DOE/CF-030
Volume 7

Department of Energy

FY 2009 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

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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.

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

	FY 2007 Current Op. Plan	FY 2008 Current Approp.	FY 2009 Congressional Request	FY 2009 vs. FY 2008 $	FY 2009 vs. FY 2008 %
Discretionary Summary By Appropriation					
Energy And Water Development, And Related Agencies					
Appropriation Summary:					
Energy Programs					
Energy efficiency and renewable energy	——	1,722,407	1,255,393	-467,014	-27.1%
Electricity delivery and energy reliability	——	138,556	134,000	-4,556	-3.3%
Nuclear energy	——	961,665	853,644	-108,021	-11.2%
Legacy management	——	33,872	——	-33,872	-100.0%
Energy supply and Conservation	2,145,149	——	——	——	——
Fossil energy programs					
Clean coal technology	——	-58,000	——	+58,000	+100.0%
Fossil energy research and development	580,946	742,838	754,030	+11,192	+1.5%
Naval petroleum and oil shale reserves	21,316	20,272	19,099	-1,173	-5.8%
Strategic petroleum reserve	164,441	186,757	344,000	+157,243	+84.2%
Northeast home heating oil reserve	7,966	12,335	9,800	-2,535	-20.6%
Total, Fossil energy programs	774,669	904,202	1,126,929	+222,727	+24.6%
Uranium enrichment D&D fund	556,606	622,162	480,333	-141,829	-22.8%
Energy information administration	90,653	95,460	110,595	+15,135	+15.9%
Non-Defense environmental cleanup	349,687	182,263	213,411	+31,148	+17.1%
Science	3,836,613	3,973,142	4,721,969	+748,827	+18.8%
Nuclear waste disposal	99,206	187,269	247,371	+60,102	+32.1%
Departmental administration	147,943	148,415	154,827	+6,412	+4.3%
Inspector general	41,819	46,057	51,927	+5,870	+12.7%
Innovative technology loan guarantee program	——	4,459	——	-4,459	-100.0%
Total, Energy Programs	8,042,345	9,019,929	9,350,399	+330,470	+3.7%
Atomic Energy Defense Activities					
National nuclear security administration:					
Weapons activities	6,258,583	6,297,466	6,618,079	+320,613	+5.1%
Defense nuclear nonproliferation	1,824,202	1,335,996	1,247,048	-88,948	-6.7%
Naval reactors	781,800	774,686	828,054	+53,368	+6.9%
Office of the administrator	358,291	402,137	404,081	+1,944	+0.5%
Total, National nuclear security administration	9,222,876	8,810,285	9,097,262	+286,977	+3.3%
Environmental and other defense activities:					
Defense environmental cleanup	5,731,240	5,349,325	5,297,256	-52,069	-1.0%
Other defense activities	636,271	754,359	1,313,461	+559,102	+74.1%
Defense nuclear waste disposal	346,500	199,171	247,371	+48,200	+24.2%
Total, Environmental & other defense activities	6,714,011	6,302,855	6,858,088	+555,233	+8.8%
Total, Atomic Energy Defense Activities	15,936,887	15,113,140	15,955,350	+842,210	+5.6%
Power marketing administrations:					
Southeastern power administration	5,602	6,404	7,420	+1,016	+15.9%
Southwestern power administration	29,998	30,165	28,414	-1,751	-5.8%
Western area power administration	232,326	228,907	193,346	-35,561	-15.5%
Falcon & Amistad operating & maintenance fund	2,665	2,477	2,959	+482	+19.5%
Colorado River Basins	——	-23,000	-23,000	——	——
Total, Power marketing administrations	270,591	244,953	209,139	-35,814	-14.6%
Federal energy regulatory commission	——	——	——	——	——
Subtotal, Energy And Water Development and Related Agencies	24,249,823	24,378,022	25,514,888	+1,136,866	+4.7%
Uranium enrichment D&D fund discretionary payments	-452,000	-458,787	-463,000	-4,213	-0.9%
Excess fees and recoveries, FERC	-43,595	-34,411	-36,932	-2,521	-7.3%
Total, Discretionary Funding	**23,754,228**	**23,884,824**	**25,014,956**	**+1,130,132**	**+4.7%**

