DOE/CF-041
Volume 7

U.S. DEPARTMENT OF ENERGY

FY 2010 Congressional Budget Request

Fossil Energy Research and Development
Naval Petroleum and Oil Shale Reserves
Strategic Petroleum Reserve
Northeast Home Heating Oil Reserve
Clean Coal Technology
Ultra-Deepwater Unconventional Natural Gas

Office of Chief Financial Officer
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The Department of Energy's Congressional Budget justification is available on the Office of Chief Financial Officer, Office of Budget homepage at http://www.cfo.doe.gov/crorg/cf30.htm.

For the latest details on the Department of Energy's implementation of the Recovery Act, please visit: http://www.energy.gov/recovery

U.S. DEPARTMENT OF ENERGY
FY 2010 Internal Statistical Table by Appropriation
(dollars in thousands - OMB Scoring)

	FY 2008 Current Approp.	FY 2009 Current Approp.	FY 2009 Current Recovery	FY 2010 Congressional Request	FY 2010 vs. FY 2009	
					$	%
Discretionary Summary By Appropriation						
Energy And Water Development, And Related Agencies						
Appropriation Summary:						
Energy Programs						
Energy efficiency and renewable energy	1,704,112	2,178,540	16,800,000	2,318,602	+140,062	6.4%
Electricity delivery and energy reliability	136,170	137,000	4,500,000	208,008	+71,008	51.8%
Nuclear energy	960,903	792,000	----	761,274	-30,726	-3.9%
Legacy management	33,872	----	----	----	——	0.0%
Fossil energy programs						
Clean coal technology	-58,000	----	----	----	——	0.0%
Fossil energy research and development	727,181	876,320	3,400,000	617,565	-258,755	-29.5%
Naval petroleum and oil shale reserves	20,272	19,099	----	23,627	+4,528	23.7%
Strategic petroleum reserve	186,757	205,000	----	229,073	+24,073	11.7%
Northeast home heating oil reserve	12,335	9,800	----	11,300	+1,500	15.3%
Total, Fossil energy programs	888,545	1,110,219	3,400,000	881,565	-228,654	-20.6%
Uranium enrichment D&D fund	622,162	535,503	390,000	559,377	+23,874	4.5%
Energy information administration	95,460	110,595	----	133,058	+22,463	20.3%
Non-Defense environmental cleanup	182,263	261,819	483,000	237,517	-24,302	-9.3%
Science	4,082,883	4,772,636	1,600,000	4,941,682	+169,046	3.5%
Energy transformation acceleration fund	----	----	400,000	10,000	+10,000	N/A
Nuclear waste disposal	187,269	145,390	----	98,400	-46,990	-32.3%
Departmental administration	148,415	155,326	----	182,331	+27,005	17.4%
Inspector general	46,057	51,927	15,000	51,445	-482	-0.9%
Advanced technology vehicles manufacturing loan	----	7,510,000	10,000	20,000	-7,490,000	-99.7%
Innovative technology loan guarantee program	4,459	----	----	----	——	0.0%
Section 1705 temporary loan guarantee program	----	----	5,990,000	----	——	0.0%
Total, Energy Programs	9,092,570	17,760,955	33,588,000	10,403,259	-7,357,696	-41.4%
Atomic Energy Defense Activities						
National nuclear security administration:						
Weapons activities	6,302,366	6,380,000	----	6,384,431	+4,431	0.1%
Defense nuclear nonproliferation	1,334,922	1,482,350	----	2,136,709	+654,359	44.1%
Naval reactors	774,686	828,054	----	1,003,133	+175,079	21.1%
Office of the administrator	402,137	439,190	----	420,754	-18,436	-4.2%
Total, National nuclear security administration	8,814,111	9,129,594	----	9,945,027	+815,433	8.9%
Environmental and other defense activities:						
Defense environmental cleanup	5,411,231	5,657,250	5,127,000	5,495,831	-161,419	-2.9%
Other defense activities						
Health, safety and security	425,461	446,471	----	449,882	+3,411	0.8%
Legacy Management	154,961	185,981	----	189,802	+3,821	2.1%
Nuclear energy	75,261	565,819	----	83,358	-482,461	-85.3%
Defense related administrative support	98,104	108,190	----	122,982	+14,792	13.7%
Office of hearings and appeals	4,565	6,603	----	6,444	-159	-2.4%
Congressionally directed projects	----	999	----	----	-999	-100.0%
Subtotal, Other defense activities	758,352	1,314,063	----	852,468	-461,595	-35.1%
Adjustments	-8,893	----	----	----	——	0.0%
Total, Other defense activities	749,459	1,314,063	----	852,468	-461,595	-35.1%
Defense nuclear waste disposal	199,171	143,000	----	98,400	-44,600	-31.2%
Total, Environmental & other defense activities	6,359,861	7,114,313	5,127,000	6,446,699	-667,614	-9.4%
Total, Atomic Energy Defense Activities	15,173,972	16,243,907	5,127,000	16,391,726	+147,819	0.9%
Power marketing administrations:						
Southeastern power administration	6,404	7,420	----	7,638	+218	2.9%
Southwestern power administration	30,165	28,414	----	44,944	+16,530	58.2%
Western area power administration	228,907	218,346	10,000	256,711	+38,365	17.6%
Falcon & Amistad operating & maintenance fund	2,477	2,959	----	2,568	-391	-13.2%
Colorado River Basins	-23,000	-23,000	----	-23,000	——	0.0%
Total, Power marketing administrations	244,953	234,139	10,000	288,861	+54,722	23.4%
Federal energy regulatory commission	----	----	----	----	——	0.0%
Subtotal, Energy And Water Development and Related Agencies	24,511,495	34,239,001	38,725,000	27,083,846	-7,155,155	-20.9%
Uranium enrichment D&D fund discretionary payments	-458,787	-463,000	----	-663,000	-200,000	-43.2%
Excess fees and recoveries, FERC	-20,370	-27,682	----	-26,864	+818	3.0%
Total, Discretionary Funding	**24,032,338**	**33,748,319**	**38,725,000**	**26,393,982**	**-7,354,337**	-21.8%

Fossil Energy Research and Development

Fossil Energy Research and Development

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Appropriation 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), [$876,320,000] *$617,565,000*, to remain available until expended.

[, of which $149,000,000 shall be derived by transfer from ``Clean Coal Technology'': Provided, That of the amounts provided, $288,174,000 is available for the Clean Coal Power Initiative Round III solicitation, pursuant to title IV of the Public Law 109--58: Provided further, That funds appropriated for prior solicitations under the Clean Coal Technology Program, Power Plant Improvement Initiative, Clean Coal Power Initiative, and FutureGen, but not required by the Department to meet its obligations on projects selected under such solicitations, may be utilized for the Clean Coal Power Initiative Round III solicitation under this Act in accordance with the requirements of this Act rather than the Acts under which the funds were appropriated: Provided further, That no Clean Coal Power Initiative project may be selected for which full funding is not available to provide for the total project: Provided further, That if a Clean Coal Power Initiative project selected after enactment of this legislation for negotiation under this or any other Act in any fiscal year, is not awarded within 2 years from the date the application was selected, negotiations shall cease and the Federal funds committed to the application shall be retained by the Department for future coal-related research, development and demonstration projects, except that the time limit may be extended at the Secretary's discretion for matters outside the control of the applicant, or if the Secretary determines that extension of the time limit is in the public interest: Provided further, That the Secretary may not delegate this responsibility for applications greater than $10,000,000: Provided further, That financial assistance for costs in excess of those estimated as of the date of award of original Clean Coal Power Initiative financial assistance may not be provided in excess of the proportion of costs borne by the Government in the original agreement and shall be limited to 25 percent of the original financial assistance: 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 as well as those contained under the heading ``Clean Coal Technology'' in prior appropriations: Provided further, That any technology selected under these programs shall be considered a Clean Coal Technology, and any project selected under these programs 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 funds available for the Clean Coal Power Initiative Round III Funding Opportunity Announcement may be used to support any technology that meets the requirements of the Round III Announcement relating to carbon capture and storage or other beneficial uses of CO, without regard to the 70 and 30 percent funding allocations specified in section 402(b)(1)(A) and 402(b)(2)(A) of Public Law 109--58: 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, of the amount appropriated in this paragraph, $43,864,150 shall be used for projects specified in the table that appears under the heading ``Congressionally Directed Fossil Energy Projects'' in the text and table under this heading in the explanatory statement described in section 4 (in

the matter preceding division A of this consolidated Act). (Energy and Water Development and Related Agencies Appropriations Act, 2009.) **]**

Explanation of Change

No funds are requested in FY10 for CCPI or FutureGen. For FY2010, all Clean Coal Technology project funding commitments have been fulfilled and only project closeout activities remain.

The regulation against the use of nuclear explosives should be moved to a general section, per guidance from DOE GC.

Fossil Energy Research and Development
Office of Fossil Energy

Overview

Appropriation Summary by Program

	FY 2008 Current Appropriation	FY 2009 Enacted	FY 2009 Additional Appropriation	FY 2010 Request
Fossil Energy Research and Development				
Coal	479,871	692,410		403,865
Natural Gas Technologies	19,270	20,000		25,000
Petroleum - Oil Technology	4,817	5,000		0
Program Direction	148,597	152,000		158,000
Plant and Capital Equipment	12,882	18,000		20,000
Fossil Energy Environmental Restoration	9,483	9,700		10,000
Cooperative R&D	4,817	5,000		0
Special Recruitment Programs	650	656		700
Congressional Directed Projects	46,794	43,864		0
Subtotal, Fossil Energy Research and Development	727,181	946,630		617,565
Use of prior-year balances	0	-70,310		0
Total, Fossil Energy Research and Development	727,181	876,320		617,565
Clean Coal Technology				
Deferral of Unobligated Balances, FY 2008	257,000	0		0
Deferral of Unobligated Balances, FY 2009	-149,000	149,000		0
Transfer to Fossil Energy R&D (FutureGen)	-75,000	0		0
Transfer to Fossil Energy R&D (Clean Coal Power Initiative)	-70,000	-149,000		0
Transfer to Fossil Energy R&D (Fuel and Power Systems)	-21,000	0		0
Total, Clean Coal Technology	-58,000	0		0

	FY 2008 Current Appropriation	FY 2009 Enacted	FY 2009 Additional Appropriation	FY 2010 Request
Strategic Petroleum Reserve				
Facilities Expansion	24,773	31,507		0
Facilities Development	161,984	173,493		229,073
Total, Strategic Petroleum Reserve	186,757	205,000		229,073
Northeast Home Heating Oil Reserve	12,335	9,800		11,300
Naval Petroleum & Oil Shale Reserves	20,272	19,099		23,627
American Recovery and Reinvestment Act	0	0	3,400,000	0
Total, Fossil Energy	888,545	1,110,219	3,400,000	881,565

Public Law Authorizations:
P.L. 110-161, "Consolidated Appropriations Act" (2008)
P.L. 111-008, "Omnibus Appropriation Act" (2009)

Preface

Secure, affordable, and environmentally acceptable energy sources are essential to our Nation. The Fossil Energy Research and Development (FER&D) appropriation addresses issues related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels.

The FER&D appropriation implements several key Research, Development and Demonstration (RD&D) programs. To advance Carbon Capture and Storage (CCS) technologies, the Clean Coal Power Initiative is an industrial collaboration to demonstrate advanced clean coal technologies, and build and operate near-zero atmospheric emissions power plants which capture and store carbon dioxide (CO_2). The Regional Carbon Sequestration Partnerships perform small and large scale CO_2 injection tests across the nation. FER&D also supports methane hydrates research and the Strategic Petroleum Reserve.

Mission

The FER&D Program creates public benefits by enhancing U.S. economic, environmental, and energy security. The program carries out three primary activities: (1) managing and performing energy-related research that reduces market barriers to the production and use of fossil fuels for domestic usage and conversion to other fuels such as hydrogen; (2) partnering with industry and others to advance fossil energy technologies toward commercialization; and (3) supporting the development of information and policy options that benefit the public.

Benefits

The FER&D Program supports DOE's mission to achieve national energy security in an economic and environmentally sound manner through the development of the technical capability to dramatically reduce carbon emissions to achieve near-zero atmospheric emissions power production. In the near term, advanced technologies that increase the power generation efficiency for new plants, and

technologies to capture CO_2 from both new and existing plants will be developed. In the longer term, the goal is to increase energy plant efficiencies, and reduce both the energy and capital costs of CO_2 capture and storage from new, advanced coal plants and existing plants, allowing coal to remain a strategic fuel for the Nation.

American Reinvestment and Recovery Act (ARRA)

The ARRA of 2009 authorizes funds for Fossil Energy Research and Development. Projects include: Fossil Energy Research and Development; Additional funding for the Clean Coal Power initiative Round III Funding Opportunity Announcement; Industrial Carbon Capture and Storage Applications; Geologic Site Characterizations; and Geologic Sequestration Research and Training.

Strategic Themes, Goals and the Secretary's Initiatives

FE's development of clean coal technology is one of the Secretary's top ten initiatives. The clean coal subprograms contribute to the Secretary's goal as follows:

- The Clean Coal Power Initiative, by or before 2010, will initiate demonstration(s) of at least one advanced, high efficiency commercial-scale coal-based power generation. By 2015, plant(s) will begin operation that will achieve 90 percent CO_2 capture efficiency and storage or beneficial reuse of CO_2. These technologies can be configured to co-produce heat, fuels, chemicals, or other useful byproducts, and provide a demonstrated suite of advanced technologies that can produce substantial near, mid, and long-range economic and environmental public benefits.

- The Innovations for Existing Plants activity develops technology to reduce CO_2 emissions from existing pulverized coal (PC) power plants, which is the current standard industry technology for coal-fueled electricity generation. By 2016, field testing will be completed on flue gas slipstreams at multiple operating power plants and other large-scale facilities of advanced oxy-combustion and post-combustion CO_2 capture technologies that can achieve 90 percent CO_2 capture at no more than a 35 percent increase in the busbar cost-of-electricity relative to the same plant without CO_2 capture.

- The Advanced Integrated Gasification Combined Cycle (IGCC) activity will develop, by 2010, technologies that can produce electricity from coal at 45 to 50 percent efficiency based on higher heating value (HHV) at a capital cost of $1600/kW (in 2007 dollars). By 2012, advanced IGCC technologies will complete R&D to integrate this technology with CO_2 separation, capture, and storage into "near-zero" atmospheric emissions configurations that can ultimately provide electricity with less than a 10 percent increase in the busbar cost of electricity relative to 2003 technology baseline.

- The Advanced Turbines activity develops highly efficient syngas turbines for use in gasification based systems. By 2012, advanced turbines capable of firing up to 100 percent hydrogen will be developed.

- The Carbon Sequestration activity, by 2012, will develop technologies to separate, capture, transport, and store CO_2 using either direct or indirect systems that result in a less than 10 percent increase in the busbar cost of electricity, for gasification based systems relative to a 2002

technology baseline. By 2012, the activity will have developed methodology capable of predicting CO_2 storage capacity in geologic formations to within +/- 30 percent of actual capacities.

- The Fuels activity will, by 2010, complete testing to show the feasibility of modules capable of producing hydrogen from coal at less than or equal to $0.9 per kilogram ($30/barrel crude oil equivalent, without delivery, incentives or tax credits; in constant 2002 dollars) when integrated with advanced coal power systems.

- By 2010, the Fuel Cells activity will increase reliability of the Solid State Energy Conversion Alliance (SECA) fuel cell technology to commercially acceptable levels and provide the technology base to permit low cost (less than or equal to $400/kW, a 10-fold reduction versus the 2000 baseline), ultra-clean, 40 to 60 percent electrical efficiency (when coal fueled), kilowatt-scale solid oxide fuel cell modules for grid-independent distributed generation applications. By FY 2015, the activity will have tested multi-MW-class fuel cell systems.

- The Advanced Research activity conducts research that helps sustain U.S. preeminence in fossil fuel technology by supporting development of materials, computational methods, and control system knowledge needed to bridge gaps between basic science and engineering development. Advanced Research Program efforts will allow development of enabling technologies that support the goals of near-zero atmospheric emissions energy for next generation power systems.

- The Natural Gas Technologies program develops technologies to exploit large methane hydrate resources. Increased and diversified domestic supplies of natural gas will reduce energy imports, reduce the cost of energy to consumers, and enhance competitiveness of U.S. industries that need reliable, abundant supplies of energy as feedstocks and fuels.

A new strategic plan has not yet been established and approved by the Secretary of Energy. The Secretary has established major priorities and initiatives.

The Secretary's Fossil Energy initiatives are:

Clean Coal Technology: Develop and pilot innovative technologies for the emission-free coal plants of the future, allowing our nation to safely utilize our abundant coal resources.

Science and Basic Research in the Energy Technologies of the Future: Investments in building and renovating laboratories and scientific research facilities that will create jobs immediately and enable the research on for technologies and innovations that will sustain American industry and provide new energy and climate solutions over the longer term.

The following chart aligns the current Strategic Plan with the Secretary's priorities:

Strategic Theme	Strategic Goal Title	Secretary's Priorities	GPRA Unit Program Number	GPRA Unit Program Title	Office

1. Energy Security	1. Energy Diversity	Lower GHG Emissions	08	Near-Zero Emissions Coal-Based Electricity and Hydrogen Production	FE
			09	Natural Gas Technology	FE
			10	Oil Technology, Abundant Oil	FE
			11	Petroleum Reserves	FE

Basic and Applied R&D Coordination

As a requirement under the Energy Policy Act of 2005, the Under Secretary for Science led nine program reviews in 2006 that identified over 21 areas for coordination between the basic and applied programs that present opportunities for increasing mission success. A Portfolio Working Group consisting of basic and applied program managers reviewed these areas in 2007 and selected six of these coordinated research areas, one of which was carbon dioxide capture and storage, to initiate activities in FY 2009. In support of this, the storage portion of this R&D coordination focus area was a subject of a BES workshop on Basic Research Needs for Geosciences in February 2007, which addressed the research challenges posed by carbon dioxide storage in deep porous geological formations. This is consistent with Secretarial priority #5: Clean Coal Technology - Develop and pilot innovative technologies for the emission-free coal plants of the future, allowing our nation to safely utilize our abundant coal resources.

Regaining ENERGY Science and Engineering Edge (RE-ENERGYSE)

The Department is undertaking a broad educational effort that cuts across program offices to inspire students and workers to pursue careers in science, engineering, and entrepreneurship related to clean energy and other fields important to the Department's mission. RE-ENERGYSE is a new initiative to focus on a number of critical areas that will build the foundation of a vibrant American workforce to participate in the green economy and advance science and innovation in the U.S. Fossil Energy will participate in this initiative.

Energy Innovation Hub

Fossil Energy takes part in the Department's multi-disciplinary Energy Innovation Hubs (Hubs), which focus on critical science and technology for high-risk, high-reward research to revolutionize how the U.S. produces, distributes, and uses energy. Hubs will promote energy security and reduce greenhouse gas emissions. They will also strengthen the Nation's economy by coordinating teams of experts from multiple fields to blend technology development, engineering design, and energy policy. Finally, they will develop the critical areas of expertise needed for the green economy. Fossil Energy will support one Hub that focuses on carbon capture and storage.

Facilities Maintenance and Repair

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by this budget are displayed below.

Direct-Funded Maintenance and Repair

	FY 2008 Current Appropriation	FY 2009	FY 2010 Request
National Energy Technology Laboratory	11,009	11,339	11,679
Total, Direct-Funded Maintenance and Repair	11,009	11,339	11,679

Fossil Energy Research and Development

Office of Fossil Energy

Funding by Site by Program

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Ames National Laboratory			
Coal	1,225	1,315	1,355
Total, Ames	1,225	1,315	1,355
Argonne National Laboratory (East)			
Coal	2,817	3,140	2,655
Natural Gas Technologies	250	0	0
Total, Argonne National Laboratory (East)	3,067	3,140	2,655
Idaho National Engineering and Environmental Laboratory			
Coal	365	598	420
Natural Gas Technologies	220	400	150
Petroleum – Oil Technology	0	26	0
Total, Idaho National Engineering and Environmental Laboratory	585	1,024	570
Lawrence Berkeley National Laboratory			
Coal	3,102	3,909	1,810
Natural Gas Technologies	1010	1,165	1,230
Petroleum – Oil Technology	0	50	0
Total, Lawrence Berkeley National Laboratory	4,112	5,124	3,040
Lawrence Livermore National Laboratory			
Coal	700	1,258	1,019
Total, Lawrence Livermore National Laboratory	700	1,258	1,019
Los Alamos National Laboratory			
Coal	1,681	2,444	2,249
Total, Los Alamos National Laboratory	1,681	2,444	2,249
National Energy Technology Laboratory			
Coal	302,649	369,841	371,732
Natural Gas Technologies	17,510	17,359	22,080
Petroleum – Oil Technology	4,334	4,379	0

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Program Direction	116,607	121,055	125,150
Plant and Capital Equipment	7,927	0	0
Fossil Energy Environmental Restoration	6,238	6,300	8,310
Cooperative Research and Development	4,757	4,950	0
Clean Coal Power Initiative	67,444	288,174	0
FutureGen	72,262	0	0
Total, National Energy Technology Laboratory	599,728	812,058	527,272
Oak Ridge National Laboratory			
Coal	3,328	3,175	3,658
Natural Gas Technologies	186	250	250
Total, Oak Ridge National Laboratory	3,514	3,425	3,908
Pacific Northwest Laboratory			
Coal	5,250	6,250	6,250
Natural Gas Technologies	94	295	150
Total, Pacific Northwest Laboratory	5,344	6,545	6,400
Sandia National Laboratories			
Coal	550	118	118
Total, Sandia National Laboratories	550	118	118
Washington Headquarters			
Coal	18,498	12,188	12,599
Natural Gas Technologies	0	531	1,140
Petroleum – Oil Technology	483	545	0
Program Direction	31,990	30,945	32,850
Fossil Energy Environmental Restoration	3,245	3,400	1,690
Plant and Capital Equipment	4,955	18,000	20,000
Special Recruitment Programs	650	656	700
Cooperative Research and Development	60	50	0
Congressionally Directed Projects	46,794	43,864	0
Total, Washington Headquarters	106,675	110,179	68,979
Total, Fossil Energy Research and Development	727,181	946,630	617,565

Site Description

Ames National Laboratory

The Ames National Laboratory is located in Ames, Iowa.

Coal

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

ANL research supports the following: concepts for various technologies supporting FutureGen; DOE strategies to capture CO_2 from existing and advanced fossil fuel conversion systems in Carbon Sequestration; DOE strategies to develop non-destructive testing examination of materials and mineral sequestration kinetics in the Advanced Research; and the core technology program in the Fuel Cells program.

Brookhaven National Laboratory

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

Coal

The Brookhaven National Laboratory conducts research on various technologies in support of near-zero atmospheric emissions coal energy system.

Idaho National Engineering and Environmental Laboratory

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

Coal

Research conducted at INEEL supports the following: concepts for various technologies for central systems; research on breakthrough concepts to separate and capture CO_2 in Carbon Sequestration; and research and development on materials development in Advanced Research.

Lawrence Berkeley National Laboratory

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

Coal

LBNL conducts research in the following areas: concepts for various technologies for central systems and research and development on geologic sequestration approaches and measurement, monitoring, and verification protocols in Carbon Sequestration.

Lawrence Livermore National Laboratory

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

Coal
Research will focus on geologic sequestration approaches.

Los Alamos National Laboratory

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

Coal
Research supports the following: (1) concepts for various technologies for central systems; (2) research and development in the area of Carbon Sequestration to lower the costs of CO_2 capture, provide fundamental scientific information on engineered geologic sequestration approaches, and develop advanced instrumentation to measure and validate geologically sequestered carbon; and (3) research and development in the area of Advanced Research to model mineral sequestration and develop hydrogen separation membranes.

National Energy Technology Laboratory

The National Energy Technology Laboratory (NETL), located in Morgantown, West Virginia, Pittsburgh, Pennsylvania, Tulsa, Oklahoma, and Fairbanks, Alaska 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
Scientists and engineers at NETL conduct basic and applied research and development in to the Coal programs. In-house research in the coal gasification area involves advanced materials testing, gas-stream pollutant removal, sorbents development, and membrane separations. NETL researchers are also working to improve the next generation of gas turbines, fuel cells, and coupled turbine-fuel cell systems. 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 conducted to utilize advanced simulation techniques to improve and speed the development of cleaner, more efficient energy devices and plants.

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, Tulsa, OK, and Fairbanks, AK.

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 site at Albany, Oregon.

Oak Ridge National Laboratory

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

Coal
The Oak Ridge National Laboratory conducts research in the following areas: (1) advanced materials that are applicable to advanced coal based power generation systems in Fuels and Power Systems; Carbon Sequestration to further geologic sequestration concepts, including measurement, monitoring and verification; and Advanced Research to develop materials.

Pacific Northwest Laboratory

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

Coal
The Pacific Northwest Laboratory conducts research and development in the areas of Advanced Research to perform materials research and environmental analyses and Fuel Cells in support of the DOE-Solid State Energy Conversion Alliance (SECA) program.

Sandia National Laboratories

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

Coal
The SNL conducts research and development in the area of Carbon Sequestration on injection of CO_2 into depleted oil and gas formations, and advanced monitoring methodologies based on advanced seismic concepts. SNL also conducts research and development in the area of Advanced Research to develop hydrogen separation membranes and conduct fundamental combustion research.

Washington Headquarters

Coal
This funding provides program support and technical support for each of the programs within the Coal Program.

Program Direction
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.

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

Coal

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2009 Additional Appropriation	FY 2010
Coal				
Clean Coal Power Initiative	67,444	288,174		0
FutureGen	72,262	0		0
Fuels and Power Systems	340,165	404,236		403,865
American Recovery and Reinvestment Act			3,390,000	
Total, Coal	479,871	692,410	3,390,000	403,865

Mission

The mission of the Coal program is to ensure the availability of near-zero atmospheric emissions, abundant, affordable, domestic energy (including hydrogen) to fuel economic prosperity, strengthen energy security, and enhance environmental quality.

Benefits

There is the growing consensus that steps must be taken to significantly reduce greenhouse gas (GHG) emissions from energy use at a pace consistent with climate change goals, and that carbon dioxide (CO_2) capture and geologic storage (CCS) is a promising option for addressing this challenge. FE RD&D is a major component of the global activities needed if coal power plants with cost-effective CCS (coal/CCS) are to be widely deployed. Regarding these activities:

- Coal/CCS allows the US to obtain continued economic benefits and energy security from large domestic coal resources under significant CO_2emission constraints.
- Coal/CCS is not currently cost-effective; however projects being considered by FE RD&D could considerably reduce costs of CO_2 capture. Most cost-reduction opportunities are in the area of CO_2 capture.
- Barriers to CO_2 storage include safety, permanence, and geologic storage capacity. Considerable progress in these areas has been made under FE's Regional Carbon Sequestration Partnership (RCSP) program. The RCSPs are beginning to implement large-scale CO_2 storage tests in locations throughout the U.S. and Canada.

- A significant number of additional demonstration projects carried out under the Clean Coal Power Initiative (CCPI) program are intended to prove the commercial viability of a suite of coal/CCS technology options.

- Widespread commercial deployment will require an extensive CO_2 transportation infrastructure, indemnification framework, regulatory certainty and public acceptance.

- CCS may be ready for mass commercial deployment in selected applications by 2020.

Climate Change Technology Benefits

The FE Coal Program is a direct contributor to DOE's carbon reduction portfolio, focusing on reduction of greenhouse gas emissions through significantly improved generation efficiency and CO_2 capture and storage (CCS). For CCS to make gigaton-level reductions in CO_2 emissions by 2050, it will need to be a reasonable-cost option for major types of coals and in a variety of geologic storage settings. The cost of deploying currently available CCS technologies is very high (e.g., approximately an 80 percent increase in the cost of electricity for a supercritical pulverized coal plant with stack capture of CO_2, though significantly less for gasification systems with pre-combustion capture). The Fuels and Power Systems program is supporting R&D on a variety of major cost-reduction technology innovations which could help make CCS a viable domestic and global option.

Contribution to the Secretary's Priorities

The Clean Coal portion of Fossil Energy applies directly to the Secretarial Priority 2.3; Clean Energy: Develop and deploy clean, safe, low carbon energy supplies. The primary focus of the Clean Coal program is to reduce the cost and environmental impacts of CCS technologies, thereby enabling a low CO_2, domestic, secure supply of electricity.

The development of CCS technologies also applies to the following Secretarial Priorities:
Priority 5.1: Provide science and technology inputs needed for global climate change negotiations
Priority 5.2: Develop and deploy technology solutions domestically and globally

Contribution to GPRA Unit Program Goal 1.2.08.00 (Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production)

- The Clean Coal Power Initiative, by or before 2010, will initiate demonstration projects for advanced, high efficiency coal-based power generation capable of achieving: 40 percent electrical efficiency (exclusive of energy consumption for carbon capture); nitrogen oxide (NO_x) emissions of less than 0.15 lb/MMBTU and sulfur dioxide emission of 0.04 lb SO2/MMBTU or lower. By or before 2015 the program will verify or validate that commercial scale carbon capture and sequestration or beneficial reuse technologies that target to achieve 90% capture efficiency for carbon dioxide are ready for deployment in the coal-fired utility industry.

