Management Support.....	884	879	0	-879	-100.0%
Total, Technical/Program Management Support	884	879	0	-879	-100.0%

Description

Technical/Program Management has been used in support of activities relating to annual awards, technical analysis, information management, outreach publications, and legislative/executive branch reporting. These activities will be discontinued under this subprogram and absorbed by other subprograms as appropriate.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Technical/Program Management Support	**884**	**879**	**0**
As FEMP's core activities have matured, the efficiencies in those activities have increased, enabling FEMP to streamline its support activities. The support activities under this subprogram will be discontinued and will be absorbed by other subprograms as appropriate.			
Total, Technical/Program Management Support	**884**	**879**	**0**

Explanation of Funding Changes

	FY 2004 vs. FY 2005 ($000)
Technical/Program Management Support	
As FEMP's core activities have matured, the efficiencies in those activities have increased, enabling FEMP to streamline its support activities. Activities will continue to be undertaken in other subprograms as appropriate	-879
Total Funding Change, Technical/Program Management Support	**-879**

Program Management

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation [a]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Program Management						
Program Direction	69,941	70,132	73,078	75,109	+2,031	+2.8%
Planning, Evaluation, and Analysis	4,972	4,944	4,944	5,005	+61	+1.2%
Information, Communications, and Outreach	1,540	1,531	1,531	1,550	+19	+1.2%
Cooperative Program with States...	0[b]	4,939	4,939	0	-4,939	-100.0%
Congressionally-Directed Activities.....	497	3,458	3,458	0	-3,458	-100.0%
Total, Program Management	76,950	85,004	87,950	81,664	-6,286	-7.1%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)
P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 95-618, "Energy Tax Act of 1978"
P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)
P.L. 96-294, "Energy Security Act" (1980)
P.L.102-486, "Energy Policy Act of 1992"

Mission

The Energy Conservation Program Management budget provides executive and technical direction, public information, planning, analysis, evaluation, and oversight required for efficient and productive implementation of Energy Conservation programs in the Office of Energy Efficiency and Renewable Energy (EERE). Program Management supports Headquarters functions, six Regional Offices, and the

[a] Programs in the Energy Conservation appropriation were reduced by the Interior appropriation's 0.646 percent across-the-board reduction and the 0.59 percent rescission in the Omnibus Appropriation Bill.

[b] Total FY 2003 funding was $2,928,000. Those funds are shown under the State Energy Activities subprogram within the Weatherization and Intergovernmental Program, which was how FY 2003 was presented in the FY 2004 DOE Congressional Request.

Golden (Colorado) Field Office in planning and implementing EERE activities, as well as facilitating delivery of applied R&D and grant programs to Federal, regional, State, and local customers. Program Management also contains several Congressionally-directed activities in FY 2004.

As stated in the Departmental Strategic Plan, DOE's Strategic and General Goals will be accomplished not only through the efforts of the major programs in the Department but with additional effort from offices which support the programs in carrying out the mission. Through its Program Management activities, EERE performs critical functions which directly support the mission of the Department. These functions include managing information technology, ensuring sound legal and policy advice and fiscal stewardship, developing and implementing uniform program policy and procedures, performing cross-cutting economic and market analyses, estimating GPRA and other benefits of EERE's programs, maintaining and supporting our workforce, providing security at our Golden Field Office and Regional Offices, and providing Congressional and public liaison and information.

Benefits

Each of the major subprograms of Program Management serves to make possible, enhance, or quantify the benefits of all the other programs in Energy Conservation.

The Program Direction subprogram is essential to the performance of all Energy Conservation programs and the achievement of their missions, because it provides for their staff, management, and program execution (contracting and financial awards.) It also provides the cross-cutting functions necessary for a successful program, including preparation of budget requests, communication with Congress and the Office of Management and Budget, and oversight to ensure that program activities are consistent with the Department's mission, the National Energy Policy, and the President's Management Agenda. The Golden Field Office provides much of EERE's project management capability, and the Regional Offices provide EERE with a support mechanism to understand and address regional variations in energy resources, markets, and demand patterns.

Through the implementation of the August 26, 2003 EERE Management Action Plan (summary information on the web at: www.eere.energy.gov), EERE will increase its corporate costing of work by 5 percent (a weighted composite of 2 -10 percent increases for each program) in FY05 vs. FY04.

The Communications and Outreach subprogram coordinates and manages efforts to make all of the other programs' work – and their results – known to the public. This contributes both to the Energy Conservation account's deployment goals and to Administration E-government initiatives to make government more transparent and accessible to the public.

The Planning, Evaluation, and Analysis subprogram funds analysis contracts that support the integration of performance measurement and benefits estimation with program planning, support the development of consistent multi-year planning methods, provide energy-market foresight, and calculate the GPRA benefits estimates for all other DOE Energy Conservation programs. Each of these activities is central to the goals of the President's Management Agenda, and each is also key to effective management of the Energy Conservation programs and to deciding on the optimal allocation of resources among the programs.

Program Direction

Funding Profile by Category

(dollars in thousands, whole FTEs)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Headquarters					
Salaries and Benefits	31,300	31,902	33,458	+1,556	+4.9%
Travel	1,770	1,975	1,975	0	0%
Support Services	9,113	8,316[a]	8,512	+196	+2.4%
Other Related Expenses	3,802	5,131	5,023	-108	-2.1%
Total, Headquarters	45,985	47,324	48,968	+1,644	+3.5%
Full Time Equivalents	274	270	262	-8	-3.0%
Golden Field Office					
Salaries and Benefits	3,838	5,202	6,770	+1,568	+30.1%
Travel	160	191	220	+29	+15.2%
Support Services	1,158	1,108	1,158	+50	+4.5%
Other Related Expenses	846	825	1,304	+479	+58.1%
Total, Golden Field Office	6,002	7,326	9,452	+2,126	+29.0%
Full Time Equivalents	37	50	60	+10	+20.0%
Operations Offices					
Salaries and Benefits	1,415	0	0	0	0.0%
Travel	0	0	0	0	0.0%
Support Services	0	0	0	0	0.0%
Other Related Expenses	0	0	0	0	0.0%
Total, Operations Offices	1,415	0	0	0	0.0%
Full Time Equivalents	13	0	0	0	0.0%
Regional Offices					
Salaries and Benefits	10,914	11,196	11,879	+683	6.1%
Travel	834	830	830	0	0.0%
Support Services	1,460	687	887	+200	+29.1%
Other Related Expenses	3,331	2,769	3,093	+324	+11.7%
Total, Regional Offices	16,539	15,482	16,689	+1,207	+7.8%
Full Time Equivalents	119	119	119	0	0.0%

[a] $894K was added by Congress to be used at the National Energy Technology Laboratory (NETL) to provide project management services to EERE's Distributed Energy Program in FY 2004. The support services funding available to EERE for Headquarters use in FY 2004 is $7,422K.

(dollars in thousands, whole FTEs)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Total Program Direction					
Salaries and Benefits	47,467	48,300	52,107	+3,807	+7.9%
Travel	2,764	2,996	3,025	+29	+1.0%
Support Services	11,731	10,111	10,557	+446	+4.4%
Other Related Expenses	7,979	8,725	9,420	+695	+8.0%
Total, Program Direction	69,941	70,132	75,109	+4,977	+7.1%
Total, Full Time Equivalents	443	439	441	+2	+0.5%

Mission

Program direction activities are performed in three office groups:

- Headquarters, where technical and budget planning and policy development are centered, and where the first stages of program execution occur;
- Golden Field Office, which provides field management of the National Renewable Energy Laboratory and where EERE is developing its centralized Project Management Office to handle the later stages of program execution; and
- Six Regional Offices, which provide regionalized support for EERE's deployment and State Grant programs, along with other local coordination activities requested by the 11 technology programs.

Headquarters

EERE faces four major institutional management challenges:

1. EERE's programs are numerous and diverse, addressing multiple national goals and providing multiple types of public benefits, making management and integration at the corporate level very complex;
2. EERE complies with multiple external requirements, such as the Government Performance Results Act (GPRA), that require a broad spectrum of information to be delivered at different times of the year, and has been at the forefront (often a "pilot" program) of efforts to improve benefits analysis and R&D performance measurement;
3. EERE's customer base is very diverse and therefore information preparation and delivery must address a greater range of intended audiences than many programs face; and
4. EERE's research, development and deployment (RD&D) programs have, in the past, depended heavily on contractors managing subcontractors.

In response to outside recommendations (e.g. the National Academy of Public Administration - NAPA) and its own continuing self assessments, EERE has established an Action Plan for FY 2004-2005 to guide reforms that will address identified shortcomings, including:

- Continuing to implement our streamlined and integrated program and business model, which consolidated our work into eleven technology development and deployment programs and centralized our business administration functions into a single EERE organization. Our work will focus on culture change and consolidating the improvements already made.
- Continuing a formal Program Management Initiative begun in FY 2003, focused on training for all program managers. As a result, EERE intends to have a fully certified and trained program management corps.
- Integrating the Strategic Management System (SMS) with the best features of the existing EERE project management systems and with the evolving DOE I-Manage initiative, in order to provide a unified corporate approach toward planning and budgeting, program execution, and performance measurement across EERE. A unified interim program planning and performance management software platform will be implemented in FY 2004 and 2005, with data migrated to I-Manage as soon as the Department-wide R&D management modules are ready.
- Developing new standard operating procedures intended to reduce end-of-year uncosted balances.
- Implementing advance procurement planning and improved "work packaging" to reduce procurement and financial assistance "churning" due to administrative change orders and numerous very small funding actions.
- Concluding a Workforce Analysis in FY 2004 to assess the most effective distribution of FTEs across EERE's programs, and implementing a workforce restructuring in FY 2004-2006 in order to provide effective oversight and to manage towards performance goals.
- Developing stronger management oversight on the use of support service contracts, and combining that with the workforce analysis to develop a strategy for optimally deploying support service resources for maximum benefit.
- Working with the DOE Chief Financial Officer (CFO), the White House Office of Management and Budget (OMB), and Congress to better convey and account for expenditure of program direction and policy analysis costs.

The Headquarters program direction budget supports staff, facilities, and contracted services in four functional areas that are essential for productive operation of the EERE enterprise:

1. Program and Project Management. Supplies the critical expertise needed to organize, plan, direct and monitor RD&D activities associated with energy efficiency programs at Headquarters and in the field.
2. Program Execution Support. Provides a full spectrum of program execution business activities for EERE managers from a single integrated organization. These services include all actions associated with program execution; funding allocation, acquisition, reporting and analysis steps that make appropriation intentions reality. They also encompass human resources, travel, training, space, and security activities (except cyber security).
3. Planning, Budget Formulation and Analysis (PBFA). Provides relevant and timely budget, planning, evaluation, and analysis support for budget formulation, performance measurement, and technology assessment. PBFA manages development of EERE's annual Government Performance and Results Act (GPRA) metrics and EERE's performance planning and accountability report. It coordinates development of EERE's budget requests, including integration of performance measures and updates of the EERE Strategic Plan. PBFA also coordinates the planning, evaluation, and analysis required by the President's Management Agenda (PMA) and EERE's reporting of PMA progress through the Program Assessment Rating Tool (PART) and R&D Investment Criteria. PBFA also provides analysis for the statutorily-required biennial National Energy Policy report and similar government-wide policy efforts.
4. Information and Business Management Systems. Develops and manages corporate level information and business management systems to insure consistent, efficient and effective business policies and practices for EERE's Headquarters and field organizations. These information systems serve all of the business activities associated with planning and budget formulation, budget execution, analyses and evaluation. This function also addresses other headquarters and field business systems; information technology and associated cyber security; environmental, safety and health; the coordination of audit activities and national laboratory evaluations as well as identifying field facility needs.

Golden Field Office

The Golden Field Office (GO), with 60 FTEs budgeted for FY 2005 (up from 50 in FY 2004), supports EERE energy conservation efforts through field project management of R&D partnerships, laboratory contract administration, and a variety of professional, technical, and administrative functions. Federal staff expenditures are funded by both of EERE's Energy Supply and Energy Conservation appropriations. GO provides management support for approximately 450 agreements and some 300 active projects in nearly every State and in several other nations to support the following programs:

- Weatherization & Intergovernmental Program;
- Federal Energy Management Program;
- Distributed Energy Resources;
- Building Technologies;
- Industrial Technologies;
- FreedomCAR & Vehicle Technologies.

Key activities include:

- Administering the management and operating contract for the National Renewable Energy Laboratory (NREL).
- Managing the Federal Energy Management Program (FEMP) Super Energy Savings Performance Contracts ("Super-ESPCs") and serving as the focal point for FEMP finance and procurement activities.
- Providing procurement, legal, business management, information resource management, and technical support to the six EERE Regional Offices.
- Supporting the Inventions and Innovations Program.
- Partnering with industry and academia in joint R&D projects to further develop and facilitate delivery of applied R&D.

Regional Offices

EERE's 6 Regional Offices (ROs), located in Atlanta, Boston, Chicago, Denver, Philadelphia, and Seattle, catalyze the implementation of energy efficient and renewable energy strategies at the State and local level by working with States and communities to promote EERE programs; identifying and engaging community and State partners; and integrating EERE programs with public and private sector activities. The ROs, with 119 FTEs budgeted for FY 2005, represent over a quarter of EERE's Federal workforce, and administer nearly $0.4 billion in program funding to States, localities, and regional organizations. They play a key role in implementing EERE's mission in administering grants, managing projects, and delivering programs that accelerate market penetration of energy efficiency and renewable energy technologies, plays a key role in implementing EERE's mission. Key activities include:

- Administering EERE's principal technology deployment grant programs, including the Weatherization Assistance Program and the State Energy Program;
- Delivering EERE's principal technical assistance programs, including Clean Cities, Rebuild America, and the Federal Energy Management Program;
- Serving as EERE's liaison to State Energy Offices, other State agencies, regional organizations of the National Governors' Association, and other stakeholders involved in energy and environmental quality issues;
- Organizing over 150 meetings, workshops and conferences per year across all EERE technologies, and providing logistical support and briefing materials for high-profile/VIP events and visits for senior EERE and DOE management.
- Implementing Memoranda of Understanding between DOE and other Federal agencies, such as the Environmental Protection Agency, General Services Administration, Federal Emergency Management Agency (FEMA), and the Department of the Interior (DOI), to implement joint projects where the whole portfolio of EERE technologies is relevant;
- Providing EERE's national program managers at Headquarters with customer feedback on how to make their programs more effective and efficient;
- Supporting and helping deliver special initiatives of the President, Secretary, and Assistant Secretary;

- Creating local, State, and regional partnerships and leveraging local, State, and regional resources to maximize the impact of EERE's technologies and programs; and
- Helping EERE's end use sectors deliver their programs to State and local stakeholders.

The following is a crosscut of FY 2005 Regional Office budget estimates by EERE's major Energy Conservation programs: Federal Energy Management Program; Weatherization & Intergovernmental Program; Industrial Technologies Program; Distributed Energy Resources; as well as support activities:

FY 2005 Regional Office Budget Estimates

(dollars in thousands)

	FEMP	WIP	Industry	DER	Crosscutting	Mgmt & Admin	Totals
Atlanta	360	1,081	300	360	421	482	3,004
Boston	195	958	149	304	244	632	2,482
Chicago	250	1,026	115	686	58	150	2,285
Denver	367	1,362	190	300	567	766	3,552
Philadelphia	324	1,071	242	267	0	779	2,683
Seattle	315	1,083	130	285	360	510	2,683
Totals	1,811	6,581	1,126	2,202	1,650	3,319	16,689

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Salaries and Benefits	**47,467**	**48,300**	**52,107**

Funds a total of 441 full time equivalent employees in FY 2005, two more than the FY 2004 request. Staff funded in this decision unit provide the executive management, program oversight, analysis, and information required for the effective implementation of the EERE programs funded in the Energy Conservation appropriation. The two additional FTEs will support the Fuel Cell Program in the Golden Field Office (GO).

The past several budgets have underestimated the total per-FTE cost, which has required internal redirection of program direction funding and vacancies to be left unfilled longer than planned. The increase requested for FY 2005 addresses that issue and reflects appropriate personnel costs and expected escalation.

The DOE Headquarters component, consisting of 262 FTEs in FY 2005 (a reduction of 8 from FY 2004), is responsible for the development of policies, strategic plans and related guidance to program offices; the evaluation of program performance; the formulation, defense and execution of energy conservation budgets; program planning and execution; and communications with the public and

stakeholders regarding policies, funding, program performance, and related issues.

Program Direction supports a GO personnel level of 60 FTEs in FY 2005. This represents an increase of 10 from the FY 2004 request. Eight of these FTE represent a shift in FTE balance from Headquarters to Golden, and the remaining two represent a net increase in FTE. This shift and increase is intended to support the development of a centralized EERE Project Management Office at Golden. In order to have dedicated support at the NNSA Service Center in Albuquerque, GO will station one or two people there who will work on EERE programs full-time, but they will continue to be treated as GO employees.

In FY 2004, 13 FTEs previously supporting EERE at 3 operations offices were consolidated at GO. This consolidation of expertise dedicated to EERE field management is expected to increase productivity and effectiveness, because of focus on a single DOE program and adoption of unified business practices.

Program Direction also supports 119 FTEs located in EERE's six Regional Offices, the same level as requested in FY 2004.

Staff performance is measured by responsiveness to National Energy Policy goals and objectives; implementation of the President's R&D criteria for priority decision making; continued improvement in the utilization of Federal personnel, travel, and support service activities; increases in competitive and cost-sharing procurement awards; extending the use of more efficient electronic government information systems, improving financial performance; and further integration of program metrics into resource allocation processes.

Travel	**2,764**	**2,996**	**3,025**

The FY 2005 request provides adequate travel funds for 441 FTE, including an enhanced staff of project managers at the GO.

Support Services	**11,731**	**10,111**	**10,557**

Continue implementing management improvements guided by the President's Management Agenda. Peer review EERE program performance, providing feedback to research staff. Continue to provide program management support at Headquarters, Golden, and the Regional Offices for information technology, outreach, communication, procurement, financial and human resources management. Provide a small amount of staff training and provide funds for DCCA audits, not included in FY 2004. The FY 2004 figure also includes $894,000 Congressionally directed to be used at the National Energy Technology Laboratory (NETL) for project-management services for EERE's Distributed Energy program. *Participants will include: TMS, Inc., NETL, TBD.*

Other Related Expenses	**7,979**	**8,725**	**9,420**

The FY 2005 request will support:

- $4,994,000 for Headquarters Working Capital Fund (WCF) activities such as administrative services, rent, automated office support, contract close out, telephone services, postage,

(dollars in thousands)

FY 2003	FY 2004	FY 2005

printing, graphics, and similar services;

- $2,700,000 for rent at the GO and the six Regional Offices; and
- $1,726,000 for Other Related Expenses, including computer equipment and support, utilities, postage, printing, graphics, administrative expenses, and security at Golden and the Regional Offices, plus Worker's Compensation, software licenses, publications, and conferences.