Fossil Energy Research and Development

Fossil Energy Research and Development

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Fossil Energy Research and Development

Proposed Appropriation Language

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95-91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, [and for the hire of passenger motor vehicles, the hire, maintenance, and operation of aircraft, the purchase, repair, and cleaning of uniforms, the reimbursement to the General Services Administration for security guard services,] 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), [$750,000,000] *$754,030,000*, to remain available until expended, of which [$166,000,000] *$149,000,000* shall be derived by transfer from ''Clean Coal Technology'': *Provided, That of the amounts provided,$241,000,000 is available for the Clean Coal Power Initiative Round III solicitation, pursuant to Title IV of the Public Law 109-58, and for a FutureGen solicitation: Provided further*, That funds appropriated for prior solicitations under the Clean Coal Technology Program, Power Plant Improvement Initiative, [and] 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 *or FutureGen 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 or FutureGen* 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 or FutureGen application selected after enactment of this legislation for negotiation under this or any other Act in any fiscal year, is not awarded within two 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 *or FutureGen* 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 at least 50 percent cost-sharing shall be required in each budget period of a project: *Provided further*, That in accordance with section 988(e) of Public Law 109-58, repayment of the DOE contribution to a project shall not be a condition of making an award under this solicitation: *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 the Secretary may vest fee title in property acquired under FutureGen projects in any entity, including the United States: 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 in this Act and future Acts, [up to 4 percent of] program direction funds available to the National Energy Technology Laboratory [may] *shall only* be used to support Department of Energy activities

[not] included in this Fossil Energy account[: *Provided further*, That in this Act and future Acts, the salaries for Federal employees performing research and development activities at the National Energy Technology Laboratory can continue to be funded from any appropriate DOE program accounts: *Provided further*, That revenues and other moneys received by or for the account of the Department of Energy or otherwise generated by sale of products in connection with projects of the Department appropriated under the Fossil Energy Research and Development account may be retained by the Secretary of Energy, to be available until expended, and used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements]. *(Energy and Water Development and Related Agencies Appropriations Act, 2008.)*

Explanation of Change

Changes reflect revisions to funding amounts. Other changes include:

…….and for the hire of passenger motor vehicles, the hire, maintenance, and operation of aircraft, the purchase, repair, and cleaning of uniforms, the reimbursement to the General Services Administration for security guard services,

Fossil Energy Research and Development does not require this language in FY 2009 because the vehicles are leased, there are no aircraft or uniforms, and there are no reimbursements to GSA for security guard services.

…….Provided, That of the amounts provided, $241,000,000 is available for the Clean Coal Power Initiative Round III solicitation, pursuant to Title IV of the Public Law 109-58, and for a FutureGen solicitation:

Language provides for full up-front funding, which makes the investments more attractive to the private sector.

…….Provided further, That if a Clean Coal Power Initiative or FutureGen application selected after enactment of this legislation for negotiation under this or any other Act in any fiscal year, is not awarded within two 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:

Language provides for a two-year time restraint for the awarding of Clean Coal Power Initiative and FutureGen projects to avoid multi-year project delays.

……. 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 the Secretary may vest fee title in property acquired under FutureGen projects in any entity, including the United States:

Language provides for full up-front funding, which makes the investments more attractive to the private sector.

…….[*Provided further*, That in this Act and future Acts, the salaries for Federal employees performing research and development activities at the National Energy Technology Laboratory can continue to be funded from any appropriate DOE program accounts: Provided further, That revenues and other moneys received by or for the account of the Department of Energy or otherwise generated by sale of products in connection with projects of the Department appropriated under the Fossil Energy Research and Development account may be retained by the Secretary of Energy, to be available until expended, and used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements.]

Language is eliminated in the 2009 budget request because Fossil Energy program direction provides full funding for Federal employees performing research and development activities at the National Energy Technology Laboratory.