- The Innovations for Existing Plants activity is directed to the development of technology to reduce CO_2 emissions from pulverized coal (PC) power plants, which is the current standard industry technology for coal-fueled electricity generation. This program will develop

technologies to separate CO_2 that can be economically and effectively employed on existing PC power plants. By 2013, complete bench-scale (1 scfm to 1000 scfm) development of advanced post-combustion and oxy-combustion CO_2 capture technologies capable of 90 percent CO_2 capture at no more than a 35 percent increase in the cost of electricity (COE). By 2016, complete field testing on flue gas slipstreams (1,000 to 12,000 scfm, or 0.5 to 5 MW) at operating power plants and other large-scale facilities of advanced oxy-combustion and post-combustion CO_2 capture technologies that achieve 90 percent CO_2 capture at no more than a 35 percent increase in COE. By 2020 complete full-scale demonstration (>25MW) of advanced oxy-combustion and post-combustion CO_2 capture technologies that achieve 90 percent CO_2 capture at no more than a 35 percent increase in cost-of-electricity.

- The Advanced Integrated Gasification Combined Cycle (IGCC) activity will develop by 2010 advanced IGCC technologies that can produce electricity from coal at 45 to 50 percent efficiency based on higher heating value (HHV) at a capital cost of $1600/kW (in 2007 dollars). By 2012, advanced IGCC technologies will be integrated at pilot scale with CO_2 separation, capture, and sequestration into "near-zero" atmospheric emissions configurations that can ultimately provide electricity with less than a 10 percent increase in COE.

- The Advanced Turbines activity, by 2010, will develop technology capable of delivering advanced turbine performance on a coal-based synthesis gas fuel at a combined cycle power island that can produce electricity that is 45 to 50 percent efficient (HHV). Specifically, by 2010, advanced turbine technology will deliver a 2 to 3 percentage point improvement in the HHV efficiency of a combined cycle power island and reduce its capital cost ($/kW) by at least 10 % through higher power output when compared to previously available systems. This will be done while maintaining 2 ppm or less NOx emissions, when fueled by Hydrogen. By 2012, advanced turbines will be developed capable of firing up to 100 percent hydrogen.

- The Carbon Sequestration activity, by 2012, will develop technologies to separate, capture, transport, and sequester CO_2 using either direct or indirect systems that result in a less than 10 percent increase in COE. By 2012, the program will have developed methodology capable of predicting CO_2 storage capacity in geologic formation to within +/-30 percent of actual storage capacity. By 2018, Best Practice Manuals for site selection, characterization, operational, and closure practices will be completed.

- The Fuels activity, by 2010, will complete testing to show the feasibility of modules capable of producing hydrogen from coal at $0.9 per kilogram ($30/barrel crude oil equivalent, without delivery, incentives or tax credits, in constant 2002 dollars) when integrated with advanced coal power systems. By 2012, gasifier products will be characterized to assess the impact of contaminants on gas cleanup systems in order to identify the best product mix and environmental mitigation strategy.

- The Fuel Cells activity, by 2010, will increase reliability of the Solid State Energy Conversion Alliance (SECA) fuel cell technology to commercially acceptable levels and reduce the cost of the fuel cell power block to $400/kW (2000 dollars, assuming 250 MW per year production); and provide the technology base to permit low cost ($400/kW in 2000 dollars,a 10-fold reduction

versus the 2000 baseline), ultra-clean, 40-60 percent electrical efficiency (when coal fueled), and kilowatt-scale solid oxide fuel cell modules for grid-independent distributed generation applications. Within current SECA industry teams, a new SECA manufacturing element will be initiated in FY 2009, with a scheduled completion date of FY 2012. By FY 2015, the activity will have tested multi-MW-class, coal and carbon capture fuel cell systems with a minimum 50 percent HHV efficiency, emissions of less than 0.5 ppm nitrogen oxides, carbon capture ready and suitable for integration with high efficiency gasification. Ultimately, by FY 2018, technology will be developed for 250 MW-class pressurized fuel cell/turbine systems for integration with high efficiency gasification. These direct carbon capture systems capable of 50 to 60 percent HHV efficiency when integrated with gasification will be available for demonstration in 2020.

- The Advanced Research activity conducts research that helps sustain U.S. pre-eminence in fossil fuel technology by supporting development of materials, computational methods, and control system knowledge needed to bridge gaps between basic science and engineering development. Advanced Research efforts will allow development, of enabling technologies that support the goals of near-zero atmospheric emissions energy for next generation power systems.

Means and Strategies

Fossil Energy 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 Department will implement the following means:

- Fossil Energy will engage the scientific, academic and industrial communities, and other public sector entities, including the states, to identify research needs and opportunities; technology strategies for addressing the highest priority needs; and the appropriate government roles in meeting those needs. The program will be implemented through competitively solicited, cost-shared public-private partnerships.

The Department will implement the following strategies:

- It will employ a systematic approach to monitor the spectrum of R&D needs to better select and plan activities with a clear governmental role. Such an approach will ensure better planning and execution. Periodic external reviews will be conducted to ensure that the program maintains its focus and terminates projects that industry can fund.

These strategies will result in the acceleration of the commercial availability of cost-effective, lower emission coal utilization technology that will save consumers money, improve the environment, and enhance security through the use of an abundant, domestic energy resource.

The following external factors could affect FE's ability to achieve its strategic goal:

- The benefits of some of FE's R&D, such as carbon sequestration, are dependent on future actions that strongly incentivize reduction of greenhouse gas emissions.

- Program results may also be affected by world prices for competitive feedstocks and energy technologies; new and evolving environmental regulations or any new legislation; industry restructuring/deregulation issues and uncertainties; and technology advances in the private sector.

In carrying out the program's mission, FE performs the following collaborative activities:

- The impact of the program is expanded by: performing R&D activities in partnership with universities, state and local governments, industry, and other stakeholders; using cost-shared projects and diverse technology paths to improve chances of success, and to create a direct technology transfer component; seeking synergy with the capabilities of multiple governmental agencies and industry, including the unique capabilities of National Laboratories; collaborating with other agencies to effectively promulgate revolutionary domestic energy technologies; investing jointly with other groups in promising technologies for target areas; conducting field demonstrations in collaboration with industry, academia, and others; and transferring technologies in cooperation with state and industry organizations.

Validation and Verification

The program and projects contained within this goal will be evaluated by peer review at annual contractor meetings and other forums. 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 independent external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the Government Accountability Office, the Department's Inspector General, the National Research Council, the U.S. Environmental Protection Agency, state environmental and health agencies, 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.

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
GPRA Unit Program Goal 1.2.08.00 (Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production)					
Clean Coal Power Initiative					
Initiated 100% of the active industrial projects selected under the first round of the competitive CCPI solicitation and made project selections from the second round CCPI solicitation. (MET GOAL)	Made go/no go decisions regarding award of cooperative agreements for all projects selected under Round 2 CCPI. (MET GOAL)	Award CCPI-2 projects based on decisions made in FY 2006 (MET GOAL)	Make go/no go decisions regarding continuation applications for projects awarded under Rounds 1 & 2 CCPI that will promote and bring the best emerging new coal-based power generating technologies to demonstration through the use of industry partnerships. (MET GOAL) Complete CCPI Round 3 solicitation, proposal evaluations and project selections to assemble the initial portfolio of advanced technology systems that sequester carbon dioxide to encourage the Nation's energy industry to identify and cost share the best emerging new coal-based power generating technology. (NOT MET)	Complete CCPI Round 3 solicitation, proposal evaluations and project selections to assemble the initial portfolio of advanced technology systems that capture and reuse or sequester carbon dioxide from coal-fired energy systems on a commercial scale to encourage the Nation's energy industry to identify and cost share the best emerging new coal-based power generating technology. The FY 2009 goal in the FY 2009 Congressional Budget Justification was to begin construction of two major CCPI Round 1-2 projects. 2 of the 3 major outstanding Round 1-2 projects have been terminated and funds allocated to the Round 3 solicitation. The remaining major outstanding Round 1-2 project has not yet begun construction.	Begin construction of one major CCPI Round 1-2 project(s) that will promote and bring the best emerging new coal-based power generating technologies to demonstration through the use of industry partnerships. Make awards for CCPI-Round 3.
FutureGen					
	Issued initial site selection solicitation and evaluated sites. (MET GOAL).	Site selection for FutureGen (NOT MET)	Complete the issuance of the Funding Opportunity Announcement for the Restructured FutureGen project that will lead in future years to competitively awarded demonstration projects, which integrate commercial-scale, coal-based power generation with geologic sequestration of carbon dioxide. (MET GOAL)	Conduct the evaluation of project proposals or make recommendations on how to proceed with the FutureGen Program in preparation of identifying project selections under Restructured FutureGen project that will lead in future years to competitively awarded demonstration projects, which integrate commercial-scale, coal-based power generation with geologic sequestration of carbon dioxide. This target is	This target is under development pending a review of the FutureGen program.

subject to revision pending a review of the FutureGen program.

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
Fuels and Power Systems:					
Innovations for Existing Plants					
Developed field performance and cost data for emission control technologies and established baseline for emissions transport from coal-fired boilers in support of proposed mercury and air quality regulations. (MET GOAL)	Conducted initial pilot scale slipstream field test of at least one technology capable of 90% mercury removal. (MET GOAL)	Validate technology improvements for mercury capture technology that translate to 50-75% capture at 50-75% of the 2003 cost of conventional technology of $50,000-$70,000 per pound of mercury captured. (MET GOAL)	Ensure a low cost option for reducing green house gases and allow continued use of the Nation's most abundant fossil resource by validating technology improvements of an advanced power plant with 90% carbon capture that can be extrapolated and translates to an electricity cost increase of 40% when compared to a conventional non-capture power plant. (MET GOAL)	Complete bench-scale (1 scfm to 1000 scfm) development of advanced carbon dioxide (CO2) capture technologies applicable to the existing coal-fired power generation fleet that are capable of 90% carbon capture while achieving less than a 65% increase in cost of energy when modeled at full scale through engineering and systems analyses, compared to a conventional non-capture coal-fired power plant*	Complete bench-scale (1 scfm to 1000 scfm) development of advanced post-combustion and oxy-combustion CO_2 capture technologies are capable of 90 percent CO_2 capture at no more than a 55% increase in cost-of-electricity when modeled at full scale through engineering and systems analyses, compared to a conventional non-capture coal-fired power plant*.
Advanced Integrated Gasification Combined Cycle					
Began construction of slipstream test units, test planning, and testing of advanced gas cleanup concepts using real coal-derived synthesis gas. In FY 2005, the Gasification Technologies program moved ultra-clean cleanup, including economical and efficient sulfur removal and/or multi-contaminant cleanup, a significant step closer to commercialization, eventually leading to capital cost reductions of $60-$80 kW and efficiency improvements of >1 efficiency points and the turbine technology area of Advanced Power showed progress towards the contribution of 2-3 percentage points improvement in combined cycle turbine	Began construction and testing of advanced gas separation technologies. In FY 2006, the Gasification Technologies program moved gas separation, including ceramic membrane, hydrogen separation, CO_2 hydrate formation and ceramic membrane air separation, closer to commercialization, eventually leading to capital cost reductions of $60-$80 per kW from the baseline of $1200/kW(in constant 2003 dollars) for IGCC systems and efficiency improvements of >1 efficiency points.	Validate technology improvements in gas cleanup, air separation, gasifier, and turbine technology that translate to a system with 42% efficiency at a capital cost of $1150/kW (in constant 2003 dollars) and progress toward the 2010 goal of an advanced coal-based power system capable of achieving 45-50% efficiency at a capital cost of $1000/kW (in constant 2003 dollars) or less. (MET GOAL)	43% efficiency from advanced, coal-based, gasification energy plants. Efficiency is the percent of fuel energy converted to electricity. Progress is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation and turbine technology. (MET GOAL) $1840/kW capital cost of advanced, coal-based, gasification energy plants of (in 2007 dollars). Performance is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel),	44% efficiency from advanced, coal-based, gasification energy plants. Efficiency is the percent of fuel energy converted to electricity. Progress is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation, and turbine technology. $1760/kW capital cost of advanced, coal-based, gasification energy plants (in 2007 dollars). Performance is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation and turbine technology.	45% efficiency from advanced, coal-based, gasification energy plants. Efficiency is the percent of fuel energy converted to electricity. Progress is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation, and turbine technology. $1600/kW capital cost of advanced, coal-based, gasification energy plants (in 2007 dollars). Performance is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation and turbine technology.

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
efficiency. (MET GOAL)	(MET GOAL)		gasifier, gas cleanup, air separation, and turbine technology. (MET GOAL)		
Advanced Turbines					
No targets reported	Initiate a prototype combustor module test for large frame engines of low NOx combustion technology (trapped vortex, catalytic, lean premix, or modified diffusion flame) using simulated coal based synthesis gas to demonstrate progress towards a 2 ppm NOx emissions goal. (MET GOAL)	Complete prototype combustor module testing, demonstrate performance of achieving single digit NOx at lower flame temperature (2100° F vs. design inlet temperature of 2500° F and pressures, and identify the two most promising low NOx, high-hydrogen fueled, combustion concepts for further evaluation and testing in Phase II of the hydrogen turbine development projects. (MET GOAL)	Initiate development of large frame hydrogen-fired turbine technologies (Phase II), including final combustion system down selection, and complete the test plan for the full head-end combustion system testing to achieve single digit NOx at progressively higher temperature and pressure. Complete preliminary rig tests of 3rd stage turbine blades as input to design for ability to withstand increased power output to ensure the availability of a new generation of electric power generating "platforms". (MET GOAL)	Quantitative performance goals under development.	Quantitative performance goals under development.
Carbon Sequestration					
Completed at least two pilot scale tests on emerging advanced capture technologies related to oxyfuel, sorbents, membranes or hydrates. (MET GOAL)	Performed pilot-scale testing and also laboratory testing of different CO_2 capture technologies to lead to significant improvement in cost and performance, and initiated field sequestration activities within the Regional Partnerships, including selecting and awarding seven Phase II Regional Carbon Sequestration Partnerships that will begin to evaluate regional infrastructure and technologies to	Validate technology improvements on carbon capture technology that can be extrapolated and translate to 90% capture at a cost of electricity increase of 20% when compared to an equivalent state-of-the-art non-sequestered plant. (MET GOAL)	Award initial round of Phase III (deployment) of the Regional Carbon Sequestration Partnerships, conduct site selection, and complete National Environmental Policy Act (NEPA) activities for at least four large volume field tests through the use of industry partnerships, bringing the best emerging new coal-based power generating technologies to deployment. (MET GOAL) Complete site selection,	Complete the validation phase injection tests of Regional Carbon Sequestration Partnerships Program (Phase II) through the use of industry partnerships, bringing the best emerging new coal-based power generating technologies to deployment. 17% net cost of CO_2 capture and sequestration as measured by percent of cost of electricity. Cost of electricity increase is for 90% CO_2 capture and sequestration when compared to a conventional (off-the-shelf)	15% net cost of CO2 capture and sequestration as measured by percent of cost of electricity. Cost of electricity increase is for 90% CO_2 capture and sequestration when compared to a conventional (off-the-shelf) non-capture power plant. Performance is measured by validating technology improvements of an advanced power plant with carbon capture technology. Inject 1 million metric tons CO_2 at each of two or more large-volume field test sites of

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
	permanently sequester greenhouse gas emissions through small scale validations tests. (MET GOAL)		reservoir modeling, site characterization, and begin injection at depleted oil reservoir, unmineable coal seam, and saline formation to demonstrate that storage of CO2 in geologic formations is a viable greenhouse gas mitigation option to develop technologies that can safely and economically store carbon dioxide (CO_2) from coal-based energy systems. (MET GOAL) 19% net cost of CO2 capture and sequestration as measured by percent of cost of electricity. Cost of electricity increase is for 90% CO2 capture and sequestration when compared to a conventional (off-the-shelf) non-capture power plant. Performance is measured by validating technology improvements of an advanced power plant with carbon capture technology. (MET GOAL)	non-capture power plant. Performance is measured by validating technology improvements of an advanced power plant with carbon capture technology. Inject 0.5 million metric tons CO_2 at least one large-volume field test site to demonstrate the formations capacity to sequester carbon by developing technologies that can safely and economically store carbon dioxide from coal-based energy systems.	different geological conditions to demonstrate the formation's capacity to sequester CO_2.
Fuels					
Completed analysis and continued compilation of data derived from hydrogen separations research and document in the Hydrogen from Coal RD&D Plan. These are in a format that can be used as the basis for developing industry standards needed to design and operate commercial-scale separation technology. (MET GOAL)	Developed industry standards for the design and operation of a bench scale advanced hydrogen separation system, identify such standards and requirements in the RD&D plan, and conduct initial tests of a prototype unit to validate design parameters. (MET GOAL)	Develop industry standards for the design and operation of a scale-up reactor for simultaneous production of additional hydrogen and its separation in accordance with the standards and requirements in the RD&D plan. (MET GOAL)	Design and build a bench scale prototype system that combines multiple gas separation process and meets or exceeds hydrogen separation target of 95% purity to develop more affordable methods to extract commercial grade Hydrogen (H_2). (MET GOAL)	Complete long term testing of bench scale water-gas shift (WGS) membrane reactor systems that demonstrate hydrogen production of 30% over the equilibrium limitation while maintaining 95% hydrogen purity to develop more affordable methods to extract commercial grade Hydrogen.	Complete testing to show the feasibility of modules capable of producing hydrogen from coal at $0.9 per kilogram ($30/barrel crude oil equivalent, without delivery, incentives or tax credits; when integrated with advanced coal power systems.

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
Fuel Cells					
Began prototype validation of technical requirements for low-cost SECA fuel cell systems. Tested prototype capable of achieving SECA cost reductions and efficiency Phase I goals. (MET GOAL) 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. (MET GOAL)	Four SECA industry teams completed phase I prototype validation demonstrating SECA phase I efficiency and cost goals. (MET GOAL) Incorporate seal and interconnect concepts into fuel cell stacks and perform initial tests. (MET GOAL)	Validate technology improvements to the SECA fuel cell stack that reduce projected stack manufacturing costs to at least $250/kW. (MET GOAL)	$600/kW capital cost of solid oxide fuel cell (SOFC) system. Projected system manufacturing cost is measured by validating technology improvements of the SECA fuel system to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants). (MET GOAL) $225/kW capital cost of solid oxide fuel cell (SOFC) stack modules. Projected stack manufacturing cost is modeled by validating technology improvements to the SECA fuel cell stack system to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants). (MET GOAL) 250 mW/cm2 Economic Power Density of solid oxide fuel cell (SOFC) with specific size and fuel type, SOFC on syngas fuel in full system test to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants). (MET GOAL)	$165/kW capital cost of solid oxide fuel cell (SOFC) stack modules. Projected stack manufacturing cost is measured by validating technology improvements to the SECA fuel cell stack to reduce the cost and environmental impact of new advanced coal fired plants ((Integrated Gasification Combined Cycle plants). 300 mW/cm2 Economic Power Density of solid oxide fuel cell (SOFC) with specific size and fuel type, SOFC on syngas fuel in short stack test to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants).	$400/kW (2000 dollars) capital cost of solid oxide fuel cell (SOFC) system. Projected system manufacturing cost is measured by validating technology improvements of the SECA fuel system to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants). $100/kW capital cost of solid oxide fuel cell (SOFC) stack modules. Projected stack manufacturing cost is measured by validating technology improvements to the SECA fuel cell stack to reduce the cost and environmental impact of new advanced coal fired plants ((Integrated Gasification Combined Cycle plants). 300 mW/cm2 Economic Power Density of solid oxide fuel cell (SOFC) with specific size and fuel type, SOFC on syngas fuel in full system test to reduce the cost and environmental impact of new advanced coal fired plants (Integrated Gasification Combined Cycle plants).
Advanced Research					

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
			Complete prototype demonstration of distributed fiber optic sensors capable of selective and accurate gas detection of hydrogen (H_2) and carbon monoxide (CO). in high temperature (500ºC), high pressure (200 PSI0) in harsh (high temperature transient, corrosive and erosive) environments to be used in integrated temperature, pressure, and gas measurement applications by 2009 to enable and enhance the operation of gasification based zero emission power plants by providing measurement of key constituents. (MET GOAL) Complete and validate the development of a prototype virtual power plant steady state simulator that can be integrated with NETL's Advanced Process Engineering Co-Simulator (APECS) together with an immersive virtual engineering plant walk-through environment for use by 2011 to ensure the availability of new generation power systems by reducing the cost and development time required for new coal fired power plants. (MET GOAL)	Quantitative performance goals under development.	Quantitative performance goals under development.
Efficiency Measures					
			Administrative costs as a percent of total program costs. Less than 17 percent. (NOT MET)	Administrative costs as a percent of total program costs. Less than 13 percent. Note – Needs to be revised based on CFO and OMB's proposed	DOE is developing an appropriate methodology for calculating the operational efficiency measure.

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
				efficiency measure	

* FE will validate the FY 2009 and FY 2010 Innovations for Existing Plants goals through an independent review of the probability of achieving the technology performance and the probability that the technology will achieve significant commercial deployment at the target technology performance. FE will also establish cost and performance baselines, and provisions for escalating the baseline cost.

CCPI

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
CCPI			
CCPI	67,444	288,174	0
SBIR/STTR (non-add)			
Total, CCPI	67,444	288,174	0

Description

The mission of the Clean Coal Power Initiative (CCPI) is to enable and accelerate the deployment of advanced technologies to ensure clean, reliable, and affordable electricity for the United States. The CCPI is a cost-shared partnership between the government and industry to develop and demonstrate advanced coal-based power generation technologies at the commercial scale.

The 2010 Budget maintains the 2009 funding level for R&D, but does not provide any demonstration funds because these projects are already strongly supported through the American Recovery and Reinvestment Act (ARRA). ARRA provided $3.4 billion for CCS, about 5 times the 2009 level, of which $800 million is for CCPI. DOE will make dramatic progress in demonstrating CCS at commercial scale using these funds without the need for additional resources for demonstration in 2010.

Benefits

CCPI demonstrations address the reliability and affordability of the Nation's electricity supply, particularly from its coal-based generation. CCPI demonstrations will meet technical requirements set forth in the Energy Policy Act of 2005. CCPI is a key component of the President's commitment to research and development of clean coal technologies to meet this challenge. By enabling advanced technologies to overcome technical risks and bringing them to the point of commercial readiness, the CCPI accelerates the development of new coal technologies for power and hydrogen production, contributes to proving the feasibility of integrating carbon sequestration and power production, and facilitates the movement of technologies into the market place that are emerging from the core research and development activities.

Round I of the CCPI focused on advancing technologies in coal based power generation that resulted in efficiency, environmental, and economic improvements compared to the state-of-the-art. Eight projects were selected under Round I. From Round I, one project has been successfully completed, 2 projects withdrew, 2 projects were discontinued during project development, DOE ceased negotiations prior to award on another, and the following 2 projects are currently active: We Energies/TOXECON and Great River Energy/Increasing Power Plant Efficiency. Demonstration testing is planned to be completed on the We Energies/TOXECON project in 2009 and on the Great River Energy project in 2010. Round II of the CCPI focused on technologies that were applicable to gasification technology and advanced clean-up systems (including mercury control). Four projects were selected under Round II. One project

withdrew and 3 projects remain active. Current Round II projects include: Southern/Transport Gasifier, Excelsior/Mesaba IGCC, and NeuCo (formerly Pegasus)/Mercury and Multi-Pollutant Control. The NeuCo project initiated demonstration testing in 2009. Both the Southern and Excelsior projects plan to complete the NEPA Record of Decision and initiate detailed design by the end of calendar year 2009. In FY 2008, the solicitation for Round III was issued and proposals were received in January 2009. Project selections under Round III are expected in July 2009. A second Round III solicitation will be issued in 2009 using ARRA funds. Round III is focused on projects that utilize carbon capture and sequestration technologies and/or beneficial reuse of carbon dioxide

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Clean Coal Power Initiative	**67,444**	**288,174**	**0**

For FY 2010, continue ongoing Clean Coal Power Initiative (CCPI) Round 1 and Round 2 projects and initiate Round III projects. Based upon project selections and fact finding, CCPI anticipates awards to assemble the initial portfolio of advanced technology systems that capture carbon dioxide for sequestration or beneficial reuse of carbon. Efforts will focus on initiation/completion of National Environmental Policy Act (NEPA) procedures for Round 2 and 3 CCPI projects.

For FY 2009, continue ongoing Clean Coal Power Initiative (CCPI) Round 1 and Round 2 projects to support the President's Coal Research Initiative. In FY 2009, CCPI will complete the Round 3 solicitation, proposal evaluations, and project selections to assemble the initial portfolio of advanced technology systems that capture carbon dioxide for sequestration or beneficial reuse of carbon.

For FY 2008, continue ongoing Clean Coal Power Initiative (CCPI) Round 1 and Round 2 projects and Power Plant Improvement Initiative (PPII) projects. In FY 2008, the solicitation for a third round of projects will be issued.

SBIR/STTR (non-add)	**(1,919)**	**(0)**	**(0)**

In FY 2008, $1,713,000 and $206,000 were transferred to the SBIR and STTR programs respectively. In FY 2009 and FY 2010 this program was removed from sbir/sttr because it is considered a demonstration program and not research and development.

Total, CCPI	**67,444**	**288,174**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
CCPI	
No funding is being requested for the CCPI program in FY 2010. The 2010 Budget does not provide any demonstration funds because demonstration projects are already strongly supported through the American Recovery and Reinvestment Act, including	-288,174

	FY 2010 vs. FY 2009 ($000)
$800 million for CCPI.	
SBIR/STTR (non-add)	
	-0
Total Funding Change, CCPI	-288,174

FutureGen

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
FutureGen			
FutureGen	72,262	0	0
SBIR/STTR (non-add)			
Total, FutureGen	72,262	0	0

Description

The direction of the FutureGen project is currently being evaluated and is pending a program review.

The initial FutureGen program was aimed at establishing the technical capability and potential economic feasibility of co-producing electricity and hydrogen from coal with near-zero atmospheric emissions. The project required integration of subsystems and components being developed commercially, such as gasification and power generation, with low cost CO_2 capture and storage technology that involved considerable risk.

The 2010 Budget does not provide any demonstration funds because these projects are already strongly supported through the American Recovery and Reinvestment Act (ARRA). ARRA provided $3.4 billion for CCS, about 5 times the 2009 level. DOE will make dramatic progress in demonstrating CCS at commercial scale using these funds without the need for additional resources for demonstration in 2010.

In 2008, FutureGen was restructured to accelerate the commercial use of near-zero atmospheric emissions coal technologies. FutureGen's restructured approach proposes multiple 300-600 MW commercial-scale demonstration coal power plants, built in partnership with the private sector, that would operate as demonstration facilities, each producing electricity and capturing and safely sequestering at least one million metric tons each of CO_2 annually. The revised approach focuses on commercial demonstration aspects and would answer the critical questions up front concerning commercial deployment, including feasibility of integrating IGCC with carbon capture and storage, as well as siting and permitting issues, thus accelerating broad commercial deployment of IGCC-CCS

Benefits

The FutureGen program is aimed at demonstrating the technical capability and potential economic feasibility of advanced coal power plants with near-zero atmospheric emissions. The program enhances the continued use of coal, our most abundant and lowest cost domestic energy resource. FutureGen will integrate power generation subsystems and components with CO_2 capture and storage

Detailed Justification

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
FutureGen	72,262	0	0

In FY 2010, FutureGen activities are dependant on a program review.

In FY 2009, FutureGen activities are dependant on a program review.

In FY 2008, activities included drafting and finalization of a Restructured FutureGen program plan, development and issuance of a Request for Information and a Funding Opportunity Announcement (FOA), and review and analysis of proposals received.

SBIR/STTR (non-add) (2,055)

In FY 2008, $1,835,000 and $220,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Total, FutureGen	72,262	0	0

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
FutureGen	
There is no change in funding from FY2009 to FY2010. The current funds available will enable the FutureGen program to continue activities related to NEPA, pending a program review. The 2010 Budget does not provide any demonstration funds because demonstration projects are already strongly supported through the American Recovery and Reinvestment Act (ARRA).	0
SBIR/STTR (non-add)	
	0
Total Funding Change, FutureGen	**0**

Fuels and Power Systems

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Fuels and Power Systems			
Innovations for Existing Plants	35,083	50,000	41,000
Advanced Integrated Gasification Combined Cycle	52,029	65,236	55,000
Advanced Turbines	23,125	28,000	31,000
Carbon Sequestration	115,620	150,000	179,865
Fuels	24,088	25,000	15,000
Fuel Cells	53,956	58,000	54,000
Advanced Research	36,264	28,000	28,000
SBIR/STTR (non-add)	(9,537)	(11,163)	(11,177)
Total, Fuels and Power Systems	340,165	404,236	403,865

Description

The Fuels and Power Systems program provides research to significantly reduce coal power plant emissions (including CO_2) and substantially improve efficiency to reduce carbon emissions, leading to a viable near-zero atmospheric emissions coal energy system and supporting carbon capture and storage.

Background

The Department is developing advanced clean coal technology with a goal of deploying high efficiency coal power plants achieving near-zero atmospheric emissions. The Office of Fossil Energy's Fuels and Power Systems program is leading efforts to make possible greater utilization of the Nation's most abundant energy resource (coal) in an environmentally sensitive way. The core Research and Development (R&D) efforts of the Fuels and Power Systems program focuses on a variety of carbon capture and storage technologies for pulverized coal, oxy-fuel, and gasification plants: post-combustion carbon capture for new and existing plants, improved gasification technologies, development of stationary power fuel cells, improved turbines for future coal-based combined cycle plants, and creation of a portfolio of technologies that can capture and permanently store greenhouse gases.

The Fuels and Power Systems program supports a robust demonstration program, which includes the Clean Coal Power Initiative (CCPI). CCPI seeks to accelerate private sector development of new coal-based power technologies that can meet increasingly stringent environmental regulations, and develops the technological foundation within the Nation's power industry for near-zero emission coal-based energy facilities.