Total, Program Direction	**69,941**	**70,132**	**75,109**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Salaries and Benefits	
More accurate pricing of on-board FTE and an increase of 2 FTE at Golden for the Fuel Cell Technology program; reflect pay increases enacted by Congress.	+3,807
Travel	
Small increase in GO travel.	+29
Support Services	
Provide funding for DCAA audits and staff training, provide support for increased staff at Golden Field Office, partially restore historical support levels at Regional Offices, stretch out time-frame for development of unified program management and information systems to help cover the costs of the previous items. Expand project management funding at NETL.	+446
Other Related Expenses	
Begin putting desktop PCs and EERE servers on a 3-year replacement rotation; cover anticipated increases in rent.	+695
Total Funding Change, Program Direction	+4,977

Support Services by Category

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Management Support					
Management Support	11,731	9,217	8,657	-560	-6.1%
NETL Project Management	0	894	1,900	+1,006	+112.5%
Total, Management Support	11,731	10,111	10,557	+446	+4.4%

Other Related Expenses

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Other Related Expenses					
Equipment transport	75	75	75	0	0.0%
Rent to GSA	2,400	2,255	2,594	+339	+15.0%
Rent to Others	100	103	106	+3	+2.9%
Communications, Utilities, Misc	1,087	701	1,102	+401	+57.2%
Printing and Reproduction	160	150	160	+10	+6.7%
Other Services	0	0	29	+29	
Supplies and Materials	180	160	180	+20	+12.5%
Equipment	175	150	180	+30	+20.0%
Working Capital Fund	3,802	5,131	4,994	-137	-2.7%
Total, Other Related Expenses	7,979	8,725	9,420	+695	+8.0%

Planning, Evaluation, and Analysis

Funding Schedule by Activity

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Planning, Evaluation, and Analysis					
Planning, Evaluation, and Analysis...	4,972	4,944	5,005	+61	+1.2%
Total, Planning, Evaluation and Analysis.....	4,972	4,944	5,005	+61	+1.2%

Description

Planning, Evaluation and Analysis collects economic, market, and technology characterization data and develops analytical tools and models for forecasting future energy and technology markets, the impact that energy-efficiency technologies might have, 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 lead to the achievement of EERE goals in the most cost effective manner. A solid analytical foundation is basic to understanding the potential for increasing the penetration of energy efficient and renewable energy technologies, and for achieving the correct balance and direction of programmatic activities. In addition, analysis and evaluation activities are required to ensure continued program alignment with the goals of the National Energy Policy (NEP) and the President's Management Agenda, and to properly explain the budgets and benefits of EERE's programs.

EERE maintains strong capabilities in data analysis and model development to ensure that decisions regarding program direction and resource allocation are guided by the best possible information. Analytical capabilities and supporting databases are continually refined and strengthened to improve the information available for program guidance decisions and to better evaluate the energy, economic, and environmental impacts of programmatic alternatives.

Benefits

The Planning, Evaluation, and Analysis subprogram funds analysis contracts that support the integration of performance measurement and benefits estimation with program planning, support the development of consistent multi-year planning methods, provide energy-market foresight, and calculate the GPRA benefits estimates for all other DOE Energy Conservation programs. Each of these activities is central to the goals of the President's Management Agenda, and each is also key to effective management of the Energy Conservation programs and to deciding on the optimal allocation of resources among the programs.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Planning, Evaluation, and Analysis	4,972	4,944	5,005

The FY 2005 funding for this activity represents level funding, the same as the FY 2004 request, although the funds will be more focused on crosscutting analyses in order to provide adequate support for numerous new and expanded analytical requirements. The funds have been consolidated under the EERE reorganization in order distribute them among all Energy Conservation programs in a manner consistent with EERE's annual corporate analytical agenda.

The Office of Planning, Budget Formulation, and Analysis (PBFA) conducts program evaluations and supports program planning by developing, interpreting and disseminating the basic data required to implement energy policy and manage and evaluate energy efficiency programs. PBFA will continue its collaboration with Energy Information Administration on energy use data.

PBFA is also responsible for execution of the analysis elements of the National Academy of Public Administration Implementation Plan; tracks program objectives and goals as required under the Government Performance and Results Act (GPRA); and analyzes new starts and technology commercialization to document program performance metrics. In developing EERE's strategic plans, PBFA must maintain the analytical capability to estimate the best pathways to making the U.S. transportation, buildings and industry sectors sustainable with respect to domestic fuels used and greenhouse gases emitted.

Recent emphasis on GPRA and the President's Management Agenda, including the Office of Management and Budget's "Program Assessment Rating Tool" and "Research and Development Investment Criteria" assessments, requires a greater effort to project benefits, assess past performance and benefits, anticipate future markets, and provide a more solid integration of analysis tools and products across the EERE program portfolio.

Participants are expected to include: NREL, LBNL, ORNL, PNNL, and TBD.

Total, Planning, Evaluation, and Analysis	4,972	4,944	5,005

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Planning, Evaluation, and Analysis	
Provide the same level of analysis as supported by the FY 2004 request. The increase restores across-the-board reductions applied during the FY 2004 appropriation process	+61
Total Funding Change, Planning, Evaluation, and Analysis	+61

Information, Communications, and Outreach

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Information, Communications, and Outreach					
Information, Communications, and Outreach	1,540	1,531	1,550	+19	+1.2%
Total, Information, Communications, and Outreach	1,540	1,531	1,550	+19	+1.2%

Description

Information, Communications, and Outreach activities in EERE are carried out by the Office of Communication & Outreach (OCO). OCO communicates the EERE mission, program plans, accomplishments, and technology capabilities to a variety of stakeholder audiences including Congress, the public, educational institutions, industry, and other government and non-government organizations. In addition, OCO writes testimony and prepares briefing books; coordinates answers to congressional questions (between 600 and 1,000 per year); prepares speeches and presentations by the Assistant Secretary and others when requested; manages the EERE public website and EERE's centralized public information clearinghouse; manages official correspondence; and coordinates reviews of EERE related statements by other DOE offices and Federal agencies.

Many of OCO's functions are inherently Federal, and are performed by EERE staff, whose salaries, benefits, and all related funding (like all EERE staff) are covered in the Program Direction subprogram. The funding requested in this subprogram is focused on two EERE public information activities: the EERE public website and a central information clearinghouse, which provides a toll-free information "hotline."

The objectives of the EERE public website and the central information clearinghouse activities are: (1) to provide accurate information on energy efficiency and renewable energy technologies to the public so EERE's customers can make informed decisions in the marketplace, resulting in an increase in the adoption of EERE efficiency technologies and efficient energy practices; and (2) to raise the general awareness of state-of-the-art energy efficiency technologies and practices.

Benefits

The Communications and Outreach subprogram coordinates and manages efforts to make the all of the other programs' work – and their results – known to the public. This contributes both to the Energy Conservation account's deployment goals and to Administration E-government initiatives to make government more transparent and accessible to the public.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Information, Communications, and Outreach	1,540	1,531	1,550

From March 2002 through February 2003, the number of web pages called up by users doubled to 4.8 million. The increased demand for information in this medium will require us to devote a larger share of the ICO budget to web-server operations and maintenance and to content creation and updates. We will identify (in FY 2004) and implement (in FY 2005) ways to improve website content management and content timeliness in response to this increased consumer and stakeholder usage. We are continuing to update the website to reflect the recent reorganization and to incorporate a consistent "EERE corporate" look and feel across its many components.

The toll-free information clearinghouse provides a more personalized service than the website, and is available to consumers and businesses who do not have Internet access. The clearinghouse fielded 34,000 inquiries and delivered 425,000 publications to consumers, businesses, and schools in 2002.

As more individuals and businesses use the Internet as their first-choice resource for information, we are re-evaluating the clearinghouse's focus and operations in order to find efficiencies that will allow more resources to be applied to our Web-based information offerings. OCO is also examining ways to consolidate three existing program-specific and program-funded clearinghouses with the central EERE clearinghouse, in order to address the needs of all of EERE's programs and stakeholders with the most economical infrastructure.

Participants will include: NREL, LBNL, ORNL, PNNL, RS Information Systems, and TBD.

Total, Information, Communications, and Outreach	1,540	1,531	1,550

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Information, Communications, and Outreach	
Restore general reductions applied to FY 2004 appropriation.	+19
Total Funding Change, Information, Communications, and Outreach	+19

Cooperative Program with States

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Cooperative Program with States					
Cooperative Program with States	0[a]	4,939	0	-4,939	-100.0%
Total, Cooperative Program with States.....	0	4,939	0	-4,939	-100.0%

Description

The Cooperative Program with States is a Congressionally-directed activity that funds cooperative agreements with States, which in turn support technology development, field testing, and deployment activities that promote the commercialization of energy-efficiency technologies. The technologies and applications supported can address any sector of the nation's economy.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Cooperative Program with States	0[a]	4,939	0

FY 2004 will be distributed through cooperative agreements with States to support technology development, field testing, and deployment activities that promote the commercialization of energy-efficiency technologies.

Participants will include: TBD.

Total, Cooperative Program with States.....	0[a]	4,939	0

[a] Total FY 2003 funding was $2,928,000. Those funds are shown under the State Energy Activities subprogram within the Weatherization and Intergovernmental Program, which was how FY 2003 was presented in the FY 2004 DOE Congressional Request.

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Cooperative Program with States	
No funds are requested for this Congressionally-directed activity.	-4,939
Total Funding Change, Cooperative Program with States	-4,939

Congressionally Directed Activities

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Congressionally Directed Activities					
National Academy of Sciences Program Review	497	495	0	-495	-100.0%
Energy & Research Consortium of the Western Carolinas	0	2,963	0	-2,963	-100.0%
Total, Congressionally Directed Activities	497	3,458	0	-3,458	-100.0%

Description

These activities have been added at the direction of Congress. The National Academy of Sciences review of selected R&D activities is a continuation of an activity directed in FY 2003. The activities at the Energy & Research Consortium of the Western Carolinas represent new direction in FY 2004.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
National Academy of Sciences (NAS) Program Review	**497**	**495**	**0**

The National Academy of Sciences is funded to study the prospective (predicted) benefits of Energy Conservation programs, and the possible methodologies for such predictions.

Participants will include: NAS.

Energy & Research Consortium of the Western Carolinas	**0**	**2,963**	**0**

This activity will be executed in accordance with Congressional direction. EERE will endeavor to obtain benefits to the Department's goals and EERE's programs in negotiating the work to be performed by the earmark recipient.

Participants will include: Energy & Research Consortium of the Western Carolinas.

Total, Congressionally Directed Activities	**497**	**3,458**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Congressionally Directed Activities	
No funds are requested to continue either of these Congressionally-directed activities in FY 2005.	- 3,458
Total Funding Change, Congressionally Directed Activities	- 3,458

Energy Efficiency Science Initiative (EESI)

Funding Profile by Subprogram[a]

(dollars in thousands)

	FY 2003[b] Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Energy Efficiency Science Initiative						
Energy Efficiency Science Initiative.....	2,440	0	0	0	0	0.0%
Total, Total, Energy Efficiency Science Initiative.....	2,440	0	0	0	0	0.0%

Public Law Authorizations:

P.L. 93-275, “Federal Energy Administration Act of 1974"
P.L. 93-577, “Federal Non-nuclear Energy Research and Development Act of 1974"
P.L. 94-163, “Energy Policy and Conservation Act” (EPCA) (1975)
P.L. 95-91, "Department of Energy Organization Act" (1977)
P.L. 102-486, “Energy Policy Act of 1992"

Mission

In collaboration with the DOE Office of Fossil Energy and the Office of Science, address technology gaps between exploratory science and pre-commercial applied R&D.

Benefits

By bridging the gap between exploratory science and pre-commercial R&D, this program helped accelerate applied research thereby facilitating the movement of basic science into the market.

[a] SBIR/STTR funding in the amount of $87,762 was transferred to the Science appropriation in FY 2003.
[b] The office of Fossil Energy received, through transfer, $1,220,000, or half of these funds.

Funding Schedule by Activity

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Energy Efficiency Science Initiative					
Energy Efficiency Science Initiative.....	2,440	0	0	0	0.0%
Total, Energy Efficiency Science Initiative.....	2,440	0	0	0	0.0%

Description

This program expanded upon existing cooperative efforts with the Office of Fossil Energy in areas such as natural gas-fueled turbine and fuel cell technologies; combined heat, power and cooling applications; hydrogen production, and carbon emission sequestration. It also coordinated with the Office of Science in pursuing follow-on research in the areas of energy efficiency and clean energy development, including basic biosciences, plant genetics, photo emission, heat transfer, new materials, catalysts, and computational science to bridge gaps between fundamental exploratory science and pre-commercial applied R&D.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Energy Efficiency Science Initiative	**2,440**	**0**	**0**
No funds requested for FY 2004 or 2005. In FY 2003, this activity was reduced by $87,762 for SBIR/STTR and transferred to the Science Appropriation.			
Total, Energy Efficiency Science Initiative	**2,440**	**0**	**0**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Energy Efficiency Science Initiative.....	0
Total Funding Change, Energy Efficiency Science Initiative	0

Economic Regulation

Economic Regulation

Economic Regulation

Proposed Appropriation Language

Explanation of Change

Appropriation language is being deleted due to phase out of Interior and Related Agencies funded activities.

Economic Regulation
Office of Hearings and Appeals

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2004 Base	FY 2005 Request	FY 2005 Request vs. Base	
					$ Change	% Change
Economic Regulation						
Program Direction……..	1,487	1,047	1,047	0	-1,047	-100.0%
Subtotal, Economic Regulation……..	1,487	1,047	1,047	0	-1,047	-100.0%
Rescission[ab]……..	0	-13	-13	0	+13	-100.0%
Total, Economic Regulation	1,487	1,034	1,034	0	-1,034	-100.0%

Preface

The Office of Hearings and Appeals provides legal adjudicatory services for the Department's programs in order to resolve any conflicting interests in a fair, impartial and efficient manner.

Within the Economic Regulation Appropriation, the Office of Hearings and Appeals has three principal legal staffs –the Office of Legal Analysis, the Office of Financial Analysis and the Office of Economic Analysis.

This Overview will describe Strategic Context, Mission and Benefits. These items together put this Appropriation in context.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines the mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. As stated in the Departmental Strategic Plan, DOE's Strategic and General Goals will be accomplished not only through the efforts of the major program offices in the Department but with additional effort from offices which support the programs in carrying out DOE's mission. The Office of Hearings and Appeals performs critical functions which directly support the mission of the Department. These functions include careful, effective stewardship

[a] Distribution of the rescission from the Consolidated Omnibus Appropriation Bill in FY2004.
[b] Also includes a general reduction of $7,000 in the FY 2004 Interior and Related Agencies Appropriation.

of the oil overcharge monies entrusted to the Department and providing efficient restitution to those firms and individuals that had been injured by oil overcharges pursuant to the Emergency Petroleum Allocation Act of 1973 (EPAA).

Mission

The Office of Hearings and Appeals (OHA) mission is to conduct fair and efficient hearings and to issue decisions of the Department with respect to any adjudicative proceedings delegated by the Secretary. OHA's jurisdiction includes review of determinations issued by officials within the Department.

Benefits

In regard to its Economic Regulation mission, OHA adjudicates cases arising under the Emergency Petroleum Allocation Act of 1973 (EPAA), and continues to conduct refund proceedings returning petroleum overcharge funds collected by the Department. As directed by Congress, OHA will finish all Interior-funded Economic Regulation activities by the end of FY 2004.

Program Direction

Funding Profile by Category

	(dollars in thousands/whole FTEs)				
	FY 2003	FY 2004	FY 2005	$ Change	% Change
Headquarters					
Salaries and Benefits	987	793	0	-793	-100.0%
Travel	15	15	0	-15	-100.0%
Support Services	20	20	0	-20	-100.0%
Other Related Expenses	465	206	0	-206	-100.0%
Total, Program Direction	1,487	1,034	0	-1,034	-100.0%
Total, Full Time Equivalents	8	2	0	-2	-100.0%

Mission

The Office of Hearings and Appeals (OHA) mission is to conduct fair and efficient hearings and to issue decisions of the Department with respect to any adjudicative proceedings which the Secretary may delegate. OHA's jurisdiction includes appeals requesting review of any determination reached by any other official within the Department under OHA's jurisdiction.

As stated in the Departmental Strategic Plan, DOE's Strategic and General Goals will be accomplished not only through the efforts of the major program offices in the Department but with additional effort from offices which support the programs in carrying out DOE's mission. The Office of Hearings and Appeals performs critical functions which directly support the mission of the Department. These functions include effective stewardship of oil overcharge monies entrusted to the Department and through monetary restitution to firms and individuals injured by oil overcharges.

Detailed Justification

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Salaries and Benefits…….	**987**	**793**	**0**

Funding for personnel costs including pay raises and promotions. No funding requested in FY 2005 due to phase out of Interior and Related Agencies funded activities.

Travel……	**15**	**15**	**0**

For transportation to DOE field sites to conduct hearings on crude oil overcharge cases. No funding requested in FY 2005 due to phase out of Interior and Related Agencies funded activities.

Support Services…….	**20**	**20**	**0**

Funding for computer hardware and related contractual support services. No funding requested in FY 2005 due to phase out of Interior and Related Agencies funded activities.

Other Related Expenses…….	**465**	**206**	**0**

Funding for the Working Capital Fund expenses, which include rent, telephone, supplies, postage, building operations, equipment maintenance, printing and Automated Office Support System support and maintenance. No funding requested in FY 2005 due to phase out of Interior and Related Agencies funded activities.

Total, Program Direction……..	**1,487**	**1,034**	**0**

Explanation of Funding Change

	FY 2005 vs. FY 2004 ($000)
Salaries and Benefits	
Decrease is due to phase out of Interior-funded activities in FY 2004……..	-793
Travel	
Decrease is due to phase out of Interior-funded activities in FY 2004……..	-15
Support Services	
Decrease is due to phase out of Interior-funded activities in FY 2004…….	-20
Other Related Expenses	
Decrease is due to phase out of Interior-funded activities in FY 2004..	-206
Total Funding Change, Program Direction……	**-1,034**

Support Services by Category

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Technical Support……	20	20	0	-20	-100.0%
Total, Support Services……	20	20	0	-20	-100.0%

Other Related Expenses by Category

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Working Capital Fund……	465	206	0	-206	-100.0%
Total, Other Related Expenses…	465	206	0	-206	-100.0%

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Proposed Appropriation Language

For necessary expenses to carry out Strategic Petroleum Reserve facility development and operations and program management activities pursuant to the Energy Policy and Conservation Act of 1975 as amended (42 U.S.C. 6201 et seq.), $172,100,000 [171,963,000*] to remain available until expended.*

Explanation of Change

Increase from FY 2004 appropriation ($171,963,000) reflects full funding for 128 FTEs and technical/program management support.