Fossil Energy Research and Development
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments[a]	FY 2008 Current Appropriation	FY 2009 Request
Fossil Energy Research and Development					
Coal	414,438	497,912	-4,530	493,382	623,732
Natural Gas Technologies	11,709	20,000	-182	19,818	0
Petroleum - Oil Technology	2,625	5,000	-46	4,954	0
Program Direction	129,803	149,962	-1,365	148,597	126,252
Plant and Capital Equipment	12,000	13,000	-118	12,882	5,000
Fossil Energy Environmental Restoration	9,715	9,570	-87	9,483	9,700
Cooperative R&D	0	5,000	-46	4,954	0
Special Recruitment Programs	656	656	-6	650	656
Congressional Directed Projects	0	48,900	-782	48,118	0
Subtotal, Fossil Energy Research and Development	580,946	750,000	-7,162	742,838	765,340
Use of prior-year balances	0	0	0	0	-11,310
Total, Fossil Energy Research and Development	580,946	750,000	-7,162	742,838	754,030
Clean Coal Technology					
Deferral of Unobligated Balances, FY 2007	257,000	0	0	0	0
Deferral of Unobligated Balances, FY 2008	-257,000	257,000	0	257,000	0
Deferral of Unobligated Balances, FY 2009	0	-149,000	0	-149,000	149,000
Transfer to Fossil Energy R&D (FutureGen)	0	-75,000	0	-75,000	-149,000

[a] Includes two rescissions of 0.091% and 1.6% in accordance with P.L. 110-161, Consolidated Appropriations Act, 2008.

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments[a]	FY 2008 Current Appropriation	FY 2009 Request
Transfer to Fossil Energy R&D (Clean Coal Power Initiative)	0	-70,000	0	-70,000	0
Transfer to Fossil Energy R&D (Fuel and Power Systems)	0	-21,000	0	-21,000	0
Total, Clean Coal Technology	0	-58,000	0	-58,000	0
Strategic Petroleum Reserve	164,441	188,472	-1,715	186,757	346,923
Use of prior-year balances	0	0	0	0	0
Use of offsetting receipts	0	0	0	0	-2,923
Total, Strategic Petroleum Reserve	164,441	188,427	-1,715	186,757	344,000
Strategic Petroleum Account	0	0	0	0	0
Northeast Home Heating Oil Reserve					
Northeast Home Heating Oil Reserve	5,000	12,448	-113	12,335	9,800
Offsetting receipts	2,966	0	0	0	0
Transfer from balances	1,734	0	0	0	0
Subtotal, Northeast Home Heating Oil Reserve (Program Level)	9,700	12,448	-113	12,335	9,800
Use of prior-year balances	-1,734	0	0	0	0
Total, Northeast Home Heating Oil Reserve	7,966	12,448	-113	12,335	9,800
Naval Petroleum & Oil Shale Reserves	21,316	20,472	-200	20,272	19,099
Elk Hills School Lands Funds	0	0	0	0	0
Total, Fossil Energy	774,669	913,392	-9,190	904,202	1,126,929

Preface

Secure, affordable, and environmentally acceptable energy sources are essential for our Nation to maintain our high quality living standards for current and future generations. In support of this, 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 Presidential Initiatives. The President's Hydrogen Fuel Initiative will work through partnerships with industry to develop the technologies and infrastructure needed to produce, store, and distribute hydrogen, and to use it in stationary, portable, and vehicular applications. The President's Clean Coal Power Initiative will partner with industry to demonstrate advanced clean coal technologies at a commercial scale. The President's FutureGen program will partner with industry to build and operate near-zero atmospheric emissions power plants that will produce electricity coal while capturing and storing carbon dioxide (CO_2) through sequestration.

Within the Energy and Water Development Appropriation FER&D has ten programs: Coal, Natural Gas Technologies, Petroleum - Oil Technology, Program Direction, Plant and Capital Equipment, Environmental Restoration, Import/Export Authorization, Advanced Metallurgical Research, Cooperative Research and Development, and the Special Recruitment Program. Other programs within the Office of Fossil Energy include the Clean Coal Technology Program, the Strategic Petroleum Reserve, the Northeast Home Heating Oil Reserve, the Naval Petroleum and Oil Shale Reserves, and the Elk Hills School Lands Funds. Consistent with the FY 2006, FY 2007, and FY 2008 Budgets, the Natural Gas Technologies and Oil Technology programs are being terminated in FY 2009. The Energy Policy Act of 2005 (Public Law 109-58) created a mandatory Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research program. Consistent with previous budgets, the FY 2009 Budget proposes to cancel the program through a legislative proposal.