Many demonstration projects are also eligible for Loan Guarantees and/or Tax Incentives, which involve input from the Office of Fossil Energy. The Energy Policy Act of 2005 (EPACT) authorized the U.S. Department of Energy to issue loan guarantees to eligible projects that "avoid, reduce, or sequester air

pollutants or anthropogenic emissions of greenhouse gases" and that "employ new or significantly improved technologies as compared to technologies in service in the United States at the time the guarantee is issued". The 2009 appropriations bill provided $8 billion in loan guarantee volume for coal projects. EPAct also authorized $1.65 billion in tax credits for clean coal projects that utilize Integrated Gasification Combined Cycle (IGCC), advanced coal technologies, or gasification projects for chemicals production. The Energy Improvement and Extension Act of 2008 further added $1.5 billion in tax credits, including $1.25 billion for power projects and $0.25 billion for gasification projects.

In addition to the funding levels reflected in the Fuels and Power Section, Program Direction accounts for NETL Program Specific Activities supporting Fuels and Power Systems. This funding supports Federal staff directly associated with conducting research activities specific to Fuels and Power Systems in Integrated Gasification Combined Cycle, Innovations for Existing Plants, Advanced Turbines, Carbon Sequestration, Fuels, Advanced Research and Fuel Cells.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Innovations for Existing Plants	**35,083**	**50,000**	**41,000**

The IEP activity is focused on the development of post-combustion CO_2 capture technology for new and existing plants. Post-combustion CO_2 capture technology is applicable to pulverized coal (PC) coal power plants, which is the current standard industry technology for coal-fueled electricity generation

Carbon Capture - In FY 2010, continue projects awarded under an FY 2008 Funding Opportunity Announcement (FOA) directed at laboratory and bench-scale research in the areas of oxy-combustion, membranes, advanced solvents and sorbents (post-combustion) and chemical looping. Technology for advanced shockwave compression of CO_2 will also continue.

▪ **Carbon Capture**	**35,083**	**33,000**	**0**

Carbon capture is a primary activity of Innovations for Existing Plants as described above.

In FY 2009, the program continued research initiated in FY 2008 on post-combustion capture, separation, and advanced shockwave compression of CO_2, which is applicable to utility boilers in pulverized coal power plants. Conducted R&D at the laboratory through small pilot-scale on promising concepts for cost-effective oxy-combustion/chemical looping and post-combustion capture of CO_2 emissions from pulverized coal power plants and beneficial uses of CO_2.

In FY 2008, the IEP was refocused to develop advanced technology for post-combustion capture, separation, compression, and beneficial uses of CO_2, which is applicable to pulverized coal power plants.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
▪ **Water Management**	**0**	**12,000**	**0**

No new work will be initiated in FY2010.

In FY 2009, initiate a new competitive funding opportunity announcement for pilot-scale R&D focused on developing and testing advanced water conservation technologies applicable to new and existing thermoelectric power plants. Continued to conduct research on optimizing power plant water use as it is related to CO_2 capture efficiency and optimization that was initiated in FY 2008.

In FY 2008, water management for carbon capture technologies occurred under the carbon capture key activity area.

▪ **Fine Particulate Control / Air Toxics**	**0**	**5,000**	**0**

In FY 2010, funding for this activity will be redirected to work on carbon capture and storage technologies.

In FY 2009, initiated new fundamental and pilot-scale mercury control research to address: challenges associated with mercury removal in the presence of SO_3; balance of plant issues with regards to mercury control such as an increase in fine particulate release, multi-pollutant control for selenium, and the impact of mercury control on by-product materials; and the demonstration of sorbent enhancement additives for mercury control.

In FY 2008, no activity occurred in this area.

▪ **SBIR/STTR (non-add)**	**(998)**	**(1,400)**	**(1,148)**

In FY 2008, $891,000 and $107,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and 2010 amount shown are an estimate of requirement for the continuation of the SBIR and STTR program.

Advanced Integrated Gasification Combined Cycle	**52,029**	**65,236**	**55,000**

The IGCC activity is developing advanced gasification-based technologies to reduce the cost of near-zero emissions (including CO_2) coal-based IGCC plants, to improve the thermal efficiency, and to achieve near-zero atmospheric emissions of all pollutants, including CO_2, SO_2, NO_x, and mercury.

In FY 2010, the subprogram will continue to develop technologies for gas stream purification to achieve near-zero atmospheric emission goals and to meet synthesis gas quality requirements for

(dollars in thousands)

FY 2008	FY 2009	FY 2010

use with fuel cells and conversion processes; to enhance process efficiency and availability; to reduce costs for producing oxygen; and to develop advanced gasification technologies. The successful accomplishment of these activities will enhance the commercialization prospects of advanced near-zero emissions IGCC technologies for the production of electricity for use by utilities, independent power producers, and other industrial stakeholders..

- **Gasification Systems Technology** **48,175** **60,436** **51,000**

Gasification: This activity focuses specifically on technology developments related to the gasification system and targets improvements in electrical efficiencies of 1% to 3 % compared to, capital cost reductions of >$100/kWe, improved availabilities of >5 percent, and up to a 10 percent reduction in operating and maintenance costs compared to the 2003 baseline design in PART. To achieve these targets, activities focus on the advanced transport gasifier, solid feed pump development, coal/biomass co-feeding and gasification, advanced materials and instrumentation, and computational fluid dynamic modeling and dynamic simulation of IGCC plants.

In FY 2010, the Power Systems Development Facility (PSDF) will continue to test and evaluate the transport gasifier and implement modifications to the facility to accommodate testing of advanced carbon dioxide capture and other advanced gasification technologies at various scales of operation. The transport gasifier will be operated using low-rank coals under air- and oxygen-blown conditions to demonstrate the versatility of the gasifier and to provide synthesis gas for the testing of advanced CO_2 separation technologies. Work will also continue on testing of coal/non-food biomass co-feeding and gasification in the transport gasifier, evaluation of catalytic filter elements for possible elimination of the water-gas shift reactors, and testing of advanced syngas cleaning technologies.

Advanced non-chrome-based refractory samples will undergo performance tests and compared to today's chrome-based materials using rotary slag testing. Construction of the 600-ton/day coal feed pump will be completed. Work will continue on the semi-scale test rig to evaluate the pump's ability to co-feed coal and a variety of biomass feedstocks and to identify possible design modifications.

Modeling activities will include extensive computational fluid dynamic (CFD) modeling of the transport gasifier and transport desulfurizer/regenerator. The IGCC dynamic simulator will be delivered to NETL for acceptance testing. Fundamental kinetic data on coal and coal/biomass gasification systems will be generated and kinetic models developed for incorporation into CFD models. *Participants include: SCS, NETL, PWR, VPI, Invensys, IAES.*

In FY 2009, the Power Systems Development Facility (PSDF) activities will focus on modifying the facility to accommodate the testing of advanced carbon dioxide separation technologies. The transport gasifier will be operated using low-rank coals under air- and oxygen-blown conditions to demonstrate the versatility of the gasifier and to provide synthesis gas for the testing of advanced carbon dioxide separation technologies. Testing will commence on the co-feeding and gasification of coal with non-food biomass resources such as wood wastes, switch grass, and

prairie grass to reduce the carbon dioxide footprint of IGCC plants.

Testing of the high pressure coal feed pump continued on the bench scale test unit to provide engineering data to support the design of the pump. Begin detailed design of the 600 ton/day prototype feed pump. Advanced refractory materials development to improve plant availability and reduce operating and maintenance costs in slagging gasifiers will continue with particular emphasis on non-chromium-based materials. Modeling activities will include extensive computational fluid dynamic (CFD) modeling of the transport gasifier including coal/biomass gasification, kinetic modeling of coal/biomass gasification, and the development of a dynamic simulator of an IGCC plant for training plant personnel and others. *Participants include: SCS, NETL, UNDEERC, PWR*

In FY 2008, work at the PSDF will focus on parametric testing using higher rank bituminous coals to determine the degree to which modifications to the transport gasifier (including the addition of a larger riser section and modifications to the solids collection system) will improve carbon conversion and the quality of the synthesis gas and enhance fuel flexibility. Complete evaluation of transport gasifier riser inlet geometry on solids and gas mixing and residence time distribution. Development of non-chromium-based high temperature refractory will continue; test samples will be installed in a commercial gasifier for testing if initial screening results are promising. CFD modeling of the chemical looping processes along with cold flow experimentation for model validation will continue to support the development of the technology. Complete incorporation of ash slagging/fouling chemistry into CFD codes for entrained gasifiers, identify and simulate flyash source constituents in coal, and demonstrate validity and utility of the CFD code for slagging gasifiers. *Participants include: SCS, NETL, Alstom, GTI, and TDA.*

Gas Cleaning/Conditioning: This activity focuses on developing advanced high temperature technologies for achieving near-zero emissions of all pollutants including SO_2, NO_x, particulates, mercury, arsenic, selenium, phosphorous, and cadmium while simultaneously reducing the capital cost of an IGCC plant by at least $250/kWe and increasing plant efficiency by 3-4 percentage points compared to the 2003 baseline design in PART.

In FY 2010, site characterization and environmental assessments will be completed to comply with applicable permitting requirement for the 50 MWe high temperature desulfurization, Direct Sulfur Recovery Process (DSRP), and multi-contaminant (i.e., Hg, As, Se, NH_3) control test units to be integrated with the Tampa Electric IGCC plant. Detailed design of the facility will be initiated. Development of the transport desulfurization CFD model will continue and used to aid in the design of the unit and to develop the experimental test protocol. The development of high temperature sorbents for the capture of ammonia, chlorides, mercury, phosphorous, and other trace contaminants will continue with Promising candidates evaluated at the PSDF or other suitable sites. The most promising materials will be considered for evaluation in the 50 MWe test unit. *Participants include: NETL, RTI, Eastman, GTI, IAES*

In FY 2009, procurement of Phase 1 of the 50 MWe high temperature desulphurization test unit

(dollars in thousands)

FY 2008	FY 2009	FY 2010

project will be initiated. The transport desulphurization CFD model will be used to aid in the design of the absorber and regenerator and to develop the test protocol for the unit. The development of advanced sorbents for the capture of ammonia, chlorides, mercury, selenium, phosphorous, and other trace contaminants will continue with testing of promising materials at the PSDF or other suitable sites. *Participants include: NETL, RTI*

In FY 2008, continue development of advanced sorbents/catalyst and other concepts for removal of all pollutants, including sulfur, ammonia, chlorides, mercury, arsenic, cadmium, and selenium while simultaneously reducing the cost of IGCC systems. Pilot plant testing of an integrated warm gas multi-contaminant synthesis gas cleanup technology will begin pending successful completion of laboratory testing of the concept. Validate CFD model for coupled transport desulfurizer/regenerator using data obtained from the test unit at Eastman Chemical. Preliminarydesign of a 50 MWe equivalent scale unit to evaluate the performance of the high temperature desulfurization and direct sulfur recovery process will be completed. *Participants include: NETL, UNDEERC, GTI, TDA, RTI, Eastman Chemical, and TBD.*

Gas Separation: This activity focuses on developing advanced air separation technologies including Ion Transport Membranes (ITM) with the goal of reducing the capital cost of air separations by >$100/kWe and increasing efficiency by >1 percent in a non-capture IGCC plant.

In FY 2010, continue work under Phase III which comprises design, construction, and operation of the 150-ton/day ITM Intermediate Scale Test Unit (ISTU) which is currently scheduled to begin shakedown in FY2011. Manufacturing infrastructure expansion to meet ITM wafer production needs will be completed and production of the membrane modules for the ISTU will be initiated with delivery commencing near the end of the construction phase. The sub-scale engineering prototype (SEP) unit will continue to be operated as needed to support the design, engineering, and safe operation of the ISTU. Work will continue on the development of a syngas chemical looping technology and a dense metallic membrane for the separation of hydrogen and carbon dioxide from syngas or shifted syngas. An assessment of the technologies will be conducted to provide guidance for future scale-up and testing at the PSDF. Implementation of Phase IV of the Ion Transport Membrane (ITM) program is expected to begin in late FY2010 and will initially focus on the design and construction of the automated membrane manufacturing facility to support the 2,000-ton/day ITM air separation unit currently planned for shakedown in mid 2013. *Participants include: APCI, Ceramatec, RTI, Eltron*

In FY 2009, the 150-ton/day ISTU will begin commissioning to provide engineering performance and design data for integrated operation with a gas turbine. Scale up and cost optimal automation of the membrane and module fabrication process will be developed to support the construction of a nominal 2,000 ton/day air separation unit. *Participants include: APCI, Ceramatec.*

In FY 2008, work will continue on the development of the Ion Transport Membrane (ITM) technology for air separation. The preliminary design of the 150 tpd engineering prototype unit

(dollars in thousands)

FY 2008	FY 2009	FY 2010

will be completed. The economic impact of ITM on a carbon-capture IGCC plant will be evaluated. Provide an assessment of the commercialization potential of the advance steam-iron process for coproducing hydrogen and electricity based on initial test results. Work on the novel metal alloy membrane will focus on optimizing process conditions to demonstrated long-term performance for coal-derived synthesis gas and developing low-cost methods for membrane fabrication. Preliminary design of and subscale engineering prototype (i.e., 200 lb/day of hydrogen) will be initiated. *Participants include: APCI, Eltron, and RTI.*

- **Systems Analysis/Product Integration** **3,854** **4,800** **4,000**

In FY 2010, work will continue on assessing the technical viability and economics of advanced process concepts to support the development and deployment of near-zero atmospheric emissions plants, including CO_2 capture. An engineering analysis of the syngas chemical looping technologies will be conducted to assess the technical readiness for scale-up of the technologies and testing on coal-derived syngas. Concepts for integrating ITM air separation membranes with high temperature gas cleaning technologies in a carbon capture IGCC power plant will be evaluated. Conduct an informational workshop for state environmental and economic regulators and energy officials to assist in providing state-or-the-art information for use in permitting advanced energy plants and developing state policies. Continue updating the worldwide and U.S. gasification databases to reflect the current status of gasification-based project and to incorporate newly announced projects. *Participants include: NETL, RDS, TAMS, Noblis, GTC*

In FY 2009, work will continue on assessing the technical viability and economics of advanced process concepts to support the development and deployment of near-zero atmospheric emissions plants, including CO_2 capture. Studies will focus on completing the baseline design of IGCC plants using low-rank coals with hybrid cooling cycles, updating the economic impact of the ITM air separation membrane on carbon capture demonstrations, advanced IGCC power plants, and other gasification-based processes; the integration and optimization of advanced air separation membranes, and high-temperature synthesis gas cleanup, and coal/biomass co-feeding in advanced energy plants on the cost of electricity. Continue updating the worldwide gasification database to reflect the current status of gasification-based project and to incorporate newly announced projects. *Participants include: NETL, RDS, TAMS, Noblis, GTC*

In FY 2008, work will continue on assessing the economics of advanced process concepts to support the development and deployment of near-zero atmospheric emissions plants, and in particular CO_2 capture demonstrations. Development of the three dimensional dynamic simulation model of an IGCC plant both with and without CO_2 capture will be continued to provide a means for both predicting the performance of carbon capture demonstration plants and to provide preliminary training for plant operators and other personnel. Conduct informational workshops on gasification technologies to state economic and environmental regulators and state legislators and energy officials. Continue updating the worldwide gasification database to reflect current status. *Participants include: NETL, RDS, TAMS, Noblis, and GTC.*

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
▪ **SBIR/STTR (non-add)**	**(1,480)**	**(1,827)**	**(1,540)**

In FY 2008, $1,321,000 and $159,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Advanced Turbines	**23,125**	**28,000**	**31,000**

The Turbines activity is designed to enable the cost effective implementation of the Climate Change Technology Program and carbon capture and storage technology. The focus is on creating the technology base for turbines that will permit the design of near-zero atmospheric emission - IGCC plants (including CO_2 capture and storage). Key technologies are needed to enable the development of advanced turbines that will operate with near-zero atmospheric emissions and higher efficiency when fueled with coal-derived hydrogen fuels.

▪ **Hydrogen Turbines**	**23,125**	**28,000**	**31,000**

In FY 2010, the Advanced Turbines activity will be implementing projects that will enable efficient, clean and cost effective hydrogen fueled turbines for coal-based integrated gasification combined cycle power systems that capture and sequester CO_2.

By FY 2010, the hydrogen turbine development effort conducted by both GE and Siemens Power Generation (SPG) will have completed the second year of a five-year Phase II work effort focused on component testing and validation. These components are designed for turbine systems required to meet the FY 2010 Advanced Power Systems performance goals and to provide hydrogen turbine technology for CO_2 capture demonstration projects. FY 2010 work will focus on identifying the most promising material systems (base alloys, bond coats and thermal barrier coatings) for hot gas path parts including rotating and stationary airfoils. Technology for enhanced cooling effectiveness of hot gas path parts will also be pursued. Methods for reducing leakage in the combustor-expander transition piece and the airfoil tip-casing interface will be developed. These improvements will result in higher turbine efficiency for plants with lower cost-of-electricity.

In FY 2010, work will continue with the NETL in-house research group, other national laboratories and U.S. universities to assess combustor designs and the fundamentals associated with hydrogen combustion and turbine subsystems. Work with Lawrence Berkley, and Ames National Laboratories on hydrogen combustion and heat transfer, respectively, will be continued. The University Turbines Systems Research Program will continue to address applied fundamentals for hydrogen and syngas fueled turbines. *Participants include: GE, Siemens Power Generation, UTSR (Clemson), Ames Lab, LBNL, NETL.*

In FY 2009, the Advanced Turbines activity will be implementing projects that will enable efficient, clean and cost effective turbine-based power systems that use coal-derived fuels and capture and sequester CO_2.

By FY 2009, the hydrogen turbine development effort conducted by both GE and Siemens Power

(dollars in thousands)

FY 2008	FY 2009	FY 2010

Generation (SPG) will have completed the first year of a five-year Phase II work effort focused on component testing and validation. These components are designed for turbine systems required to meet the FY 2010 Advanced Power Systems performance goals and to provide the latest hydrogen turbine technology for carbon capture demonstration projects. FY 2009 work will focus on the refinement of combustor designs and the development and testing of the turbine expander section of the machine to reduce leakage, improve efficiency and increase power output.

Turbine and combustor development work with Siemens Power Generation (SPG), and Clean Energy Systems, Inc., for oxy fuel based systems that capture 100 percent of the CO_2 emitted from coal based plants, will be concluded.

In FY 2009, work will continue with the NETL in-house research group and other national laboratories to assess combustor designs and the fundamentals associated with hydrogen combustion and turbine subsystems. Work with Oak Ridge, Lawrence Berkley, and Ames National Laboratories on materials, hydrogen combustion and heat transfer, respectively, will be continued. The University Turbines Systems Research Program will continue to address applied fundamentals for hydrogen and syngas fueled turbines. *Participants include: GE, Siemens Power Generation, UTSR (Clemson), Ames Lab, ORNL, LBNL, NETL.*

In FY 2008, the Hydrogen Turbines Program will be implementing projects that will enable highly efficient, clean and cost-effective turbine-based power systems that use coal-derived fuels and capture and sequester CO_2. Project work initiated in FY 2005-2006 through the Hydrogen Turbines solicitation will contribute to significantly increasing combined cycle efficiency, reducing NO_x emissions and reducing the combined cycle power island capital cost. These turbines designed to operate on 100 percent hydrogen fuels will make possible coal-based power systems that dramatically reduce CO_2 emissions. Additional work will be conducted on the fundamentals of hydrogen combustion for MW-scale turbines as well as advancing CO_2 compression turbo machinery to minimize the compression penalty in coal-based carbon capture plants.

By FY 2008, both GE and SPG will have completed their Research and Development Implementation Plans and limited preliminary screening testing (Phase I) of their hydrogen turbine projects. Both projects will be initiating Phase II work. Phase II work will focus on the detailed designs of components and systems required to meet the 2010 and carbon capture demonstration objectives, and perform validation testing of combustion systems and machine components with a focus on demonstrating the ability to attain the 2010 Turbine Program performance goals. By FY 2008, the results of the concluded SPG catalytic combustion work will be incorporated into their hydrogen turbine development project.

Work on advanced CO_2 compression technology with Southwest Research Institute and Ramgen Power Systems to reduce the parasitic power consumption and capital cost associated with CO2 compression will be transitioned to the Innovation of Existing Plants activity area.

In FY 2008, work on oxy-fuel based turbines (SPG) will be concluded at the end of Phase I work.

(dollars in thousands)

FY 2008	FY 2009	FY 2010

The associated oxy-fuel combustion system (Clean Energy Systems, Inc.) for this turbine will also be concluded. Work from these two projects will have identified plant performance and configurations for near-term and long-term systems with near-zero atmospheric emissions and carbon capture.

In FY 2008, work will continue with the NETL in-house research group, and other national laboratories to assess combustor designs and the fundamentals associated with hydrogen combustion and turbine subsystems. This work will be applicable to large-frame turbines and MW-scale turbines. *Participants include: GE, Precision Combustion, Inc., Parker Hannifin, Siemens Westinghouse, SwRI, NETL, LBNL, NIST, Ames Lab.*

- **SBIR/STTR (non-add)** **(657)** **(784)** **(868)**

  In FY 2008, $587,000 and $70,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Carbon Sequestration **115,620** **150,000** **179, 865**

The mission of the Carbon Sequestration activity 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. The technologies developed through the Sequestration activity will be used to benefit the existing and future fleet of fossil fuel power generating facilities by reducing the cost of electricity impacts and providing protocols for carbon capture and storage demonstrations as they are designed to capture, transport, store, and monitor the CO_2 injected in geologic formations while prioritizing the most cost-effective applications. No funding is provided for reforestation or other terrestrial sequestration.

- **Greenhouse Gas Control** **105,985** **136,000** **130,865**

  The overall goal of the carbon sequestration program is safe, cost effective, permanent storage of CO_2. All Greenhouse Gas Control activities support this effort and that for CO_2 capture demonstrations.

The Carbon Sequestration Regional Partnerships (CSRP) program consists of seven Regional Partnerships and has been implemented in 3 Phases: I) Characterization phase; II) Validation phase and III) Development phase. Phase I focused on characterizing regional opportunities for carbon capture and storage, identified CO_2 sources, and identified priority opportunities for field tests. Phase II has focused on the small scale field tests in a variety of geological storage sites in the US and Canada. Phase III, commenced in FY 2008, will help the development on a large scale of CO_2 capture, transportation, injection, and storage such that it can be achieved safely, permanently, and economically. Public outreach and education have been an important component of each of these phases.

In FY 2010, significant activity for the nine projects within Phase III will be conducted at the

(dollars in thousands)

FY 2008	FY 2009	FY 2010

initial sites for large volume sequestration tests. The large-scale field tests will be near the end of the first stage of the projects consisting of site selection and characterization, NEPA, pre-injection monitoring, and permitting. This initial stage was estimated to last two to four years depending on the site selected for storage and information known at the site. The next stage, CO_2 injection and monitoring, is planned for three to five years of operation depending on source and availability of CO_2 at the project sites. Some projects starting into the second stage of the project will be undertaking injection operations for large volume injection tests that will last several years with extensive monitoring and modeling. A significant volume of CO_2 (1 million metric tons) should be injected at each of two or more sites at a rate of 1 Mte/yr/site. These large-volume injections are needed to demonstrate the formations selected for storage are capable and have the capacity to sequester carbon. These injections are also needed for the development of technology that can safely and economically store carbon dioxide from coal-based energy systems.

CO_2 capture projects, awarded through a FY 2009 solicitation, will be starting and progressing the area of pre-combustion CO_2 capture including novel concepts, system analysis, bench-scale, and pilot-scale projects in an effort to reduce the cost associated with capturing CO_2 for sequestration.

Projects will be started from a Funding Opportunity Announcement (FOA) that looked for Innovative and Advanced Technologies and Protocols for Monitoring/Verification/Accounting (MVA), Simulation, and Risk Assessment of Carbon Dioxide (CO_2) Sequestration in Geologic Formations. This FOA is specifically focused on development of innovative, advanced technology and protocols for: (1) monitoring, verification, and accounting (MVA) of CO_2 sequestration in geologic formations; (2) simulating the behavior of geologically-sequestered CO_2; and (3) conducting risk assessments associated with geologic CO_2 sequestration activity. Applications submitted in response to the FOA will address key challenges with the integration of MVA, Simulation, and Risk Assessment of CO_2 sequestration in geologic formations. The specific objectives of the FOA are to develop technologies and protocols that will significantly improve our ability to:

- *Monitor* the movement of CO_2 into, through, and out of the targeted geologic storage area;
- *Verify* the location of CO_2 that has been placed in geologic storage;
- *Account* for the entire quantity of CO_2 that has been transported to geologic storage sites;
- Mathematically *simulate* the placement, storage, movement, and release of carbon dioxide (CO_2) into, through, and from geologic formations; and
- *Assess the risks* associated with the placement of the CO_2 in geologic formations and the potential release of CO_2 from these formations after it is stored.

The goal of DOE research in geologic storage is to develop technologies to safely, permanently, and cost effectively store CO_2 in geologic formations and monitor its movement and behavior. This involves developing an improved understanding of CO_2 flow and trapping mechanisms within the geologic formations that can support the development of improved and novel technologies for site construction, reservoir engineering, and well construction. Experience gained from field tests will facilitate the development of Best Practices for site development,

(dollars in thousands)

FY 2008	FY 2009	FY 2010

operations, and closure to ensure that CO_2 storage is secure and environmentally acceptable and does not impair the geologic integrity of underground formations. Several best practices manuals will be initiated or drafted in the different areas of geologic carbon storage. The overall areas include best practices for MVA, site selection, permitting, well construction, risk assessment and mitigation strategies, project implementation, public outreach and education, and site closure. *Participants include: Montana State University, UNDEERC, Univ. of Kansas, Battelle, SRI, Southern Company, Univ. of Delaware, MIT, Consol, IEA, Univ. of Illinois, SSEB, New Mexico Institute of Mining and Technology, California Energy Commission, NETL, LANL, SNL, LLNL, LBNL, PNNL, ORNL, INEEL, BNL, SRNL, TBD.*

In FY 2009, the CSRP Phase II will complete many of the remaining CO_2 injections, continue monitoring, and publish results from the geological sequestration tests involving CO_2 injection and monitoring, verification and accounting (MVA) operations in saline formations, depleted oil and gas fields, and unmineable coal seams. Results of all tests will be compiled and developed into a best management practice manual for estimating site storage capacity, operations, monitoring, and closure. This information will be available and will be refined from results obtained in the Phase III initiative.

The large-scale sequestration projects in Phase III will be in various stages of development during FY 2009 and all will have significant activity scheduled. Injection will be occurring at one of the large-scale sequestration projects and will include the procurement of the CO_2 and the conduct of MVA operations to determine the fate of the CO_2. Monitoring operations will include geophysical surveys, groundwater, vadose zone, and formation water sampling; and atmospheric monitoring. Results will be used to update baseline simulation models. All NEPA requirements will be satisfied for the field projects. Baseline characterization will be completed at the remaining large-scale field project sites which will include geophysical imaging; formation, groundwater, vadose zone, and atmospheric sampling, and simulation modeling (geochemical, mechanical, and flow). Underground injection permits and several deep injection and 15 monitoring wells will be drilled and completed at the field sites during FY 2009. Plans for and initial construction of major infrastructure including CO_2 compression equipment, pipelines, and injection equipment will be initiated at some of the large-scale projects sites.

The National Carbon Sequestration Database and Geographical Information System (NATCARB) will continue to transition to NETL and will begin to implement new tools and continue to enhance information and functionality for the system. NATCARB is a relational database and geographic information system (GIS) that integrates carbon sequestration data from the Regional Carbon Sequestration Partnership and various other sources to provide a national view of the potential of carbon sequestration in the US and Canada. Data from NATCARB will be utilized in the first update to the Carbon Sequestration Atlas of the United States and Canada. This update will be produced and published in FY 2009 based on further refinement of existing data and additional more comprehensive data sets.

The cost of CO_2 capture is a major contributor to the overall costs of CCS; therefore, a Funding

(dollars in thousands)

FY 2008	FY 2009	FY 2010

Opoptunity Anouncement (FOA) will seek projects to help reduce the energy and cost associated with pre-combustion capture.

The work performed by these projects will support the carbon sequestration program to meet its goals of reducing the cost of energy for sequestration of CO_2 from fossil fuel power plants. Fabrication of a technically and economically viable CO_2 capture system based on a polybenzimidazole (PBI) membrane will be demonstrated and a plan for blending the system into an IGCC power plant will be optimized.

A funding opportunity announcement (FOA) specifically focused on projects for Innovative and Advanced Technologies and Protocols for Monitoring/Verification/Accounting (MVA), Simulation, and Risk Assessment of Carbon Dioxide (CO_2) Sequestration in Geologic Formations will be initiated. These efforts help to increase understanding and verify the movement of CO_2 in the subsurface. *Participants include: Montana State University, UNDEERC, Univ. of Kansas, Battelle, SRI, Southern Company, Univ. of Delaware, MIT, Consol, IEA, Univ. of Illinois, SSEB, New Mexico Institute of Mining and Technology, California Energy Commission, NETL, LANL, SNL, LLNL, LBNL, PNNL, ORNL, INEEL, BNL, SRNL, TBD.*

In FY 2008, the CSRP Phase II will complete and publish results for several of the 25 geologic sequestration tests involving CO_2 injection and MMV operations in saline formations, depleted oil and gas fields, and unmineable coal seams. These tests are designed to assess the safety of operations, develop best management practices manuals for operations and monitoring, determine the fate of CO_2 stored in these geologic formations, refine storage capacity estimates, validate formation modeling, and determine future regional opportunities for large-scale deployment of sequestration technologies, should they be needed.