Strategic Petroleum Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Strategic Petroleum Reserve……..	171,732	170,948	171,355	172,100	+745	+0.4%

Detailed Funding Table

(dollars in thousands)

Strategic Petroleum Reserve (SPR)	FY 2003	FY 2004	FY 2005
Facilities Development and Operation……	157,823	155,044	155,100
Management……..	13,909	15,904	17,000
Total, SPR……..……	171,732	170,948	172,100

Preface

The Strategic Petroleum Reserve provides the United States with adequate strategic and economic protection against disruptions in oil supplies. The program's goal is to mitigate the Nation's energy and security vulnerabilities and to serve as the global benchmark for petroleum reserves.

There are two programs within the Strategic Petroleum Reserve appropriation:

- Facilities Development and Operation
- Management

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals, and Funding by General Goal. These items together put the appropriation in perspective. The Annual Performance Results and Targets, Means and Strategies and Validation and Verification sections address how the goals will be achieved and how performance will be measured. Finally, this Overview will address the Program Assessment Rating Tool (PART) and Significant Program Shifts in all programs.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus the "goal cascade" is the following:

Department Mission →Strategic Goal (25 years)→General Goal (10-15 years)→Program Goal (GPRA Unit) (10-15 years)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA" unit concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will complete a Program Assessment Rating Tool (PART). A unique program goal was developed for each GPRA unit.

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals, and ultimately to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Mission

The mission of the Strategic Petroleum Reserve (SPR) is to store petroleum to reduce the adverse economic impact of a major petroleum supply interruption to the US and to carry out obligations under the international energy program. At the end of 2004, the inventory is projected to be 656 million barrels, which will provide 56 days of net import protection. The Reserve will be filled to its 700 million-barrel capacity in 2005, providing 59 days of net import protection.

Benefits

The U.S. (and trading partner) reliance on oil and U.S. net oil import levels (forecast to increase) combined with location of significant global oil reserves in regions of the world subject to political unrest, have made the U.S. vulnerable to supply disruptions. The presence of the SPR provides protection from supply disruptions.

Strategic Goal

The Department's Strategic Plan identifies four strategic goals: one each for defense, energy, science, and environmental aspects of the mission plus seven general goals that tie to the strategic goals. The Strategic Petroleum Reserve appropriation supports the following goal:

Energy Strategic Goal: To protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The programs funded within the Strategic Petroleum Reserve appropriation have one Program Goal that contributes to the General Goals in the "goal cascade". This goal is:

Program Goal 04.58.00.00: Maintain operational readiness of the Strategic Petroleum Reserve to drawdown at a sustained rate of 4.4 million barrels per day for 90 days, within 15 days notice by the President, and fill the SPR to its current capacity of 700 million barrels by 2005.

Contribution to the General Goal

The programs within the SPR appropriation contribute to General Goal 4 by assuring the Reserve is maintained in a high state of readiness. Assurance is measured by how quickly the program can respond to a Presidential direction to draw down; how much of the oil inventory in SPR storage is available; and the cost efficiency of operations. Facilities Development and Operations funds all requirements associated with developing and maintaining facilities for the storage of petroleum, operations associated with placing petroleum into storage, and operational readiness initiatives associated with drawing down and distributing the inventory in 13 - 15 day s notice in the event of an emergency. Management funds personnel and administrative expenses related to maintaining the Project Management Office (New Orleans, Louisiana) and the Program Office (Washington, DC), as well as contract services required to support management and the technical analysis of program issues.

Funding by General Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.58.00.00 Petroleum Reserves	171,732	170,948	172,100	+1,152	+0.7%
Total……	173,687	170,948	172,100	+1,152	+0.7%

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Facilities Development & Operations and Management					
Complete the Life Extension Program to ensure the long-term reliability, effectiveness, and operational readiness of SPR facilities and systems. (MET GOAL)					
Ensure the achievement of a calculated site availability of 95 percent or greater with drawdown capability of 4.1 million barrels per day for a sustained 90-day period within 15 days notice by the President. (MET GOAL)					
	Establish a Northeast Heating Oil Reserve of up to two million barrels. (MET GOAL)				
Complete contracting for the transfer and/or exchange of 28 million barrels of Federal Royalty Oil from the Department of the Interior for a net increase of approximately 23 million barrels in the SPR inventory, with deliveries of a remaining four million barrels in FY 2001. (MET GOAL)	Complete the transfer of Phase I - Federal Royalty Oil to the SPR by November 2000 per the FY 1999 Agreement with the Department of Interior. (MET GOAL)	Complete the transfer of Phase II and III - Federal Royalty Oil to the SPR. (MET GOAL - Added approximately 19.6 million of Royalty Oil that contributed to the total delivery to inventory of 42.5 million barrels from all Exchange and Federal Royalty Oil agreements.)	Increase crude oil inventory to 628 million barrels. (GOAL NOT MET - The inventory of the SPR at the end of September was 624.4MMB. The variance was caused by deferral of nearly 20 MMB in oil receipts during the Venezuela oil crisis. For this deferral, we will receive an additional 2.9MMB crude premium.)	Increase crude oil inventory to 656 million barrels.	

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
		Achieve maximum sustained (90 day) drawdown rate of 4.2 MMB (MET GOAL)	Achieve maximum sustained (90 day) drawdown rate of 4.3 MMB (MET GOAL)	Achieve maximum sustained (90 day) drawdown rate of 4.4 MMB.	Achieve maximum sustained (90 day) drawdown rate of 4.4 MMB.
		Achieve ≥95% of monthly maintenance and accessibility goals. (EXCEEDED GOAL WITH 98%)	Achieve ≥ 95% of monthly maintenance and accessibility goals. (EXCEEDED GOAL WITH 98%)	Achieve ≥95% of monthly maintenance and accessibility goals.	Achieve ≥95% of monthly maintenance and accessibility goals.
		Award firm fixed-price turnkey (design/build) contract to provide a portable degas plant for continuous removal of excess gas from the SPR crude oil inventory. (MET GOAL)	Complete the Degas Plant design. (MET GOAL)	Commence full Degas Plant operations at a rate of 100,000 – 150, 000 barrels per day by May, 2004 at the Big Hill, TX storage site. Degas 23 MMB of crude oil inventory.	Degas 30 MMB of crude oil inventory.
		Achieve operating cost per barrel of capacity of $0.206 (EXCEEDED GOAL WITH $0.198)	Achieve operating cost per barrel of capacity of $0.213 (EXCEEDED GOAL WITH $0.2004)	Achieve operating cost per barrel of capacity of $0.207	Achieve operating cost per barrel of capacity of $0.207

Means and Strategies

The SPR will use various means and strategies to continue its mission and achieve program goals. Assurance of a readiness posture will be accomplished through internal readiness reviews, assessments, exercises, and tests. Effectiveness of the SPR to mitigate the economic damage of severe oil supply disruptions will be influenced by the SPR's size (inventory and capacity) and ability to deliver into the marketplace. Since FY 1999, the Department has been using agreements with the Department of the Interior to use Federal Royalty Oil to fill the SPR to its 700 million barrel capacity. Completion of deliveries is scheduled for 2005. The SPR's Vapor Pressure Mitigation Program includes construction of a portable vapor pressure (degas) plant for continuous removal of excess gas from the crude oil inventory. Full degas plant operations (at a rate of 100,000 – 150,000 barrels per day) will be initiated in FY 2004.

Performance can be affected by external factors including petroleum market conditions and developments in the commercial distribution system (i.e., pipelines, and terminals). Continuing royalty-in-kind transfers beyond FY 2003 will be contingent on annual delivery targets negotiated with the Department of the Interior.

Validation and Verification

There is a hierarchy of performance information for the SPR. The Department collects & tracks the "critical few" measures. The SPR Program Office monitors limited, specific, short and long-term measures. The SPR Project Management Office manages the detailed, operational measures that are implemented by the contractors. Organizational and action plans are reviewed and analyzed at quarterly Program Reviews. Monthly Project Assessments and Project Reviews are conducted to analyze performance against all milestones and contracts. These reviews provide an opportunity to discuss performance and provide direction to contractors. These same measures are reviewed daily during the site managers' site status meetings. Budget formulation/ execution assessments are regularly conducted throughout the year, including annual budget validations. Other evaluations include: semiannual M&O contractor award fee performance assessments against Work Authorization Directives; on-site reviews to verify operational, maintenance and management performance data; and draw down readiness quarterly reviews.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish outcome- and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2005 Budget Request, and the Department will take the necessary steps to continue to improve performance.

Assessment under the PART found the SPR to be an effective program, well designed with a clear

mission. The total program score was 92%, with individual sections scoring as follows: 1Program Purpose and Design - 100%, Strategic Planning – 88%, Program Management - 100%, and Program Results – 87%. OMB found that the Department's budget was not sufficiently aligned with program goals to distinguish the impact of funding changes on performance. To address these findings, there is a stronger link between the goals and funding request as shown in this budget submission.

Significant Program Shifts

In November 2001, the President directed the Secretary of Energy to continue using the royalty oil transfer plan initiated in 1999, as a means to fill the Reserve to its current capacity of 700 million barrels. Filling the SPR to 700 million barrels is scheduled for completion in 2005.

The Strategic Petroleum Reserve continues to intermittently operate at a higher security alert. Additional security protection Officers have been placed on duty at all sites and a series of 40 security measures have been implemented, as directed by the Office of Security Operations at Department of Energy headquarters. In addition, permanent physical security enhancements have been implemented in response to the perceived threat of continued terrorist activity.

Due to continued geothermal heating and renewed gas intrusion into the crude oil, the SPR initiated a second vapor pressure mitigation program. Continuous removal of excess gas from the SPR crude oil inventory will commence in May 2004. Through degassing, the SPR will be able to maintain its full mission capability while delivering crude oil that meets all safety and environmental standards.

Strategic Petroleum Reserve
Office of Fossil Energy

Funding By Site By Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
SPR Project Offices ……	164,605	162,508	163,103	+595	+0.4%
Washington Headquarters ……	3,469	4,618	5,120	+502	+10.9%
Sandia National Laboratories…….....	2,558	2,612	2,667	+55	+2.1%
National Energy Technology Laboratory…….	750	860	860	0	0%
Oak Ridge Operations Office/Oak Ridge National Laboratory…….	350	350	350	0	0%
Total, SPR…….	171,732	170,948	172,100	+1,152	+0.7%

Site Description

SPR Project Offices

The sites located in Texas and Louisiana provide all operational readiness activities (operations, maintenance, security, etc) for the Reserve. Also includes technical and program management support in Washington, DC and New Orleans, Louisiana.

Washington Headquarters

The Washington Headquarters includes technical and program management support in Washington, DC.

Sandia National Laboratory

The Sandia National laboratory, located in Albuquerque, NM, provides technical, comprehensive, site-specific engineering research and development support for the planning, design, development, and monitoring of Strategic Petroleum Reserve (SPR) crude oil storage facilities.

National Energy Technology Laboratory

The National Energy Technology Laboratory (NETL) located in Morgantown, WV, Pittsburgh, PA and Tulsa, OK is a multipurpose laboratory, owned and operated by the U.S. Department of Energy. NETL conducts detailed analysis of crude oil streams, caverns and storage cavern composites to ascertain the quality of stored oil on selected oil samples. These measurements include the vapor pressure and gas-oil ratio.

Oak Ridge National Laboratory

The Oak Ridge National Laboratory (ORNL), located in Oak Ridge, TN, provides analytic support to the SPR by documenting SPR analysis models, assisting in the development of SPR oil valuation and bid analysis tools, evaluating potential applications of DIS-Risk model approach related to energy policy issues and evaluating SPR planning alternatives.

Facilities Development and Operation

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Facilities Development and Operations ……..	157,823	155,044	155,044	155,100	+56	+0%
Total, Facilities Development and Operations……	157,823	155,044	155,044	155,100	+56	+0%

Public Law Authorization:

P.L. 94-163, "Energy Policy and Conservation Act" (FY 2003)

Mission

The mission of Facilities Development and Operation is to provide for all requirements associated with developing and maintaining facilities for the storage of petroleum, as well as operations associated with placing petroleum into storage. Operational readiness activities associated with drawing down and distributing the inventory on a 13-15 day notice in the event of an emergency are also included.

Benefits

Facilities Development and Operation provides funding for protection from supply disruptions. The U.S. (and trading partner) reliance on oil and U.S. net oil import levels (forecast to increase) combined with location of significant global oil reserves in regions of the world subject to political unrest, have made the U.S. vulnerable to supply disruptions.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Facilities Development and Operations……..	157,823	155,044	155,100

Continue activities for renewed vapor pressure mitigation, to include full degas plant operations at a rate of 100,000 – 150,000 barrels per day. Maintain the Drawdown Readiness Program and perform annual exercises. Continue Recovery Program exercises to maintain readiness and reliability. Address risk reduction by continuing the ES&H program and corrective action plan activity. Continue RIK transfer program with the Department of the Interior to fill the Reserve to capacity in 2005.

FY2004 and FY 2003 activities included completion of site modifications at the Big Hill storage site and initiation of degas activities in May 2004. Continued delivery of exchanged and Federal Royalty Oil. Maintained the Drawdown Readiness Program and performed annual exercises. Continued Recovery Program exercises to maintain readiness and reliability. Continued ES&H Program and corrective action plan activity developed to address unacceptable risk.

Total, Facilities Development and Operations……..	157,823	155,044	155,100

Explanation of Funding Changes

FY 2005 vs. FY 2004 $ (000)

Facilities Development & Operations

Increased cost of security requirement (SECON2), offset by decrease in power requirements due to reduction in RIK barrels delivered	+56
Total Funding Change, Facilities Development & Operations	**+56**

Management

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Management ……	13,909	15,904	16,453	17,000	+547	+3.3%

Mission

The mission of Management is to provide for all costs of personnel and administration related to maintaining the Project Management Office in New Orleans, Louisiana and the Program Office in Washington, DC. Includes funding for contract services required to support management and the technical analysis of program issues.

Benefits

Management provides funding for federal staff and contract support services to ensure protection from oil supply disruptions. Reliance on oil and U.S. net oil import levels (forecast to increase) combined with location of significant global oil reserves in regions of the world subject to political unrest, have made the U.S. vulnerable to oil supply disruptions.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Salaries and Benefits ……	12,238	12,382	12,931

Funds salaries and benefits for 128 full time equivalent employees to assure achievement of Level 1 Performance criteria for drawdown and distribution. Provide for support and oversight of M&O contractor and subcontractor activities and program operations.

	140	473	493

Provides travel to assure capability to achieve Level 1 Performance criteria for drawdown and distribution. FY 2003 requirements were offset with available carryover. FY2004 and FY 2005 reflect full funding requirements.

Support Services……..…….…	986	1,000	1,400

Provide analytic support for SPR development, fill and distribution policy decisions. Includes distribution modeling maintenance. FY 2003 and FY 2004 requirements were offset with available carryover. FY 2005 reflects full funding requirements.

Other Related Expenses……..…	545	2,049	2,176

Major elements are communications, building lease and electric power for DOE-occupied space (New Orleans, Louisiana), training, small purchases, and personal computer hardware and software. Also includes contractual services, supplies and materials.

Total, Management……..……	13,909	15,904	17,000

Explanation of Funding Changes

FY 2005 vs. FY 2004 $ (000)

Management

Mandatory increase for Cost of Living adjustment and general pay raises..... …+ 549

Increase reflects full funding for 128 FTE's and technical/program management support ..... +547

Total Funding Change, Management ..... **+1,096**

Management

Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Washington Headquarters					
Salaries and Benefits.....	2,998	3,113	3,243	+130	+4.2%
Travel.....	140	160	180	+20	+12.5%
Support Services	986	1,000	1,400	+400	+40.0%
Other Related Expenses	494	543	787	+244	+44.9%
Total, Washington Headquarters.....	4,618	4,816	5,610	+794	+16.5%
Full Time Equivalents	27	27	27	0	0.0%
Strategic Petroleum Reserve Project Office					
Salaries and Benefits.....	9,240	9,269	9,688	+419	+4.5%
Travel.....	0	313	313	0	+0%
Support Services	0	0	0	0	+0%
Other Related Expenses	51	1,506	1,389	-117	-7.8%
Total, Strategic Petroleum Reserve Project Office.....	9,291	11,088	11,390	+302	+2.7%
Full Time Equivalents	101	101	101	0	0.0%
Total, Strategic Petroleum Reserve					
Salaries and Benefits.....	12,238	12,382	12,931	+549	+4.4%
Travel.....	140	473	493	+20	+4.2%
Support Services	986	1,000	1,400	+400	+40.0%
Other Related Expenses	545	2,049	2,176	+127	+6.2%
Total, Strategic Petroleum Reserve	13,909	15,904	17,000	+1,096	+6.9%
Total, Full Time Equivalents	128	128	128	0	0.0%

SUMMARY OF SUPPORT FOR ENERGY INFORMATION ADMINISTRATION (EIA)

Strategic Petroleum Reserve

(dollars in thousands)

PROGRAM	FY 2003	FY 2004	FY 2005
Energy Modeling Forum	6	5	5
ADP System Utilization	50	50	50
Petroleum Analysis/Subscripts	85	65	65
Total	140	120	120

Per the Memorandum of Understanding between the EIA and SPR dated June 13, 1983, funding is provided for the services as computer usage and hardware support, logistics information, and data collection.

SPR Petroleum Account
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
SPR Petroleum Account ……	6,955	0	0	0	0	+0.0%
Rescission of Previously Appropriated Funds	-5,000	0	0	0	0	+0.0%
Total, SPR Petroleum Account	1,955	0	0	0	0	+0.0%

Detailed Funding Table

(dollars in thousands)

SPR Petroleum Account	FY 2003	FY 2004	FY 2005
Oil Acquisition & Transportation……..	6,955	0	0
Rescission of Previously Appropriated Funds……..	-5,000		
Total, SPR Petroleum Account……..	1,955	0	0

Preface

The Strategic Petroleum Reserve (SPR) provides the United States with strategic and economic protection against disruptions in oil supplies. The program's goal is to mitigate the Nation's energy and security vulnerabilities.

The SPR Petroleum Account appropriation funds Oil Acquisition and Transportation activities for the Reserve.