Mission

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

A New Strategic Approach for FutureGen

FutureGen is a key component of FE's CCS activities. On February 27, 2003, when the President announced FutureGen, a $1 billion cost-shared program to create the world's first coal-based, near-zero atmospheric emissions power plant, the focus was on developing a revolutionary coal technology that addresses climate change concerns resulting from atmospheric carbon dioxide, a greenhouse gas (GHG). Today, the goal of a technology solution for climate change relating to coal use is still the same. Coal remains a strategic domestic, low-cost energy resource for our Nation's energy and economic security. The FutureGen program continues to support recommendations in the National Energy Policy (NEP) issued in May 2001, which highlights the need for a broad policy to "protect national and economic security by promoting a diverse, secure source of reliable, affordable and environmentally sound energy," and recognizes that "If rising U.S. electricity demand is to be met, then coal must play a significant role."

The Energy Information Administration projects that an additional 199,000 megawatts of power will be needed in the U.S. over the next 22 years, if current trends continue. Since the inception of FutureGen,

however, there have been changes in the marketplace that have altered the energy/power and environmental landscape. These changes include escalation in material and labor costs for new power plants and growing near-term interest by industry in carbon dioxide (CO_2) emissions control technologies. In a number of States, approval of new coal plants has become contingent on provisions to control CO_2 emissions. This has catalyzed the need to demonstrate the commercial viability of a new generation of advanced coal-based power systems (namely, Integrated Gasification Combined Cycle, or IGCC) with CCS technology. There is additional financial burden and risk associated with adding the significant technical and economic uncertainty associated with CCS to an advanced technology such as coal-based IGCC that has seen only limited commercial-scale operation.

Therefore, for FutureGen to effectively meet its goal under these new market realities, it is necessary to adopt a new strategic approach, one that emphasizes early commercial experience with near-zero atmospheric emission coal plants (IGCC with CCS) through multiple commercial demonstrations linked to the commercial operations of IGCC. This "New FutureGen" approach differs from the original FutureGen, which focused on the large-scale integration of advanced R&D technologies in a "living laboratory" setting to be followed by commercial demonstrations and deployment. Under the New FutureGen, the program moves to immediate commercial demonstration, allowing for earlier deployment of IGCC-CCS technologies along side commercial IGCC operations. New FutureGen will address early on the challenges associated with near-zero atmospheric emissions plants, including siting issues, and help drive the regulatory frameworks for CO_2 transport, injection and storage associated with power generation. New FutureGen will also address the technical and operational viability questions of near-zero atmospheric emission coal plants associated with integration of interdependent coal conversion/power and carbon capture/storage systems.

The New FutureGen has the overall aim of advancing FutureGen's goals and objectives through multiple commercial demonstrations, while limiting the government's financial exposure and leveraging its investment across a wider range of nearer-term coal based IGCC-CCS projects. This change in direction means moving away from the proposal to build an experimental "living laboratory" 275 megawatt plant, and instead conduct up to two or three commercial demonstrations of IGCC with CCS. Each of these units at the plant would capture and store in a saline reservoir at least one million metric tons of CO_2 per year in addition to reducing emissions of sulfur dioxide, nitrogen oxide, particulate matter, and mercury to near-zero emissions levels. It is expected that these full-scale projects will be in operation in the next six to eight years.

As part of this new direction for FutureGen, the Department's plan is to limit the Government's financial exposure to only the CCS portion of the demonstration unit of the overall commercial IGCC-CCS plant. The entire cost for the IGCC power island will be borne by industry. In the original investment strategy, the Department would have funded 74 percent of the entire project cost, which included both the power plant and CCS technology, and also borne 74 percent of cost overruns.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Fossil Energy Research and Development appropriation supports the following goals:

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.

Strategic Goal 1.2, Environmental Impacts of Energy: Improve the quality of the environment by reducing greenhouse gas emissions and environmental impacts to land, water, and air from energy production and use.