Significant activity for Phase III will be conducted at initial sites for large volume sequestration tests. Expediting large-scale testing in high priority formations will provide important information on the cost and feasibility of deployment of sequestration technologies. Large-scale field testing in a variety of geologic formations across the United States are required to determine, with confidence, the ability of this greenhouse gas mitigation option. These large-scale field tests are needed to identify opportunities for carbon capture technologies to be deployed and investigated throughout the United States. In FY 2008, Phase III will be initiated, including site identification, site development, drilling wells, seismic tests, and other formation characterization measurements that are required before injection can occur

Carbon capture projects awarded through a FY 2006 solicitation will be on-going in the areas of CO_2 capture including novel concepts, system analysis, bench-scale, and pilot-scale projects in an effort to reduce the cost associated with capturing CO_2 for sequestration.

NATCARB will continue to enhance and upgrade the functionality of the Relational Database Management System covering the United States.

Participants include: Montana State University, UNDEERC, Univ. of Kansas, Battelle, Babcock

(dollars in thousands)

FY 2008	FY 2009	FY 2010

and Wilcox, CMU, BOC Group, ARI, SRI, Univ. of Michigan, Univ. of Delaware, Univ. of North Carolina-Charlotte, UOP, Notre Dame, Carbozyme, BP, Kansas State, Univ. of KY, MIT, Consol, IEA, Univ. of Illinois, SSEB, New Mexico Institute of Mining and Technology, California Energy Commission, NETL, LANL, SNL, LLNL, LBNL, PNNL, ORNL, INEEL, TBD.

- **Energy Innovation Hub** **0** **0** **35,000**

In FY 2010, the Energy Innovation Hub for Carbon Capture and Storage will focus on enabling fundamental advances and discovery of novel and revolutionary capture/separation approaches to dramatically reduce the energy penalty and costs associated with CO2 capture. Both computational and experimental studies will be carried out for surface interactions of CO2 and other gases, novel solvents/sorbents, and chemical, physical, and biological separation approaches. There are a number of technical issues associated with Carbon Capture and Storage (CCS), the most challenging of which is to significantly reduce the high cost of capturing CO2 from large stationary emission sources such as coal power plants and transporting for permanent sequestration in either a liquid or solid form. Cost reductions are an imperative for CCS to be a viable technology option in the U.S, and in large coal-dependent developing nations.

- **Focus Area for Carbon Sequestration Science** **9,635** **14,000** **14,000**

In FY 2010, the Geological and Environmental Systems Focus Area will continue applied research in support of Phase III field efforts from the Regional Carbon Sequestration Partnerships (RCSPs), including (1) experimental assessments of materials and conditions consistent with Phase III tests, (2) initial development of a predictive model for the behavior of wellbores exposed to CO_2 and brine under conditions representative of Phase III RCSPs, (3) development of an improved representation of coal capacity as a function of coal properties (for use with RCSPs to improve assessments of coal bed storage potential), (4) continued development and application of a robust science-based framework for site specific risk assessment (coordinated with RCSP activities), and (5) continued assessment of CO_2-water-rock interactions and the potential impact on permeability (reservoir integrity) and compositions of subsurface aqueous fluids (e.g., groundwater).

Advanced methods of CO_2 separation offer the potential to reduce the energy used to remove CO_2 from existing and future power plants. The Energy System Dynamics and Computational and Basic Science Focus Areas are modeling and developing several new techniques to remove CO_2 from synthesis gas, including ionic liquid solvents, CO_2 selective membranes based on ionic liquids, phase-change polymers that absorb CO_2, metal-organic framework sorbents, and sorbents that enhance hydrogen production. Recently, the focus areas have begun to evaluate novel methods to re-use a portion of the CO_2, with the emphasis on exploiting waste-heat to reduce the CO_2. This has the potential to reduce the amount of CO_2 sent to sequestration applications. Current plans are to select and scale-up various technologies with commercial partners for application in FY 2010. *Participants include: NETL, West Virginia University, University of Pittsburgh, and Carnegie Mellon University.*

(dollars in thousands)

FY 2008	FY 2009	FY 2010

In FY 2009, the Geological and Environmental Systems Focus Area will continue to perform collaborative research with the Regional Partnerships and other partners. Emphasis will be placed on saline formation sequestration as the Regional Partnerships prepare for and perform Phase III field projects, but some work will continue to improve the assessment of capacity and injectivity for coal beds.

During FY 2009 a quantitative risk assessment of a Regional Partnership field site will be initiated. This effort will incorporate data from the permanent storage activity and the laboratory/simulation effort. The assessment will consist of rating the risks of negative events on a high to low scale.

The Focus Area will determine if a new class of regenerable solid sorbents can be used at IGCC conditions. These compounds change phases and subsequently absorb and release CO_2 within a small pressure swing, which may provide high-pressure CO_2 separation from coal syngas.

Also during FY 2009, the Focus Area will develop a process design for using ionic liquid as a physical solvent for syngas fuel gas applications. Development and scale-up of a membrane using an ionic liquid impregnated in a high-temperature substrate will also be continued.. *Participants include: NETL, West Virginia University, University of Pittsburgh, and Carnegie Mellon University.*

In FY 2008, the Focus Area for Carbon Sequestration will conduct needed lab scale experiments and simulations to determine expected performance of new CO_2 capture approaches identified by the NETL research group in FY 2007. Depending on the amount of commercial interest and viability, ammonia-based scrubbing studies will be conducted as needed to support deployment by commercial partners. As indicated in FY 2007, membranes for CO_2 separation will be considered for continued improvement and application to carbon capture and IGCC plants.

The Focus Area will continue to support the Regional Partnership field projects. Techniques to ensure permanent storage will continue to be applied at Regional Partnership sites for various geological formations.

By the end of FY 2008, a quantitative risk assessment will be partially constructed and populated with data that could then be applied at individual Regional Partnership field sites. *Participants include: NETL, West Virginia University, University of Pittsburgh, and Carnegie Mellon University.*

- **SBIR/STTR (non-add)** **(3,288)** **(4,200)** **(5,037)**

In FY 2008, $2,936,000 and $352,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Fuels	**24,088**	**25,000**	**15,000**

The Fuels activity helps reduce technological market barriers for the reliable, efficient and environmentally conversion of coal to hydrogen with a goal of $0.9 per kilogram ($30/barrel crude oil equivalent, without delivery, incentives or tax credits). It also is a major contributor to reaching the Fossil Energy GPRA Unit Program Goal 1.2.08.00, Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production.

Specifically, the activity focuses on developing technologies that will facilitate the production of ultra high-purity hydrogen derived from coal for both stationary and mobile applications. Research will target reducing costs specific to production of hydrogen from coal (versus other hydrogen sources), delivering high purity hydrogen to electric power generation turbines as well as ultra-pure hydrogen for use in the transportation sector (such as proton exchange membrane (PEM) fuel cells which require purity at the parts per billion level), and increasing efficiency of the coal-based hydrogen systems, from plant gate to consumer. No funding is provided for synthetic (substitute) natural gas production, coal to liquids and other high hydrogen content liquid carriers, on-board (vehicle) hydrogen storage, or mobile hydrogen utilization (e.g., vehicle engines).

Hydrogen from Coal Research - In FY 2010, continue support for the bench-scale development of hydrogen separation membranes and components capable of performing multiple reactions and separation processes (process intensification), including computational science and systems analysis. Proceed with engineering scale development of advanced hydrogen separation membranes. *Participants include: Argonne National Laboratory, Praxair Corp., NETL, United Technologies Research Corp., Ohio State University, Worcester Polytechnic Institute, Southwest Research Institute, Research Triangle Institute, Parsons, LTI, RDS, SAIC, TMS, TBD.*

▪ **Hydrogen from Coal Research**	**24,088**	**20,000**	**0**

Hydrogen from Coal Research is a primary activity of Innovations for Fuels as described above.

In FY 2009, continue to support Department's overall Hydrogen Program via development of one advanced hydrogen separation module at the engineering scale for evaluation. Activities include: 1) laboratory-scale development of hydrogen separation membranes, (2) laboratory-scale development of components capable of performing multiple reactions and separation processes (process intensification), (3) scale-up of one hydrogen/carbon dioxide separation membrane to the engineering scale, (4) development of a membrane reactor which combines a water-gas shift (WGS) and hydrogen separation in one reactor, and (5) high-speed computation science to provide technical foundations for advanced system components associated with production of hydrogen from coal.

Continue to perform systems engineering studies and analyses to determine optimum strategies for maturing hydrogen from coal technologies, and to gauge technical performance in advancing the state-of-the-art. *Participants include: Eltron Research, Inc., Argonne National Laboratory, Praxair Corp., NETL, United Technologies Research Corp., Media & Process Technologies,*

(dollars in thousands)

FY 2008	FY 2009	FY 2010

Ohio State University, Worcester Polytechnic Institute, Southwest Research Institute, Arizona Public Service, ETEC, Research Triangle Institute, Iowa State University, Louisiana State University, Parsons, LTI, RDS, SAIC, TMS, TBD.

In FY 2008, continue research for the development of novel technology to: 1) separate hydrogen from mixed gas steams while also removing remnant impurities via improved process intensification and filter concepts prior to utilization; and 2) use high-speed computation science to provide the technical foundations for advanced system components associated with the production of hydrogen from coal. Continue to perform systems engineering studies and analyses to determine optimum strategies for maturing hydrogen from coal technologies, and to gauge technical performance in advancing the state-of-the-art.

Also, in FY 2008, activities will be initiated to progress to the next level of maturity by study of potential configurations for scaling up of hydrogen membrane reactors and advanced CO_2/H_2 separation technology systems. Research activities in hydrogen storage will be brought to a logical conclusion. *Participants include: Gas Technology Institute, Eltron Research, Inc., Argonne National Laboratory, Research Triangle Institute, NETL, Southwest Research Institute, TBD.*

▪ **Coal and Coal-Biomass to Liquids**	**0**	**5,000**	**0**

No new work will be initiated in FY2010.

In FY2009, perform systems engineering analyses and computational science to determine optimal strategies for design of coal and biomass to liquids process, gauge technical performance, and provide research guidance. *Participants include: Southern Research Institute, Iowa State University, Louisiana State University, University of Kentucky Center for Applied Energy Research, NETL, ANL, ORNL, LTI, RDS, TMS, TBD.*

▪ **SBIR/STTR (non-add)**	**(685)**	**(700)**	**(420)**

In FY 2008, $612,000 and $73,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Fuel Cells	**53,956**	**58,000**	**54,000**

The objectives of the Fuel Cells activity are to enable the generation of efficient, cost-effective electricity from domestic coal with near-zero atmospheric emissions of CO_2 and air pollutants in

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
central station applications. The objectives also include providing the technology base to permit grid-independent distributed generation applications.			
▪ **Innovative Systems Concepts/SECA**	**53,956**	**58,000**	**54,000**

By 2010, the Fuel Cells activity will increase reliability of the Solid State Energy Conversion Alliance (SECA) fuel cell technology to commercially acceptable levels and reduce the cost of the fuel cell power block to $400/kW in 2010 ($2000 baseline) ; and provide the technology base to permit low, ultra-clean, 50 % to 60 % electrical efficiency (when coal-fueled) and 40 % to 50 % electrical efficiency in distributed generation systems. This element supports CO_2 capture, water reduction, and near-zero atmospheric emissions. From FY2012 to FY2017, the activity will have tested multi-MW class coal-based fuel cell systems, capable of 99 % CO_2 capture with a minimum 50 percent HHV efficiency, low water consumption and near zero emissions. By FY2018, this technology will be ready for 250 MW class atmospheric fuel cell or pressurized fuel cell/turbine systems for integration with high efficiency gasification. These systems, capable of 50 % to 60 % HHV efficiency when integrated with high efficiency gasification, will be economically comparable to current cost-of-electricity and available for demonstration in FY2020. Research and development proceeded to address the key technical issues identified by industry and government managers. *Participants include: FuelCell Energy/ Versa Power (one team), United Technologies/Delphi (one team), Rolls Royce, Siemens Power Generation, General Electric, PNNL, ANL, NETL, LBNL, ORNL, and universities and small businesses.*

In FY 2009, the Solid State Energy Conversion Alliance (SECA) is continuing to develop key technology and advances critical to delivering up to 40 MW fuel cell capacity. Four fuel cell stacks will be validated that demonstrate cost-reduction improvements and scaling features. Work is continuing to complete design and initiate manufacturing for four fuel cell sub-systems demonstrating size enlargement and optimization. The cost-reduction and modular scaling activities of four SECA Fuel Cell Coal-Based Teams will be fully integrated. SECA is continuing cost-reduction activities focused on the $400/kW goal by 2010. Research and development is proceeding to address the key technical issues identified by industry and government managers. Giving careful consideration to high-efficiency coal power plants configurations, activities will start leading to manufacture of up to 15MW. This includes forming teams between existing stack developers and industry capable of developing capacity and delivering hardware by FY 2012. The integration of a manufacturer and fuel cell stack developer will be accomplished either through a solicitation or through normal business practice. *Participants include: Siemens Power Group, FuelCell Energy/ Versa Power (one team), General Electric, PNNL, ANL, NETL, LBNL, ORNL, SNL, universities and small businesses, Two Industry Teams- TBD.*

In FY 2008, SECA demonstrated advances important to delivering 10 MW to 50 MW fuel cell capacity for high-efficiency coal power plants. Tests included four fuel cell stacks demonstrating cost-reduction improvements and three fuel cell stacks demonstrating size enlargement and optimization. The cost-reduction and modular scaling activities of three SECA Fuel Cell Coal-Based Teams were fully integrated. Two teams additionally pursued auxiliary power system

(dollars in thousands)

	FY 2008	FY 2009	FY 2010

development and demonstration based on stacks capable of modular deployment in high-efficiency coal power plants. This ensures early demonstration of reliability, performance and manufacturing capacity. SECA continued cost-reduction activities focused on the $400/kW goal by FY 2010. Research and development proceeded to address the key technical issues identified by industry and government managers. Activities were initiated leading to manufacture of 50 kW for demonstrations, depending on the demonstration plant configuration for fuel cells. This includes forming teams between existing stack developers and industry capable of developing capacity and delivering hardware by 2011. The integration of manufacturer and fuel cell stack developer will be accomplished either through solicitation or through normal business practice. Research and development proceeded to address the key technical issues identified by industry and government managers. *Participants include: General Electric, Siemens Power Group, FuelCell Energy/Cummins Power Generation/Versa Power (one team), Delphi, Acumentrics, PNNL, ANL, NETL, LBNL, ORNL, SNL, universities and small businesses, TBD.*

▪ **SBIR/STTR (non-add)**	**(1,534)**	**(1,624)**	**(1,512)**

In FY 2008, $1,370,000 and $164,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Advanced Research	**36,264**	**28,000**	**28,000**

The Advanced Research activity serves as a bridge between basic and applied research by fostering the development and deployment of innovative systems for improving efficiency and environmental performance while reducing costs of Advanced Fuels and Power Systems.

In FY 2010 two potential new program areas will be investigated under Advanced Research to address breakthrough technologies for carbon capture: transformational technologies for carbon capture will identify and focus on innovative carbon capture technological breakthroughs for new and existing plants and from air; novel electrochemical energy conversion and storage will focus on innovative and novel devices and methods for achieving electrochemical energy conversion and storage.

▪ **Coal Utilization Science**	**12,033**	**10,913**	**10,900**
• **Sensors and Controls Innovations**	**9,159**	**8,500**	**8,100**

Sensors and Controls are an essential and enabling technology for power generation that directly contributes to a system's safe, efficient, and environmentally benign operation.

In FY 2010, carry out the development of new classes of sensors technology capable of monitoring key parameters in harsh environment conditions of coal power systems with near-zero atmospheric emissions, including carbon capture. Projects include fiber-based gas sensors utilizing nanomaterials, micro sensors, laser based trace chemical sensors, and modified sapphire fiber sensors. Support the utilization of sensors with the development of artificially intelligent sensor networks, advanced process controls, and applications of system models. Research efforts will include the design and analysis of self organizing sensor

(dollars in thousands)

FY 2008	FY 2009	FY 2010

networks with embedded intelligence (smart sensors). The development of model based process control systems for gasification and chemical looping processes will be instituted. Fundamental, novel, and innovative technologies that directly contribute to the environmentally benign utilization of coal will be considered and investigated. *Participants include: NETL, Alstom, GE, VPI, Siemens, New Mexico Tech, SNL, Ames Lab, ANL.*

In FY 2009, continue the development of high-tech sensor networks and integrated control systems that improve the efficiency and enhance the reliability and availability of power systems. Initiate technology transfer of sensors and evaluate commercial potential of these new technologies for coal power systems with near-zero atmospheric emissions, including carbon capture. *Participants include: NETL, SNL, Ames Lab, Alstom, GE, ANL, VPI, and TBD.*

In FY 2008, develop new classes of sensors that are capable of monitoring key parameters in harsh environment conditions of coal power systems with near-zero atmospheric emissions, including carbon capture. *Participants include: NETL, SNL, ARC, New Mexico Tech, Univ. of Utah, Ames Lab, GE, VPI, and TBD.*

• **Computational System Dynamics**	**2,874**	**2,413**	**2,800**

Computational system dynamics will develop the capability to utilize immersive, interactive, and distributed visualization technology in the design of next-generation advanced power systems like those under development and implements the use of advanced, distributed computer aided design tools for virtual design groups and develops system tools that will allow the integrated use of information technology in next-generation advanced power systems design including carbon capture.

In FY 2010, continue projects focused on steady state and dynamic simulations along with the framework that supports those simulations. Investigations of basic combustion and gasification chemistry will be conducted to determine mechanisms that effect emissions behavior or coal under advanced and conventional combustion/gasification and use the information for validation purposes and advanced control system development. All work is intended to lead to a suite of products capable of controlling the operation of near zero emission power plants that are based on validated models and highly detailed representations of equipment and processes. *Participants include: Alstom, Tech4Imaging, SNL, CMU, Fluent, University of Colorado, Ames Lab, ORNL, and TBD.*

In FY 2009, integrate co-simulator models with the virtual engineering plant walk-through environment models. The computational system dynamics information is used to validate combustion/gasification models thereby enabling the use of these integrated modeling and simulation packages to aid in the design and evaluation of advanced power systems like those under development for carbon capture demonstrations. *Participants include: SNL, CMU, Ansys, Fluent, University of Colorado, Ames Lab, and TBD.*

(dollars in thousands)

FY 2008	FY 2009	FY 2010

In FY 2008, conduct projects related to steady state simulations, the framework that supports the simulations, and the reduced order models to carry out the simulations for carbon capture demonstrations. This information will be used to validate combustion/gasification models. *Participants include: SNL, CMU, Fluent, Ames Lab, and TBD.*

▪ **High Performance Materials**	**8,569**	**7,735**	**9,100**
• **High Temperature Materials Research**	**3,225**	**3,900**	**4,183**

In FY 2010, continue development and evaluation of structural alloys to significantly improve the performance of the high temperature materials and components needed for advanced combined cycle and advanced coal combustion systems. For example, substrate materials of advanced hydrogen and oxy-fuel turbine blades will have to be able to survive at sustained temperatures of at least 1175 ºC. Develop economical techniques for processing oxide dispersion strengthened materials. Develop joining technologies for materials used in advanced high efficiency, low-emission fossil energy conversion systems. Utilize computational methodologies, such as computer generated phase diagrams, to reduce the time required to develop new alloys for high temperature applications. Continue to evaluate material performance in oxidizing and corrosive atmospheres. Develop nondestructive evaluation techniques that will assess the performance of components both prior to installation and also in-situ. Investigate corrosion performance of materials in CO_2 and in steam-CO_2 environments pertinent to carbon emission reduction and carbon sequestration systems through measurement of the growth rate of oxide scale. This work will provide the fundamental information on structural and functional materials that will need to be used in advanced high temperature, low-emission, and high-efficiency energy systems utilizing fossil fuels. *Participants include: ANL, INEEL, NETL and ORNL, PNNL, and Ames Lab.*

In FY 2009, continue development and evaluation of structural alloys for improved performance of high temperature alloys and components in advanced coal combustion systems. Develop a multi-stage process that can be used for alloy selection for high temperature applications. Evaluate material performance in oxidizing and corrosive atmospheres to provide fundamental information on structural and functional materials that can be used in advanced high temperature, low-emission, and high-efficiency energy systems utilizing fossil fuels. Develop nondestructive evaluation techniques that can assess the performance of high-temperature gas separation membranes, and thermal barrier coating for turbines. Determine the corrosion performance of structural and gas turbine alloys that are pertinent to advanced steam cycle, oxy-fuel combustion, and enriched/pure oxygen combustion systems. Emphasis is placed on the corrosion performance of materials in CO_2 and in steam-CO_2 environments pertinent to carbon emission reduction and carbon sequestration systems. *Participants include: ANL, INEEL, NETL, ORNL, and Ames Lab.*

In FY 2008, develop and evaluate structural alloys for improved performance of high temperature alloys and components, with an emphasis on operating temperatures exceeding 700 ºC. Address the materials related barriers to expediting the use of oxide dispersion-strengthened (ODS) alloys in components required to operate at temperatures higher then are

(dollars in thousands)

	FY 2008	FY 2009	FY 2010

possible with conventionally-strengthened alloys. Develop an understanding of the behavior of ODS alloys in fabrication, and service performance. Assess the feasibility of different material and design approaches to smart protective coatings by exploring new alloying and microstructural routes to improved high-temperature environmental resistance of metallic components. *Participants include: ANL, INEEL, ORNL, and Ames Lab.*

• **Materials for Ultra Supercritical and other Advanced Fossil Energy Power Generation Systems**	**5,344**	**3,835**	**4,917**

In FY 2010, continue development of very high temperature materials for fireside and steamside ultrasupercritical (USC) boiler steam conditions and ultrasupercritical steam turbine applications. Continue long-term testing and analysis of samples to determine material performance in the extreme environments of ultrasupercritical power plants. Explore the use of cast versions of wrought alloys for turbine casings and other large components as a cost saving technology enabling opportunity. Casting methods and optimized chemistry for materials will be investigated to ensure that the required properties are achieved. Develop heat treatment conditions to optimize microstructural stability and mechanical properties of steam turbine materials. Increase research on oxy-fuel combustion processes that produce CO_2 as a more concentrated stream in the flue gas that is easier to capture.

Efforts in molecular- and microstructural-scale modeling of high-temperature alloys, with experimental verification will be undertaken. This is to reduce the time to develop new materials for high temperature applications in energy systems through the synergy resulting from combining both modeling and experimental efforts. *Participants include: ORNL, Energy Industries of Ohio, and NETL.*

In FY 2009, develop materials for fireside and steamside ultrasupercritical (USC) boiler steam conditions and ultrasupercritical steam turbine applications. This development effort is a priority for efforts to commercialize higher efficiency USC power plants. Weldability of rotors, resistance to oxidation, exfoliation of the oxides, and solid-particle erosion are key constraints to achieving USC turbine temperature/pressure steam conditions. Heat treatment conditions will be developed to optimize microstructural stability and mechanical properties of steam turbine materials. Oxy-fuel combustion processes to produce CO_2 as a more concentrated stream in the flue gas that is easier to capture will continue.

The program will explore the use of cast versions of wrought alloys for turbine casings and other large components as a cost savings/technology enabling opportunity. Efforts in molecular- and microstructural-scale modeling of high-temperature alloys, with experimental verification will continue. The purpose of this work is to reduce the time to develop new materials for high temperature applications in energy systems through the synergy that results from combined modeling and experimental efforts. *Participants include: ORNL, Energy Industries of Ohio, B&W, EPRI, NETL, and PNNL.*

In FY 2008, long term effects of fireside and steamside corrosion on ultrasupercritical boiler

(dollars in thousands)

FY 2008	FY 2009	FY 2010

materials will be investigated. Establish heat treatment conditions needed to optimize microstructural stability and mechanical properties of steam turbine materials. Initiate work on oxy-fuel combustion to produces a concentrated CO_2 in the flue gas that is easier to capture. USC technology and oxy-fuel combustion are expected to result in a higher efficiency plant with much lower emissions.

In the area of gas separations, develop a rapid cycling system for air separation into O_2 and N_2 utilizing a molecular sieve material which can be regenerated by electrical swing adsorption (ESA). Conduct fundamental studies on characterizing the influence of thermal activation conditions with respect to O_2 and N_2 adsorption on isotropic pitch-based activated carbon fibers. *Participants include: ORNL, PNNL, Energy Industries of Ohio, NETL, Ames Lab, and LANL*

- **Biomimetics** **0** **0** **50**

In FY 2010, this program will investigate options for biological methods and systems found in nature to design advanced engineering systems and modern technology with the goal of reducing and mitigating processing emissions and effluents from advanced coal power systems. *Participants include: NETL and TBD.*

- **Coal Technology Export** **613** **750** **650**

In FY 2010, create US jobs by working with international organizations to facilitate exporting of U.S. climate technology and energy services to the developing world. Continue the momentum for carbon capture and storage (CCS) in multilateral organizations including International Energy Agency IEA), United Nations, World Energy Council (WEC), and the Carbon Sequestration Leadership Forum and bilaterals with key countries such as China and India.

Generate international support for CCS and work with the WEC to mitigate climate change. Ensure that U.S. policy is reflected in IEA support for G8 initiatives on highly efficient coal-fired power generation and CCS technology. Provide global outreach on advanced coal technology and CCS for climate change mitigation and energy security in multilateral forums including: The IEA, United Nations, WEC, and bilaterals with key countries such as China and India.

In FY 2009, provide global outreach on advanced coal technology for climate change mitigation and energy security. Ensure that U.S. policy is reflected in IEA support for G8 initiatives on highly efficient coal-fired power generation and carbon capture and storage technology. Work with the World Energy Council to promote the uptake of CCS.

In FY 2008, sustain momentum for low/near-zero atmospheric emission technology in multilateral organizations including IEA, United Nations, WEC, and the Carbon Sequestration Leadership Forum and bilaterals with key countries.

- **Environmental Activities** **700** **700** **450**

(dollars in thousands)

FY 2008	FY 2009	FY 2010

In FY 2010, continue analysis of issues associated with air and water quality, solid waste disposal, and global climate change. *Participants include: ANL, ICF, TMS, ORNL, LANL, and PNNL.*

In FY 2009, continue analysis of issues associated with air and water quality, solid waste disposal, and global climate change. *Participants include: ANL, ICF, TMS, ORNL, LANL, and PNNL.*

In FY 2008, continue analysis of issues associated with air and water quality, solid waste disposal, and global climate change. *Participants include: ANL, ICF, Resource Dynamics, TMS, and PNNL.*

- **Technical and Economic Analyses** **560** **900** **500**

In FY 2010, continue studies supporting multi-year planning FE strategy and program formulation; conduct studies on issues that crosscut FE programs including strategic benefits of and new markets for fossil fuel technology. Continue to conduct critical studies to identify major challenges, 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, and TMS.*

In FY 2009, continue studies supporting multi-year planning FE strategy and program formulation; conduct studies on issues that crosscut FE programs including strategic benefits of and new markets for fossil fuel technology. *Participants include: ANL, ICF, EIA, Resource Dynamics, and TMS.*

In FY 2008, continue studies supporting multi-year planning FE strategy and program formulation; conduct studies on issues that crosscut FE programs including strategic benefits of and new markets for fossil fuel technology. *Participants include: ANL, ICF, EIA, Resource Dynamics, and TMS.*

- **International Program Support** **706** **776** **700**

In FY 2010, continue funding the activity of the International Energy Agency Clean Coal Center (IEACCC). This activity is a significant and highly-visible international initiative to advance coal technologies and carbon capture and storage (CCS) as a means to mitigate climate change. Promote the deployment of CCS technologies worldwide. Enhance the competitiveness and adoption of US environmental technology in China and utilize specific initiatives to protect local and global environments through the use of U.S. Clean Coal Technologies in targeted countries.

Continue 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. Preserve and enhance active relationships with national and international

(dollars in thousands)

FY 2008	FY 2009	FY 2010

organizations. Focus on expanding cleaner energy technology power systems activities in Southern and Western regional African countries, the Pacific Rim, South Asia/Near East, and the Western Hemisphere. Determine opportunities for cleaner power systems and clean fuels from coal in targeted countries. Participants to be determined.

In FY 2009, ensure that U.S. policy is reflected in the implementation of G8 initiatives regarding Near-term opportunities for CCS. The subactivity is designed to enhance the competitiveness and adoption of U.S. Clean Energy and Environmental Technology in China and utilize specific APP initiatives to protect local and global environments through the use of U.S. Clean Coal Technologies in targeted countries; and to continue funding the activity of the IEACCC. This activity is a significant and highly-visible international initiative to advance coal technologies.

In FY 2008, continue funding the activity of the IEACCC. Promote the deployment of CCS technologies worldwide. Influence opportunities for cleaner power systems and fuels from coal in selected countries, particularly China and India.

- **Focus Area for Computational Energy Science** **2,224** **3,000** **2,400**

Computational Energy Science develops science-based models of the physical phenomenon occurring in fossil fuel conversion processes and develops multi-scale, multi-physics simulation capabilities that couple fluid flow, heat and mass transfer, and complex chemical reactions for optimizing the design and operation of fuel cells, heat engines, combustors, gasifiers, chemical reactors, and other important unit processes in advanced power generation systems.