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals, and Funding by General Goal. These items together put the appropriation in perspective. The Annual Performance Results and Targets, Means and Strategies and Validation and Verification sections address how the goals will be achieved and how performance will be measured. Finally, this Overview will address the Program Assessment Rating Tool (PART) and Significant Program Shifts in all programs.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus the "goal cascade" is the following:

Department Mission →Strategic Goal (25 years)→General Goal (10-15 years)→Program Goal (GPRA Unit) (10-15 years)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA" unit concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will complete a Program Assessment Rating Tool (PART). A unique program goal was developed for each GPRA unit.

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals, and ultimately to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Mission

The mission of the Strategic Petroleum Reserve (SPR) is to store petroleum to reduce the adverse economic impact of a major petroleum supply interruption to the US and to carry out obligations under the international energy program. At the end of 2004, the inventory is projected to be 656 million barrels, which will provide 56 days of net import protection. The Reserve will be filled to its 700 million-barrel capacity in 2005, providing 59 days of net import protection.

Benefits

The U.S. (and trading partner) reliance on oil and U.S. net oil import levels (forecast to increase) combined with location of significant global oil reserves in regions of the world subject to political unrest, have made the U.S. vulnerable to supply disruptions. The presence of the SPR provides protection from supply disruptions.

Strategic Goal

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission plus seven general goals that tie to the strategic goals. The Strategic Petroleum Reserve appropriation supports the following goal:

Energy Strategic Goal: To protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The programs funded within the Strategic Petroleum Reserve appropriation have one Program Goal that contributes to the General Goals in the "goal cascade". This goal is:

Program Goal 04.58.00.00: Maintain operational readiness of the Strategic Petroleum Reserve to drawdown at a sustained rate of 4.4 million barrels per day for 90 days, within 15 days notice by the President, and fill the SPR to its current capacity of 700 million barrels by 2005.

Contribution to the General Goal

The programs within the SPR appropriation contribute to General Goal 4 by assuring the Reserve is maintained in a high state of readiness. Assurance is measured by how quickly the program can respond to a Presidential direction to draw down; how much of the oil inventory in SPR storage is available; and the cost efficiency of operations. Facilities Development and Operations funds all requirements associated with developing and maintaining facilities for the storage of petroleum, operations associated with placing petroleum into storage, and operational readiness initiatives associated with drawing down and distributing the inventory in 13 - 15 days notice in the event of an emergency. Management funds personnel and administrative expenses related to maintaining the Project Management Office (New Orleans, Louisiana) and the Program Office (Washington, DC), as well as contract services required to support management and the technical analysis of program issues.

Funding by General Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Security					
Program Goal 04.58.00.00 Petroleum Reserves……	6,955	0	0	0	+0%
Rescission of Previously Appropriated Funds……	-5,000				
Total……	1,955	0	0	0	+0%

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Oil Acquisition and Transportation					
Complete contracting for the transfer and/or exchange of 28 million barrels of Federal Royalty Oil from the Department of the Interior for a net increase of approximately 23 million barrels in the SPR inventory, with deliveries of a remaining four million barrels in FY 2001. (MET GOAL)	Complete the transfer of Phase I - Federal Royalty Oil to the SPR by November 2000 per the FY 1999 Agreement with the Department of Interior. (MET GOAL)	Complete the transfer of Phase II and III - Federal Royalty Oil to the SPR. (MET GOAL - Added approximately 19.6 million of Royalty Oil that contributed to the total delivery to inventory of 42.5 million barrels from all Exchange and Federal Royalty Oil agreements.)	Increase crude oil inventory to 628 million barrels. (GOAL NOT MET - The inventory of the SPR at the end of September was 624.4MMB. The variance was caused by deferral of nearly 20 MMB in oil receipts during the Venezuela oil crisis. For this deferral, we will receive an additional 2.9MMB crude premium.)	Increase crude oil inventory to 656 million barrels.	

Means and Strategies

The SPR will use various means and strategies to continue its mission and achieve program goals. Assurance of a readiness posture will be accomplished through internal readiness reviews, assessments, exercises, and tests. Effectiveness of the SPR to mitigate the economic damage of severe oil supply disruptions will be influenced by the SPR's size (inventory and capacity) and ability to deliver into the marketplace. Since FY 1999, the Department has been using agreements with the Department of the Interior to use Federal Royalty Oil to fill the SPR to its 700 million barrel capacity. Completion of deliveries is scheduled for 2005.

Performance can be affected by external factors including petroleum market conditions and developments in the commercial distribution system (i.e., pipelines, and terminals). Continuing royalty-in-kind transfers beyond FY 2003 will be contingent on annual delivery targets negotiated with the Department of the Interior.

Validation and Verification

There is a hierarchy of performance information for the SPR. The Department collects & tracks the "critical few" measures. The SPR Program Office monitors limited, specific, short and long-term measures. The SPR Project Management Office manages the detailed, operational measures that are implemented by the contractors. Organizational and action plans are reviewed and analyzed at quarterly Program Reviews. Monthly Project Assessments and Project Reviews are conducted to analyze performance against all milestones and contracts. These reviews provide an opportunity to discuss performance and provide direction to contractors. These same measures are reviewed daily during the site managers' site status meetings. Budget formulation/ execution assessments are regularly conducted throughout the year, including annual budget validations. Other evaluations include: semiannual M&O contractor award fee performance assessments against Work Authorization Directives; on-site reviews to verify operational, maintenance and management performance data; and draw down readiness quarterly reviews.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish outcome and output oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2005 Budget Request, and the Department will take the necessary steps to continue to improve performance.

Assessment under the PART found the SPR to be an effective program, well designed with a clear mission. The total program score was 92%, with individual sections scoring as follows: Program Purpose and Design - 100%, Strategic Planning – 88%, Program Management - 100%, and Program Results – 87%. OMB found that the Department's budget was not sufficiently aligned with program

goals to distinguish the impact of funding changes on performance. To address these findings, there is a stronger link between the goals and funding request as shown in this budget submission.

Significant Program Shifts

In November 2001, the President directed the Secretary of Energy to continue using the royalty oil transfer plan initiated in 1999, as a means to fill the Reserve to its current capacity of 700 million barrels. Fill of the SPR to 700 million barrels is scheduled for completion in 2005. Funding was not requested for Royalty Oil expenses beginning in FY 2004 due to contractual changes making transportation charges for Royalty-In-Kind fill the responsibility of the contractors.

SPR Petroleum Account
Office of Fossil Energy

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
Strategic Petroleum Reserve Project Office ……..	6,955	0	0	0	+0%
Rescission of Previously Appropriated Funds…….	-5,000				
Total, SPR Petroleum Account……..	1,955	0	0	0	+0%

Public Law Authorizations:
P.L. 94-163, "Energy Policy and Conservation Act" (FY 2003)

Site Description

Strategic Petroleum Reserve Project Office

The SPR Project Office, located in New Orleans, LA, funds transportation activities related to fill of the Reserve to its current capacity of 700 million barrels.

SPR Petroleum Account
Office of Fossil Energy

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Oil Acquisition & Transportation …….	6,955	0	0	0	0	+0%
Rescission of Previously Appropriated Funds……	-5,000					
Total, SPR Petroleum Account……..	1,955	0	0	0	0	+0%

Mission

The mission of the SPR Petroleum Account subprogram is to fund drawdowns and sales operations per the provisions of the Omnibus Budget Reconciliation Act of 1981 P.L. 97-35. The Strategic Petroleum Reserve (SPR) was created by the Energy Policy and Conservation Act (EPCA) of 1975 to provide the United States with adequate strategic and economic protection against disruptions in oil supplies.

Benefits

U.S. (and trading partner) reliance on oil and U.S. net oil import levels (forecast to increase) combined with location of significant global oil reserves in regions of the world subject to political unrest, have made the U.S. vulnerable to supply disruptions. The presence of the SPR provides protection from supply disruptions.

Detailed Justification

	(dollars in thousands)		
	FY 2003	FY 2004	FY 2005
Oil Acquisition and Transportation……	6,955	0	0
Rescission of Previously Appropriated Funds……	-5,000		
Oil Acquisition and Transportation ..	1,955	0	0

FY 2003 activities support continued Royalty-in-Kind (RIK) transfers to fill the Reserve to capacity. Funding is not being requested in FY 2004 and FY 2005 due to contractual changes making transportation charges the responsibility of the contractors.

Total, Oil Acquisition and Transportation …	1,955	0	0

Explanation of Funding Changes

N/A

Northeast Home Heating Oil Reserve

Proposed Appropriation Language

For necessary expenses for Northeast Home Heating Oil Reserve storage, operations and management activities pursuant to the Energy Policy and Conservation Act of 2000 (Public Law 106-469), $5,000,000 to remain available until expended.

Explanation of Change

The only change from the language proposed in FY 2004 is to the proposed funding amount. FY 2004 reflects the application of a rescission.

Northeast Home Heating Oil Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Northeast Home Heating Oil Reserve……..	5,961	4,939	4,939	5,000	+61	+1.0%

Preface

The Northeast Home Heating Oil Reserve is a permanent part of America's energy readiness effort (separate from the Strategic Petroleum Reserves)- assuring home heating oil supply for the Northeast states during times of very low inventories and significant threats to immediate further supply.

Mission

On July 10, 2000, the President directed the Department of Energy to establish a heating oil reserve in the Northeast capable of assuring home heating oil for the Northeast states during times of very low inventories and significant threats to immediate further supply. On March 6, 2001, Energy Secretary Abraham formally notified Congress that the Administration would establish the Reserve as a permanent part of America's energy readiness effort, separate from the Strategic Petroleum Reserve.

Benefits

Two million barrels of heating oil will protect the Northeast against a disruption for 10 days, the time required for ships to carry heating oil from the Gulf of Mexico to New York harbor for distribution. The Reserve was originally established in commercial facilities located in New York Harbor and New Haven, Connecticut. In 2001, the Secretary approved the relocation of 250,000 barrels of heating oil inventory from Connecticut to Rhode Island, giving the reserve additional truck and marine loading options.

Significant Program Shifts

None.

Northeast Home Heating Oil Reserve

Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$Change	%Change
Northeast Home Heating Oil Reserve					
Amerada Hess ……	1,800	2,280	2,280	0	0%
Motiva (New haven, CT) ……..	1,140	600	600	0	0%
Morgan Stanley …….	1,200	1,200	1,200	0	0%
Motiva (Providence, RI) ……	0	600	600	0	0%
Strategic Petroleum Reserve Project Office	1,621	20	20	0	0%
Washington Headquarters	200	239	300	+61	+1.2%
Total, NEHHOR	5,961	4,939	5,000	+61	+1.0%

Site Description

Amerada Hess (Woodbridge, NJ)
The Amerada Hess Terminal is located in the New York Harbor (Woodbridge, NJ) currently holds 1 million barrels of home heating oil.

Motiva (New Haven, CT)
The Motiva Terminal is located in New Haven, CT and currently holds 250,000 barrels of home heating oil.

Morgan Stanley (New Haven, CT)
The Morgan Stanley Terminal is located in New Haven, CT and currently holds 500,000 barrels of home heating oil.

Motiva (Providence, RI)
The Motiva Terminal is located in Providence, RI, and currently holds 250,000 barrels of home heating oil.

Strategic Petroleum Reserve Project Office
The project office is located in New Orleans, LA and administers the quality and management surveillance support from Defense Energy Support Center (DESC).

Washington Headquarters
The headquarters office located in Washington, DC handles development and maintenance of the Northeast Home Heating Oil Reserve bid platform and other technical and management support to maintain readiness.

Northeast Home Heating Oil Reserve

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Northeast Home Heating Oil Reserve ……..	5,961	4,939	5,000	61	+1%

Public Law Authorization:
P.L. 94-163, "Energy Policy and Conservation Act" (FY 2003)

Mission

The Northeast Home Heating Oil Reserve assures a home heating oil supply for the Northeast states during times of very low inventories and significant threats to immediate further supply. The Reserve is a permanent part of America's energy readiness effort, separate from the Strategic Petroleum Reserve. The current structure of the Northeast Home Heating Oil Reserve is:

Location	**Amount of distillate**	**Distribution Capability** (minimum contractual capabilities)
Amerada Hess (NY harbor)	1,000,000 BBL	100,000 BPD
Motiva (New Haven, CT)	250,000 BBL	25,000 BPD
Morgan Stanley (New Haven, CT)	500,000 BBL	50,000 BPD
Motiva (Providence, RI)	250,000 BBL	25,000 BPD

Benefits

Two million barrels of heating oil will protect the Northeast against a disruption for 10 days, the time required for ships to carry heating oil from the Gulf of Mexico to New York harbor for distribution. The Reserve was originally established in commercial facilities located in New York Harbor and New Haven, Connecticut. In 2001, the Secretary approved the relocation of 250,000 barrels of heating oil inventory from Connecticut to Rhode Island, giving the reserve additional truck and marine loading options.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Northeast Home Heating Oil Reserve...	5,961	4,939	5,000

Continues operation of the Reserve, including lease of commercial storage space, and administrative support from the Defense Energy Support Center.

FY2004 and FY 2003 activities included storage leases, administration, and mock sales exercises with industry participation to test and evaluate the sales processes, procedures and on-line system.

Northeast Home Heating Oil Reserve...	5,961	4,939	5,000

Explanation of Funding Changes

Northeast Home Heating Oil Reserve

- Increase reflects the difference between FY 2004 with a rescission and the actual FY 2005 Congressional Budget Request ..... +61

Total Funding Change, Northeast Home Heating Oil Reserve ..... +61

Energy Information Administration

Energy Information Administration

Energy Information Administration

Proposed Appropriation Language

For necessary expenses in carrying out the activities of the Energy Information Administration, [$82,111,000] *$85,000,000,* to remain available until expended.

Explanation of Funding Changes

EIA's FY 2005 request is an increase of $3,900,000 over the FY 2004 comparable appropriation. The increase will maintain a comparable level of services and surveys as compared to FY 2004 when EIA made use of use $3,155,000 of prior year uncosteds and unobligated funds to supplement allotted funding. The FY 2005 funding will be used to fund Federal employee pay raise at a reduced FTE level, provide better regional information in the monthly Short-term Energy Outlook, operate the Weekly Natural Gas Underground Storage Survey, improve the weekly and monthly Petroleum Supply data quality, develop and field a Natural Gas Production Survey, and enhance the voluntary reporting of Greenhouse Gas emissions, and improve the transportation component of the National Energy Modeling System.

Energy Information Administration

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation[a]	FY 2004 Comparable Appropriation[bc]	FY 2005 Base	FY 2005 Request	FY 2005 Request vs. Base	
					$ Change	% Change
Energy Information Administration	80,587	81,100	84,421	85,000	+579	+0.7%
Use of Prior Year Balances	-500	0	0	0	0	0%
Total, Energy Information Administration	80,087	81,100	84,421	85,000	+579	+0.7%

Detailed Funding Table

	FY 2003[a]	FY 2004[bc]	FY 2005
Energy Information Administration			
Oil & Gas	22,026	21,825	23,672
Coal, Nuclear, Electric, & Alternate Fuels	11,908	12,285	12,774
Energy Markets & End Use	12,103	11,936	12,407
Integrated Analysis & Forecasting	8,781	8,952	10,324
Information Technology	8,257	7,753	7,308
National Energy Info Center	2,320	2,473	2,564
Statistics & Methods	2,776	2,895	2,794
Resource Management	12,416	12,981	13,157
Subtotal, Energy Information Administration	80,587	81,100	85,000
Use of Prior Year Balances	-500	0	0
Total, Energy Information Administration	80,087	81,100	85,000

Preface

The Energy Information Administration (EIA) is being increasingly called upon to provide timely energy information and analysis on ongoing and topical energy issues to assist the Administration and Congress in their deliberations regarding national and international energy policy, markets and investments. As energy is the foundation of the U.S. economy, it is to EIA that the Nation's leaders, media, and citizens turn for information and analyses when an energy disruption occurs; when debates on competing national energy development and utilization strategies are discussed; or when government

[a] Reflects rescission of $523,972 in FY 2003 (P.L. 108-7).

[b] In FY 2004, EIA will use $3,155,000 of prior year deobligations to maintain the same level of data, analyses, and services as compared to FY 2003.

[c] Reflects rescission of $530,000 in FY 2004 (P.L. 108-108), and a second rescission of $481,328 cited in the Consolidated Omnibus Appropriation Bill for FY 2004, for a total reduction of $1,021,328.

and industry policy-makers need access to the most comprehensive source of energy data. EIA strives to be this Nation's premier source of unbiased energy information, analysis and forecasting.

As the energy industry restructures, expands and becomes increasingly more complex and interdependent, EIA will need to revise and update its energy data collection, analysis activities and capabilities to reflect the current industry composition and operation, and allow EIA to continue to provide the most comprehensive picture of the energy markets and industry. This budget request presents EIA planned program funding and resource requirements, and the integration of EIA's performance in support of the Department of Energy's (DOE) strategic goals.

Strategic Context

As the Nation faced two oil price shocks in the 1970s, Congress realized that the United States did not have a source of energy data that could be relied upon to understand our energy situation and provide a sound basis for development and implementation of energy policies. EIA was created with the 1977 Department of Energy Organization Act (P.L. 95-91, 42 U.S.C. 7135) to serve as an independent agency to acquire, analyze and disseminate accurate and unbiased energy information and analyses. Since 1977, EIA has undertaken its mandate with determination, and is widely recognized as the best source for energy information and analysis.

The Administration, Congress, and the energy industry continually turn to EIA to obtain the clearest picture of the current and projected energy situation. As energy challenges arise, like the recent power outage in the Northeast, tight gasoline and heating oil markets, imbalances between natural gas supply and demand, or world events that create instability in the global energy supply, EIA is called upon to provide an accurate analysis of the situation, and to assess impacts to the Nation's citizens and economy of various courses of action being considered by energy policymakers.

To maintain the capability for EIA to provide clear, accurate, unbiased and timely information and analyses, EIA must continually reshape and revise its energy data collection and analysis programs to reflect changing energy markets. And as the energy industry is becoming increasingly interdependent, and energy sources are increasingly constrained, a problem in one part of the Nation's energy system can impact on all other energy arenas in both the national and international levels. Past investment in EIA has brought this Nation a first-rate ability for policymakers to see the overall energy picture.

Mission

The Energy Information Administration is a leader in providing high-quality, policy-neutral energy information to meet the requirements of Congress, the Federal Government, industry, and the public in a manner that promotes sound policymaking, efficient markets, and public understanding.

Benefits

Every Congress and Administration since EIA's inception have come to rely on EIA's data and analysis to provide the basis for energy policy development, debates, and decisions. They rely on EIA to investigate, analyze and report on potential impact of energy policy plans, and to provide a clear, accurate and concise assessment of topical energy issues and events. EIA has established itself as a non-policy making, unbiased and independent information and analysis resource to which the Congress and the Administration can turn to provide the continuous flow of reliable energy information and analysis needed to make informed energy policy decisions. Energy consumers, energy producers, State and Local governments, and international agencies also rely extensively on EIA's energy data and analysis.