The programs funded within the Fossil Energy Research and Development appropriation have three GPRA Unit Program Goals that contribute to the Strategic Goals 1.1 and 1.2 in the "goal cascade." These goals are:

GPRA Unit Program Goal 1.2.08.00**:** "Near-Zero Atmospheric Emissions" Coal-Based Electricity and Hydrogen Production: Create public/private partnerships to develop technology capable of addressing air emissions concerns associated with coal use while providing domestically secure, cost-efficient electricity generation, including the development of near-zero atmospheric emissions technologies and completion of a prototype, "near-zero atmospheric emissions" plant (including carbon) that is coal fuel-flexible, and capable of multi-product output ultimately, by 2015, leading to an advanced class of power plants capable of achieving energy efficiencies over 60 percent (exclusive of energy consumption for sequestration) with coal.

GPRA Unit Program Goals 1.1.09.00 and 1.1.10.00 which include oil and gas activities will not be achieved with the termination of these programs in FY 2008.

Contribution to Strategic Goal

FE contributes to Strategic Goal 1.2 through its Coal Program. The Coal Program pursues GPRA Unit Program Goal 1.2.08.00 above and encompasses the following activities:

- The Clean Coal Power Initiative, by or before 2010, will initiate demonstration of advanced coal-based power generation technologies capable of achieving: 45 percent electrical efficiency (exclusive of energy consumption for carbon capture); greater than 90 percent mercury removal at 70 percent of the cost of current (2003 baseline) technology; and 0.15 lb/MMBtu nitrogen oxide (NO_x) at 75 percent of the cost of current technology (selective catalytic reactors). By 2015, plant(s) will begin operation that will achieve 90 percent carbon capture and sequestration or beneficial reuse of carbon. 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 New FutureGen program will prove the technical feasibility and economic viability of the "near-zero atmospheric emission" (including carbon) coal concepts. By 2015, begin operation, of commercial scale plant(s), for at least 300 MWe of capacity, and produce electricity with "near-zero" atmospheric emissions and demonstrate the effectiveness, safety, and performance of CO_2 sequestration on a commercial scale.

    - The Advanced Integrated Gasification Combined Cycle activity will develop by 2010 advanced gasification combined cycle technologies that can produce electricity from coal at 45-50 percent efficiency based on higher heating value (HHV) at a capital cost of $1000/kW (in

constant 2003 dollars). By 2012, gasification technology 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 cost.

- The Advanced Turbines activity will, by 2010, develop advanced turbine combined cycle technologies that can produce electricity from coal at 45-50 percent efficiency (HHV) when integrated into gasification-based power plants. By 2012, advanced turbines capable of firing up to 100 percent hydrogen will be integrated into coal-based power plants that separate, capture, and sequester CO_2.

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

- The Innovations for Existing Plants activity will be redirected 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 and permanently store CO_2 that can be economically and effectively employed on PC power plants. The program has discontinued previous work on criteria pollutants and coal byproducts.

- By 2010, the Fuels Program will complete the development of modules capable of producing hydrogen from coal at $0.9 per kilogram ($30/barrel crude oil equivalent, without incentives or tax credits) when integrated with advanced coal power 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.

- 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 (assuming 250 MW per year production); and provide the technology base to permit low cost ($400/kW, 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. 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 systems capable of 50-60 percent HHV efficiency integrated with gasification will be available for demonstration in 2020.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.2, Environmental Impacts of Energy			
GPRA Unit Program Goal 1.2.08.00, Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production	414,438	493,382	623,732
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.09.00, Natural Gas Technologies, Abundant Affordable Gas	11,709	19,818	0
GPRA Unit Program Goal 1.1.10.00, Petroleum - Oil Technology, Abundant Oil	2,625	4,954	0
Total Strategic Goals 1.1 and 1.2	428,772	518,154	623,732
All Other			
Oil and Gas Security	0	0	0
Program Direction	129,803	148,597	126,252
Plant and Capital Equipment	12,000	12,882	5,000
Fossil Energy Environmental Restoration	9,715	9,483	9,700
Cooperative R&D	0	4,954	0
Special Recruitment Programs	656	650	656
Congressionally Directed Projects	0	48,118	0
Total, All Other	152,174	224,684	141,608
Total, Strategic Goals 1.1 and 1.2 (Fossil Energy Research and Development)	580,946	742,838	765,340

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 2007	FY 2008	FY 2009
National Energy Technology Laboratory	8,326	11,009	11,339
Total, Direct-Funded Maintenance and Repair	8,326	11,009	11,339