In FY 2010, continue development of advanced modeling and simulation capability to optimize the design and operation of advanced zero emission power plants; develop and apply next generation multiphase flow models (MFIX) for complex dynamic analysis of energy conversion and emission control devices. Continue development and application of the Advanced Process Engineering Co-Simulator (APECS) to better understand and optimize the plant-wide performance of next-generation power generation systems, including carbon capture. *Participants include: NETL, CMU, West Virginia University, State of West Virginia, Penn. Supercomputing Center and University of Pittsburgh.*

In FY 2009, continue the development and application of next-generation modeling capabilities for fossil energy applications: the capability for describing particle size distribution, typically found in fossil fuel reactors, will be developed in Multi-phase Flow with Interphase Exchanges code. Continue development and application of the Advanced Process Engineering Co-Simulator (APECS). *Participants include: NETL, CMU, West Virginia University, State of West Virginia, Penn. Supercomputing Center and University of Pittsburgh.*

In FY 2008, using mathematical computational simulations and computer based models continue the development and application of next generation modeling capabilities for fossil energy.

- **University Coal Research** **2,367** **2,413** **2,400**

(dollars in thousands)

FY 2008	FY 2009	FY 2010

In FY 2010, 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. Key research areas supported include advanced power systems including near-zero emission power plants; hydrogen from coal; global climate change; development of advanced materials, sensors and controls; fuel cells; and the technological development of Advanced Coal Systems. Advanced Coal Systems include ultra-clean energy plants that could co-produce electric power, fuels, chemicals and other high-value products from coal. Its key goals are the near-zero release of emissions, including greenhouse gases such as carbon dioxide, by the year 2015, along with substantial increases in energy conversion efficiency for using our Nation's abundant coal resources. The program will continue to solicit applications submitted from individual universities. Selected projects will be eligible for funding of approximately $300,000 for a three-year period. Six to seven competitively selected grants are anticipated to be awarded. Each participating university will be required to provide at least one outstanding student with grant support.

In FY 2009, the University Coal Research (UCR) Program anticipates awarding six grants. Each participating university will be required to provide at least one student with grant support. Allocated funding will also be used to reduce existing commitments which would facilitate the support of additional grants and students in FY 2010 over those possible in FY 2009.

In FY 2008, the UCR Program selected two projects for award with the requirement that at least one outstanding student be supported on the grant.

- **HBCUs, Education and Training** **783** **813** **850**

The Historical Black Colleges and Universities (HBCU) and other minority institutions (OMI) education and training program awards research grants to HBCUs and OMIs which emphasize longer-term research for achieving Fossil Energy's strategic objectives. Funding will be used to conduct Fossil Energy research activities at these institutions and to support an HBCU/OMI annual technology transfer symposium. Participants are determined by an open financial opportunity announcement on research topics that are of highest priority to Fossil Energy's programs.

In FY 2010, three awards are expected to be made and one existing obligation will be completely funded. The maximum grant value is limited to $200,000.

In FY 2009, four awards are expected to be made. The maximum grant value is limited to $200,000.

In FY 2008, four grants were awarded.

- **Liquefied Natural Gas (LNG) Report** **7,709** **0** **0**

In FY 2008, prepare a report on liquefied natural gas as required in the FY 2008 Consolidated Appropriations Act.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
▪ **SBIR/STTR (non-add)**	**(895)**	**(628)**	**(652)**
In FY 2008, $800,000 and $95,000 were transferred to the SBIR and STTR programs respectively. The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.			
Total, Fuels and Power Systems	**340,165**	**404,236**	**403,865**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Innovations for Existing Plants	
The decrease will reduce the number of projects selected under FY 2010 FOAs on bench scale to pilot scale/slip stream testing of the most promising carbon capture technologies.	-9,000
Advanced Integrated Gasification Combined Cycle	
▪ **Gasification Systems Technology**	
The decrease in funding is due to a delay in implementation of Phase IV of the Ion Transport Membrane (ITM) program for the design and construction of the automated membrane manufacturing facility to support the 2,000-ton/day ITM air separation unit and extension of the schedule for the 50 MWe high temperature desulfurization unit. Additional time is needed to achieve cost-effective progress on these activities.	-9,436
▪ **Systems Analysis/Product Integration**	
The decrease in funding is due to the completion of the low-rank coal IGCC and substitute natural gas baseline engineering studies and the reduction to one environmental workshop.	-800
Total, Advanced Integrated Gasification Combined Cycle	**-10,236**
Advanced Turbines	
Hydrogen Turbines	
The increase supports high-priority hydrogen turbine development for carbon capture demonstrations, including refinement of combustor designs and the development and testing of the turbine expander section of the machine to reduce	+3,000

	FY 2010 vs. FY 2009 ($000)
leakage, improve efficiency, and increase power output.	
Carbon Sequestration	
The increase supports Fossil Energy's component of the Department's multi-disciplinary Energy Innovation Hubs (Hubs), which focus on critical science and technology for high-risk, high-reward research to revolutionize how the U.S. produces, distributes, and uses energy. Fossil Energy will support one Hub that focuses on carbon capture and storage.	**+29,865**
Fuels	
Continue hydrogen from coal research to develop novel technology for the production of ultra-pure hydrogen including technologies that simultaneously produce and separate coal-derived hydrogen from membrane or chemical looping advanced concepts. Decrease reflects reduced level of effort in early engineering and design studies on hydrogen production modules. Reduced level of effort for research activities and system studies on coal-biomass mixtures to liquid fuels.	**-10,000**
Fuel Cells	
▪ **Innovative Systems Concepts/SECA**	
Funding for the manufacturing development necessary to prepare for MW scale near-zero emissions coal technology will be reduced. Additional time is needed to achieve cost-effective progress on this activity.	-4,000
Advanced Research	
▪ **Coal Utilization Science (Core)**	
Sensors and Controls Innovations: Funding for projects focused on advanced sensors will be re-scoped.	-13
▪ **High-Performance Materials**	
Increase support to steam turbine materials for ultrasupercritical power plants.	+1,365

	FY 2010 vs. FY 2009 ($000)
▪ **Biomimetic**	
Increase supports the initiation of biomimetic that will pursue biological methods and systems found in nature to design advanced engineering systems to reduce and mitigate processing emission and effluents...	+50
▪ **Coal Technology Export**	
Reduce the level of effort in the coal technology export activity	-100
▪ **Environmental Activities**	
In FY 2010, continue analysis of issues associated with air and water quality, solid waste disposal, and technology to reduce greenhouse gas emissions from fossil energy related sources. Continue to advance the state-of-the-art for carrying out life cycle analysis of advanced greenhouse gas reduction technologies. Participants include: ANL, ICF, TMS, ORNL, LANL, and PNNL.	-250
▪ **Technical and Economic Analyses**	
In FY 2010, continue studies supporting multi-year planning FE strategy and program formulation; conduct studies on issues that crosscut FE programs including strategic benefits of and new markets for fossil fuel technology. Continue to conduct critical studies to identify major challenges, 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, and TMS.*	-400
▪ **International Program Support**	
Reduced level of effort in international program support.	-76
▪ **Focus Area for Computational Energy Science**	
The decrease reflects reduced technical support to NETL from the Supercomputing Consortium. The reduction is due to the emphasis on higher priority research in other Advanced Research programs. Funding for projects will be re-scoped.	-600

	FY 2010 vs. FY 2009 ($000)
▪ **University Coal Research**	
The decrease will still enable the same number or one additional grant to be awarded in FY10 than in FY09 due to less funds being needed to pay off prior year obligations.	-13
▪ **HBCUs, Education and Training**	
This increase will permit increased payment of prior year obligations.	+37
Total, Advanced Research	**0**
SBIR/STTR (non-add)	
The increase in SBIR/STTR is due to an increase in research funding.	(+14)
Total Funding Change, Fuels and Power Systems	**-371**

Natural Gas Technologies

Funding Profile by Subprogram

	FY 2008 Appropriation	FY 2009 Enacted	FY 2010 Request
Natural Gas Technologies			
Natural Gas Technologies	19,270	20,000	25,000
Total, Natural Gas Technologies	19,270	20,000	25,000

Mission

The Natural Gas Technologies Program develops scientific information and advanced technologies to increase environmentally responsible supplies of natural gas (both in North America and around the world) through research and development (R&D) with clear and substantial benefits to the American public.

Benefits

Expanding the Nation's natural gas resource base and energy supply options has substantial economic, energy security, and environmental benefits for the country. Economic benefits include: savings to consumers, through price reductions that accompany supply expansion and increased employment, increased economic viability, royalty payments, tax receipts, and economic activity. Increased national security would be realized through increased and diversified supplies of natural gas to meet the energy needs of American consumers.

1. Developing gas hydrates will allow the US to obtain economic and energy security benefits. Due to recent research, scientists now have the ability to make estimates of the gas hydrate resource in the Arctic and offshore. Previously estimates were based only on estimated sediment volumes existing within the gas hydrate temperature and pressure conditions. In 2008, Minerals Management Service released a new assessment of the amount of methane in place in the Gulf of Mexico. Technically recoverable or economically recoverable resources will be smaller, but cannot be defined without additional exploration and production testing of these potential deposits. In the Alaska North Slope, where the hydrate resources are better known, the US Geological Survey released a technically recoverable methane resource estimate in 2008.

Contribution to the Secretary's Priorities

The Gas Hydrate Program contributes to several Secretarial priorities as follows:

PRIORITY 5.2: Develop and deploy technology solutions domestically and globally: The gas hydrate program coordinates and shares research with scientists in Canada, China, Korea, Japan, European

Union and India, which gives the US access to valuable data sets and innovative research, which accelerates progress in U.S. hydrate technology and allows other nations to develop their own clean energy resources.

Contribution to GPRA Unit Program Goal

The Natural Gas Technologies Program supports the following goal:

Strategic Theme 1, Energy Security - Promoting America's energy security through reliable, clean, and affordable energy.
Strategic Goal 1.1, Energy Diversity: Increase our energy options and reduce dependence on oil, thereby reducing vulnerability to disruption and increasing the flexibility of the market to meet U.S. needs.

The Natural Gas Technologies program has one program goal, which contributed to Strategic Goal 1.1 in the "goal cascade".

GPRA Unit Program Goal 1.1.09.00: 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.

Means and Strategies

The natural gas program will conduct research at national laboratories, universities and in partnership with industry and foreign scientists thru bilateral agreements in order to reach its goals.
Collaboration Activities: The Natural Gas Technologies program accomplishes it goals through collaboration: 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: Balancing environmental impacts of natural gas exploration and production with development of the supply of domestic natural gas is a key factor impacting the market for natural gas technologies. 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.

Validation and Verification

To validate and verify program performance, FE conducts various internal and external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the General Accounting Office, and the Department's Inspector General. 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. The gas hydrate program has a Federal Advisory Committee, which oversees the efforts. Every five years the National Academy of Science is asked to assess the progress and make recommendations on future activities of the gas hydrate program.
Planned Program Evaluation: The Office of Oil and Natural Gas 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) individually monitors projects with status and major milestone reporting documented in a NETL project database.

Annual Performance Results and Targets

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY 2010 Targets
Strategic Goal 1.1.09.00 (Natural Gas Technologies, Abundant Affordable Gas)					
Complete four of the prototype near-term products or field tests from the following critical technology areas: advanced drilling, and 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 and, production and storage. Benefits will be based on modeling estimates. The prototype projects can be found on the program's website. (MET GOAL) (4.56.1)	Complete four of the prototype near-term products or field tests from the following critical technology areas: advanced drilling, advanced diagnostics/imaging, stripper-well enhancement, and gas storage. Conduct exploratory and characterization studies that confirm and/or advance development of methane hydrate exploration technologies or help assess the viability of future production scenarios. (MET GOAL) (4.56.1)	Conduct a drilling and logging program over one or more sites in the Gulf of Mexico or Alaska that are projected to contain high-saturation methane hydrate accumulations within sandstone reservoirs.(MET GOAL)			This target is under development.
Efficiency Measure					
			Administrative costs as a percentage of total program costs for FE. Less than 17 %	Administrative costs as a percentage of total program costs for FE. Less than 17 %	FE is developing an appropriate methodology for calculating the operational efficiency measure.

Annual Outyear Performance Targets

FY 2011	FY 2012	FY 2013	FY 2014
GPRA Unit Program Goal 1.1.09.00 (Natural Gas Technologies, Abundant Affordable Gas)			

Natural Gas Technologies

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Natural Gas Technologies			
Gas Hydrates Technologies	14,453	15,000	25,000
Effective Environmental Protection	4,817	5,000	0
SBIR/STTR (non-add)	—		—
Total, Natural Gas Technologies	19,270	20,000	25,000

Description

The Natural Gas Technologies program focuses on technologies to find and produce gas hydrates and reduce the environmental impacts.

Gas hydrates are a novel potential resource located in Alaska and the Gulf of Mexico and other offshore locations of the U.S., which contains huge resources of natural gas; if only 1 percent were economically producible, the U.S. could triple its resource base. In addition to its potential as a resource, hydrate appears to have implications for the global climate, both as a methane repository and a potential mechanism for CO_2 sequestration. Significant research is needed to provide the knowledge and technology to understand the fundamental characteristics of hydrate by FY 2010, and to commercially produce gas from hydrate starting in FY 2015-2025, when more conventional resources are projected to decline. Because this research is high risk and long term, there is little incentive for industry to take the lead in hydrate development.

DOE's Effective Environmental Protection program has aimed to reduce the environmental impacts of domestically produced natural gas, including developing more cost-effective, environmentally sound technologies for produced water management. This area will have no new activity in FY 2010.

Benefits

Given recent positive research results, the program in FY 2010 will focus on science and technology to find and produce natural gas from methane hydrates. Gas hydrate, located in Alaska and in the Gulf of Mexico and other offshore locations of the U.S., contains significant resources of natural gas (for example, Minerals Management Service estimates that the mean in-place gas hydrate resource within the most prospective reservoirs in the Gulf of Mexico is approximately 6,700 trillion cubic feet (TCF), whereas US consumption is about 21 TCF per year). Assuming funding at requested levels, DOE research will provide the knowledge and technology to enable commercial production of natural gas from hydrates starting in FY 2015 (Alaska) and 2020 (Gulf of Mexico), when more conventional resources are projected to decline. Because this research is high risk and long term and requires unique expertise not resident in most oil and gas exploration and production companies, there is little incentive for industry to take the lead in hydrate research.

The program will also continue to provide effective coordination of gas hydrate related R&D across seven federal agencies, and provide major international collaborative opportunities (including Korea, Japan, India, and China).

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Gas Hydrates	**14,453**	**15,000**	**25,000**

In FY 2010, conduct long-term tests of multiple Arctic production technologies including CO_2 sequestration and conduct supporting laboratory studies and numerical modeling. These tests will be used to determine potential flow volumes that impact the economics of methane hydrate production utilizing vertical and horizontal wells, CO_2 injection, and thermal and mechanical stimulation. Conduct geological/geophysical prospecting and evaluation of data recovered in FY 2009 to identify locations for FY 2011 drilling and coring in the Gulf of Mexico. Conduct field tests of a new pressure-coring system. Initiate planning for offshore expeditions outside the Gulf of Mexico. Expand research into the environmental impacts of potential production, including geomechanical and subsidence issues, methane release, and water production issues. *Participants will include: Chevron JIP, BPXA, ConocoPhillips, USGS, WVU, NETL, National Labs, Rice University, Georgia Tech, MIT, U Texas, Scripps Institute, UCSB, UAF, U. Chicago, and TBD.*

In FY 2009, drill and log multiple Gulf of Mexico locations with interpreted high concentrations of gas hydrate in potentially producible reservoir settings. Continue development of Alaska North Slope production test options. Evaluate the feasibility of injecting CO_2 for methane production and CO_2 sequestration. Conduct laboratory studies to characterize the properties of gas hydrate-bearing sediments. Study the role of gas hydrate in the global carbon cycle. *Participants include: Chevron JIP, BPXA, WVU, Univ. Alaska, UC-SB, Oregon State Univ., NETL, National Labs. , ConocoPhillips, USGS, WVU, NETL, National Labs, Rice, Georgia Tech, MIT, U Texas, Scripps Institute, UCSB, UAF, U. Chicago, and international collaborations.*

In 2008, continue laboratory-based studies of gas hydrate geophysical and geomechanical properties. Continue to develop numerical models of methane production. Initiate competitively selected projects for production systems, remote sensing tools and research into the linkages between gas hydrate and global climate. *Participants included: National Labs, NETL, USGS, Chevron JIP, BPXA, and Univ. Texas.*

Effective Environmental Protection	**4,817**	**5,000**	**0**

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

No new activity in FY 2010

In FY 2009, the program continues funding environmental science and technology development associated with natural gas production including produced water management, produce water beneficial use, and water disposal permitting. Program is developing decision tools, analytical models, and water resources management tools and techniques to aid in natural gas development *Participants include: Western Research Institute, Clemson Univ., ALL Consulting, Univ. Alaska Fairbanks, National Lab,s and TBD.*

In FY 2008 the program initiates competitively selected studies to reduce the cost and environmental impacts of produced water. Technology transfer efforts were also funded. *Participants included: National Labs, Utah Geologic Survey, ALL Consulting, Western Research Institute, Clemson University, University of Alaska-Fairbanks, Colorado School of Mines, and PTTC.*

SBIR/STTR (non-add)	(411)	(560)	(700)

In FY 2008, $367,000 and $44,000 were transferred to the SBIR and STTR programs, respectively.

The FY 2009 and FY 2010 amounts shown are estimated requirements for the continuation of the SBIR and STTR program

Total, Natural Gas Technology	**19,270**	**20,000**	**25,000**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Natural Gas Technology	
• **Gas Hydrate**: Funding levels will expedite accomplishment of program goals for Arctic production technology by 2015 and offshore production technology by 2025, allowing multiple field production tests in 2010.	+10,000
• **Effective Environmental Protection** No activity in FY 2010.	-5,000
• **SBIR/STTR (**Increase reflects increase in budget for Gas Hydrate program and smaller decrease in the Effective Environmental Protection program)	+ (140)
Total Funding Change, Natural Gas Technology	**+5,000**

Oil Technology

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2010 Request
Oil Technology			
Oil Technology	4,817	5,000	0
Total, Oil Technology	4,817	5,000	0

Mission

The Oil Technology Program develops technology and policy options to resolve the environmental, supply, and reliability constraints of producing oil resources.

Consistent with the President's policy to not fund government R&D for oil, the program is requesting no funding in FY 2010.

Benefits

The Oil Technology program has contributed to the technical advancement of producing domestic oil in an environmentally responsible manner to increase energy security.

Contribution to GPRA Unit Program Goal

The Oil Technology Program has supported the following goal:

Strategic Theme 1, Energy Security - Promoting America's energy security through reliable, clean, and affordable energy.

Strategic Goal 1.1, Energy Diversity: Increase our energy options and reduce dependence on oil, thereby reducing vulnerability to disruption and increasing the flexibility of the market to meet U.S. needs.

The Oil Technology Program has one program goal, which contributed to Strategic Goal 1.1 in the "goal cascade."

Program Goal 1.1.10.00: Oil Technology, Abundant Oil: 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.

Means and Strategies

No activity is proposed in FY 2010.

Validation and Verification

To validate and verify program performance, FE has conducted various internal and external reviews and audits. FE's programmatic activities were subject to continuing review by the Congress, the General Accounting Office, and the Department's Inspector General. FE Headquarters senior management and Field managers continue to conduct quarterly, in-depth reviews of cost, schedule, and scope to ensure projects are on-track and within budget.
Planned Program Evaluation: The Office of Oil and Natural Gas 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) technology managers individually monitor projects with status and major milestone reporting documented in a NETL project database.

Oil Technology

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Oil Technology			
Exploration and Production	4,817	5,000	0
SBIR/STTR (non-add)	—		—
Total, Oil Technology	4,817	5,000	0

Description

The Oil Technology Program implemented a policy and technology research and development program to resolve the environmental, supply, and reliability constraints of producing oil resources.

Consistent with the President's policy to not fund government R&D for oil, the program is requesting no funding in FY 2010.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Exploration and Production	**4,817**	**5,000**	**0**

No activity in FY 2010.

In FY 2009, DOE funding for technology solutions focuses on risk based data management, low impact environmental technologies, marginal wells, and enhanced oil recovery. *Participants include: Ground Water Protection Council, Lumedyne, Colorado School of Mines, The Penn State University, University of North Dakota, University of Illinois, National Labs, NETL, University of Kansas, and*

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

TBD.

In FY 2008, funding supported risk based data management, low impact environmental technologies, and enhanced oil recovery. *Participants included: Groundwater Protection Council, Interstate Oil and Gas Compact Commission, The Penn State University, Lumedyne, Colorado School of Mines, University of North Dakota, University of Illinois, University of Kansas, National Labs, and University of Alabama*

SBIR/STTR (non-add)	(137)	**(137)**	**0**

In FY 2008, $122,000 and $15,000 was transferred to the SBIR and STTR programs, respectively.

The FY 2009 amount shown is the estimated requirement for the continuation of the SBIR and STTR programs.

Total, Oil Technology	**4,817**	**5,000**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Oil Technology	
• No activity in FY 2010.	-5,000
• SBIR/STTR decrease associated with R&D decrease.	(-137)
Total Funding Change, Oil Technology	**-5,000**

Program Direction

Funding Profile by Category

	FY 2008	FY 2009	FY 2010
Indirect Program Direction			
Headquarters Indirect			
Salaries and Benefits	16,998	17,885	18,163
Travel	806	750	1,000
Support Services	495	80	80
Other Related Expenses	9,533	10,311	11,688
Total, Headquarters Indirect	27,832	29,026	30,931
Full Time Equivalents	122	122	122
NETL Indirect			
Salaries and Benefits	41,178	42,749	50,600
Travel	1,488	1,545	1,673
Support Services	24,493	25,427	25,000
Other Related Expenses	23,198	24,083	18,990
Total, NETL Indirect	90,357	93,804	96,263
Full Time Equivalents	358	360	387
Total Indirect Program Direction			
Salaries and Benefits	58,176	60,634	68,763
Travel	2,294	2,295	2,673
Support Services	24,988	25,507	25,080
Other Related Expenses	32,731	34,394	30,678
Total, Indirect Program Direction	118,189	122,830	127,194
Full Time Equivalents	480	482	509
NETL Coal Research and Development Direct Program Direction			
Salaries and Benefits	21,388	22,204	23,025
Travel	550	571	543
Support Services	4,312	4,476	5,319
Total, NETL Coal Research and Development Direct Program Direction	26,250	27,251	28,887
Full Time Equivalents	184	182	180
Loan Guarantee for Alaska Natural Gas Transportation Project[a]			
Salaries and Benefits	721	0	0
Travel	99	0	0

[a] No funding is requested for this program because existing balances are sufficient to conduct FY 2010 activities.

	FY 2008	FY 2009	FY 2010
Other Related Expenses	1,490	0	0
Total, Loan Guarantee for Alaska Natural Gas Transportation Project	2,310	0	0
Full Time Equivalents	5	5	5
Import/Export Authorization			
Salaries and Benefits	1,310	1,360	1,360
Travel	20	21	21
Other Related Expenses	518	538	538
Total, Import/Export Authorization	1,848	1,919	1,919
Full Time Equivalents	14	14	14
Total Program Direction			
Salaries and Benefits	81,595	84,198	93,148
Travel	2,963	2,887	3,237
Support Services	29,300	29,983	30,399
Other Related Expenses	34,739	34,932	31,216
Total, Program Direction[b]	148,597	152,000	158,000
Total, Full Time Equivalents	683	683	708

Mission

The Program Direction and Management Support function provides the Federal staff with resources that assist the Office of Fossil Energy (FE) in carrying out its goals. These resources are allocated and the costs are generated based on the goals, strategic directions, priorities, and plans that have been pre-established.

- The Headquarters staff is responsible for providing overall guidance and direction for the program offices. In addition to the Headquarters staff, the NETL performs the day-to-day project management functions of the FE programs. NETL is also responsible for developing project budgets, implementing procurement plans, and other programs and site support activities necessary to achieve their program objectives.

- The NETL staff is also directly associated with conducting in-house research activities for the Coal Research and Development program (the NETL Coal Research and Development Direct Program Direction activity).

- Alaska Natural Gas Transportation Project - The Loan Guarantee Program administers activities authorized in the Alaska Natural Gas Pipeline Act (ANGPA). The Alaska Gas Transportation Project was authorized to reduce the dependency on foreign sources of energy.

- The Office of Import/Export Authorization manages the regulatory review of natural gas imports and exports. The program exercises regulatory oversight of the conversion of existing oil and

[b] NETL was provided $10M for program direction activities as a result of the American Recovery and Reinvestment Act (ARRA).

gas-fired power plants, processes exemptions from the statutory provisions of the Power plant and Industrial Fuel Use Act of 1978 (FUA), as amended, and processes certifications of alternate fuel capability.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Indirect Program Direction	**118,189**	**122,830**	**127,194**
Headquarters Indirect	**27,832**	**29,026**	**30,931**
Salaries and Benefits	**16,998**	**17,885**	**18,163**

The funding supports 122 FTEs in FY 2008, FY 2009, and FY 2010 at Headquarters. Headquarters staff is responsible for implementing and communicating DOE policy to the field offices, which includes NETL. The staff also sets program objectives, develop program plans, and evaluate alternative strategies. In addition, they are responsible for developing budgets, approving procurement plans, and overseeing the progress of the activities with regard to the efficient and effective use of resources and the associated costs. Federal staff (funded from the program direction account) will continue to work toward an orderly termination of the Oil program in FY 2010.

Travel	**806**	**750**	**1,000**

Provide funds for both domestic and international travel in support of Fossil Energy business. Travel includes costs and transportation of persons, subsistence of travel, and incidental travel expenses in accordance with Federal travel regulations. Enables HQ staff to effectively manage a broad spectrum of Fossil Energy projects at geographically dispersed locations, and attend project and program reviews.

Support Services

▪ **E-Government Initiatives**	**495**	**80**	**80**

The requested funding will provide for the costs associated with Government-wide E-Government initiatives and Lines of Business.

Other Related Expenses	**9,533**	**10,311**	**11,688**
▪ **Technical and Management Support Services**	**4,142**	**4,355**	**4,200**

Provide for technical and management contractual services that are generic to the entire FE program.

▪ **Computer Systems and Support**	**1,031**	**1,031**	**1,040**

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

▪ **Working Capital Fund**	**4,360**	**4,925**	**6,448**

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

The request provides support to HQ for office space, utilities, building/equipment maintenance, mail services, LAN connections, supplies and other services and equipment. Also included is FE's annual contribution for operation and maintenance of the STARS corporate financial system.

NETL Indirect	**90,357**	**93,804**	**96,263**
Salaries and Benefits	**41,178**	**42,749**	**50,600**

The funding supports 358 FTEs in FY 2008 and FY 2009. In FY 2010, the funding will support 387 FTEs. Activities of the staff include project management, product development, contract management, and other activities related to program and administrative activities. The increase in staff is the result of additional FTEs required to carry out the FE mission and is consistent with the approved staffing plan. It is anticipated that 90 NETL FTEs in FY 2009 and FY 2010 will be paid via reimbursable agreements from other fund sources. Therefore, the salaries and benefits and the associated FTEs for this reimbursable staff are not included in the budget estimate.

Travel	**1,488**	**1,545**	**1,673**

Provide funds for both domestic and international travel in support of Fossil Energy business. Travel includes costs and transportation of persons, subsistence of travel, and incidental travel expenses in accordance with Federal travel regulations. Enables NETL staff to effectively manage a broad spectrum of Fossil Energy projects at geographically dispersed locations, and attend project and program reviews.

Support Services	**24,493**	**25,427**	**25,000**

This budget line includes all costs associated with site support contractors that assist in the operation and maintenance of the Lab. The support provided includes facility operations, maintenance, grounds and janitorial services, finance, information technology/automation services, security, administrative and technical support.

Other Related Expenses	**23,198**	**24,083**	**18,990**

Provide supplies/materials and other services funding for facility operations, maintenance, finance, information automation, administrative, management and technical support. Other Related Expenses also funds the NETL information technology investment, which includes general information technology infrastructure support such as LAN, internet and intranet networking, cyber security, desktop support, televideo, telecom, information architecture planning, and systems support. The funding also supports rents, communications, utilities, maintenance agreements, and training.

NETL Coal Research and Development Direct Program Direction	**26,250**	**27,251**	**28,887**
Salaries and Benefits	**21,388**	**22,204**	**23,025**

Provide funds for 180 FTEs in FY 2010, 182 FTE's in FY 2009, and 184 FTEs in FY 2008 such as technicians, engineers and scientists who support the NETL Office of Research and Development (in-house research and development). Activities include in-house research in support of the following

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

program areas: Integrated Gasification Combined Cycle, Turbines, Carbon Sequestration, Fuels, Fuel Cells, Methane Hydrate, and Advanced Research.

Travel	**550**	**571**	**543**

Provide funds for both domestic and international travel in support of the activities that support the mission of FE.

Support Services	**4,312**	**4,476**	**5,319**

Provide funding for supplies/materials and contractor support for the in-house research and development functions.

Other Related Expenses	**0**	**0**	**0**

Provide funding for supplies, materials, and other services required to support in-house research and development efforts.

Alaska Natural Gas Transportation Project	**2,310**	**0**	**0**
Salaries and Benefits	**721**	**0**	**0**

Provide funds for 5 FTEs for the Loan Guarantee Program Office which administers Loan Guarantee activities for the Alaska Natural Gas Transportation Project.

Travel	**99**	**0**	**0**

Provide funds for both domestic and international travel in support of the activities that support the mission of FE using prior year balances.

Other Related Expenses	**1,490**	**0**	**0**

The FY 2010 request will provide contractual services in support of the Office of Loan Guarantee for Alaska Natural Gas Transportation Projects using prior year balances.

Import/Export Authorization	**1,848**	**1,919**	**1,919**
Salaries and Benefits	**1,310**	**1,360**	**1,360**

Provides for 14 FTEs in the Office of Import/Export Authorization (OIEA).

Travel	**20**	**21**	**21**

Provide funds for both domestic and international travel in support of the activities that support the mission of FE.