Energy Strategic Goal: To protect our national and economic security by reducing imports and promoting a diverse supply of reliable, affordable, and environmentally sound energy.

General Goal 4, Energy Security: Enhance energy security by developing technologies that foster a diverse supply of affordable and environmentally sound energy, improving energy efficiency, providing for reliable delivery of energy, exploring advanced technologies that make a fundamental change in our mix of energy options, and guarding against energy emergencies.

Program Goal 04.61.00.00, Energy Security: EIA's information program is relevant, reliable and consistent with changing industry structures, and EIA's products are accurate and timely.

Contribution to General Goal

The purpose of EIA's energy data collection, analysis, and dissemination endeavors is to promote sound policymaking, efficient markets, and public understanding. In order to achieve this outcome, EIA provides national and international energy data, analysis, and information and forecasts to meet the needs of energy decision-makers and the public.

Assessing the level of achievement of these ultimate outcomes is extremely difficult. EIA approximates overall achievement of its mission by measuring product usage and the number of information products prepared at the request of Congress, the Administration, and State policymakers per year (includes briefings, testimony, and reports). EIA tracks product usage levels in many ways (number of Web site file downloads, number of requests from Congress and the Administration for reports and analysis, number of customers and the products they use, number of telephone inquiries, and number of news media citations, etc.)

EIA's priority is to maintain high quality, core energy data programs and forecasting methodologies essential to providing timely energy information, analysis and forecasts. EIA will continue to collect, analyze and disseminate energy information, and provide analyses and forecasts to Administration and Congressional energy policymakers, and the public. EIA will accomplish its mission through the use of surveys, expert analyses, and various information collection and dissemination techniques, most notably the Internet. EIA also will continue investment in resources to assure the long-term accuracy of energy data and analyses, which reflect changes in various energy sectors resulting from actions such as: the restructuring of energy industries, demographic changes, new fuel standards, and other legislative decisions.

EIA's FY 2005 budget request will contribute to this goal by maintaining the highest priority energy surveys, discontinuing lower priority data collection efforts, providing funds for investments in critical data, programs, and model improvements. This request will allow EIA to maintain a comparable level of services and surveys as compared to FY 2004, when EIA was directed to make use of prior year uncosteds and unobligated funds to supplement budgeted resources.

In FY 2005, EIA plans to discontinue the Annual Electric Industry Financial Report (EIA-412) that collects financial, plant cost, and transmission line data from municipal, State, and Federal utilities and generation and transmission cooperatives. Funds provided with this request, and savings from the discontinuation of the EIA-412 survey will be used to:

- improve the quality and timeliness of natural gas data. As part of this initiative, a new natural gas product survey will be developed and fielded, and the funding provided by this request will allow EIA to continue the Weekly Underground Natural Gas Storage Survey.

- update our core electricity surveys to provide improved estimates of fuel-switching capabilities and other critical parameters, and enhance data quality.

- continue the monthly surveys of foreign crude acquisition and domestic crude oil first purchases. Also, update petroleum product surveys and systems to maintain data quality and accommodate changes in fuel specifications.

- provide better regional information in the Short-term Energy Outlook; conduct independent reviews of EIA's data and analytical work to improve its accuracy and timeliness; and improve EIA's voluntary reporting surveys and databases to collect and disseminate information on greenhouse gas emission reductions in accord with updated reporting guidelines that are being issued as part of the President's Climate Change Initiative.

Funding by General Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
General Goal 4, Energy Information Administration					
Program Goal 04.16.000.00, Energy Security	80,587	81,100	85,000	+3,900	+4.8%
Subtotal, General Goal 4	80,587	81,100	85,000	+3,900	+4.8%
Use of Prior Year Balances	-500	0	0	0	0.0%
Total, General Goal 4	80,087	81,100	85,000	+3,900	+4.8%

Annual Performance Results and Targets

FY 2000 Results	FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Targets	FY 2005 Targets
Met goal by hosting 50 percent more Web site users in FY 2000 than in FY 1999, and 80 percent more users in FY 2001 as compared to FY 2000. (Met Goal)	In FY 2001, EIA had an increase of over 6.9 million unique users of EIA's Web site. (Met Goal)	In FY 2002, EIA had an increase of over 2.3 million unique users of EIA's Web site. (Met Goal)	In FY 2003 EIA had an increase of over 2 million unique users of EIA's web site. (Met Goal)	Increase the number of unique monthly users of EIA's Web site by at least 20 percent per year through 2005 from a FY 1997 baseline of 37,000 monthly users sessions.	85 percent of EIA products meeting their release date targets.
In FY 2000, EIA provided 85 informational briefings for high-level policymakers in the Administration and Congress. (Met Goal)	In FY 2001, EIA provided 76 informational briefings for high-level policymakers in the Administration and Congress. (Met Goal)	In FY 2002, EIA provided 85 informational briefings for high-level policymakers in the Administration and Congress. (Met Goal)	In FY 2003, EIA provided 236 informational briefings for high-level policymakers in the Administration and Congress. (Met Goal)	Conduct informational briefings for high-level energy policy-makers in the Administration and Congress to provide timely information and analyses on topical energy issues and situations.	90 percent or more of customers rate themselves in customer surveys as satisfied or very satisfied with the quality of EIA information.
In FY 2000, EIA's work received 164 citations in major media outlets. This represents a 200 percent increase from the prior year. (Met Goal)	In FY 2001, EIA's work received 194 citations in major media outlets. This represents an 18 percent increase from the prior year. (Met Goal)	In FY 2002, EIA's work received 96 citations in major media outlets. From FY 1992 through FY 2002, EIA has averaged a 61 percent per year growth in media citations. (Met Goal)	In FY 2003, EIA's work received 96 citations in major media outlets. From FY 1992 through FY 2003, EIA has averaged an 82 percent per year growth in media citations. (Met Goal)	Increase the number of citations of EIA in major media outlets by at least an average of 10 percent per year through 2003 from a FY 1999 baseline of 79, and then maintain a constant level of media citations +/- 10 percent.	70 percent of key EIA survey frames[a] will have sufficient industry coverage to produce accurate supply, demand and price statistics.

[a] Survey frames are a list, map, or other specification of the units that constitute the available information relating to the population of interest for a particular collection effort.

Means and Strategies

In FY 2005, EIA's program will consist of data collection necessary to fulfill its statutory requirement for the maintenance of a comprehensive energy database, the publication of reports and analyses for a wide variety of customers in the public and private sectors, the maintenance of the National Energy Modeling System for mid-term energy markets analysis and forecasting, the maintenance of the Short-Term Integrated Forecasting System for near-term energy market analysis and forecasting, and customer forums and surveys to maintain an up-to-date product and service mix. EIA's strategy is to make its broad mix of products and services available to its customers through an expansion of electronic information dissemination via the EIA Web site. All but four periodicals, which are both more costly less timely, have been eliminated and replaced with Internet dissemination.

EIA has a number of different collaborative activities underway with statistical representatives from other cabinet agencies. The most important collaboration is via the Interagency Council on Statistical Policy (ICSP), composed of the heads of the major statistical agencies and chaired by the Office of Management and Budget's Chief Statistician. The ICSP has supported a number of collaborative activities, including: FedStats – a Web site providing data from the major statistical agencies in a user-friendly environment; the National Science Foundation (NSF) Digital Government initiative, which provides funds to researchers to interact with consortia of statistical agencies on issues related to data dissemination and the presentation and collection of large-scale databases on the Web; and the Joint Program in Survey Methodology (JPSM), which trains college graduates in applied survey methodology, conducts a summer intern program and develops other certification alternatives. ICSP is backing the data sharing legislation that would allow the agencies to share data and sampling lists and still protect the confidentiality of respondents.

External Factors Affecting Performance of EIA's data and analyses will continue to become more visible and critical over the next several years due to:

- increasing tightness and price volatility in U.S. markets for natural gas and petroleum products, which have increased demand for up-to-date information and projections,
- Congressional and other customer requests for analyses and forecasts regarding the effects of alternative energy and environmental policies, and
- the continual restructuring of the electric and natural gas industries, which has made energy use and price data, especially at the end-use level, much more difficult to obtain from new and emerging merchant providers.

EIA's data and analysis is especially useful to State governments, who increasingly rely on these data and analyses to understand and effectively manage the current and emerging effects of energy industry developments on consumers in their State. Partly as a result of this increasing visibility and importance, it is critical to maintain the quality of the data from EIA's surveys. EIA will face an unprecedented challenge in maintaining the quality of its data due to:

- the increasing amount of work needed to keep survey response rates high in the current cultural climate, with respondents increasingly more difficult to reach and more resistant to completing surveys, and
- the need for expanded and more complex energy consumption and expenditures data collection procedures, due to the more complex energy supply structure, especially those related to the natural gas and electric markets.

EIA's ability to provide data and information on the natural gas industry is severely challenged by changes in the regulatory environment and ongoing industry restructuring. Since natural gas is often a swing fuel in electric generation, information on gas supply is essential in understanding the fuel choices made by electric generator operators and the subsequent availability of gas to industrial users.

This request includes funding in support of the Natural Gas Data Initiative announced by Secretary Abraham on June 26, 2003. With increasingly tight and volatile markets for natural gas, both consumers and producers need high-quality and timely information regarding prices and the forces that drive them in order to make wise decisions about both consumption and investments to increase gas supply. To this end, EIA will: (1) launch a natural gas production survey to provide more timely and accurate information than is provided by the current system of voluntary reporting by the States on an inconsistent basis, (2) provide more regionally disaggregated short-term forecasts of natural gas markets, and (3) provide better end-use price data. In addition, FY 2005 request includes funding for the Weekly Underground Natural Gas Storage Survey begun in FY 2003.

Validation and Verification

EIA annually conducts a customer satisfaction survey. EIA's senior management reviews the results of the customer survey, and uses the information to enhance the quality of EIA's Web site, customer services, and electronic products. Often specific survey questions about EIA's Web site and electronic products are included in the customer survey.

EIA's statistical survey development, of which survey frames are a crucial portion, is driven by EIA's information quality guidelines. EIA has performance standards to ensure the quality (i.e., objectivity, utility, and integrity) of information it disseminates to the public. Quality is ensured and maximized at levels appropriate to the nature and timeliness of the disseminated information. EIA also strives for transparency about information and methods in order to improve understanding and to facilitate reproducibility of the information. Additional information about EIA's quality program is available at our information quality guidelines Web site: http://www.eia.doe.gov/neic/aboutEIA/guidelines.html.

EIA's results on performance measures are presented to senior management on a quarterly basis. Included is the number of unique monthly users of EIA's Web site, and EIA's progress in meeting the established goal of continuously increasing the numbers of customers accessing and using EIA's energy data, information and service. Management also is briefed on the number of media citations and briefings to high-level policy makers in the Administration and Congress.

Program Assessment Rating Tool (PART)

EIA was not selected to participate in PART for FY 2005. DOE and the Office of Management and Budget (OMB) plan to have EIA activities reviewed via the PART tool in FY 2006.

Significant Program Shifts

Increasing data and analysis requirements, combined with increased complexity of the energy sector, and in the face of shrinking budgets, is impacting all areas of EIA's energy data collection, analysis and forecasting capabilities and quality. For example, in a recent GAO Report, *Electricity Restructuring: Action Needed to Address Emerging Gaps in Federal Information Collection*, GAO-03-586, noted how the electric industry has " been most affected by restructuring," which "has led to changes in the number of entities from which EIA collects data, the volume of data collected on electricity markets, and the way in which EIA uses the data to complete its mission of examining the energy sector." The GAO

report went on to note that "EIA has had to revise surveys and expand its collection database, the volume of data transmitted to EIA has increased, and EIA has had to significantly alter the way it examines energy sectors and electricity in particular." In regard to data quality, the GAO report notes, "EIA is challenged because there have been a substantial increase in the number of sources of information (especially nonutilities) resulting from restructuring while EIA has also experienced substantial budget cuts."

In FY 2004, EIA will use $3,155,000 in prior year uncosteds and unobligated funds to deliver the same level of energy information and analyses as in FY 2003. EIA will use the additional funds requested and allow normal attrition through FY 2004 to reduce our staffing from the current ceiling level of 374 FTEs to 369 FTEs to help offset operating costs, and terminate the operation of the EIA-412, *Annual Electric Industry Financial Report*. The combination of additional resources, attrition and the termination of one survey, help support the following high-priority initiatives:

- improve the quality and timeliness of natural gas data. This includes developing and fielding a new natural gas product survey, and to continue the Weekly Underground Natural Gas Storage Survey.

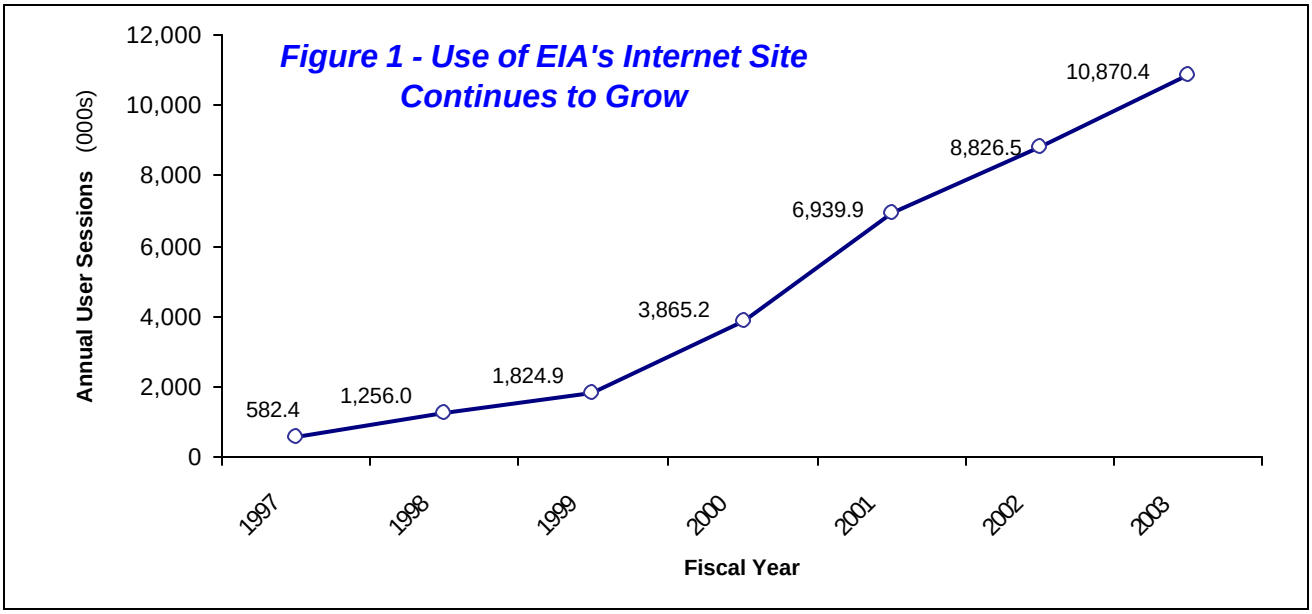
- update our core electricity surveys to enhance data quality, and improve estimates of fuel-switching capabilities and other critical parameters.

- continue the monthly surveys of foreign crude acquisition and domestic crude oil first purchases, and update petroleum product surveys and systems to maintain data quality and accommodate changes in fuel specifications.

- provide better regional information in the Short-term Energy Outlook; conduct independent reviews of EIA's data and analytical work to improve its accuracy and timeliness, and improve EIA's voluntary reporting surveys and databases to collect and disseminate information on greenhouse gas emission reductions in accord with updated reporting guidelines that are being issued as part of the President's Climate Change Initiative.

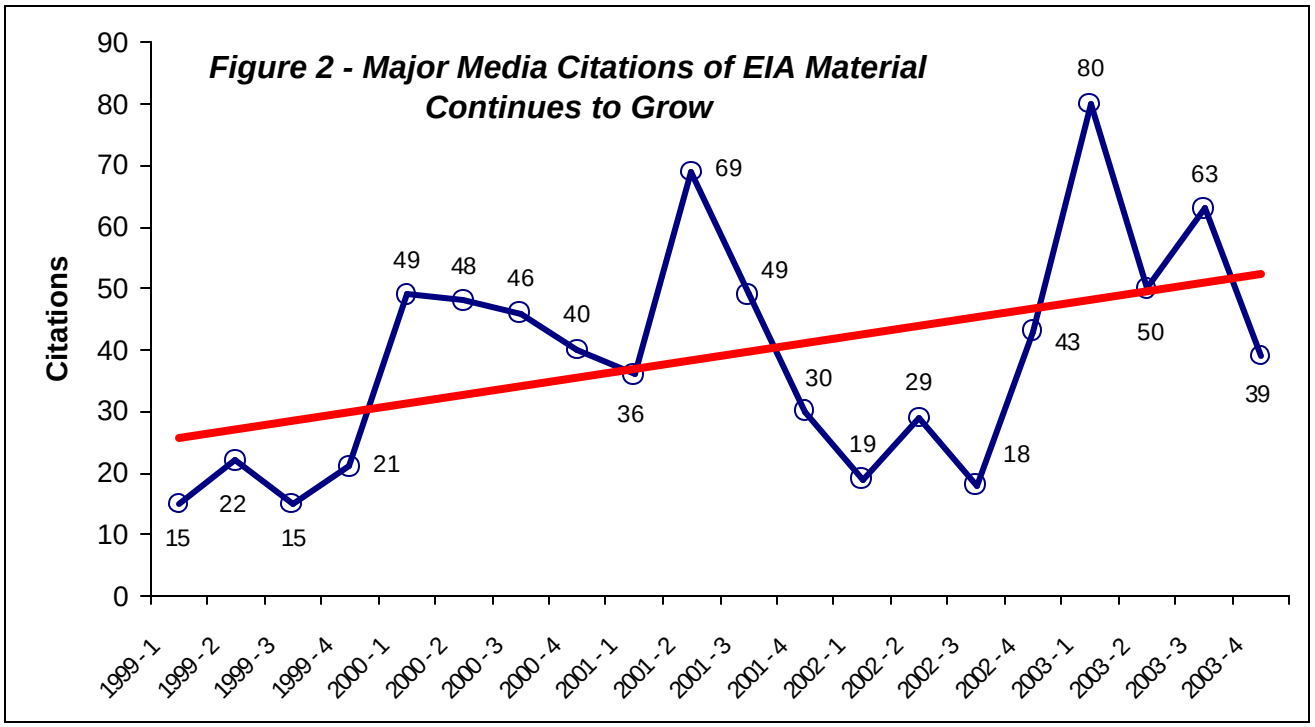
Performance

EIA aggressively works to expand the availability of electronic information and upgrade energy data dissemination, particularly on the EIA Web site. This increased use of electronic technology for energy data dissemination has led to an explosive growth in the number of our data customers and the breadth of their interests, as well as an increase in the breadth of information distributed. For example, the growth in monthly users of EIA's Internet services is remarkable (see Figure 1). During FY 1997, EIA established a goal to increase the number of monthly users of its Web site by 20 percent annually, from a baseline of 37,000 per month. In each of the succeeding years EIA has either met or exceeded this commitment, with a 23 percent increase in FY 2003 by delivering more than 2,600 gigabytes of data. EIA also has increased dramatically the distribution of its information by becoming the dependable source of objective energy information for the major news media (Figure 2). This achievement has enabled our energy data to be widely seen and used by the general public with minimal cost to the agency.