Fossil Energy Research and Development

Office of Fossil Energy

Funding by Site by Program

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Ames National Laboratory	1,122	1,275	1,305
Coal			
Argonne National Laboratory (East)			
Coal	3,090	2,817	2,630
Natural Gas Technologies	0	150	0
Total, Argonne National Laboratory (East)	3,090	2,967	2,630
Brookhaven National Laboratory			
Coal	200	0	0
Idaho National Engineering and Environmental Laboratory			
Coal	884	365	540
Natural Gas Technologies	200	200	0
Total, Idaho National Engineering and Environmental Laboratory	1,084	565	540
Lawrence Berkeley National Laboratory			
Coal	2,217	2,306	600
Natural Gas Technologies	755	1,010	0
Total, Lawrence Berkeley National Laboratory	2,972	3,316	600
Lawrence Livermore National Laboratory			
Coal	455	185	0
Los Alamos National Laboratory			
Coal	1,006	1,554	386
National Energy Technology Laboratory			
Coal	275,583	308,946	348,511
Natural Gas Technologies	9,687	17,480	0
Petroleum – Oil Technology	2,548	4,471	0
Program Direction	97,192	116,607	95,492
Plant and Capital Equipment	8,000	7,927	0
Fossil Energy Environmental Restoration	6,300	6,238	6,300
Cooperative Research and Development	0	4,894	0
Clean Coal Power Initiative	58,758	69,363	85,000

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
FutureGen	52,504	74,317	156,000
Total, National Energy Technology Laboratory	510,572	610,243	691,303
Oak Ridge National Laboratory			
Coal	4,479	3,128	3,136
Natural Gas Technologies	250	250	0
Total, Oak Ridge National Laboratory	4,729	3,378	3,136
Pacific Northwest Laboratory			
Coal	5,250	5,250	8,250
Natural Gas Technologies	282	50	0
Total, Pacific Northwest Laboratory	5,532	5,300	8,250
Sandia National Laboratories			
Coal	744	550	0
Washington Headquarters			
Coal	8,146	23,326	17,374
Natural Gas Technologies	535	678	0
Petroleum – Oil Technology	77	483	0
Program Direction	32,611	31,990	30,760
Fossil Energy Environmental Restoration	3,415	3,245	3,400
Plant and Capital Equipment	4,000	4,955	5,000
Special Recruitment Programs	656	650	656
Cooperative Research and Development	0	60	0
Congressionally Directed Projects	0	48,118	0
Total, Washington Headquarters	49,440	113,505	57,190
Total, Fossil Energy Research and Development	580,946	742,838	765,340

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 and bio-processing research 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 terrestrial sequestration approaches, and develop advanced instrumentation to measure and validate terrestrially 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, particulate removal, and membrane separations. NETL researchers are also working to improve the next generation of gas turbines, fuel cells, and coupled turbine-fuel cell systems. In-house emissions control research focuses on the problems of mercury and $PM_{2.5}$ because these will be regulated in the near future, while the by-product utilization in-house research solves environmental problems related to wastes and by-products formed during combustion processes. Research in carbon sequestration science studies the scientific basis for carbon sequestration options for large stationary sources of CO_2. Finally, research in computational energy science is being 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 such as Vision 21 in Fuels and Power Systems; Carbon Sequestration to further geologic sequestration concepts, including measurement, monitoring and verification, and to understand the important soil parameters that facilitate terrestrial sequestration; and Advanced Research to develop materials and perform bio-processing research.

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

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Coal					
Clean Coal Power Initiative	58,758	70,000	-637	69,363	85,000
FutureGen	52,504	75,000	-683	74,317	156,000
Fuels and Power Systems	303,176	352,912	-3,210	349,702	382,732
Total, Coal	414,438	497,912	-4,530	493,382	623,732

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.

Strategic and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Coal program supports the following goal:

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

Strategic Goal 1.2, Environmental Impacts of Energy: Improve the quality of the environment by reducing greenhouse gas emissions and environmental impacts to land, water, and air from energy production and use.

The Coal program has one program goal which contributes to Strategic Goal 1.2 in the "goal cascade".