Other Related Expenses	**518**	**538**	**538**

Provide funds for contractual services in support of the OIEA.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Total, Program Direction	**148,597**	**152,000**	**158,000**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Indirect Program Direction	
Headquarters Indirect	
Salaries and Benefits	
The increase reflects projected Cost-of-Living Adjustments and anticipated increases in benefits, promotions, and within grade increases.	+ 278
Travel	
The increase is due to increased participation in international and domestic conferences, conventions, seminars, business events, research symposiums, and training sessions.	+250
Other Related Expenses	
The increase is due to inflation and also additional costs for Working Capital Fund activities, such as I-MANAGE.	+1,377
Total, Headquarters Indirect	**+1,905**
NETL Indirect	
Salaries and Benefits	
The increase is due to estimated cost of living adjustments. This increase also reflects an increase in FTEs, per the approved staffing plan.	+7,851
Travel	
The increase is due to the escalation of travel costs and an increase in travelers, due to the additional FTEs.	+128
Support Services	
The change reflects a decrease in support for facility, operations, maintenance, finance, information automation, administrative, management and technical support. A portion of the decrease is attributed to increased efficiencies and cost savings such as back filling vacancies with lower-salaried employees and limiting overtime.	-427
Other Related Expenses	
The change reflects a significant decrease in other services, supplies and materials, communications, utilities, and maintenance/service agreements.	-5,093
Total, NETL Indirect Program Direction	**+2,459**
Total, Indirect Program Direction	**+4,364**

NETL Coal Research and Development Direct Program Direction

	FY 2010 vs. FY 2009 ($000)
Salaries and Benefits	
The increase allows for additional R&D by federal employees at NETL.	+821
Travel	
The decrease is due to reduced travel requirements resulting from increase use of video conferencing for meetings and on-site training	-28
Support Services	
The increase is due to the escalation of the support contractor's costs.	+843
Total, NETL Coal Research and Development Direct Program Direction	**+1,636**
Loan Guarantee for Alaska Natural Gas Transportation Project	
No funding is requested for this program because existing balances are sufficient to conduct FY 2009 activities.	0
Total Funding Changes, Program Direction	**+6,000**

Support Services by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Technical Support			
Surveys Or Reviews of Technical Operations	500	500	500
Economic and Environmental Analysis	925	925	925
Test and Evaluation Studies	3,500	3,500	3,500
Total, Technical Support	4,925	4,925	4,925
Management Support			
Management Studies	650	650	650
ADP Support	6,410	6,610	6,710
Administration Support Services	17,315	17,798	18,114
Total, Management Support	24,375	25,058	25,474
Total, Support Services	29,300	29,983	30,399

Other Related Expenses by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Other Related Expenses			
Other Services	25,499	24,301	18,903
Operations and Maintenance of Equipment	1,090	1,831	1,940
Working Capital Fund	4,400	4,925	6,448
Training	550	550	550
Rental Space	625	625	625
Software Procurement/Maintenance Activities/Capital Acquisitions	2,575	2,700	2,750
Total, Other Related Expenses	34,739	34,932	31,216

Congressionally Directed Projects

Funding Profile by Subprogram

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
Congressionally Directed Projects	0	43,864	0

Description

The FY 2009 Omnibus Act included 25 Congressionally directed projects within the Office of Fossil Energy. Funding for these projects was appropriated as a separate funding line although specific projects may relate to ongoing work in a specific programmatic area. Prior year funding for a specific project will be noted in the table below as a non-additive column entry.

Detailed Justification

(dollars in thousands)

Congressionally Directed Projects	FY 2008	FY 2009	FY 2010
▪ **Center for Zero Emissions Technology, Montana State University, Clean Coal Technologies**	**0**	**5,709**	**0**
▪ **ITM Reaction-Driven Ceramic Membrane Systems (PA)**	**0**	**952**	**0**
▪ **North Dakota Energy and Environmental Center, Grand Forks, ND, Fossil Fuel Cooperative Research & Development**	**0**	**3,806**	**0**
▪ **North Dakota Energy and Environmental Center, Grand Forks, ND, National Center for Hydrogen Technology**	**0**	**2,855**	**0**
▪ **Gulf of Mexico Hydrates Research Consortium at the University of Mississippi, MS**	**0**	**1,142**	**0**
▪ **Penn State University, Solid Oxide Fuel Cells, Pennsylvania**	**0**	**1,903**	**0**
▪ **Arctic Energy Office, Alaska**	**0**	**3,806**	**0**
▪ **Direct Methanol Fuel Cell (IN)**	**0**	**952**	**0**
▪ **Fuel Cell Tech for Clean Coal Power Plants (OH)**	**0**	**1,427**	**0**
▪ **Methanol Economy (CA)**	**0**	**1,903**	**0**
▪ **Multi-Pollutant Removal and Advanced Multi-Pollutant Removal and Advanced Carbon Capture and Storage Projects Using Eco**	**0**	**952**	**0**

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Technology (OH)			
▪ **Pilot Energy Cost Control Evaluation (PECCE) Project (WV, PA, & IN)**	**0**	**2,356**	**0**
▪ **Redirection of FY 2008 Funding for Pilot Energy Cost Control Evaluation (WV,PA, & IN)**	**0**	**(1,404)**	**0**
▪ **Rolls Royce Solid Oxide Fuel Cell Systems Development (OH)**	**0**	**1,285**	**0**
▪ **University of Kentucky Strategic Liquid Transportation Fuels Derived from Coal (KY)**	**0**	**1,380**	**0**
▪ **Wyoming CO2 Sequestration Testing Program (WY)**	**0**	**856**	**0**
▪ **CO2 Capture/Sequestration Research, PSU (PA)**	**0**	**476**	**0**
▪ **Carbon Sequestration in a Deep Saline Reservoir Xcel Energy (CO)**	**0**	**1,427**	**0**
▪ **Shale Oil Upgrading Utilizing Ionic Conductive Membranes Ceramatec, Inc (UT)**	**0**	**2,188**	**0**
▪ **The Center for Advanced Separation Technology, University of Kentucky, (KY)**	**0**	**2,855**	**0**
▪ **University of Kentucky Coal-Derived Low Energy Materials for Sustainable Construction Project (KY)**	**0**	**952**	**0**
▪ **Refining Capacity Study, NDAREC (ND)**	**0**	**476**	**0**
▪ **Utah Center for Ultra Clean Coal Utilization & Heavy Oil Research (UT)**	**0**	**4,758**	**0**
▪ **Long Term Environmental and Economic Impacts of the Development of a Coal Liquefaction Sector in China, WVU**	**0**	**476**	**0**
▪ **Versailles Borough Stray Gas Mitigation**	**0**	**381**	**0**
▪ **Center for Zero Emissions Technology, Montana State University, Clean Coal Technologies**	**0**	**5,709**	**0**
Total, Congressionally Directed Projects	**0**	**43,864**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Congressionally Directed Projects	
No funding requested	-43,864
Total, Congressionally Directed Projects	**-43,864**

Plant and Capital Equipment

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Plant and Capital Equipment			
Capital Line Item	7,927	0	0
General Plant Projects	4,955	18,000	20,000
Total, Plant and Capital Equipment	12,882	18,000	20,000

Mission

The Plant and Capital Equipment program creates, improves, and maintains the facilities and infrastructure making up the National Energy Technology Laboratory (NETL). NETL has about 119 facilities and related infrastructure located in Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Albany, Oregon.

Benefits

FY 2010, execution of this program's mission will support the Secretary's climate change technology goals. Additionally, these funds will contribute to the Secretary's priority for clean energy and GPRA Unit Program Goals by maintaining and improving facilities and related infrastructure supporting performance of research to develop and deploy clean, safe, low-CO2 emissions energy sources.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Capital Line Item	**7,927**	**0**	**0**

No funding is requested for Capital Line Item construction projects in FY 2009 and 2010 budgets.

In FY 2008, Congress appropriated $7.927 million for construction projects at NETL. The funds were used to complete Technology Support Facility located in Morgantown WV.

General Plant Projects	**4,955**	**18,000**	**20,000**

FY 2010, Request will be used to conduct projects to reduce environmental, safety, health risks and

(dollars in thousands)

FY 2008	FY 2009	FY 2010

liabilities posed by aging infrastructure and more stringent energy and building standards.

FY 2009 Request will be used to conduct projects at the three NETL field sites to reduce environmental, safety, health risks and liabilities posed by aging infrastructure and more stringent energy and building standards.

FY 2008, Congress appropriated $4.955 million for GPP. The funding will correct environmental safety and health issues existing in facilities in Albany, Morgantown, and Pittsburgh.

Total, Plant and Capital Equipment	**12,882**	**18,000**	**20,000**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
General Plant Projects	
Increased funding will be applied to conduct projects to reduce environmental, safety, health risks and liabilities posed by aging infrastructure.	+2,000
Total Funding Change, Plant and Capital Equipment	**+2,000**

Fossil Energy Environmental Restoration

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Fossil Energy Environmental Restoration			
CERCLA[a] Remedial Actions	1,125	1,155	1,155
RCRA[b] Remedial Actions	2,972	3,105	3,105
Other ES&H Actions	5,386	5,440	5,740
Total, Fossil Energy Environmental Restoration	9,483	9,700	10,000

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 FE mission of the National Energy Technology Laboratory (NETL) at the Morgantown (MGN), West Virginia; Pittsburgh (PGH), Pennsylvania; Houston, Texas; Fairbanks, Alaska; and Albany (ALB), Oregon sites.

Benefits

Execution of this program's mission will follow the Secretary's priorities/guidelines and the strategic themes of the Department.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
CERCLA Remedial Actions	**1,125**	**1,155**	**1,155**
▪ **Rock Springs Sites**	**525**	**600**	**550**

In FY 2010, continue limited operation and maintenance of the *In-Situ* aerobic bioremediation system at Rock Springs Site 9 to remove organic contaminants from the Tipton aquifer ground water. Continue preliminary stabilization period for Sites 4, 6, 7, and 12. Conduct periodic ground water sampling events at Sites 4, 6, 7, 9, and 12 to evaluate contaminant removal and to assess progress toward meeting regulatory requirements set forth by the WDEQ. Receive notification from the WDEQ that ground water has been restored to baseline conditions and approval to plug and abandon approximately 50 ground water monitor wells at Sites 4, 5, 6, 7, and

[a] Comprehensive Environmental Response, Compensation and Liability Act (of 1980)
[b] Resource Conservation and Recovery Act (of 1976)

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

12. Contour and seed disturbed areas with seed mixtures approved by WDEQ.

In FY 2009, operate and maintain the *in-situ* aerobic bioremediation systems at Rock Springs Sites 6 and 12 to remove benzene, toluene, ethyl benzene, and xylene (BTEX) compounds from the Tipton aquifer ground water, as required by the Wyoming Department of Environmental Quality. (WEDQ). Continue the ground water stability period at Sites 4 and 9 to assess contaminant rebound potential. Conduct periodic ground water sampling events to determine progress in degrading organic contaminants. Receive approval from the WDEQ to plug and abandon approximately 32 ground water monitoring wells that are no longer required in the monitoring systems. *Participants include: U.S. Army Corps of Engineers, HydroGeoLogic Consultants, and RDS (NETL site support contractor).*

In FY 2008, operate and maintain the *in-situ* aerobic bioremediation systems at Rock Springs Sites 4, 6, 7, and 12 to remove BTEX compounds from the Tipton aquifer ground water, as required by the WDEQ. Initiate a 1-year stability period at Site 9 to assess contaminant rebound potential and conduct microbial enumeration evaluations at Site 12 to determine the effectiveness of aerobic bacteria in degrading organic contaminants. Conduct periodic ground water sampling events to determine progress in degrading organic contaminants. Plug and abandon approximately ten ground water monitor wells that are no longer required in the monitoring systems. *Participants include: U.S. Army Corps of Engineers, HydroGeoLogic Consultants, and RDS (NETL site support contractor).*

▪ **Hoe Creek Site**	**248**	**250**	**450**

In FY 2010, complete the second year of a 2-year ground water stability period at the Hoe Creek III Site. Conduct quarterly ground water sampling events to verify ground water quality parameters have stabilized and ground water can be considered restored to baseline conditions by the WDEQ. Receive approval from WDEQ to plug and abandon all remaining ground water monitor wells (approximately 100). Remove all surface facilities (buildings, air sparge lines, office trailer) and contour and seed all disturbed areas with seed mixtures approved by the WDEQ. *Participants include: U.S. Army Corps of Engineers, Cape Environmental Associates*

In FY 2009, conduct a two-year stability period at the Hoe Creek III site to assess contaminant rebound potential. Conduct periodic ground water sampling events to determine progress in degrading organic contaminants to levels required by the WDEQ. If necessary, initiate air sparge system operations in selected monitoring wells for short time periods. Receive approval from the WDEQ to plug and abandon approximately 40 monitoring wells that are no longer required in the monitoring system. Re-seed disturbed areas with seed mixtures approved by the WDEQ. *Participants include: U.S. Army Corps of Engineers, Cape Environmental Associates.*

In FY 2008, continue aerobic bioremediation systems operation at the Hoe Creek III site on selected air sparge wells and conduct a shut-down period for 12 months to evaluate contaminant rebound in the Felix 1 aquifer. The semi-annual ground water monitoring results in October 2006

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

(in addition to a six-well sampling event in August to check recalcitrant areas in the well field) indicated three monitor wells had benzene levels above target values required by the regulatory agency. The semi-annual sampling event in April 2007 will measure contaminant values and, if values are reduced sufficiently, a twelve month shutdown period will be initiated. However, if values remain in excess of the targeted values, additional air sparging efforts may be necessary. Monitor the Hoe Creek II reclamation success and reseed areas where necessary. Plug and abandon approximately 18 ground water monitoring wells that are no longer required in the monitoring system. Perform periodic ground water sampling events to evaluate ground water contaminant removal. *Participants: U.S. Army Corps of Engineers, Cape Environmental Associates.*

▪ **Hanna Site Revegetation**	**40**	**30**	**5**

In FY 2010, all requirements for measuring vegetation cover and production will be met. The reclamation performance bond should be released and the permit terminated. All requirements for public comment and response will be fulfilled, resulting in complete regulatory release of R&D License # 1 1/222.

In FY 2009, continue additional required vegetation evaluation at the Hanna DOE Underground Coal Gasification site. The additional vegetation cover and production sampling is required to determine if reclaimed areas are equal to or greater than what was present previous to the disturbance. Reclamation performance bond release and permit termination will be requested. *Participants include: BKS Environmental Associates.*

In FY 2008, complete the Hanna DOE Site evaluation and receive final liability and reclamation performance bond release from the WDEQ. Terminate the R&D License # 1 1/222. Take additional samples if statistical cover and production sampling results are inconclusive in determining if reclaimed vegetation exceeds that prior to the disturbance. This effort was initiated in July 2007 and completed in FY 2008.

▪ **NETL Preliminary Site Investigations**	**79**	**40**	**25**

In FY 2010, investigate/support two sites where NETL may have current and/or future environmental liabilities (e.g., typically associated with property disposition issues due to environmental contamination at off-site locations) as determined through EPA and state environmental agency interactions. *Participants include: U.S. Army Corps of Engineers.*

In FY 2009, investigate/support two sites where NETL may have current and/or future environmental liabilities (e.g., typically associated with property disposition issues due to environmental contamination at off-site locations) as determined through EPA and state

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

environmental agency interactions. *Participants include: U.S. Army Corps of Engineers.*

In FY 2008, continue to investigate/support two sites where NETL may have current and future environmental liability (e.g., typically associated with property disposition issues due to environmental contamination at an off-site contractor location) as determined through EPA and state environmental agency interactions.

▪ **NETL Site Remediation**	**10**	**10**	**10**

In FY 2010, perform on-site building and soil type remediation assessments at NETL.

In FY 2009, perform on-site building and soil type remediation assessments at NETL.

In FY 2008, perform on-site building and soil type remediation assessments at NETL (reassessment).

▪ **CERCLA Potentially Responsible Party (PRP) Response Activities**	**223**	**225**	**115**

In FY 2008-2010, conduct remedial investigations, feasibility studies, and address environmental claims for one or two sites found to be contaminated and requiring cleanup under Federal CERCLA and state cleanup standards.

RCRA Remedial Actions	**2,972**	**3,105**	**3,105**
▪ **NETL On-Site Remediation**	**1,585**	**1,605**	**1,605**

In FY 2008-2010, implement chemical- and pollutant-related environmental management plans under NETL's ISO-14001 program; continue NETL RCRA-related on-site regulatory, corrective, preventive, and improvement activities, such as asbestos and lead abatement and waste minimization and pollution prevention activities; perform activities to ensure compliant wastewater treatment plant operations in order to address past notices of violations; and fund RCRA-related risk management and maintenance activities. Continue retrofit of heating and cooling systems with acceptable refrigerants to meet Federal requirements by 2010.

▪ **Albany On-Site Remediation**	**1,387**	**1,500**	**1,500**

In FY 2008-2010, continue Albany RCRA cleanup actions, including abating lead and asbestos exposures; resolving chemical storage and labeling issues; monitoring soil and ground water; upgrading ventilation and air pollution systems; and improving air emission management, materials handling, and waste disposal activities. Continue regulatory ground water monitoring

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010

activities in conjunction with the Oregon Department of Environmental Quality. Continue investigation and risk assessment activities for the specific trichloroethylene (TCE) ground water contamination issue and identify the most appropriate path forward for remediation. Continue activities associated with beryllium removal. This will primarily involve continuing the cleanup of beryllium-contaminated areas at Albany which began in FY 2007.

Other ES&H Actions	**5,386**	**5,440**	**5,740**
▪ **Other ES&H Actions at NETL**	**3,736**	**3,750**	**5,665**

In FY 2008-2010, implement and improve baseline regulatory compliance, integrated safety management, and ISO 14001 programs (i.e., emergency management, occupational medicine and health, industrial hygiene, safety, environmental management, ergonomics, training, security, and fire protection). Implement actions in support of correcting ES&H deficiencies associated with infrastructure (e.g., ventilation systems, waste pads, and gas cylinder storage areas). Implement actions in support of achieving DOE's pollution prevention and energy management goals. Maintain indoor air quality and ventilations systems, walking/working surfaces, personal protective equipment, and conduct facility seismic evaluations. Major costs include contracted security services and contracted ES&H support.

▪ **ES&H Corrective Action at NETL Tulsa Site**	**15**	**15**	**0**

In FY 2009, implement ergonomics corrective actions, provide site-specific ES&H training, conduct emergency drills, and perform infrastructure inspections.

▪ **ES&H Corrective Action at Albany**	**1,561**	**1,600**	**0**

In FY 2007-2009, continue Albany safety and health programs and corrective actions including industrial hygiene monitoring and surveillance efforts, an occupational medicine program, emergency preparedness and drills, ergonomics, training, fire protection, and security improvements. Maintain indoor air quality and ventilations systems, walking/working surfaces, personal protective equipment, and conduct facility seismic evaluations. Continue incremental progress toward attaining pollution prevention and energy management goals. Major costs include contracted security services and contracted ES&H support.

▪ **Program Support**	**74**	**75**	**75**

Fund technical and program management support.

Total, Fossil Energy Environmental Restoration	**9,483**	**9,700**	**10,000**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
CERCLA Remedial Actions	+0
RCRA Remedial Actions	+0
Other ES&H Actions	
The increase is due to a slight increase in general ES&H activities at the Morgantown and Pittsburgh sites.	+300
Total Funding Change, Fossil Energy Environmental Restoration	**+300**

Special Recruitment Programs

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Special Recruitment Programs			
Special Recruitment Programs	650	656	700
Total, Special Recruitment Programs	650	656	700

Mission

The Office of Fossil Energy (FE) has developed two programs to help attract minority and other highly qualified technical and engineering students to work in the development of fossil fuels. They are the FE Career Intern Program (FECIP) and the Mickey Leland Energy Fellowship (MLEF) Program.

The FECIP program collaborates with the top earth science and engineering universities to provide a "pipeline" of future employees who will become FE's successor managers and technical scientists of the future.

The MLEF program is a ten-week summer internship program that offers minority and other under represented students majoring in math, science, and engineering an opportunity to learn about FE programs and initiatives. In addition, Fossil Energy works closely with these students participating in the MLEF program and who are studying in academic disciplines related to the Fossil Energy mission to encourage them to pursue careers in Fossil Energy fuel research.

Benefits

The Special Recruitment Programs support the Secretary's Priority of developing and nurturing science and engineering talent and helps to train the next generation of scientists and engineers.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Special Recruitment Programs	**650**	**656**	**700**
In FY 2010, FY 2009 and FY 2008, applicants will be recruited and selected to participate in the Fossil Energy Career Intern Program and the Mickey Leland Energy Fellowship program.			
Total, Special Recruitment Programs	**650**	**656**	**700**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Special Recruitment Programs	
No significant change in level of effort from FY 2009 to FY 2010	+44
Total Funding Change, Special Recruitment Programs	**+44**

Cooperative Research and Development

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Cooperative Research and Development			
Cooperative Research and Development	4,817	5,000	0
Total, Cooperative Research and Development	4,817	5,000	0

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).

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Cooperative Research and Development	**4,817**	**5,000**	**0**

In FY 2010, the Department anticipated that these centers would compete successfully for Fossil Energy funding through the competitive solicitation process.

In FY 2008 and FY 2009, fund cooperative research programs at WRI and UNDEERC, which are 50-50 cost-shared with non-federal partners. Funding will be split evenly between the two participants.

SBIR/STTR (non-add)	(138)	(140)	(0)

The FY 2008 and FY 2009 amount shown is an estimate of requirements for the continuation of the SBIR and STTR program.

Total, Cooperative Research and Development	**4,817**	**5,000**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Cooperative R&D	
In FY 2010, the Department anticipated that these centers would compete successfully for Fossil Energy funding through the competitive solicitation process.	-5,000
Total Funding Change, Cooperative R&D	**-5,000**

Naval Petroleum and Oil Shale Reserves

Naval Petroleum and Oil Shale Reserves

Naval Petroleum and Oil Shale Reserves

Proposed Appropriation Language

For expenses necessary to carry out naval petroleum and oil shale reserves' activities, including the hire of passenger motor vehicles, [$19,099,000] *$23,627,000* 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 activities. (Energy and Water Development and Related Agencies Appropriations Act, 2009.)

Explanation of Change

The increase reflects additional funding for the environmental remediation of NPR-1 and operations for NPR-3.

Naval Petroleum and Oil Shale Reserves
Office of Fossil Energy

Overview

Appropriation Summary by Program

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2009 Additional Appropriation	FY 2010 Request
Naval Petroleum and Oil Shale Reserves				
Naval Petroleum and Oil Shale Reserves	20,272	19,099	0	23,627
Total, Naval Petroleum and Oil Shale Reserves	20,272	19,099	0	23,627

Preface

The Naval Petroleum and Oil Shale Reserves (NPOSR) program manages a number of legal agreements that were executed as part of the 1998 sale of the former Naval Petroleum Reserve No. 1 (NPR-1) in California. These agreements direct post-sale work including environmental restoration and remediation, equity finalization, contract closeout, and records disposition. The Department also operates the Naval Petroleum Reserve No. 3 (NPR-3) and the Rocky Mountain Oilfield Testing Center (RMOTC), both located near Casper, Wyoming. The Casper location applies conventional oil field management and operations to the stripper field, while providing opportunities for field testing and demonstration of upstream oil and gas technologies and other energy technologies having oilfield application.

Mission

The NPOSR mission encompasses finalizing the Government's equity interests in NPR-1: releasing the DOE from its environmental liabilities resulting from the 1998 sale of NPR-1, producing oil at NPR-3, and providing the RMOTC as a user test facility.

Benefits

The NPR-1 program continues work to closeout the remaining environmental findings, as required by the agreement between DOE and the California Department of Toxic Substance Control (DTSC). NPR-3 will be operated in a cost-effective manner. RMOTC, as a user facility, will support oil and gas exploration/production; drilling and well completion; remote sensing and unconventional oil development; environmental and geothermal, energy efficiency, and other renewable, environmentally friendly technologies as they relate to oil and gas operations.

Strategic Themes, Goals and the Secretary's Initiatives
A new strategic plan has not yet been established and approved by the Secretary of Energy. The Secretary has established major priorities and initiatives.

Strategic Theme	Strategic Goal Title	Secretary's Priorities	GPRA Unit Program Number	GPRA Unit Program Title
Energy Security	Energy Diversity	Economic Prosperity	11	Petroleum Reserves

Means and Strategies
NPOSR will use various means and strategies to continue its mission and achieve its program goals. The program continues ongoing activities to attain release from remaining environmental findings related to the sale of NPR-1, as is required by the agreement between DOE and the California Department of Toxic Substance Control (DTSC). NPR-3 will be operated in a cost-effective manner and will generate additional revenues for the U.S. Treasury through the sale of produced oil until 5 April 2012 unless otherwise authorized. RMOTC, as a user facility, will provide small businesses, inventors, energy companies, academia, and other Government researchers in various energy related industries a place to perform hands-on applied research (testing and demonstration).

Validation and Verification
NPOSR manages operational measures that are implemented by support service contractors. Action plans are reviewed and analyzed at Program Reviews. These reviews provide an opportunity to discuss performance. Budget formulation/execution assessments are regularly conducted throughout the year.

Facilities Maintenance and Repair

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by this budget are displayed below.

Direct-Funded Maintenance and Repair

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Naval Petroleum and Oil Shale Reserves			
NPR – 3	446	400	200
Total, Direct-Funded Maintenance and Repair	446	400	200

Naval Petroleum and Oil Shale Reserves
Office of Fossil Energy

Funding by Site by Program

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
NPR-3, Wyoming	11,446	11,612	15,895
Washington Headquarters	8,826	7,487	7,732
Total, Naval Petroleum and Oil Shale Reserves	20,272	19,099	23,627

Site Description

Naval Petroleum Reserve - Wyoming
The Naval Petroleum Reserve (NPR-3), located in Casper, Wyoming, supports activities to produce oil at NPR-3 (Teapot Dome Oilfield) to its economic limit and provides the Rocky Mountain Oilfield Testing Center (RMOTC) with testing and demonstration facilities for industry, academia, and Government agencies to perform applied oilfield research. Environmental remediation is performed on those facilities that no longer have value to either NPR-3 production operations or RMOTC testing.

Washington Headquarters
The headquarters office located in Washington, DC supports NPR-1 remediation closeout as well as Elk Hills equity finalization activities and reports on unconventional fuels activities under EPACT 2005. An advisory staff supports the Assistant Secretary of Fossil Energy through oversight of engineering support required to prepare and support the Government's equity position before an Independent Petroleum Engineer and the Assistant Secretary for Fossil Energy.

The National Defense Authorization Act for Fiscal Year 1996 (P.L. 104-106) required the sale of the Government's interest in Naval Petroleum Reserve No. 1 (NPR-1). To comply with this requirement, the Elk Hills oil 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 of which are in Colorado, to the Department of the Interior's (DOI) Bureau of Land Management. In January 2000, the Department returned the NOSR-2 site to the Northern Ute Indian Tribe. The Energy Policy Act of 2005 transferred administrative jurisdiction and environmental remediation of Naval Petroleum Reserve 2 (NPR-2) in California to the Department of the Interior.

Naval Petroleum and Oil Shale Reserves

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Enacted	FY 2010 Request
Naval Petroleum and Oil Shale Reserves			
Production and Operation	11,213	8,185	14,166
Management	9,059	10,914	9,461
Total, Naval Petroleum and Oil Shale Reserves	20,272	19,099	23,627

Public Law Authorization:
P.L. 94-258, "Naval Petroleum Reserves Production Act" (1976)
P.L. 109-58, "Energy Policy Act of 2005"

Mission

The NPOSR mission includes environmental remediation and equity finalization at NPR-1, NPR-3 operation as a stripper field, and a field demonstration facility at RMOTC.

Validation and Verification

NPOSR manages operational measures that are implemented by the contractors. Action plans are reviewed and analyzed at Program Reviews. These reviews provide an opportunity to discuss performance. Budget formulation/execution assessments are regularly conducted throughout the year.

Means and Strategies

NPOSR will use various means and strategies to continue its mission and achieve its program goals. The program continues ongoing activities to attain release from remaining environmental findings related to the sale of NPR-1, as is required by the agreement between DOE and the California Department of Toxic Substance Control (DTSC). NPR-3 will be operated in a cost-effective manner and will generate additional revenues for the U.S. Treasury through the sale of produced oil until 5 April 2012 unless otherwise authorized. RMOTC, as a user facility, will provide small businesses, inventors, energy companies, academia, and other Government researchers in various energy related industries a place to perform hands-on applied research (testing and demonstration).

Production and Operations

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Production and Operations			
NPR-1 Closeout	3,433	1,000	4,000
NPR-3 Operations	3,717	2,885	3,866
NPR-3 Environmental Remediation	99	1,000	3,000
Rocky Mountain Oilfield Testing Center	3,964	3,300	3,300
Total, Production and Operations	11,213	8,185	14,166

Description

The mission of the Production and Operations subprogram is to release DOE from its environmental liabilities resulting from the 1998 sale of NPR-1, producing oil at NPR-3, and supporting the RMOTC user test facility.

Benefits

NPR-1 - Environmental remediation and cultural resource activities required as a result of the former NPR-1 sales agreement of 1998. The commitments were formalized in legal agreements between DOE, Occidental, Chevron, and the State of California. Activities encompass attaining remediation of and release from environmental liabilities.

NPR-3 Production Operations - Ongoing conventional oil field production and operations. The program's primary focus has been to operate NPR-3 to its economic limit. In October 2008, the President authorized continued production through April 5, 2012. NPR-3 is expected to remain profitable in FY 2010, even while it remains partially shut-in due to a decline in oil prices. Only key production facilities and the wells needed for testing will remain on production.