Additional Accomplishments

The ban on methyl tertiary butyl ether (MTBE) as a major motor gasoline component has caused explosive growth in ethanol as a replacement, causing the petroleum industry to shift significant gasoline production from refineries to downstream blending facilities, doubling the number of motor gasoline producers EIA must survey. Finding these new blenders and getting accurate reports from them has been difficult, but the effort has improved the quality of EIA motor gasoline statistics.



In partnership with the U.S. Bureau of Land Management, the U.S. Geological Survey, and the U.S. Forest Service, EIA participated in a comprehensive inventory of oil and gas resources and reserves in on-shore Federal lands and the nature of restrictions to their development, as mandated by the Energy Policy and Conservation Act Section 604. EIA implemented new analytical methodologies to provide field-level estimates of proved reserves by reserves class, field boundaries and proved ultimate recovery appreciation by field.

In support of the President's Management Agenda for e-Gov, EIA completed implementation of a new Internet-based data collection and editing process for its electric power forms. In addition to providing the vehicle for survey staff to enter and edit data, the same process can be used by respondents to submit their data to EIA. It is a secure method that is welcomed by respondents who are required to submit confidential data. By Spring 2003 all of the regular electric surveys were receiving more than 30 percent of their responses via the Internet system. In addition, EIA implemented secure transfer feature for use by survey respondents on coal and electric data collection forms. This is another electronic filing method that eliminates the paper form. It provides a secure, electronic means for respondents to transmit their data directly to EIA. The benefits are that respondents get an electronic confirmation that their information has been received, and EIA receives the information faster than previous methods employed. Respondents' reactions to both new processes have been strongly positive. The use of Internet data collection methods are all the more important given the delays in mail delivery to government offices resulting from the security procedures implemented in response to the threat of further anthrax attacks via the mail.

EIA revised its Annual Energy Review, and the Monthly Energy Review in 2003, to address a number of data issues in order to improve the quality of their reported data. These data issues included: moving fuel consumptions and the electricity generation by cogenerators and from industrial sector to the electric power sector, reviewing and correcting historical cogeneration data dating back to 1989, improving the natural gas balancing item reporting, and substituting information on natural gas consumption on the electric power survey form, for natural gas consumption information reported on natural gas survey forms.

EIA directed the State Heating Oil and Propane Program (SHOPP), a joint Federal-State data collection effort to collect weekly state level residential prices of No. 2 Heating Oil and propane needed to monitor heating fuels in the event of sudden market changes. The information provided is part of the *Weekly Petroleum Status Report*, and *This Week in Petroleum*. To prepare for the upcoming heating season, a SHOPP conference is held each August, providing the first look at the upcoming heating season.

EIA expanded market coverage of weekly retail gasoline prices effective May 27, 2003 (to include prices for ten cities, nine states, U.S. regions and total U.S.) in response to increased concerns over gasoline price volatility and price differences within geographic regions. The new information is released via a redesigned Web site to provide businesses, individual consumers, and government agencies with current fuel gasoline and diesel fuel cost information every Monday.

EIA established an ongoing program designed to enhance data quality in the areas of coal, nuclear, electricity, and alternative fuels. More robust edit methodologies were developed to automatically check for anomalies in data reporting, processing and extraction. Survey forms for electricity generators and the uranium industry were re-designed to improve accuracy in reporting and efficiency in processing. EIA's energy terminology and electricity data collection processes also were standardized to a greater extent than previously.

EIA significantly improved the timeliness of the release of quarterly coal data. The *Quarterly Coal Report, April – June 2002* and subsequent reports have been published in less than 80 days from the end of a quarter, as compared to 110 to 190 days for each prior quarterly report since 1993. This improvement was due to the development and implementation of new survey processing methodology employing a secure transfer feature for collecting data electronically, and employing electronic methods for producing the report.

EIA completed a thorough and detailed review and reorganization of non-utility generation, fuel consumption, thermal output, and fuel stocks data for the period 1989 to 2001. This project resulted in the ability to show fuel consumption and power generation in industry categories that align more closely with how the electricity industry has restructured. The effort also included a review, and revisions where needed, of the non-utility data, particularly with respect to fuel consumption for useful thermal output.

EIA completed a number of ad hoc and urgent requests for electricity data from the Secretary of Energy and from Congress. One project involved locating and mapping the power plants owned by major independent power producers. Several efforts involved analyses of electric revenues related to congressional review of proposed energy bills.

The EIA Kids Page, first developed in 1998, has been EIA's fastest-growing Web product for the past 2 years. During FY 2003 user sessions for the Kids Page topped 100,000 per month. Recent enhancements to the site include: a section on recycling and energy, a site map, a glossary, examples of converting energy units, a coloring page, and numerous student activities and current-events articles. In April, a "pop-under" survey of Kids Page customers was undertaken to gain a clearer understanding of whom (and what age group) the users are and what information they are seeking. In addition, the Kids Page is undergoing a usability study, to determine how to make the site more useful and user-friendly to customers.

In April 2003, an Energy Industry Study Program (EISP), similar to the program offered to four different groups of EIA employees between 1996 and 1999, was restarted. The 25 EISP participants spent one day per week for 10 weeks gaining an overview of the various industries in the energy sector through a combination of local field trips and expert lectures. The program, which supports the President's Management Agenda for Human Capital development, provides an overall context for work at EIA, and hands-on experience. This program increases the skill mix and flexibility of EIA participants. A second EISP session was completed in December 2003.

Other Support for the Congress, Administration and the Secretary

Historically, EIA has provided numerous special reports, briefings and analyses to the Congress, the Administration and the Department. For example, EIA provided the Energy Situation Analysis Report on a daily basis during the Venezuela crisis and the Iraq war providing policymakers and the public with frequent updated information during time of energy market stress.

Service Reports

With increasing frequency, EIA is being requested by Congress to produce comprehensive Service Reports that analyze current energy issues of major importance. The number and sophistication of these analytical requests have grown, often requiring EIA to postpone planned work, and requiring negotiation with the requestor on delivery dates and the scope of the study and final report. In FY 2002, EIA completed an assessment of the resources expended to complete the 93 special reports and analyses requested during the fiscal year, which expended nearly $2,000,000 worth of resources (Federal and contractor personnel, but not counting overhead costs). If this level of demand continues, EIA will expend over $2,000,000 to fulfill these un-reimbursable requests for analyses and reports in FY 2004 and FY 2005.

Of special note during the past year are the following analyses and reports that played, and will continue to play, a critical role in U.S. energy and environmental policy debates:

- In November 2003, EIA issued its *Report on August Gasoline Price Spike.* This report, prepared in response to a request from Secretary Abraham arising from his testimony before Congress regarding the August 2003 blackout, examined the factors behind the large price increase for retail gasoline in August 2003, which most of the country experienced. The report examines in detail the combination of unexpected demand increases and downward supply shocks occurring at a time when gasoline inventories were already low that contributed to the rise in wholesale prices.

- In September 2003, EIA issued *Analyses of Selected Provisions of Proposed Energy Legislation: 2003,* prepared at the request of Senator Dorgan. This report provided analyses of provisions in the Senate-passed version of the Energy Bill based on prior analyses of earlier energy bills and standalone provisions completed in response to requests from Congress and the Administration, including the May 2003 *Analysis of a 10-percent Renewable Portfolio Standard*, which evaluated the impact of proposed legislation on the level and mix of renewable generation used, and impacts on other fuel markets and consumers within scenarios suggested by both proponents and opponents of the program.

- Also in September, EIA issued *Analysis of S. 485, the Clear Skies Act of 2003, and S. 843, the Clean Air Planning Act of 2003*, prepared at the request of Chairman Inhofe of the Senate Environment and Public Works Committee. The analysis assessed the impacts of the bills on emissions levels, electricity prices, and the mix of fuels used for electricity generation, for each bill and a number of variants.

- In June 2003, EIA delivered the comprehensive report entitled, *Analysis of S.139, the Climate Stewardship Act of 2003*. This comprehensive report, prepared in response to requests from Senators Inhofe, McCain, and Lieberman, addressed a number of issues including: the impact on energy consumption and prices, the impact on macroeconomic activity (including employment), and the impact on consumers. In order to illustrate the impact of key assumptions and specifications in the proposed legislation, EIA evaluated the effects of a number of different scenarios including: the penetration of advanced technologies, expanded "entity" coverage (the commercial sector), excluding the adoption of new nuclear technology or geologic sequestration options, alternative allowance allocation schemes, the effects of higher natural gas prices, and the banking provisions.

- During the Senate floor debate on an ethanol amendment to the Energy Bill, Senators quoted from EIA's report 2003 *California Gasoline Price Study: Preliminary Findings, May 2003*, which addressed this spring's California gasoline market spike, specifically the underlying drivers, including the impact from California's transition to ethanol blended reformulated gasoline. Senators on opposite sides of the debate regarding an Administration-supported Renewable Fuel Standard, both relied on EIA's energy data and analysis in policy-making discussions on the U.S. energy policies.

- In October 2003, EIA issued *Preparations for Meeting New York and Connecticut MTBE Bans.* Responding to a request from Congressmen Ose and Shays, this report characterized the progress that New York and Connecticut have made in making the transition from MTBE to ethanol scheduled to take effect in January 2004 and the likely impact of the changeover on these States' gasoline supplies and gasoline prices. It also addressed similarities and differences from the situation in California, which were addressed in separate EIA reports, and lessons for other such transitions.

- In December 2002, EIA completed a study on the role of energy derivatives and their impact on energy price volatility addressing the topic of great interest to Congress and the Administration. This report *Derivatives and Risk Management – The Petroleum, Natural Gas, and Electricity Industries*, provided a description of energy risk management tools, a description of exchanges and mechanisms for trading energy contracts, an exploration of the varied uses of energy risk management tools, a discussion of any impediments to the development of energy risk management tools, an analysis of energy price volatility relative to other commodities, a review of current regulatory structure for energy derivatives markets, and a survey of literature on energy derivatives and trading.

EIA also provided several internal analyses responding to requests of the Administration, including evaluating components of proposed energy legislation, evaluating the impact of multi-pollutant legislation, and evaluating policies to enhance the financial viability of developing new nuclear power options.

Recognitions

The National Journal – During the Fall of 2003, the National Journal cited EIA's Web site as the best source for energy information.

Time Magazine - Late in FY 2002, Time Magazine listed EIA as one of its Best Web sites for Business saying, "For free research on a crucial industry, try this site from the Department of Energy, which forecasts future prices and trends for oil, gas and other petroleum products. In addition to statistical tables, the EIA produces clearly written reports that spell out in plain English what the numbers mean. It also features profiles of the energy sector in various countries and regions."

EIA Supports the President's Management Agenda

In the area of Human Capital Management

By the end of FY 2005, over 40 percent of EIA's total staff will be eligible for retirement, including 76 percent of EIA's present supervisory / managerial cadre and 60 percent of all non-supervisory GS-14 and above staff. To address this approaching need, EIA has streamlined and de-layered the organizational structure, has established new interview and training activities, and is:

- periodically updating its work force plan, including succession plans,
- continuing to revamp recruitment and associated personnel processes to improve timeliness,
- enhancing recruiting through use of brochures, outreach programs to support diversity initiatives, job fairs, and online hiring,
- instituting and encouraging knowledge sharing opportunities with departing staff to leave a knowledge base for the future,
- expanding training opportunities for staff, especially for those seeking advanced degrees, and
- supporting internship and cooperative education programs, especially at minority educational institutions.

In the area of Competitive Sourcing

EIA has reduced Federal IT staff as a result of the availability of contractual support to perform the IT work previously performed by EIA's Federal staff, which also increased EIA's use of small businesses. In addition, EIA's remaining Federal IT staff is undergoing an A-76 review.

In the area of Small Business Support

EIA plans to remain a Departmental leader in the use of small businesses. For FY 2003, EIA awarded 46 percent of its contract funding to small businesses, 2 percent over its goal. EIA projects the use of small businesses will increase to 47 percent for FY 2004, and 50 percent in FY 2005.

In the area of Financial Management

EIA is making increased use of the Department's newly developed financial management system.

In the area of E-Government

EIA continues to look at ways to use the Internet to collect and disseminate energy data, information, analysis, forecasts and reports. Currently some respondents are able to provide their data on-line with the data being checked in real-time. Currently, EIA collects data on 39 surveys via the Internet employing a secure transfer procedure to assure security of information provided. EIA's long-term goal is to increase the amount of energy data collected and provided via the Internet. In the future, EIA will look to employ alternative electronic data collection methods, as newer information technology products and processes become available.

In the area of Energy Data Dissemination

In FY 2005, EIA Web site usage is projected to be over 7,000,000 unique user sessions. In FY 2005, having completed the phase-out of nearly all printed reports, EIA will print only four multi-fuel periodic reports. All energy information, analyses, and forecasts will continue to be available via EIA's Web site.

EIA Omnibus Procurement

The EIA's current multi-award contract is expected to end in 2004. With the replacement multi-award contract, small, 8(a), woman-owned, and other disadvantaged businesses have significant opportunities to compete for task orders. Small businesses will be encouraged to partner with both large and small businesses to successfully bid for EIA's contract dollars. EIA will continue to build on the best practices for increasing small business participation.

Summary

The FY 2005 request will allow EIA to continue ongoing program activities, to meet to the extent possible, the needs of the Congress, Administration, States, industry, and the public for reliable and accurate energy information and analyses. EIA will continue to seek and implement efficiencies that provide better energy data and analyses products at less cost.

Funding by Site by Program

(dollars in thousands)

	FY 2003[a]	FY 2004[bc]	FY 2005	$ Change	% Change
Washington Headquarters[d]					
Energy Information Administration..	80,087	81,100	85,000	+3,900	+4.8%

Site Description

The Energy Information Administration (EIA) is an independent statistical agency that is increasingly called upon to provide timely energy information and analysis. EIA's primary customers include the Nation's leaders, energy policymakers, media, and citizen. EIA's goal is to be the Nation's premier source of unbiased energy information, analysis and forecasting.

[a] Reflects rescission of $523,972 in FY 2003 (P.L. 108-7).
[b] In FY 2004, EIA will use $3,155,000 of prior year deobligations to maintain the same level of data, analyses, and services as compared to FY 2003.
[c] Reflects rescission of $530,000 in FY 2004 (P.L. 108-108), and a second rescission of $481,328 cited in the Consolidated Omnibus Appropriation Bill for FY 2004, for a total reduction of $1,021,328.

Program Direction

Funding Profile by Category

(dollars in thousands)

	FY 2003[a]	FY 2004[bc]	FY 2005	$ Change	% Change
Washington Headquarters					
Salaries & Benefits	39,186	40,700	41,200	+500	+1.2%
Travel	398	398	407	+9	+2.3%
Support Services	31,309	30,089	33,220	+3,131	+10.4%
Other Related Expenses	9,694	9,913	10,173	+260	+2.6%
Subtotal, Program Direction	80,587	81,100	85,000	+3,900	+4.8%
Use of Prior Year Balances	-500	0	0	0	0.0%
Total, Program Direction	80,087	81,100	85,000	+3,900	+4.8%
Total, Full Time Equivalents[d]	364	374	369	-5	-1.3%

Public Law Authorizations:

1938 Natural Gas Act (P.L. 75-688)
1954 Atomic Energy Act (P.L. 83-703)
1974 Federal Energy Administration (FEA) Act (P.L. 93-275, 15 U.S.C. 761)
1974 Energy Supply and Environmental Coordination Act, (P.L. 93-319)
1975 Energy Policy and Conservation Act (P.L. 94-163)
1976 Energy Conservation and Production Act (P.L. 94-385, 15 U.S.C. 790)
1977 Department of Energy (DOE) Organization Act (P.L. 95-91, 42 U.S.C. 7135)
1978 Natural Gas Policy Act (P.L. 95-621)
1978 Powerplant and Industrial Fuel Use Act (P.L.95-620, 42 U.S.C. 8301)
1980 Energy Security Act (P.L. 96-294)
1982 Energy Emergency Preparedness Act (P.L. 97-229, 42 U.S.C. 6245)
1985 National Coal Imports Reporting Act (P.L. 99-58)
1985 Energy Policy and Conservation Act Amendments of 1985 (P.L. 99-58, 42 U.S.C. 6201)
1987 Powerplant and Industrial Fuel Use Act Amendments of 1987 (P.L. 100-42, 42 U.S.C. 8312)
1992 Energy Policy Act (P.L. 102-486, 42 U.S.C. 13385)
1995 Paperwork Reduction Act (P.L. 104-13, 44 U.S.C. 3501)
1998 Government Paperwork Elimination Act (P.L. 105-277, 44 U.S.C. 3504)

Other Laws, U. S. Code and Regulations with Significant Provisions Affecting EIA:

1966 Freedom of Information Act (5 U.S.C. 552)
1974 The Privacy Act of 1974 (5 U.S.C. 552a)
1980 Anti-Deficiency Act (31 U.S.C. 1341)
1982 Federal Managers' Financial Integrity Act (P.L. 97- 255)
1983 Nuclear Regulatory Commission Authorization Act (P.L. 97-415, 42 U.S.C. 2210)
1986 Omnibus Budget Reconciliation Act (P.L. 99-509, 42 U.S.C. 7135)

[a] Reflects rescission of $523,972 in FY 2003 (P.L. 108-7).
[b] In FY 2004, EIA will use $3,155,000 of prior year deobligations to maintain the same level of data, analyses, and services as compared to FY 2003..
[c] Reflects rescission of $530,000 in FY 2004 (P.L. 108-108), and a second rescission of $481,328 cited in the Omnibus appropriation for FY 2004, for a total reduction of $1,021,328.
[d] Excludes 1 FTE funded by the Nuclear Waste Disposal Fund.

1990 Chief Financial Officers Act (P.L.101-576)
1993 Government Performance and Results Act (GPRA)
1994 Government Management Reform Act (GMRA)
2002 Title V of the E-Government Act (P.L. 107-347)

18 U.S.C. 1001 makes it a crime for any person knowingly and willingly to make to any Agency or Department of the United Sates any false, fictitious or fraudulent statements as to any matter within its jurisdiction.

18 U.S.C. 1805 makes it a crime to disclose confidential information.
C.F.R. Title 5, Administrative Personnel

Department of Energy Privacy Act Issuances, Systems DOE-4 (EIA Form 457, Residential Energy Consumption Survey), System DOE-6 (EIA Customer Database), and DOE-59 (Mailing Lists for Requesters of Energy Related Information).

The EIA provides high-quality, policy-independent energy information to meet the requirements of Congress, the Administration, industry, and the public in a manner that promotes sound policy-making, efficient markets, and public understanding.

EIA's products and services support DOE's Program Goal 04.61.00.00 to provide national and international energy data, analyses, information and forecasts to meet the needs of the energy decision makers and the public.

As an independent statistical/analytical agency, EIA's primary responsibility is to conduct the functions required by statute. These functions include the development and maintenance of a comprehensive energy database, the dissemination of energy data and analyses for a wide variety of customers in the public and private sectors, and the preparation of specific reports. Statutes require EIA, among other tasks, to maintain the National Energy Modeling System for mid-term energy markets analysis and forecasting, maintain the Short-Term Integrated Forecasting System for near-term energy market analysis and forecasting, conduct surveys of energy use in residences, commercial buildings, and conduct customer forums and surveys to maintain an up-to-date product and service mix.

EIA's other responsibility is to respond to inquiries from a broad variety of customers for energy information. The primary customers of EIA services are public policy-makers in the Congress and Administration. Other customers include agencies of the Federal Government, State and local governments, the energy industry, educational institutions, the news media, and the public. The EIA strategy is to make its products and services available to customers through an expansion of electronic dissemination through the EIA Internet Web site and on compact disk, with only four printed publications produced.

Mission

Oil and Gas
The Oil and Gas (O&G) activity designs, develops, and maintains oil and gas statistical and short-term analytical and forecasting information systems. This activity involves the data collection, quality control, processing, analysis, and report preparation activities associated with these energy sources. These data are used in the Short-Term Integrated Forecasting System, and in the National Energy Modeling System. Energy information topics cover: petroleum supply focusing on crude oil and refined petroleum products; petroleum marketing focusing on crude oil and petroleum product price, and marketing statistical information systems; natural gas focusing on natural gas production, storage, consumption and markets; and reserves focusing on oil and gas reserves.

Coal, Nuclear, Electric & Alternate Fuels
The Coal, Nuclear, Electric, and Alternate Fuels (CNEAF) activity designs, develops, and maintains fuel specific statistical and short-term analytical and forecasting information systems. These data are used in the National Energy Modeling System, by the Administration and Congress as input for policy analysis initiatives, and by energy industry analysts and the public. Other activities include providing statistical interpretation, analysis, and support to the Administration, Congress, and other Federal energy policymaking officials. This activity involves the assessment of existing and potential resources, and reserves and the analysis of historical trends.

Energy Markets and End Use
The Energy Markets and End Use (EMEU) activity designs, develops, and maintains statistical and short-term energy forecasting information systems concerning supply, imports, price and consumption, and prepares integrated reports and periodicals which cut across energy sources. Energy information topics cover international, financial, and contingency/emergency statistical information and short-term modeling and integrated statistics, focusing on surveys and historical databases for energy supply and disposition, prices, and expenditures.

Integrated Analysis and Forecasting
The Integrated Analysis and Forecasting (IAF) activity develops forward-looking analyses and forecasts for alternative energy futures for the United States and other nations. This activity develops, maintains, and enhances the National Energy Modeling System, the System for the Analysis of Global Energy Markets (SAGE), and other modeling systems needed to analyze the interactions of demand, conversion, and supply for all energy sources and their economic and environmental impacts. IAF publishes annual estimates of U.S. greenhouse gas emissions and maintains the Greenhouse Gas Voluntary Reporting System and provides technical assistance to other agencies in estimating corporate and organizational emissions and calculating reductions. At the request of Congress or the Administration, IAF also conducts energy analysis and to assess the impact of alternative policy and technology paths.

Information Technology
The Office of Information Technology (OIT) provides EIA-wide desktop, hardware, software, database, network, and other Information Technology (IT) support to the EIA offices. Included are direct support for individual offices' IT activities, as well as the development and implementation of EIA-wide crosscutting enterprise applications and inter-connectivity and inter-operability with Departmental systems. OIT is responsible for identifying and applying the emerging technology solutions to EIA's business processes, and for recommending innovations in capability, efficiency, and effectiveness that

can be gained by adopting these solutions. OIT is responsible for all plans, standards, and training activities relating to EIA's IT.

National Energy Information Center
The National Energy Information Center (NEIC) is the point of contact for energy information for the U.S. Government, including the Office of the President, Congress, and Federal agencies, as well as State and local government agencies, the academic community, industrial and commercial organizations, foreign governments and international organizations, the news media, the financial community, research and consulting organizations, and the general public. Energy information is disseminated through the Internet and printed publications. NEIC also responds to public inquiries, principally through telephone and e-mail. Other NEIC services and programs include coordination of the EIA Web site; creating and maintaining special Web site features designed to improve access; other energy data dissemination activities; Web site usability testing; design, graphic, editorial, production, and outreach services for dissemination of energy data and analysis; specialty publications, press releases, brochures, flyers, and exhibits; EIA's print-on-demand program; EIA's records management program; news media services; an energy education and outreach program; and performance of customer satisfaction surveys and analysis of customer feedback.

Statistics and Methods
The Statistics and Methods Group (SMG) activity evaluates energy data quality, measures performance, designs, develops and coordinates survey and statistical standards and definitions governing collection, processing, documentation, and dissemination of energy information. Further, SMG manages EIA's respondent burden control program and public-use forms clearance program. This activity also evaluates and enhances all processes used to collect and analyze energy data, as well as assesses the quality and meaningfulness of energy information and forecasts, to continually improve the energy information provided to EIA customers.

Resource Management
The Resource Management (RM) activity includes the overall management and administrative support to EIA. This activity includes: program planning, financial, contracts, human resource management, resource and workforce analyses, and administrative and logistic support services. EIA's general overhead costs, including rent, telephones, supplies, as well as other support items provided through the Departmental Working Capital Fund, are funded by this activity.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Salaries & Benefits	**39,186**	**40,700**	**41,200**

In FY 2003 and FY 2004, fund 364 and 374 FTEs respectively, and in FY 2005 fund 369 FTEs (excluding 1 FTE funded by the Nuclear Waste Disposal Fund), to conduct weekly, monthly, and annual energy data surveys (51 total) and operate associated data collection and validation systems; disseminate energy data via publications and the Internet; conduct quadrennial surveys of energy use in residences, commercial buildings, and the manufacturing sector, analyze results on a regional basis; prepare the *Annual Energy Outlook*, the monthly *Short Term Energy Outlook*, and the *International Energy Outlook*; maintain, update, and operate required energy models.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Prepare special modeling analyses requested by the Secretary or the Congress (e.g. Clear Skies, McCain/Lieberman, Alaska pipeline, Energy Derivatives, Natural Gas Infrastructure, etc.); provide public and internal analysis and reports (e.g. Energy Situation Analysis Reports) during periods of energy market stress (Venezuela, Iraq, California, Northeast Electrical service blackout, etc.); collect and analyze financial data from major energy companies and data on foreign direct investment; prepare and update Country Analysis Briefs; operate National Energy Information Center. Includes salaries, health benefits, overtime, promotions, incentive awards, lump sum leave, and personnel performance awards.

Travel **398** **398** **407**

Fund travel for office personnel to attend training, professional development programs, industry and State conferences, met with national and international government and energy industry officials, and provide expertise in support of EIA mission.

Support Services **31,309** **30,089** **33,220**

Fund support for EIA's activities of energy data collection, analysis, forecasting, and energy information dissemination. Funded work also includes all survey development and processing, and the automated tools and equipment to collect, store, maintain, protect, and disseminate energy information. Funds also support operation of EIA financial, contracting and human resource operations.

- **Oil and Gas** **12,339** **11,603** **13,425**

  Fund contracts for statistical services in support of collection, processing, and dissemination of weekly, monthly, and annual data on reserves, supply, disposition, and prices of crude oil, refined petroleum products, natural gas and natural gas liquids; support for short-term analyses, estimates of natural gas delivery capacity, winter fuels data, and State cooperative agreements. For FY 2003 and FY 2004, continue to operate 34 petroleum and natural gas surveys including 10 weekly surveys, 18 monthly surveys, and 6 annual surveys resulting in 5 weekly, 7 monthly, and 9 annual dissemination products (Web-based and print-on-demand). EIA will conduct basic quality assurance activities, reduce survey noncompliance, and track and resolve data anomalies as a result of misreporting and non-response to assure the publication of accurate, timely data, and to implement processes for improving and maintaining data needed to understand petroleum and natural gas markets.

  In addition, EIA will release topical interest reports, such as This Week in Petroleum, and brochures such as *A Primer on Gasoline Prices and Residential Natural Gas Prices: What Consumers Should Know*, and selected one-time analytical reports on topical subjects, such as gasoline imports or the mid-West petroleum supply and price situation. Prior year balances in the amount of $2,455,000 will be used in FY 2004 to offset program requirements.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **Conduct Petroleum Surveys and Analyses..... 8,880 8,314 8,873**

  During FY 2005, activities include operating 27 surveys on weekly, monthly and annual cycles, processing the survey data, disseminating it (Website and print-on-demand); addressing deteriorating survey frames, identifying new companies required to report on petroleum surveys, providing modifications and support to the supply and marketing information database system, and continuing data quality projects such as reducing large unaccounted for crude oil statistics, missing motor gasoline production, and missing crude and petroleum product imports. The company level data gathered in these surveys are edited and aggregated into around 60,000 distinct on-line data series, for example, weekly retail gasoline prices, comprising about a billion characters of information. In FY 2004, EIA will make use of prior year uncosted balances for the operation of Petroleum Surveys and Analyses.

  In FY 2004 and FY 2005, EIA will invest $229,000 for quality improvement activities for the petroleum supply weekly and monthly surveys. For the weekly supply data, emphasis will be on validating the quality of the new motor gasoline blenders, assessing the impact of the new blenders on the adjustments made for motor gasoline, and updating the sample for blenders. EIA will improve weekly motor gasoline production data, whose customers are policy makers in the Congress, the White House, Office of the Secretary of Energy, State Energy Officials, corporate planners, gasoline producers, marketers and gasoline purchasers. For the monthly supply data, additional quality assurance to track ultra-low sulfur diesel fuel volumes, locate importers of diesel fuel and analyze major reporting issues for diesel fuel, including downgrading that may occur at various stages in the supply chain. Quality control targets would include maintenance of the total US frame of ethanol producers, ethanol motor gasoline blenders, and importers of special blending components.

- **Conduct Natural Gas Surveys and Analyses.... 2,061 1,891 3,154**

  During FY 2005, activities include operating five natural gas surveys on weekly, monthly and annual cycles, processing the survey data, disseminating it (Website and print-on-demand); addressing deteriorating survey frames, identifying new companies required to report on natural gas surveys, providing modifications and support to the information processing system, and continuing data quality projects so that surveys reflect changing natural gas markets. This program includes the Weekly Natural Gas Underground Storage Survey, which is the only weekly gas supply data in the United States and is critical to decisions of supply planners in industry and utilities, as well as to analysts in assessing the current natural gas supply and demand situation. FY 2003 includes $500,000 of prior year deobligations to fund the operation of the Weekly Natural Gas Underground Storage Survey. Prior year balances in the amount of $760,000 will be used in FY 2004 to operate the Natural Gas Surveys and Analysis activities.

For FY 2005, $649,000 will be allocated to develop and field a new natural gas production survey, which will require EIA to make use of $146,000 of program funds to help offset the funding requested to accomplish this task. The new monthly production survey would sample producers who report on the EIA-23 (annual survey of 2000+ reserves holders and operators). Due to the growing importance of natural gas, providing more timely and accurate gas production data are a high priority. This was evidenced by the recent high profile attention to the issue by Chairman Greenspan of the Federal Reserve Board, the mainstream media, and financial analysts. The goal is to publish production data for U.S. and leading States or regions about 60 days after the producing month, significantly improving the current 120-day lag time. The current voluntary survey of States to obtain annual data for all States on production and wellhead prices by State would continue.

- **Conduct Reserves Surveys and Analyses**..... **1,398** **1,398** **1,398**
During FY 2005, activities include operating the Annual Survey of Domestic Oil and Gas Reserves, a legislatively mandated data collection program (EIA 23A, 23B, 23P) and operating the Annual Report of the Origin of Natural Gas Liquids Production (EIA 64A), as well as making improvements to their frames and operations to reduce errors and increase weighted response rates. Analytical activities include the operations and maintenance of systems to estimate and forecast natural gas production and productive capacity; and systems to estimate and forecast crude oil production for use in the Short-Term Energy Outlook (STEO). Additional activities include construction, operation, maintenance and use of the US PetroSystem database; technical support on foreign and domestic upstream issues to EIA programs (EPCA ultimate recovery appreciation, well completions, equipment and operating cost studies, National Petroleum Council and National Energy Technology Laboratory studies,) and purchase of commercial reserves and production information for use in analytical work.

- **Coal, Nuclear, Electric & Alternate Fuels** **4,836** **4,806** **4,890**
Fund contracts for statistical services in support of collection, processing, and dissemination of selected highest priority weekly, monthly, quarterly, and annual data on reserves, supply, disposition, and prices for coal, nuclear, and electric power; support for short-term forecasting systems. Not included in the FY 2004 number above is $220,000 of prior year uncosted which EIA will make use of to fund the ongoing electricity data collection and analysis operations.

  - **Conduct Electric Power Surveys**..... **3,609** **3,280** **3,346**
In FY 2003 and FY 2004, operate 8 electric power data collection surveys, including three monthly surveys, four annual surveys and one emergency survey used to report major electric outages. This involves continuing to collect and process the large volume of additional data, particularly from non-utility facilities included since 2002 due to the restructuring and deregulation activities in the electric power industry. Summaries of the data collected on these surveys are made available in a monthly and an annual data report.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

For FY 2005, EIA plans to terminate the EIA-412, *Annual Electric Industry Financial Report*, which collects financial and plant-cost data from a variety of municipal, state, and federally-owned utilities, as well as data on existing and new transmission lines from those utilities and from generation and transmission (G&T) cooperatives.

- **Electricity 2005**..... **220** **600** **560**
  Complete this multi-year project to assess the scope needed to modify the existing electric power data information collected for use by EIA, DOE, the Executive Branch, Congress, industry, and the public. This evaluation concentrates on several areas including fuel-switching capabilities, transmission, reliability, and distributed and dispersed technologies, all of which are weaknesses in EIA's current electric surveys. EIA will also assess the new data confidentiality policy to determine what modifications will be needed to EIA surveys to reflect the changes in industry as it moves towards being more competitive. EIA will obtain support from electric power industry expert(s) and fund the work needed to incorporate all of the design changes to the forms and EIA energy information systems.

- **Conduct Coal Surveys**..... **569** **518** **545**
  Operate four coal data collection surveys and through an interagency agreement validate data collected by the Mine Safety and Health Administration on their quarterly production form. The two quarterly surveys are of manufacturing plants and coke plants on their coal receipts, consumption, stocks, and prices. The two annual surveys of coal producers/ preparation plants and coal distributors collect data on coal reserves, coal bed statistics, production capacity, sales and revenue, and coal distribution by State of origin to State of destination including transportation mode. These data are used to estimate weekly coal production by State and develop short-term and long-term forecasts of coal supply and demand providing a timely, reliable source of information on market trends for the industry for strategic planning and market analysis and to support rational spot markets and futures markets. It is also useful for policy makers in evaluating the impact of proposed energy and environmental programs.

- **Conduct Renewable and Alternate Fuel Surveys** **259** **256** **267**
  Process three annual surveys of manufacturers of solar and geothermal heat pump equipment. Together, with data from the electric power industry, this information is useful to policy makers in evaluating legislative proposals for incentives for renewable energy and for planning by the renewable industry. This annual survey gathers data from: (1) Federal, State and fuel provider fleets on their alternative transportation fuel vehicles and the amount of fuel consumed, and (2) auto manufacturers on the number of alternative transportation fueled vehicles that have been made available each year.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **Conduct Uranium Surveys** **179** **152** **172**
  Process an annual survey of the uranium producers, marketers, and nuclear plant operators and a quarterly survey of uranium producers in compliance with Subtitle B, 42 U.S.C. 2296b-4, Sec. 1015 of the Energy Policy Act of 1992. The data are used together with information on nuclear capacity and generation collected from the electric power industry to develop Short-Term forecasts of nuclear generation which are a basis for fee adequacy studies for the nuclear waste fund and are used to develop long term forecasts of nuclear fuel cycle requirements and spent fuel discharges.

▪ **Energy Markets and End Use**..... **5,281** **5,006** **5,346**
Fund contracts for statistical services in support of collection, processing, and dissemination of selected State and international energy data, short-term energy forecasts, and integrated energy statistics, the Financial Reporting System, and end-use energy surveys. Release first summary information from newly redesigned Commercial Buildings Energy Consumption Survey.

- **EIA Periodic Analysis Products** **1,346** **1,644** **1,767**
  Continue to conduct energy contingency analysis and produce the *Country Analysis Briefs* (CABs) and the *Energy Situation Analysis Report* (ESAR), as needed to cover energy emergency activities. (Of note, CABs is EIA's leading Web site user area). Produce monthly updates of the *Short-Term Energy Outlook* that is disseminated over EIA's Web site, produce the *Summer Motor Gasoline Outlook* and the *Winter Heating Fuels Outlook* annually; conduct the *Financial Reporting System Survey*, validate and analyze the data and produce *Performance Profiles of Major Energy Producers* report, and the annual report on *Foreign Direct Investment in U.S. Energy.* Produce the *Annual Energy Review*, and the *Monthly Energy Review*.

- **Enhance Short-Term Energy Forecasting Model Regionalization** **125** **269** **200**
  The current model is national and as such misses regional events that can have a significant impact on the projections. For example it is very possible to have normal weather on a national basis but also have enough regional variation and supply shortages at the same time. This happened in natural gas markets during the winter of 2002 - 2003, when the West had mild weather and abundant gas storage, while gas markets and storage in other regions were extremely tight. This project would complete the modification of EIA's short-term forecasting model to include regional analysis of fuel choice and fuel substitution.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **Conduct Consumption Surveys**..... **3,810** **3,093** **3,379**

Release the first summary information from the newly redesigned *Commercial Buildings Energy Consumption Survey* (CBECS). The CBECS, the first of the redesigned Energy Consumption Surveys, will include field data collection costs and survey processing of the

Buildings Survey data and initiate data collection and processing of the Energy Supplier Survey portion. The resulting summary data on building characteristics from this survey will be released during FY 2004. The CBECS is EIA's benchmark survey of energy use related to characteristics of the commercial building stock and the activities conducted therein. The *Manufacturing Energy Consumption Survey* will be conducted under an Interagency Agreement with U.S. Bureau of the Census. The *Residential Energy Consumption Survey* (RECS) work will complete the dissemination of the 2001 RECS survey and the associated documentation. These surveys are currently conducted every four years.