NPR-3 Remediation - Those facilities that are no longer useful for either field testing projects nor profitable for future production operations will be environmentally remediated.

RMOTC – Provides for industry, academia and other government entities to partner, on a cost shared basis, in the field testing and demonstration of advanced oil and gas technologies, new environmental products, and focused energy efficient, geothermal and other renewable technologies as they relate to oil and gas operations.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
NPR-1 Closeout	**3,433**	**1,000**	**4,000**

Continue ongoing Elk Hills environmental closeout which has moved into the phase of remediating field sites and requesting clean closure of those sites from the DTSC. Field work of this magnitude will require significant funding as compared with the previous of work involving risk assessments, historic preservation identification, and endangered species identification, etc. The U.S. Army Corps of Engineers has begun field work to clean up specific sites at the former NPR-1. The clean up of specific sites will release the Government from its liabilities connected with the divesture of NPR-1 and the transfer of land titles to Occidental Petroleum, Inc.

NPR-3 Operations	**3,717**	**2,885**	**3,866**

Operate and maintain 400 wells (roughly 55 percent of the wells in the field). Perform preventative maintenance on key production facilities, support infrastructure buildings, electrical distribution system, roads, and produced wastewater facility. Production is expected to average 279 barrels of oil per day, resulting in $6.6 million of revenues deposited to the U.S. Treasury. Facilities at this 18 square mile property include roughly 730 wells of various types, associated production and processing buildings and facilities, office warehouse and maintenance buildings and facilities, electrical production and distribution systems, and over 167 miles of roads. The 2007 Environmental Liabilities Study of the Rocky Mountain Oilfield Testing Center addresses closeout and associated timeline issues.

FY 2009 funding supports the operation and the maintenance for less than half of the producing wells. Perform maintenance to key production facilities, and support infrastructure buildings, electrical distribution system, roads and produced wastewater facility. Efforts will focus on those repairs and preventative maintenance activities that are necessary to keep equipment operating efficiently and personnel safe. Production is expected to average 185 barrels of oil per day, resulting in $3.1 million of revenues deposited to the U.S. Treasury.

FY 2008 funding supported maintenance and production of 400 wells (approximately 45 percent of the producible wells were temporarily shut-in). Production averaged 221 barrels of oil per day, resulting in $7.3 million of revenues deposited to the U.S. Treasury.

NPR-3 Environmental Remediation	**99**	**1,000**	**3,000**

In FY 2010, funding continues to support restoration activities identified in the Environmental Liabilities Study that are no longer of value to either production operations or RMOTC testing operations. Approximately 10 wells will be plugged and abandoned. Well sites will be reviewed to verify that they would not present an environmental risk or have a beneficial use for RMOTC testing partners.

In FY 2009 begin to remediate some of those facilities identified in the Environmental Liabilities Study that are no longer of value to either production operations or RMOTC testing operations. Activities will include asbestos remediation of NPR-3 buildings, soil remediation, and removal of some tanks. Approximately 15-20 wells will also be plugged and abandoned.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Rocky Mountain Oilfield Testing Center	**3,964**	**3,300**	**3,300**

Supports core in-house contractor staff and maintenance and operation of testing facilities and equipment used to partner with industry, universities and other government entities seeking to use the facility for development and demonstration of advanced oil and gas technologies. The technologies tested at RMOTC include: oil and gas exploration/production; drilling and well completion; remote sensing and unconventional oil development; offshore oil flow assurance, environmental and geothermal, energy efficiency, and other renewable, environmentally friendly technologies as they relate to oil and gas operations. RMOTC will identify and analyze options for becoming a self-sustaining user facility.

FY 2008 and FY 2009 funding supports testing partners seeking to use the facility for development and demonstration of new technologies, and will not be used for new drilling equipment or wells.

Total, Production and Operations	**11,213**	**8,185**	**14,166**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Production and Operations	
▪ **NPR-1 Closeout** The increase due to the Army Corps of Engineers performing fieldwork at the NPR-1 on specific field remediation sites.	+3,000
▪ **NPR-3 Operations** The increase is to perform previously deferred facilities maintenance projects.	+981
▪ **NPR-3 Environmental Remediation** This increase is to perform work identified in the Environmental Liabilities Study and to plug and abandon wells that present a threat to human health and safety and/or the environment in order to remain in compliance with Wyoming State Oil and Gas Commission regulations.	+2,000
Total Funding Change, Production and Operations	**+5,981**

Management

Funding Schedule by Activity

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
Management			
Program Direction	3,902	4,036	4,667
Equity	857	4,000	1,140
Business Management and Support	2,332	2,878	3,654
Congressionally Directed Projects	1,968	0	0
Total, Management	9,059	10,914	9,461

Mission

Management supports all business management activities associated with NPR-1 closeout, as well as supporting the finalization of equity between the Government and Chevron (who was a co-owner of the former NPR-1) and performing required duties under EPACT 2005. The program supports 28 full-time federal equivalents (FTEs), including the 17 FTEs at NPR-Wyoming who provide IT/ADP (servers, hardware, software), procurement, accounting, ESS&H, QA, security, property control, and other administrative support and program management and planning responsibilities for this Government-owned/Government-operated facility; and 11 HQ FTEs working in support of NPR-1 and Headquarters activities. Contractor personnel provide analytical and oversight support for policy decisions and ensure that the DOE ESS&H, QA, property, and finance programs are administered in accordance with local, state, and federal regulations and policies.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Program Direction	**3,902**	**4,036**	**4,667**

Provides salaries, travel, contractor support services and other related expenses to support the management and execution of the NPOSR program.

▪ **Salaries and Benefits**	**3,029**	**3,246**	**3,619**

Staff of 28 FTEs performs policy and planning, equity determination, petroleum engineering, financial management, procurement, environment and safety, IT/ADP, project management, accounting, property control, and administration of reimbursable work programs.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
▪ **Travel**	**196**	**149**	**155**
Provides travel for resolution of NPR-1 equity issues and closeout activities and for NPR-3 testing and demonstration business development and agreements, and western energy issues thereby assuring the accomplishment of NPOSR mission.			
▪ **Support Services**	**202**	**110**	**161**
Provide analytic support for policy decisions, ensure that the DOE safety programs are administered in accordance with OSHA policy to ensure environmental reporting is maintained, and provide information technology support.			
▪ **Other Related Expenses**	**475**	**531**	**732**
Major elements are communications, utilities, building leases, reproduction services, supplies, equipment and materials.			
Equity	**857**	**4,000**	**1,140**
Of the four equity zones, the Dry Gas Zone and Carneros Zone are finalized. The Stevens Zone is expected to be finalized in 2009. A final recommendation for the Shallow Oil Zone is pending.			
FY 2009 and FY 2010 funding supports the independent petroleum engineer, legal support, and expert technical analysis/consultation required to support the final Fossil Energy decision.			
Business Management & Support	**2,332**	**2,878**	**3,654**
Continue payments for post-employment medical and dental benefits to former Management & Operating (M&O) contractor employees. Maintain contractor staffing levels and services in support of environmental, safety, security, quality assurance, property control, accounting, and administrative support at the Casper office to support NPR-3 environmental remediation, NPR-3 production operations, and RMOTC testing operations.			
Congressionally Directed Projects	**1,968**	**0**	**0**
Support basin-scale environmental impacts for oil shale production in FY 2008.			
Total, Management	**9,059**	**10,914**	**9,461**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Management	
▪ **Program Direction**	
The increase is due to increases in salary, travel, support services and other related expenses.	+631

	FY 2010 vs. FY 2009 ($000)
▪ **Equity** The projected decrease is related to a possible conclusion of the technical work associated with the finalization of the Shallow Oil Zone equity.	-2,860
▪ **Business Management Support** The increase supports salary increases for in-house support service contractor staff for ESS&H, quality assurance, finance, and IT/ADP programs. The development and implementation of internal integrated financial and property control software programs for improving processes and procedures in order to plan and execute work in a safe and more efficient manner and support the increased level of testing facilities and partners, along with future environmental remediation plans. Continue to enhance and institute effective environmental, quality assurance and safety support programs to ensure continued health and safety of all work environments. Conduct a produced water study required to remain in compliance with Wyoming regulations permit that expires in FY 2010. Continue to fund Program Cyber Security Plan compliance requirements.	+776
Total Funding Change, Management Support	**-1,453**

Program Direction

Funding Profile by Category

	(dollars in thousands/whole FTEs)		
	FY 2008	FY 2009	FY 2010
NPR - Wyoming			
Salaries and Benefits	1,932	2,028	2,075
Travel	149	100	100
Support Services	0	0	0
Other Related Expenses	245	421	500
Total, NPR- Wyoming	2,326	2,549	2,675
Full Time Equivalents	17	17	17
Washington, Headquarters			
Salaries and Benefits	1,097	1,218	1,544
Travel	47	49	55
Support Services	202	110	161
Other Related Expenses	230	110	232
Total, Washington, Headquarters	1,576	1,487	1,992
Full Time Equivalents	11	11	11
Total Program Direction			
Salaries and Benefits	3,029	3,246	3,619
Travel	196	149	155
Support Services	202	110	161
Other Related Expenses	475	531	732
Total, Program Direction	3,902	4,036	4,667
Total Full Time Equivalents	28	28	28

Mission

Management supports all business management activities associated with NPR-1 closeout, as well as supporting the finalization of equity between the Government and Chevron (who was a co-owner of the former NPR-1) and performing required duties under EPACT 2005. The program supports 28 full-time federal equivalents (FTEs), including the 17 FTEs at NPR-Wyoming who provide IT/ADP (servers, hardware, software), procurement, accounting, ESS&H, QA, security, property control, and other administrative support and program management and planning responsibilities for this Government-owned/Government-operated facility; and 11 HQ FTEs working in support of NPR-1 and Headquarters activities. Contractor personnel provide analytical and oversight support for policy decisions and ensure

that the DOE ESS&H, QA, property, and finance programs are administered in accordance with local, state, and federal regulations and policies.

Support Services by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Management Support			
Preparation of Program Plans	202	110	161
Total, Support Services	202	110	161

Other Related Expenses by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Other Related Expenses			
Rent to GSA	0	15	0
Rent to Others	128	128	189
Communications, Utilities, Misc.	90	90	77
Printing and Reproduction	20	20	0
Other Services	127	168	383
Purchases from Gov. Accounts	20	20	0
Operation and Maintenance of Equipment	20	20	5
Supplies and Materials	60	60	78
Equipment	10	10	0
Working Capital Fund	0	0	0
Total, Other Related Expenses	475	531	732

Naval Petroleum Reserves Number 3
Projected Federal Revenues
(dollars in thousands)

	FY 2008		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	221	$90.03	$7,275
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$7,275

	FY 2009		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	185	$45.32	$3,060
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$3,060

	FY 2010		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	279	$64.73	$6,592
Liquid Products (GPD)	0	na	$0
Total, NPR-3	279		$6,592

	FY 2011		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	247	$75.60	$6,816
Liquid Products (GPD)	0	na	$0
Total, NPR-3	247		$6,816

	FY 2012		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	234	$87.20	$7,448
Liquid Products (GPD)	0	na	$0
Total, NPR-3	234		$7,448

	FY 2013		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	214	$93.78	$7,325
Liquid Products (GPD)	0	na	$0
Total, NPR-3	214		$7,325

	FY 2014		
	Production	Price/bbl	Revenues
Crude Oil (BOPD)	198	$107.77	$7,789
Liquid Products (GPD)	0	na	$0
Total, NPR-3	198		$7,789

Note: Revenue projections are not an indication of economic life of the field as production is being constrained by funding.

Projected Price/bbl based on EIA's 2009 Annual Energy Outlook modified (downward) for the local Rocky Mountain market.

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Proposed Appropriation Language

For necessary expenses for 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.), [$205,000,000], *$229,073,000* to remain available until expended[, of which $31,507,000 shall be provided to initiate new site expansion activities, beyond land acquisition, consistent with the budget request: Provided, That none of the funds provided for the new site expansion activities may be obligated or expended for authorized activities until the Secretary has submitted a report to the Congress on the effects of expansion of the Reserve on the domestic petroleum market, which is required to be submitted within 45 days of enactment of this Act].
(Energy and Water Development and Related Agencies Appropriations Act, 2009)

Explanation of Change

The increase in FY 2010 reflects the purchase of a commercial storage cavern to replace an existing Strategic Petroleum Reserve cavern due to environmental risk, offset by no new funding being requested for SPR expansion.

Strategic Petroleum Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2009 Additional Appropriation	FY 2010 Request
Strategic Petroleum Reserve				
Strategic Petroleum Reserve	186,757	205,000	0	229,073
Total, Strategic Petroleum Reserve	186,757	205,000[1]	0	229,073

Preface

The Strategic Petroleum Reserve, created by Congress in 1975, is a National Security program, providing an emergency stockpile of petroleum to assure United States energy and economic security. The Strategic Petroleum Reserve appropriation provides resources necessary to ensure and enhance the operational readiness and responsiveness of the Strategic Petroleum Reserve to continue protecting the Nation against potential disruptions in its foreign and domestic petroleum supplies.

Within the Strategic Petroleum Reserve appropriation, there are three subprograms:

- Facilities Development and Operations
- Management
- Expansion (Introduced in FY 2008 Budget)

Mission

The mission of the Strategic Petroleum Reserve (SPR) is to protect the U.S. from future disruptions in critical oil supplies and to meet the U.S. obligations under the International Energy Program (Energy Policy and Conservation Act, Section 151). It also provides a national defense fuel reserve in the event of war.

Benefits

The mission of the SPR program is in direct support of the Department of Energy's "Energy Security" mission. The SPR benefits the Nation by providing:

- Insurance Policy against interruption in U.S. petroleum supplies (i.e., international events, hurricanes, accidents or terrorism).
- Provides a Deterrent to hostile threats of cutoff of oil supplies.
- Protects the Economic Security of the country.

[1] Authority to transfer $22 million from the SPR Petroleum Account to the Strategic Petroleum Reserve Account has been proposed in the FY 2009 Defense Supplemental to offset damage costs incurred from Hurricanes Gustav & Ike in 2008

- Avails the U.S. of worldwide Emergency Assistance through International Energy Agency (IEA) alliance.

The SPR benefits the Nation by providing an insurance policy against potential interruptions in U.S. petroleum supplies whether originating from international supply problems, hurricanes, accidents or terrorist activities. The U.S. imports approximately 65% of its petroleum supplies; the impact of a disruption in these supplies could be significant on the Nation and the national economy without an emergency response capability. The SPR serves as a significant deterrent to hostile threats of cutoffs of oil supplies. The SPR, with current stocks equal to 71 days of imports in underground storage, provides a strong deterrent to hostile efforts. The SPR protects the economic security of the country. A release of oil from the SPR can mitigate the potential economic damage of an actual disruption in international or domestic petroleum supplies and the accompanying severe price increases. The SPR avails the United States of worldwide emergency assistance through its IEA participation. IEA members are required to maintain 90 days of strategic stocks and participate with other stockholding nations in a coordinated release of stocks in the event of a major supply disruption. The SPR provides energy security until alternatives are developed to improve energy independence.

Strategic Themes, and Goals and Secretary's Initiatives
A new strategic plan has not yet been established and approved by the Secretary of Energy. The Secretary has established major priorities and initiatives. The following chart aligns the current Strategic Plan with the Secretary's priorities:

Strategic Theme	Strategic Goal Title	Secretary's Priorities	GPRA Unit Program Number	GPRA Unit Program Title	Office
1. Energy Security	1. Energy Diversity	Economic Prosperity	11	Petroleum Reserves	FE

Facilities Maintenance and Repair

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by this budget are displayed below.

Direct-Funded Maintenance and Repair

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
Strategic Petroleum Reserve	32,768	35,869	39,012
Total, Direct-Funded Maintenance and Repair	32,768	35,869	39,012

Strategic Petroleum Reserve
Office of Fossil Energy

Funding by Site by Program

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Strategic Petroleum Reserve			
Bayou Choctaw Site, LA	10,853	14,949	53,964
Big Hill Site, TX	17,262	19,715	22,744
Bryan Mound Site, TX	20,884	21,641	19,517
National Energy Technology Laboratory	927	939	982
Oak Ridge National Laboratory	347	375	361
Richton, MS (Expansion)	24,773	31,507	0
Sandia National Laboratory	2,812	2,909	2,976
SPR Program Office, Washington, DC	4,781	4,955	5,129
SPR Project Management Office, New Orleans, LA	87,221	91,109	93,749
West Hackberry Site, LA	16,897	16,901	29,651
Total, Strategic Petroleum Reserve	186,757	205,000	229,073

Major Changes or Shifts by Site

Bayou Choctaw Site, LA
- In FY 2010, purchase of an existing commercial storage cavern to replace an existing cavern at the site that presents a major environmental risk with continued use.

West Hackberry, LA
- In FY 2010, site modifications/foundations to prepare for installation of the degas plant, beginning in 2011.

Site Description

Bayou Choctaw Site, LA
The Bayou Choctaw storage facility is 12 miles southwest of Baton Rouge, LA. The site has storage capacity of 76 million barrels**.**

Big Hill Site, TX
The Big Hill storage facility is 26 miles southwest of Beaumont, TX. The site has storage capacity of 170 million barrels.

Bryan Mound Site, TX
The Bryan Mound storage facility is three miles southwest of Freeport, TX. The site has storage capacity of 254 million barrels.

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 on selected oil samples 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 the DIS-Risk model approach related to energy policy issues; and evaluating SPR planning alternatives.

Richton Site, MS
The Richton site in Perry County, MS was selected in February 2007 to be a new storage facility for the SPR expansion to 1.0 billion barrels. This site has no storage capacity.

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 SPR crude oil storage facilities.

SPR Program Office
The Program Office, located in Washington, DC, is responsible for establishing the overall policy and program(s) necessary to carry out the mission of the SPR as set forth in the EPCA. The Program Office provides the long-range planning, program direction and financial management for the SPR program.

SPR Project Management Office
The SPR Project Management Office, located in New Orleans, LA, is responsible for operations oversight and management, facilities design and construction, and overall contractor management at the four storage facilities.

West Hackberry Site, LA
The West Hackberry storage facility is 25 miles southwest of Lake Charles, LA. The site has storage capacity of 227 million barrels.

Strategic Petroleum Reserve

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2010 Request
Strategic Petroleum Reserve			
Facilities Development and Operations	143,980	154,669	209,482
Management	18,004	18,824	19,591
Expansion	24,773	31,507	0
Total, Strategic Petroleum Reserve	186,757	205,000	229,073

Mission

The mission of the Strategic Petroleum Reserve (SPR) program is in direct support of the Department of Energy's "Energy Security" mission. Facilities Development and Operations subprogram funds all requirements associated with developing and maintaining facilities for the storage of petroleum, operations activities associated with placing petroleum into storage, and operational readiness initiatives associated with drawing down and distributing the inventory within 11-15 days notice in the event of an emergency. The Management subprogram funds personnel and administrative expenses related to maintaining the Project Management Office (New Orleans, LA) and the Program Office (Washington, DC), as well as contract services required to support management and the technical analysis of program initiatives and issues. The Expansion subprogram was introduced in FY 2008 to fund activities associated with the expansion of the SPR to 1 billion barrels as called for in the Energy Policy Act of 2005.

Benefits

The SPR benefits the Nation by providing an insurance policy against potential interruptions in U.S. petroleum supplies whether originating from international supply problems, hurricanes, accidents or terrorist activities. The SPR serves as a significant deterrent to hostile threats of cutoffs of oil supplies. The SPR protects the economic security of the country. A release of oil from the SPR can mitigate the potential economic damage of an actual disruption in international or domestic petroleum supplies and the accompanying severe price increases. The SPR avails the United States of worldwide emergency assistance through its International Energy Agency (IEA) participation.

Contribution to the Secretary's Priorities

The programs within the Strategic Petroleum Reserve appropriation contribute directly to the Department's energy security mission by providing a SPR of sufficient size to protect the Nation and the capability to respond rapidly to a wide range of disruptions. The Reserve's current capacity of 727 million barrels, when filled in the beginning of 2010, will provide 71 days of net import protection and will continue to have the capability of being mobilized within a few days of the President's direction. It is projected that U.S. petroleum consumption and dependence on imports will decline in the future and the current Reserve's protection will gradually increase to 90 days by 2025.

The SPR has provided a secure energy supply to the Nation in the past by effectively responding to disruptions in U.S petroleum supplies (Gulf War in 1991), disruptions caused by hurricanes (Katrina/Rita in 2005 and Gustav/Ike in 2008) and almost a dozen logistical emergencies as a result of incidents causing port closures.

Contribution to GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves

The programs within the SPR appropriation contribute to Strategic Goal 1.1 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. The Reserve's physical inventory of 702 million barrels at the end of December 2008 provided 62 days of net import protection. With a projected inventory of 727 million barrels in 2010, the Reserve will provide 71 days of net import protection. The Energy Policy Act of 2005 directed DOE to acquire oil to increase the SPR to one billion barrels (its authorized level) as expeditiously as practical, without incurring excessive cost or appreciably affecting the price of petroleum products to consumers. The FY 2010 budget pursues an SPR program that is environmentally responsible and fully responsive to the needs of the Nation and the public.

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 severe oil supply disruptions will be influenced by the SPR's size (inventory and capacity) and ability to deliver into the marketplace. In FY 2009, DOE will use available balances for the purchase of additional SPR oil, and will continue to fill using Federal royalty oil until a 727 million barrel inventory is achieved in FY 2010. To ensure that the SPR program is environmentally responsible and fully responsive to the needs of the Nation and the public, the FY 2010 request proposes to replace an existing SPR storage cavern that poses an environmental risk with continued use.

The SPR utilizes a transportable degas plant to ensure availability of crude oil inventories at SPR sites within environmental and safety constraints. This process prevents the off-gassing of volatile organic compounds (VOCs) above safe levels during oil movements through commercial distribution points. Inventory processing at Big Hill was completed in FY 2006, and the self-contained degas plant was relocated to Bryan Mound in FY 2007. When Bryan Mound operations complete in FY 2011, the plant will be moved to the West Hackberry site. In FY 2010, modifications/foundations at the West Hackberry site in preparation for relocation of the degas plant to the site.

Performance can be affected by several external factors including:

- Petroleum consumption and import dependence levels
- Petroleum market conditions, and
- Developments in the commercial distribution system (i.e., pipelines, and terminals)

Validation and Verification

There is a hierarchy of performance information for the SPR. The Department collects and tracks the limited "dashboard" measures. The SPR Program Office monitors the "critical few," 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: semi-annual Management & Operating (M&O) contractor award fee performance assessments against Work Authorization Directives; on-site reviews to verify operational, maintenance and management performance data; and drawdown readiness quarterly reviews.

Annual Performance Results and Targets

FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Results	FY 2009 Targets	FY2010 Targets
Strategic Goal 1.1, Energy Diversity					
Strategic Petroleum Reserve					
Increase crude oil inventory to 690 million barrels. (GOAL EXCEEDED: Inventory of 700 million barrels was reached in August 2005).					
	Achieve maximum sustained (90 day) drawdown rate of 4.4 MMB. (MET GOAL)	Achieve maximum sustained (90 day) drawdown rate of 4.4 MMB. (MET GOAL)	Achieve maximum sustained (90 day) drawdown rate of 4.4 MMB. (MET GOAL)	Enable ready distribution of Strategic Petroleum Reserve (SPR) oil by achieving maximum sustained (90 day) drawdown rate of 4.4 million barrels.	Enable ready distribution of Strategic Petroleum Reserve (SPR) oil by achieving maximum sustained (90 day) drawdown rate of 4.4 million barrels.
	Achieve ≥ 95% of monthly maintenance and accessibility goals. (MET GOAL)	Achieve ≥ 95% of monthly maintenance and accessibility goals. (MET GOAL)	Achieve ≥ 95% of monthly maintenance and accessibility goals. (MET GOAL)	Ensure drawdown readiness by achieving ≥ 95% of monthly maintenance and accessibility goals.	Ensure drawdown readiness by achieving ≥ 95% of monthly maintenance and accessibility goals.
	Achieve operating cost per barrel of capacity of $0.204. (EXCEEDED GOAL: End of year operating costs were $0.186)	Achieve operating cost per barrel of capacity of $0.203 (EXCEEDED GOAL: End of year operating costs were $0.186)	Achieve operating cost per barrel of capacity of $0.204. (EXCEEDED GOAL: End of year operating costs were $0.187)	Ensure cost efficiency of SPR operations by achieving operating cost per barrel of $0.213.	Ensure cost efficiency of SPR operations by achieving operating cost per barrel of $0.220.

Facilities Development and Operations

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Facilities Development and Operations			
Security	19,415	20,932	20,817
Power	5,304	6,254	6,221
Operations and Maintenance	116,553	124,923	179,523
Support Services	2,708	2,560	2,921
Total, Facilities Development and Operations	143,980	154,669	209,482

Description

Facilities Development and Operations provides all requirements associated with developing and maintaining facilities for the SPR storage of petroleum and the operations associated with placing petroleum into storage. Under this subprogram, the mission-essential facilities are protected, monitored, evaluated, maintained, and tested to verify their readiness and availability. Primary operational systems at these facilities are the Raw Water Supply, Brine Disposal, and Crude Oil Systems. Major types of equipment and facilities are crude oil meters, crude oil pumps, raw water pumps, brine pumps, oil and brine tanks, piping, brine disposal wells, and crude oil storage caverns.

Benefits

The mission of the SPR program is in direct support of the Department of Energy's "Energy Security" mission. The SPR benefits the Nation by providing an insurance policy against potential interruptions in U.S. petroleum supplies whether originating from international supply problems, hurricanes, accidents or terrorist activities.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Security	**19, 415**	**20,932**	**20,817**

Budget reflects a cost effective security program providing an essential level of security services during all security conditions. Assures that the protection of SPR personnel, crude oil operations, classified matter, equipment, and facilities is consistent with the Site Security Plan and drawdown implementation. The major security effort is managed by the Management and Operating contractor with a subcontractor for the security protection force.

FY 2008 and FY 2009 reflect full funding for the protection force subcontract, as well as acquisition and maintenance of weapons systems, conducting tactical training, and management of security and emergency operations. FY 2010 funding provides for the protection force subcontract (207 FTEs) as well as continued security program management and maintenance requirements.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Power	**5,304**	**6,254**	**6,221**

Includes power costs at all sites for operational readiness, degas operations, and oil fill. Includes requirements for Non-Hydro Renewable Power per Executive Order 13123.

FY 2008 and FY 2009 supports maximum rate systems test exercises at all sites as well as oil and brine movements, transfers and brine disposal operations. FY 2010 funding includes power for degas plant operations at the Bryan Mound site.

Operations and Maintenance	**116,553**	**124,923**	**179,523**

The request supports oil movements, oil accountability, cavern integrity testing, corrosion control, and site subsidence surveys. Preventive, corrective, predictive, and facilities maintenance ensure the functionality and reliability of operational systems. Maintenance construction projects involving engineering, procurement, construction, fabrication, installation, and testing are scheduled to prolong the life of buildings, structures, and physical systems. Major system test exercises are conducted (pipelines and piping, emergency power, recovery systems, security systems, and cavern integrity) to demonstrate drawdown capability and verify mission-readiness. Vapor pressure mitigation continues as well as safety and health activities, fire protection, quality assurance, property management, data systems and environmental support to ensure that the SPR maintains compliance with laws, rules, regulations, and requirements.

FY 2008 includes construction projects for fire protection and UPS systems upgrades at all four storage sites. FY 2009 funds tasks for security enhancement construction projects for drawdown critical areas and upgrades to the ADAS and site security detection systems at the Bayou Choctaw site. FY 2009 includes the upgrade of meter control equipment at the four storage sites. FY 2010 provides for the purchase of a commercial storage cavern to replace an existing Bayou Choctaw site cavern that presents a major environmental risk with continued use. FY 2010 funding includes modifications/foundations at the West Hackberry site to prepare for relocation of the degas plant to the site, starting in FY 2011.

Support Services	**2,708**	**2,560**	**2,921**

The request supports funding requirements for technical support across all sites in the areas of configuration management, scheduling, audits of oil inventories and facilities revenue. Funding provides for subcontractor headcount (25 FTEs) to support these activities.