- **Integrated Analysis and Forecasting** **2,367** **2,586** **3,550**

Fund contracts for statistical services in support of maintenance of selected highest priority mid-term macroeconomic, international, demand, supply, conversion, and integrating components of National Energy Modeling System (NEMS), *Annual Energy Outlook*, and *International Energy Outlook*.

- **Modeling, Forecasting, and Analysis of U.S. Energy Markets** **1,550** **1,660** **1,863**

Maintain and operate the NEMS, consisting of 13 inter-related energy modules addressing future energy demand for the residential, commercial, industrial, and transportation sectors, and future supply of petroleum, natural gas, coal, and renewables. NEMS is the U.S. Government's integrated mid-term energy model, used in preparing the *Annual Energy Outlook*, feature articles on significant topics in mid-term energy markets, and service reports requested by Congress, the Administration, the Department of Energy, and/or other Government agencies. For FY 2005, EIA will be implementing enhancements to the transportation modeling to provide the capabilities needed to assess the existing and proposed Corporate Average Fuel Economy (Cafe) standards, and their market impacts.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **Modeling, Forecasting, and Analysis of International Energy Markets** **277** **296** **240**

Produce the *International Energy Outlook*, the U.S. Government's publication on mid-term forecasts of world energy markets, and to answer questions concerning significant issues affecting world energy markets in the mid-term. This activity has been responsible for the development of the System for Analyzing Global Energy (SAGE), a comprehensive, energy technology model, representing global energy supply and demand in 15 regional models, on which the International Energy Outlook is based.

- **Greenhouse Gas Program** **540** **630** **1,447**

This activity encompasses the publication of the annual estimate of greenhouse gases contained in the *Emissions of Greenhouse Gases in the United States*, the Voluntary Reporting of Greenhouse Gases Program, and the enhancements to the Voluntary Reporting of Greenhouse Gases Program requested by the President in his Climate Change Initiative. As in FY 2002, to fully fund this activity in FY 2003 EIA made use of $900,000 in prior year deobligations. In FY 2004, EIA will make use of prior year uncosted balances to fully fund this program. For FY 2005, EIA will implement an enhanced program with incorporates President Bush's Climate Change Initiative announced on February 14, 2002. The funding will cover increased operating costs to analyze data that respondents will provide on baselines, emissions, and emission reductions of greenhouse gases. EIA estimated that the enhanced program would lead to more than doubling of the number of respondents, assuming the cost per respondent remains at current levels.

- **Information Technology** **4,923** **4,364** **4,167**

Operate and maintain the EIA network consisting of an enterprise server; four Web servers; over fifty production servers; all network communication equipment including hubs, routers, switches, and cables; and peripheral equipment including a storage device for the enterprise server, high speed printers, and robotic tape backup machines. Maintain communication equipment to connect the network with remote sites in Silver Spring, Maryland and Dallas, Texas, and with individual users. Maintain 900 workstations that access EIA's network. Maintain energy databases that total more than two terabytes of data. Databases are currently under development that combines data from a wide range of sources with EIA data; these new databases will have additional storage requirements over two terabytes.

Included in EIA's FY 2005 Information Technology request continues the development and implementation Internet data collection. This project was undertaken by EIA to eliminate the paper-based data collection instruments and replace these with an interactive Internet-based energy data collection system to increase the accuracy and improve timeliness of all energy data collected by EIA. The request also supports ongoing operations of EIA surveys, analysis and forecasting.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

- **National Energy Information Center**..... **610** **657** **733**

  Fund contracts for information services to respond to public inquiries, and disseminate EIA products and energy information. The incremental increase results from a reduction in FTEs to lowering operational costs while enhancing services. For FY 2005, NEIC will: (1) continue implementation of EIA's continuity of operations program, a government-wide requirement to maintain the ability to carry out essential functions in the event of an emergency or disaster. (2) Respond to approximately 30,000 requests: (A) for EIA data, analyses, and forecasts, most significantly from Executive agencies, Members of Congress and associated staffs, and print and broadcast journalists from major media outlets across the Nation and around the world; (B) for extensive EIA Web site support; and (C) for referrals to energy information elsewhere in the national and international statistical system. EIA will distribute periodicals, one-time reports, brochures, flyers, and info cards. Print 1,000 copies of EIA publications for on-demand customers. Prepare 20 press releases, notes to editors, and media advisories. Design and manage 10 Web site channels, including the increasingly popular EIA Kids' Page. Conduct two customer surveys and two Web site usability tests. Provide outreach on EIA products.

- **Statistics and Methods** **544** **631** **602**

  Fund contracts for independent expert reviews, workshops for improving knowledge and skills of EIA staff, management of the American Statistical Association Energy Committee (EIA's professional advisory committee), maintenance of Data Resources Directory, statistical services in support of quality assurance, improvement of statistical procedures used within EIA survey systems, and development-oversight of performance measures of EIA's operations and products.

- **Resource Management** **409** **436** **507**

  Funds to conduct the day-to-day operation of EIA financial, contracting and human resource personnel operations, which encompasses all resource management reports, contracts and contractor agreements and performance oversight, all budget formulation and execution activities, and support for EIA's strategic and operational planning and performance reporting activities. FY 2004 and FY 2005 funding includes upgrades to EIA's human resource and contracts management.

  During FY 2004, EIA will: (1) Expand and process more of EIA's day-to-day procurement actions, to include tracking of increased number of small businesses utilized. With the anticipated award and implementation of EIA's Omnibus Procurement instrument (EOP II), a multi-award replacement contract, EIA procurement and contracting operations will compete and monitor a far greater share of EIA's procurement activities and expand oversight; (2) Continue to improve the efficiency of EIA's financial and management information systems. EIA planning includes implementing the ability of senior management to access, monitor and obligate operational funds electronically.

  For FY 2005, EIA will: (1) Continue to implement generic processes to improve the efficiency, and especially the timeliness, of EIA's human resource, contracting and financial analysis; (2) Implement interfaces with Departmental information systems to reduce or eliminate error-prone data entry and processing steps; and (3) Recruit and develop Presidential Management Interns for EIA's support of the President's Management Agenda.

(dollars in thousands)

FY 2003	FY 2004	FY 2005

Other Related Expenses..... **9,694** **9,913** **10,173**

Fund EIA rent, furniture, utilities, communications, supplies, and other support service transfers to DOE Working Capital Fund. Fund the maintenance and operation of the EIA's Dallas Field Office. Maintain DOE required set-aside to cover prior year obligations. Fund corporate employee development, and Historical Black Colleges and Universities, Hispanic Serving Institutions, Tribal Colleges and Universities, and commemorative programs. Fund employee training. Reflects rescission of $523,972 in FY 2003 (P.L. 108-7).

Total, Program Direction..... **80,587** **81,100** **85,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Salaries & Benefits	
Net increase in Federal staff cost due to cost of living increases partially offset by a reduction of five FTEs by FY 2005.	+500
Travel	
▪ Increased costs to fund employee training, development, and EIA representation at various conferences and energy related events.	+9
Support Services	
▪ Net increase due to the exhaustion of prior year uncosted balances as a source for current year program funding, the cost escalation of contractor support, and the undertaking of new programs in support of Congress and the Administration.	+3,131
Other Related Expenses	
▪ Increase in Working Capital Fund business line costs, and EIA overhead costs.	+260
Total Funding Change, Program Direction	**+3,900**

Support Services by Category

(dollars in thousands)

	FY 2003[a]	FY 2004[bc]	FY 2005	$ Change	% Change
Technical Support					
Oil & Gas	12,339	11,603	13,425	+1,822	+15.7%
Coal, Nuclear, Electric & Alternate Fuels	4,836	4,806	4,890	+84	+1.7%
Energy Markets & End Use	5,281	5,006	5,346	+340	+6.8%
Integrated Analysis & Forecasting	2,367	2,586	3,550	+964	+37.3%
Information Technology	4,923	4,364	4,167	-197	-4.5%
National Energy Information Center	610	657	733	+76	11.6%
Statistics & Methods	544	631	602	-29	-4.6%
Resource Management	409	436	507	+71	16.3%
Total, Technical Support Services	31,309	30,089	33,220	3,131	+10.4%

Other Related Expenses by Category

(dollars in thousands)

Other Related Expense	FY 2003	FY 2004	FY 2005	$ Change	$ Change
Supplies, Copying, DOE HQ Charges, Rent to Others	669	943	1,042	+99	+10.5%
Set Aside for Prior Year Obligations	199	500	400	-100	-20.0%
Dallas Field Office – Building Occupancy, Phones & Utilities	275	281	275	-6	-2.2%
HBCU, HSI, Tribal Universities	181	189	171	-18	-9.5%
Working Capital Fund	8,370	8,000	8,285	+285	+3.6%
Total, Other Related Expenses	9,694	9,913	10,173	+260	+2.6%

[a] Reflects rescission of $523,972 in FY 2003 (P.L. 108-7).

[b] In FY 2004, EIA will use $3,155,000 of prior year deobligations to maintain the same level of data, analyses, and services as compared to FY 2003.

[c] Reflects rescission of $530,000 in FY 2004 (P.L. 108-108), and a second rescission of $481,328 cited in the Omnibus appropriation for FY 2004, for a total reduction of $1,021,328.

Clean Coal Technology

Clean Coal Technology

Clean Coal Technology
(Deferral and Rescission)

Proposed Appropriation Language

Of the funds made available under this heading for obligation in prior years, [$97,000,000] *$237,000,000* [shall not be available until October 1, 2004, and $88,000,000] are rescinded[: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing projects regardless of the separate request for proposal under which the project was selected].

Explanation of Change

The proposed language changes the amount to be rescinded from $88,000,000 in FY 2004 to $237,000,000 in FY 2005. The unneeded balances resulted from withdrawn projects in the Clean Coal Technology program.

Clean Coal Technology

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Clean Coal Technology						
Clean Coal Technology	-47,000	-98,000	-98,000	-140,000	-42,000	-42.8%

Detailed Funding Table

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Clean Coal Technology						
Advance appropriation	40,000	87,000	87,000	97,000	-10,000	-10.3%
Rescission	0	-88,000	-88,000	-237,000	-149,000	-62.8%
Deferral of Unobligated Balances	-87,000	-97,000	-97,000	0	+97,000	+100%
Clean Coal Technology	-47,000	-98,000	-98,000	-140,000	-42,000	-42.8%

Mission

The Clean Coal Technology program is a government and industry co-funded effort to provide technical and operational data of innovative coal technologies demonstrated at commercial scale. Beginning in 1985, the Department administered five competitive solicitations selecting projects with the potential to satisfy the requirements of the energy markets while improving the environmental performance of coal-based technologies. To date, more than thirty projects have been successfully completed, providing the marketplace with valuable performance data for a variety of applications.

For FY 2003, an appropriation of $40 million was made available while the availability of $87 million was deferred to FY 2004. For FY 2004, an appropriation of $87 million was made available, $88 million was rescinded, and the availability of $97 million was deferred to FY 2005. For FY 2005, the Department proposes to rescind $237 million of unneeded balances that resulted from withdrawn projects. The net

appropriation is -$140 million after accounting for the advance appropriation of $97 million of previously deferred funds.

Benefits

The importance of demonstrating technologies that improve the performance and extend the service of the Nation's reliable coal-based generating capacity is vital for supporting today's economy. The CCT Program is establishing the engineering and scientific foundation for the next generation of clean coal technologies that will be capable of near zero emissions and generation efficiencies twice that of the existing coal fleet.

Strategic Goals

The Department's Strategic Plan identifies four strategic goals one each for defense, energy, science, and environmental aspect of the mission plus seven general goals that tie to the strategic goals. The Fossil Energy Research and Development appropriation supports the following goals:

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The programs funded by the Fossil Energy appropriation have the following three Program Goals which contribute to the General Goals in the "goal cascade":

Program Goal 04.55.00.00**:** Zero Emissions Coal-Based Electricity and Hydrogen Production: Create public/private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations, and ultimately, by 2015, zero emission plants (including carbon) that are fuel-flexible, and capable of multi-product output and efficiencies over 60 percent with coal and 75 percent with natural gas.

Contribution to General Goals

Clean Coal Technology contributes to General Goal 4 through demonstrating technologies that improve the performance and extend the service of the nation's reliable coal-based generating capacity.

Funding by General Goal

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	$ Change	% Change
Goal 4, Energy Security					
Clean Coal Technology					
Clean Coal Technology	-47,000	-98,000	-140,000	-42,000	-42.8%

Funding Profile by Subprogram

(dollars in thousands)

	FY 2003 Comparable Appropriation	FY 2004 Comparable Appropriation	FY 2005 Base	FY 2005 Request	FY 2005 Request vs Base	
					$ Change	% Change
Clean Coal Technology						
Cooperative Agreements	-47,000	-98,000	-98,000	-140,000	-42,000	-42.8%
Program Direction	0	0	0	0	0	0.0%
Total, Clean Coal Technology	-47,000	-98,000	-98,000	-140,000	-42,000	-42.8%

Mission

The Clean Coal Technology program is a government and industry co-funded effort to provide technical and operational data of innovative coal technologies demonstrated at commercial scale. Beginning in 1985, the Department administered five competitive solicitations selecting projects with the potential to satisfy the requirements of the energy markets while improving the environmental performance of coal-based technologies. To date, more than thirty projects have been successfully completed, providing the marketplace with valuable performance data for a variety of applications.

For FY 2003, an appropriation of $40 million was made available while the availability of $87 million was deferred to FY 2004. For FY 2004, an appropriation of $87 million was made available, $88 million was rescinded, and the availability of $97 million was deferred to FY 2005. For FY 2005, the Department proposes to rescind $237 million of unneeded balances that resulted from withdrawn projects. The net appropriation is -$140 million after accounting for the advance appropriation of $97 million of previously deferred funds.

Benefits

The importance of demonstrating technologies that improve the performance and extend the service of the Nation's reliable coal-based generating capacity is vital for supporting today's economy. The CCT Program is establishing the engineering and scientific foundation for the next generation of clean coal technologies that will be capable of near zero emissions and generation efficiencies twice that of the existing coal fleet.

Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Clean Coal Technology	**-47,000**	**-98,000**	**-140,000**
▪ **Cooperative Agreements**	**-47,000**	**-98,000**	**-140,000**

For FY 2005, the Department proposes to rescind $237 million of unneeded balances that resulted from

withdrawn projects. Continue construction for the Kentucky Pioneer gasification project and complete operation of the fuel cell portion of the project at the Wabash River site. Complete testing and reporting for the Clean Coal Diesel project and JEA Circulating Fluid Bed Combustor project. *Participants include: JEA, Kentucky Pioneer Energy, Ltd. with Fuel Cell Energy and Global Energy, and TIAX.*

For FY 2004, an appropriation of $87 million was made available, $88 million was rescinded, and the availability of $97 million was deferred to FY 2005. Initiate construction for the Kentucky Pioneer gasification project and initiate operation of the fuel cell portion of the project at the Wabash River site. Continue demonstration phase for the JEA Circulating Fluid Bed Combustor project. Initiate 2-cylinder engine testing using coal slurry for the Clean Coal Diesel project. Complete final reports for the Advanced Coal Conversion project. *Participants include: JEA, Kentucky Pioneer Energy, Ltd. with Fuel Cell Energy and Global Energy, Western Syncoal LLC, and TIAX.*

For FY 2003, an advance appropriation of $40 million was made available while the availability of $87 million was deferred until FY 2004. Continued permitting efforts for the Kentucky Pioneer gasification project and fabrication of the fuel cell portion of the project. Continued test operations on the JEA Circulating Fluid Bed Combustor project. Restructured Clean Coal Diesel project to perform 2-cylinder testing using coal water slurry. Completed final reports for the LPMEOH^{TM} coal-methanol project and the Tampa Electric gasification project. Continued final report preparation for the Advanced Coal Conversion project. The McIntosh Circulating Fluidized-Bed projects and the Clean Power from Integrated Coal/Ore Reduction (CPICOR) project ended by mutual agreement with the participants. *Participants included: JEA, Kentucky Pioneer Energy, Ltd. with Fuel Cell Energy and Global Energy, CPICOR Management Company, LLC, Tampa Electric Company, City of Lakeland, Western Syncoal LLC, Air Products Liquid Phase Conversion Company, L.P., and TIAX.*

▪ **Program Support**	**0**	**0**	**0**

In FY 2005 and FY 2004, activities will continue under the Fossil Energy R&D Program Direction account. In FY 2003 the program direction was funded by prior year balances.

Total, Clean Coal Technology	**-47,000**	**-98,000**	**-140,000**

Explanation of Funding Changes

	FY 2005 vs. FY 2004 ($000)
Funding proposed for FY 2005 represents the return of previously deferred funds …….....	+97,000
Rescind unneeded balances that are the result of withdrawn projects……..	-237,000
Total Funding Change, Clean Coal Technology……..	-140,000

Administrative Provisions, Department of Energy

Proposed Appropriation Language

Appropriations under this Act for the current fiscal year shall be available for hire of passenger motor vehicles; hire, maintenance, and operation of aircraft; purchase, repair, and cleaning of uniforms; and reimbursement to the General Services Administration for security guard services.

From appropriations under this Act, transfers of sums may be made to other agencies of the Government for the performance of work for which the appropriation is made.

None of the funds made available to the Department of Energy under this Act shall be used to implement or finance authorized price support or loan guarantee programs unless specific provision is made for such programs in an appropriations Act.

The Secretary is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, private or foreign: Provided, That revenues and other moneys received by or for the account of the Department of Energy or otherwise generated by sale of products in connection with projects of the Department appropriated under this Act may be received by the Secretary of Energy, and, subject to appropriation in advance within two years of such receipt, be used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements:

Provided further, That amounts in excess of such appropriation shall be covered into the Treasury as miscellaneous receipts.

No funds provided in this Act may be expended by the Department of Energy to prepare, issue, or process procurement documents for programs or projects for which appropriations have not been made. In addition to other authorities set forth in this Act, the Secretary may accept fees and contributions from public and private sources, to be deposited in a contributed funds account, and prosecute projects using such fees and contributions in cooperation with other Federal, State or private agencies or concerns.

Explanation of Change

Language is unchanged from the FY 2004 proposal.