Total, Facilities Development and Operations	**143,980**	**154,669**	**209,482**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Facilities Development and Operations	
▪ **Security** The decrease is due to reduction in guard force for last six months (10 FTEs) offset by additional indirect labor expenses, training, and the inclusion of human reliability and physical fitness programs.	-115
▪ **Power** The decrease reflects cost savings. .	-33
▪ **Operations and Maintenance** The increase is due to: ➢ The requirement to purchase a replacement commercial storage cavern for a Bayou Choctaw site cavern that presents environmental risks with further use (+43,500k); ➢ Modifications/foundations at West Hackberry site for degas plant (+6,828k); ➢ Inspection and turn-around repairs for degas plant (+1,000k); ➢ Replacement of network infrastructure equipment (+984k); ➢ Upgrade of backup site data replication equipment (+387k) and of emergency management communications systems (+157k); ➢ Scheduled major maintenance construction projects (+2,347k); These increases are offset by a decrease related to changing recovery test exercises from an annual to a five year cycle (-603k).	+54,600
▪ **Support Services** The increase reflects an additional QA & Performance Specialist (1 FTE) and consultant services for security, audit and A-123 review support.	+361
Total, Facilities Development and Operations	**+54,813**

Capital Operating Expenses and Construction Summary

Capital Operating Expenses

(dollars in thousands)

	FY 2008	FY 2009	FY 2010
Security Enhancements for Drawdown Critical Areas (BM-MM-729)	1,618	0	0
ADAS System Upgrade (BM-MM-551)	1,589	0	0
Replace 42-inch Raw Water Header (WH-MM-726)	1,182	0	0
Potable Water System Upgrades (BC-MM-435)	415	0	0
Crude Oil Pipeline Repair (WH-MM-561)	270	0	0
Clean, Inspect & Repair Tank (BM-MM-529)	0	1,300	0
Upgrade Site Security Detection Systems (BC-MM-586)	0	1,266	0
ADAS System Upgrade (BC-MM-549)	0	1,141	0
ADAS System Upgrade (BH-MM-550)	0	0	1,070
ADAS System Upgrade (WH-MM-552)	0	0	1,043
Replace RWIS Bar Rack and Traveling Screen Framing (BM-MM-698)	0	0	300
Capital Equipment	10,305	8,505	6,999
Total, Capital Operating Expenses	15,379	12,212	9,412

Construction Projects

(dollars in thousands)

	Total Estimated Cost (TEC)	Prior-Year Approp-riations	FY 2008	FY 2009	FY 2010	Unapprop-riated Balance
	0	0	0	0	0	0
Total, Construction Projects	0	0	0	0	0	0

Major Items of Equipment *(TEC $2 million or greater)*

(dollars in thousands)

	Total Project Cost (TPC)	Total Estimated Cost (TEC)	Prior-Year Approp-riations	FY 2008	FY 2009	FY 2010	Completion Date
Upgrade Site Security Detection Systems (BM-MM-588)		2,560	0	1,803	0	0	FY 2008
Convert Tank 3 to External Floating Roof Tank (BM-MM-648)		4,470	0	2,148	0	0	FY 2008
Security Enhancements for Drawdown Critical Areas (BC-MM-727)		2,447	0	168	1,723	0	FY 2009
Site Modifications/ Foundation for Degas Plant (WH-MM-419)		8,505	0	0	0	6,828	FY 2010
Upgrade Site Security Detection Systems (WH-MM-589)		4,888	0	0	0	3,442	FY 2010
Upgrade Site Security Detection Systems (BH-MM-587)		3,424	0	0	0	2,411	FY 2010
Security Enhancements for Drawdown Critical Areas (BH-MM-728)		2,313	0	0	0	1,629	FY 2010
Security Enhancements for Drawdown Critical Areas (WH-MM-730)		2,053	0	0	0	1,446	FY 2010
Total, Major Items of Equipment				4,119	1,723	15,756	

Management
Funding Profile by Category

	FY 2008	FY 2009	FY 2010
Washington Headquarters			
Salaries and Benefits	3,318	3,447	3,550
Travel	167	174	179
Support Services	933	970	1,061
Other Related Expenses	710	739	700
Total, Washington Headquarters	5,128	5,330	5,490
Full Time Equivalents	27	27	27
Strategic Petroleum Reserve (SPR) Project Management Office			
Salaries and Benefits	10,722	11,337	12,281
Travel	386	468	398
Other Related Expenses	1,768	1,689	1,422
Total, SPR Project Management Office	12,876	13, 494	14,101
Full Time Equivalents	95	95	95
Total Management			
Salaries and Benefits	14, 040	14, 784	15,831
Travel	553	642	577
Support Services	933	970	1,061
Other Related Expenses	2,478	2,428	2,122
Total, Management	18,004	18,824	19,591
Total, Full Time Equivalents	126	122	122

Mission

The mission of the SPR program is in direct support of the Department of Energy's "Energy Security" mission. The SPR benefits the Nation by providing an insurance policy against potential interruptions in U.S. petroleum supplies whether originating from international supply problems, hurricanes, accidents or terrorist activities. Management provides for all costs of personnel and administration related to maintaining the SPR Project Management Office in New Orleans, Louisiana and the Program Office in Washington, DC. Funding for contract services required to support management and the technical analysis of program initiatives and issues is included.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Salaries and Benefits	**14,040**	**14,784**	**15,831**
Total, Salaries and Benefits	**14,040**	**14,784**	**15,831**

Funds salaries and benefits (122 FTEs) to assure achievement of Level 1 Performance criteria for drawdown and distribution. Provides for support and oversight of the management and operations contractor and subcontractor activities and program operations.

Travel	**553**	**642**	**577**

Provides travel to assure capability to achieve Level 1 Performance criteria for drawdown and distribution of the Reserve.

Support Services	**933**	**970**	**1,061**

Provide analytic support for SPR development, fill and distribution policy decisions. Includes distribution modeling maintenance.

Other Related Expenses	**2,478**	**2,428**	**2,122**

Major elements are communications, building lease, and electric power for DOE-occupied space (New Orleans, LA). Includes training, small purchases, personal computer hardware/software, supplies and materials for Federal staff.

Subtotal, Management	**18,004**	**18,824**	**19,591**
Total, Management	**18,004**	**18,824**	**19,591**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Management	
The increase is due to escalation and a change in the COLA rate for salaries and benefits.	+767
Total, Management	**+767**

Support Services by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Technical Support			
Economic and Environmental Analyses	933	970	1,061
Total, Support Services	933	970	1,061

Other Related Expenses by Category

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Other Related Expenses			
Rent to Others	492	515	604
Communications, Utilities, Misc	36	37	76
Other Services	1,694	1,930	1,213
Supplies and Materials	127	53	134
Equipment	129	124	95
Total, Other Related Expenses	2,478	2,659	2,122

Expansion

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Expansion			
Richton, MS	24,773	31,507	0
Total, Expansion	24,773	31,507	0

Description
In 2005, the Energy Policy Act of 2005 directed the DOE to expand the SPR to its authorized level of one billion barrels, as expeditiously as practical, without incurring excessive cost or appreciably affecting the price of petroleum products to consumers.

Benefits
The mission of the SPR program is in direct support of the Department of Energy's "Energy Security" mission. The SPR benefits the Nation by providing an insurance policy against potential interruptions in U.S. petroleum supplies whether originating from international supply problems, hurricanes, accidents or terrorist activities.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Richton, MS	**24,773**	**31,507**	**0**
The request shows the FY 2009 appropriated amount of $31,507,000 associated with the development of the Richton oil storage site which had been part of FY 2009 Congressional request for the one billion barrel expansion.			
Total, Expansion	**24,773**	**31,507**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Expansion	
Richton, MS	
In FY 2010, no funding is requested.	-31,507
Total, Expansion	**-31,507**

Capital Operating Expenses and Construction Summary

Major Items of Equipment (TEC $2 million or greater)
(dollars in thousands)

	Total Project Cost (TPC)	Total Estimated Cost (TEC)	Prior-Year Approp-riations	FY 2008	FY 2009	FY 2010	Completion Date
Richton, MS Site Development		4,200,378	0	24,773	31,507	0	FY 2020
Total, Major Items of Equipment				24,773	31,507	0	

Northeast Home Heating Oil Reserve

Northeast Home Heating Oil Reserve

Northeast Home Heating Oil Reserve

Proposed Appropriation Language

For necessary expenses for Northeast Home Heating Oil Reserve storage, operation, and management activities pursuant to the Energy Policy and Conservation Act, [$9,800,000] *$11,300,000* to remain available until expended. *(Energy and Water Development and Related Agencies Appropriations Act, 2008).*

Explanation of Change

The increase reflects the repurchase of heating oil in FY 2010 that was sold in FY 2007 to finance the commercial storage costs.

Northeast Home Heating Oil Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2009 Additional Appropriation	FY 2010 Request
Northeast Home Heating Oil Reserve				
Northeast Home Heating Oil Reserve	12,335	9,800	0	11,300
Total, Northeast Home Heating Oil Reserve	12,335	9,800	0	11,300

Preface

The Northeast Home Heating Oil Reserve is an emergency stockpile of heating oil to address weather–related supply problems in the Northeast. The Northeast has limited refinery capacity and is highly dependent on heating oil brought in from outside the region. Supplies may be strained by cold snaps, and ice and high winds may prevent resupply or normal distribution patterns. The Reserve consists of two million barrels of heating oil stored at commercial terminals in the Northeast. It is ready for sale by the Secretary upon a finding by the President that there is a severe supply interruption.

Mission

The mission of the Northeast Home Heating Oil Reserve is to store petroleum distillate to provide energy security against severe heating oil supply disruptions throughout the Northeast.

Strategic Themes, and Goals and Secretary's Initiatives

A new strategic plan has not yet been established and approved by the Secretary of Energy. The Secretary has established major priorities and initiatives. The following chart aligns the current Strategic Plan with the Secretary's priorities:

Strategic Theme	Strategic Goal Title	Secretary's Priorities	GPRA Unit Program Number	GPRA Unit Program Title	Office
1. Energy Security	1. Energy Diversity	Economic Prosperity	11	Petroleum Reserves	FE

Means and Strategies

The Northeast Home Heating Oil Reserve 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 Heating Oil Reserve to mitigate the economic damage of severe heating oil supply disruptions will be influenced by the Reserve's ability to deliver into the marketplace. During FY 2007, 35,000 barrels of heating oil was sold to supplement funding for the new storage contracts. An additional 19,253 barrels of heating oil were purchased in FY 2008, bringing the total to 1,984,253 barrels.

Validation and Verification

There is a hierarchy of performance information for the SPR. The Department collects and 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 contractors. Organizational and action plans are reviewed and analyzed at quarterly Program Reviews. Monthly Project Assessments and quarterly 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 site manager's 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 assessment against Work Authorization Directives; on-site reviews to verify operational, maintenance and management performance data; and drawdown readiness quarterly reviews.

Performance

The Reserve is strategically placed in ports along the Northeast coast to respond rapidly and efficiently to any emergency supply interruption using marine, truck and pipeline distribution.

The Reserve may only be sold by the Secretary upon a finding by the President that there is a severe supply interruption. The finding may be made based on a legislated definition of a "dislocation in the heating oil market" based on specific price relationships, or under other circumstances constituting a regional supply shortage of significant scope and duration that use of the Reserve would help to mitigate the adverse impacts.

The sale is accomplished within hours of a decision through an on-line bidding system, and the oil can begin to move within two days of the Presidential finding.

The contracts for commercial storage service provide for maintenance of product quality and quantity at all times, and ability to distribute all quantities to commercial purchasers within 10 days of notification. The contracts also provide for commercial security measures overseen by relevant Federal entities.

Northeast Home Heating Oil Reserve

Funding by Site by Program

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Hess (Woodbridge NJ)	4,320	4,800	4,800
Morgan Stanley (New Haven, CT)	3,360	3,496	3,496
Hess (Groton, CT)	1,320	1,200	1,200
Washington Headquarters	3,335	304	1,804
Subtotal, Northeast Home Heating Oil Reserve	12,335	9,800	11,300

Major Changes or Shifts by Site

Northeast Home Heating Oil Reserve

The Northeast Home Heating Oil Reserve (NEHHOR) new contracts were signed on August 7, 2007. The contracts are a one-year contract with three one-year option periods.

Site Description

Hess (Woodbridge, NJ)

The Hess Terminal in the New York Harbor (Woodbridge, NJ) currently holds 984,253 barrels of home heating oil.

Morgan Stanley (New Haven, CT)

The Magellan Terminal in New Haven, CT currently holds 750,000 barrels of home heating oil.

Hess (Groton, CT)

The Hess Terminal in Groton, CT currently holds 250,000 barrels of home heating oil.

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. Also administers the quality and management surveillance support from Defense Energy Support Center (DESC).

Northeast Home Heating Oil Reserve

Funding Profile by Subprogram

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Northeast Home Heating Oil Reserve	12,335	9,800	11,300
Total, Northeast Home Heating Oil Reserve	12,335	9,800	11,300

Mission
The mission of the Northeast Home Heating Oil Reserve is to store petroleum distillate to provide energy security against severe heating oil supply disruptions throughout the Northeast.

Benefits
The size of two million barrels was determined to be sufficient to provide an emergency supplemental supply over a10 day delivery period, the time required for ships to carry heating oil from the Gulf of Mexico to New York Harbor in the event of a supply disruption or shortage in the northeast region.

The heating oil reserve has been designed to augment commercial supplies during an emergency. The reserve is not designed to displace the private market. It provides a buffer large enough to assist the heating oil industry in mitigating short term supply interruptions, but small enough so as to not dissuade industry from responding to increasing prices as a signal that more supplies are required.

Performance
The Reserve is strategically placed in ports along the Northeast coast to respond rapidly and efficiently to any emergency supply interruption using marine, truck and pipeline distribution.

The Reserve may only be sold by the Secretary upon a finding by the President that there is a severe supply interruption. The finding may be made based on a legislated definition of a “dislocation in the heating oil market” based on specific price relationships, or under other circumstances constituting a regional supply shortage of significant scope and duration that use of the Reserve would help to mitigate the adverse impacts.

The sale is accomplished within hours of a decision through an on-line bidding system, and the oil can begin to move within two days of the Presidential finding.

The contracts for commercial storage service provide for maintenance of product quality and quantity at all times, and ability to distribute all quantities to commercial purchasers within 10 days of notification. The contracts also provide for commercial security measures overseen by relevant Federal entities.

Northeast Home Heating Oil Reserve

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Northeast Home Heating Oil Reserve			
Commercial Storage Leases	9,000	9,496	9,496
Information Technology Support	260	229	229
Quality Control & Analysis	75	75	75
Heating Oil Acquisition	3,000	0	1,500
Total, Northeast Home Heating Oil Reserve	12,335	9,800	11,300

Description

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.

Benefits

The size of two million barrels was determined to be sufficient to provide an emergency supplemental supply over a 10 day delivery period, the time required for ships to carry heating oil from the Gulf of Mexico to New York Harbor in the event of a supply disruption or shortage in the northeast region.

The heating oil reserve has been designed to augment commercial supplies during an emergency. The Reserve is not designed to displace the private market. It provides a buffer large enough to assist the heating oil industry in mitigating short term supply interruptions but small enough so as to not dissuade industry from responding to increasing prices as a signal that more supplies are required.

Location	Amount of Distillate	Distribution Capability (minimum contractual capabilities)
Hess (NY harbor)	965,000 BBL	100,000 BPD
Morgan Stanley (New Haven, CT)	750,000 BBL	75,000 BPD
Hess (Groton, CT)	250,000 BBL	25,000 BPD

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Commercial Storage Leases	**9,000**	**9,496**	**9,496**

Continues operation of the Reserve, including lease of commercial storage space. FY2007 requirement was offset with prior-year balances.

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Information Technology Support	**260**	**229**	**229**

Provides computer support. Conducts mock sales with industry participation to test and evaluate the sales process, procedures and on-line computer system.

Quality Control & Analysis	**75**	**75**	**75**

FY 2009 activities include monthly quality surveillance of three commercial storage sites by the Defense Energy Support Center (DESC).

During FY 2007, DESC managed bid evaluations and contract awards in conjunction with the NEHHOR headquarters office for the new commercial storage leases. Contract execution is managed by the SPR Project Management Office in New Orleans LA.

Heating Oil Acquisition	**3,000**	**0**	**1,500**

Provides funding for the repurchase of heating oil sold in FY 2007 to finance the new storage contracts. Quantity is dependent on price at time of bid solicitation.

Total, Northeast Home Heating Oil Reserve	**12,335**	**9,800**	**11,300**

Explanation of Changes

	FY 2010 vs. FY 2009 ($000)
Northeast Home Heating Oil Reserve	
▪ **Repurchase Heating Oil**	
Increase reflects the remaining purchase of 15,747 Barrels to reach the 2 million barrels authorized by the Energy Policy Act.	+1,500
Total Funding Change, Northeast Home Heating Oil Reserve	**+1,500**

Clean Coal Technology

Clean Coal Technology

Clean Coal Technology

[(including transfer of funds)]

[Of the funds made available under this heading for obligation in prior years, $149,000,000 of uncommitted balances are transferred to Fossil Energy Research and Development to be used until expended: *Provided,* That funds made available in previous appropriations Acts shall be made available for any ongoing project regardless of the separate request for proposal under which the project was selected.] *(Energy and Water Development and Related Agencies Appropriations Act, 2009.)*

Explanation of Change

All Clean Coal Technology project funding commitments have been fulfilled and only project closeout activities remain.

Clean Coal Technology

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2008 Current Appropriation	FY 2009 Original Appropriation	FY 2009 Additional Appropriation	FY 2010 Request
Clean Coal Technology				
Deferral of Unobligated Balances, FY 2007	0	0	0	0
Deferral of Unobligated Balances, FY 2008	257,000	0	0	0
Deferral of Unobligated Balances, FY 2009	-149,000	149,000	0	0
Transfer to Fossil Energy R&D (FutureGen)	-75,000	0	0	0
Transfer to Fossil Energy R&D (Clean Coal Power Initiative)	-70,000	-149,000	0	0
Transfer to Fossil Energy R&D (Fuels and Power Systems)	-21,000	0	0	0
Transfer to Fossil Energy R&D (FutureGen)	0	0	0	0
Total, Clean Coal Technology	-58,000	0	0	0

Preface

The Clean Coal Technology (CCT) program is a government and industry co-funded effort to provide technical and operational data of innovative coal technologies demonstrated at the 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 experience and data for a variety of applications.

For FY 2010, the Department proposes no new funding. All project funding commitments have been fulfilled and only project closeout activities remain.

For FY 2009, $149 million was transferred to Fossil Energy R&D for the Clean Coal Power Initiative.

For FY 2008, the availability of $149 million was deferred to FY 2009 and $166 million was transferred to Fossil Energy R&D.

Strategic Themes, and Goals and Secretary's Initiatives

Clean Coal Technology contributes to the Secretary's Initiatives by creating public/private partnerships to develop technology capable of addressing air emissions concerns associated with coal use, while providing domestically secure, cost-efficient electricity generation. The CCT Program has helped establish the engineering and scientific foundation for the next generation of clean coal technologies that will be capable of low CO_2 atmospheric emissions, including CO_2 capture, and generation efficiencies twice that of the existing coal fleet.

Clean Coal Technology

Funding Profile by Subprogram

(dollars in thousands)

	FY 2008 Appropriation	FY 2009	FY 2010
Clean Coal Technology			
Clean Coal Technology	-58,000	0	0
Total, Clean Coal Technology	-58,000	0	0

Mission

The Clean Coal Technology (CCT) program is a jointly funded government and industry 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 experience and data for a variety of applications.

For FY 2010, the Department proposes no new funding. All project funding commitments have been fulfilled and only project closeout activities remain.

For FY 2009, $149 million was transferred to Fossil Energy R&D for the Clean Coal Power Initiative.

For FY 2008, the availability of $149 million was deferred to FY 2009 and $166 million was transferred to Fossil Energy R&D.

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Clean Coal Technology	**-58,000**	**0**	**0**
▪ **Cooperative Agreements**	**-58,000**	**0**	**0**

For FY 2010, the Department proposes no new funding. All project funding commitments have been fulfilled and only project closeout activities remain.

For FY 2009, $149 million was transferred to Fossil Energy R&D for the Clean Coal Power Initiative. All project funding commitments have been fulfilled and only project closeout activities remain.

For FY 2008, the availability of $149 million was deferred to FY 2009 and $166 million was transferred to Fossil Energy R&D. All project funding commitments have been fulfilled and only project closeout activities remain.

Total, Clean Coal Technology	**-58,000**	**0**	**0**

Explanation of Funding Changes

	FY 2010 vs. FY 2009 ($000)
Clean Coal Technology	
CCT funding commitments are fulfilled. Prior-year balances were transferred to Fossil Energy R&D.	0
Total Funding Change, Clean Coal Technology	**0**

Ultra-Deepwater Unconventional Natural Gas

Ultra-Deepwater Unconventional Natural Gas

Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2008 Current Appropriation	FY 2009 Likely Enacted	FY 2010 Request
Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund			
Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	50,000	50,000	50,000
Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	-50,000	-50,000	-50,000
Repeal Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	-50,000
Repeal Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	50,000
Total, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	0

Mission

The mission of the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund activities was [STET] to manage and conduct industry-focused R&D in the areas identified by Section 999 of the Energy Policy Act of 2005 (Public Law 109-58).

Background

The Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund was funded from Federal revenues from oil and gas leases in FY 2008 and FY 2009. The FY 2010 Budget proposes to repeal the program through a legislative proposal. The decision to terminate funding for this program is consistent with the policy to terminate discretionary oil and gas research and development programs, with the exception of long-term, high-risk research and development on methane hydrates.

Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund			
Consortium-Ultra Deepwater	35,625	35,625	0
NETL Ultra Deepwater	14,375	14,375	0
Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	-50,000	-50,000	0
Total, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	0

Detailed Justification

	(dollars in thousands)		
	FY 2008	FY 2009	FY 2010
Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	**50,000**	**50,000**	**0**

The Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund program is a public/private partnership designed to increase domestic natural gas and oil resource base through cost reduction and efficiency improvement. A portion of the funding will be directed towards cost-shared research partnerships, while another portion will be used to carry out complementary R&D. Three program elements included in the cost-shared partnerships (consortium) are: ultra-deepwater architecture and technology, unconventional natural gas and other petroleum resource E&P, and technology challenges of small producers. The fourth program element is complementary research, which will be conducted by the National Energy Technology Laboratory. *Participants included: RPSEA, NETL.*

Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	**-50,000**	**-50,000**	**0**
Total, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	**0**	**0**	**0**

GENERAL PROVISIONS

Sec. 301. Contract Competition.
(a) None of the funds in this or any other appropriations Act for fiscal year [2009] *2010* or any previous fiscal year may be used to make payments for a noncompetitive management and operating contract, or a contract for environmental remediation or waste management in excess of $100,000,000 in annual funding at a current or former management and operating contract site or facility, or to award a significant extension or expansion to an existing management and operating contract, or other contract covered by this section, unless such contract is awarded using competitive procedures or the Secretary of Energy grants, on a case-by-case basis, a waiver to allow for such a deviation. The Secretary may not delegate the authority to grant such a waiver.
(b) Within 30 days of formally notifying an incumbent contractor that the Secretary intends to grant such a waiver, the Secretary shall submit to the Subcommittees on Energy and Water Development of the Committees on Appropriations of the House of Representatives and the Senate a report notifying the Subcommittees of the waiver and setting forth, in specificity, the substantive reasons why the Secretary believes the requirement for competition should be waived for this particular award.
(c) In this section the term ``competitive procedures'' has the meaning provided in section 4 of the Office of Federal Procurement Policy Act (41 U.S.C. 403) and includes procedures described in section 303 of the Federal Property and Administrative Services Act of 1949 (41 U.S.C. 253) other than a procedure that solicits a proposal from only one source.
Sec. 302. Unfunded Requests for Proposals. None of the funds appropriated by this Act may be used to prepare or initiate Requests For Proposals (RFPs) for a program if the program has not been funded by Congress.
Sec. 303. Department of Energy Defense Nuclear Facilities Workforce Restructuring. None of the funds appropriated by this Act may be used--
(1) to augment the funds made available for obligation by this Act for severance payments and other benefits and community assistance grants under section 4604 of the Atomic Energy Defense Act (50 U.S.C. 2704) unless the Department of Energy submits a reprogramming [request]*notice* to the appropriate congressional committees; or
(2) to provide enhanced severance payments or other benefits for employees of the Department of Energy under such section; or
(3) develop or implement a workforce restructuring plan that covers employees of the Department of Energy.
Sec. 304. Unexpended Balances. The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.
Sec. 305. Bonneville Power Authority Service Territory. None of the funds in this or any other Act for the Administrator of the Bonneville Power Administration may be used to enter into any agreement to perform energy efficiency services outside the legally defined Bonneville service territory, with the exception of services provided internationally, including services provided on a reimbursable basis, unless the Administrator certifies in advance that such services are not available from private sector businesses.

Sec. 306. User Facilities. When the Department of Energy makes a user facility available to universities or other potential users, or seeks input from universities or other potential users regarding significant characteristics or equipment in a user facility or a proposed user facility, the Department shall ensure broad public notice of such availability or such need for input to universities and other potential users. When the Department of Energy considers the participation of a university or other potential user as a formal partner in the establishment or operation of a user facility, the Department shall employ full and open competition in selecting such a partner. For purposes of this section, the term ``user facility'' includes, but is not limited to: (1) a user facility as described in section 2203(a)(2) of the Energy Policy Act of 1992 (42 U.S.C. 13503(a)(2)); (2) a National Nuclear Security Administration Defense Programs Technology Deployment Center/User Facility; and (3) any other Departmental facility designated by the Department as a user facility.

Sec. 307. Intelligence Activities. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 414) during fiscal year [2009] *2010* until the enactment of the Intelligence Authorization Act for fiscal year [2009] *2010*.

Sec. 308. Laboratory Directed Research and Development. Of the funds made available by the Department of Energy for activities at government-owned, contractor-operated laboratories funded in this Act or subsequent Energy and Water Development Appropriations Acts, the Secretary may authorize a specific amount, not to exceed 8 percent of such funds, to be used by such laboratories for laboratory directed research and development: *Provided*, That the Secretary may also authorize a specific amount not to exceed 4 percent of such funds, to be used by the plant manager of a covered nuclear weapons production plant or the manager of the Nevada Site Office for plant or site directed research and development[: *Provided further*, That notwithstanding Department of Energy order 413.2A, dated January 8, 2001, beginning in fiscal year 2006 and thereafter, all DOE laboratories may be eligible for laboratory directed research and development funding].

[Sec. 309. Reliable Replacement Warhead. None of the funds provided in this Act shall be available for the Reliable Replacement Warhead (RRW).]

Sec. [310]309. General Plant Projects. Plant or construction projects for which amounts are made available under this and subsequent appropriation Acts with a current estimated cost of less than $10,000,000 are considered for purposes of section 4703 of Public Law 107-314 as a plant project for which the approved total estimated cost does not exceed the minor construction threshold and for purposes of section 4704 of Public Law 107--314 as a construction project with a current estimated cost of less than a minor construction threshold.

[Sec. 311. Energy Production. The Secretary of Energy shall provide funding to the National Academy of Sciences to conduct an inventory of the energy development potential on all lands currently managed by the Department of Energy together with a report, to be submitted not later than July 1, 2009, which includes (1) a detailed analysis of all such resources including oil, gas, coal, solar, wind, geothermal and other renewable resources on such lands, (2) a delineation of the resources presently available for development as well as those potentially available in the future, and (3) an analysis of the environmental impacts associated with any future development including actions

necessary to mitigate negative impacts.]
[Sec. 312.
(a) Reno Hydrogen Fuel Project. The non-Federal share of project costs shall be 20 percent.
(b) The cost of project vehicles, related facilities, and other activities funded from the Federal Transit Administration sections 5307, 5308, 5309, and 5314 program, including the non-Federal share for the FTA funds, is an eligible component of the non-Federal share for this project.
(c) Contribution of the non-Federal share of project costs for all grants made for this project may be deferred until the entire project is completed.
(d) All operations and maintenance costs associated with vehicles, equipment, and facilities utilized for this project are eligible project costs.
(e) This section applies to project appropriations beginning in fiscal year 2004.]
[Sec. 313.
(a) Integrated University Program. The Secretary of Energy, along with the Administrator of the National Nuclear Security Administration and the Chairman of the Nuclear Regulatory Commission, shall establish an Integrated University Program.
(b) For the purposes of carrying out this section, $45,000,000 is authorized to be appropriated in each of fiscal years 2009 to 2019 as follows:
(1) $15,000,000 for the Department of Energy;
(2) $15,000,000 for the Nuclear Regulatory Commission; and
(3) $15,000,000 for the National Nuclear Security Administration.
(c) Of the amounts authorized to carry out this section, $10,000,000 shall be used by each organization to support university research and development in areas relevant to their respective organization's mission, and $5,000,000 shall be used by each organization to support a jointly implemented Nuclear Science and Engineering Grant Program that will support multiyear research projects that do not align with programmatic missions but are critical to maintaining the discipline of nuclear science and engineering.]
Sec. *310. None of the funds made in this or subsequent Acts may be used for the testing of nuclear explosives in the recovery of oil and gas.*
Sec. *311. (a) Section 1801 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g) is amended in subsection (b)(2) by striking "amounts contained within the Fund" and inserting "assessments collected pursuant to section 1802 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g-1) as amended".*
(b) Section 1802 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g-1) is amended:

(1) in subsection (a):

(A) by striking "$518,233,333" and inserting "$663,000,000"; and

(B) by striking "on October 24, 1992" and inserting "with fiscal year 2011".

(2) in subsection (c):

(A) by inserting "(1)" before "The Secretary";

(B) by inserting after "utilities": ", only to the extent provided in advance in appropriation Acts";

(C) by striking "$150,000,000" and inserting "$200,000,000";

(D) by inserting "beginning in fiscal year 2011" after "adjusted for inflation";

(E) by striking "(1)" and inserting "(A)";

(F) by striking "(2)" and inserting "(B)";

(G) by adding a new paragraph 2, ",(2) Amounts authorized to be collected pursuant to this section shall be deposited in the Fund and credited as offsetting receipts."

(3) in subsection (d), by striking "for the period encompassing 15 years after the date of the enactment of this title" and inserting "through fiscal year 2025"; and

(4) in subsection (e):

(A) in paragarph (1), by striking "15 years after the date of the enactment of this title" and inserting "September 30, 2025";

(B) in paragraph (2), by striking "$2,250,000,000" and inserting "$3,000,000,000"; and

(C) in paragraph (2) by inserting "beginning in fiscal year 2011" after "adjusted for inflation".
Sec. 312. Not to exceed 5 per centum, or $100,000,000, of any appropriation, whichever is less, made available for Department of Energy activities funded in this Act or subsequent Energy and Water Development Appropriations Acts may hereafter be transferred between such appropriations, but no such appropriation, except as otherwise provided, shall be increased or decreased by more than 5 per centum by any such transfers, and notification of such transfers shall be submitted promptly to the Committees on Appropriations of the House and Senate.(Energy and Water Development and Related Agencies Appropriations Act, 2009.)