GPRA Unit Program Goal 1.2.08.00: Create public/private partnerships to develop technology capable of addressing air emissions concerns associated with coal use while providing domestically secure, cost-efficient electricity generation, including the development of near-zero atmospheric emissions technologies and, by 2012, completion of a prototype near-zero atmospheric emission plant (including carbon) that is coal fuel-flexible, and capable of multi-product output and ultimately, by 2015, leading to an advanced class of power plants capable of achieving efficiencies over 60 percent (exclusive of energy consumption for carbon capture) with coal.

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 of advanced coal-based power generation technologies capable of achieving: 45 percent electrical efficiency (exclusive of energy consumption for carbon capture); greater than 90 percent mercury removal at 70 percent of the cost of current (2003 baseline) technology; and 0.15 lb/MMBtu nitrogen oxide (NO_x) at 75 percent of the cost of current technology (selective catalytic reactors). By 2015, plant(s) will begin operation that will achieve 90 percent carbon capture and sequestration or beneficial reuse of carbon. 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 New FutureGen Program project will prove the feasibility of the "near-zero atmospheric emission" (including carbon) coal concepts. By 2015 multiple prototype plants will begin operation, each of which, for at least 300 MWe of capacity, will produce electricity with "near-zero" atmospheric emissions and prove the effectiveness, safety, and performance of CO_2 sequestration.

- The Fuels and Power Systems subprogram contribute as follows:

  - The Innovations for Existing Plants activity will be redirected 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 and permanently store CO_2 that can be economically and effectively employed on PC power plants. The program has discontinued previous work on criteria pollutants and coal byproducts.

  - The Advanced Integrated Gasification Combined Cycle activity will develop by 2010 advanced gasification combined cycle technologies that can produce electricity from coal at 45-50 percent efficiency based on higher heating value (HHV) at a capital cost of $1000/kW (in constant 2003 dollars). By 2012, gasification technology 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 cost.

  - The Advanced Turbines activity will, by 2010, complete the R&D to show substantive benefits in efficiency, cost and emissions and develop a combined cycle power island that can produce electricity from coal in an IGCC configuration at 45-50 percent efficiency (HHV). By 2012, the activity will complete the R&D to switch from syngas to a pure hydrogen fuel with CO_2 separation and sequestration for a near-zero atmospheric emission configuration(s) that can provide electricity with less than a 10 percent increase in cost. This activity will provide advanced CO_2 compression systems and turbine technology, capable of burning pure hydrogen for validation testing in near-zero emissions demonstration plants.

  - The Carbon Sequestration activity, by 2012, will develop technologies to separate, capture, transport, and sequester carbon using either direct or indirect systems that result in a less than 10 percent increase in the cost of electricity. By 2012, the program will have developed

methodology capable of predicting CO_2 storage capacity in geologic formation to within +/-30 percent.

- By 2010, the Fuels Program will complete the development of modules capable of producing hydrogen from coal at $0.9 per kilogram ($30/barrel crude oil equivalent, without incentives or tax credits) 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 reduce the cost of the fuel cell power block to $400/kW (assuming 250 MW per year production); and provide the technology base to permit low cost ($400/kW, 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, supporting near-zero atmospheric emissions demonstration. 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 systems capable of 50-60 percent HHV efficiency integrated with gasification will be available for demonstration in 2020.

- 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 goal of the President's Coal Research Initiative and other activities related to coal is to remove technological market obstacles and produce public benefits by conducting research and development on coal-related technologies that will improve coal's competitiveness in future energy supply markets. The Administration strongly supports coal as an important part of our energy portfolio. This request expands on the President's commitment to invest $2 billion on clean coal research over ten years, which was completed in 2008, three years ahead of schedule.

The Coal Research Initiative consists of multiple activities. Large-scale projects are operated through the Clean Coal Power Initiative, a cost-shared research and development program; and through the FutureGen program. Further programs offer advances to central station power generation equipment including advanced turbines and gasification technology. Other programs include Carbon Sequestration, which includes researching ways to mitigate or separate and dispose of greenhouse gas from combustion; and Advanced Research, a set of cross-cutting long-term research projects that can potentially contribute to many aspects of the coal research program. Advanced stationary fuel cell technology is also developed with benefits to coal-based applications. Each of these programs is described in detail in separate sections below.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.2, Environmental Impacts of Energy			
GPRA Unit Program Goal 1.2.08.00, Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production			
Clean Coal Power Initiative	58,758	69,363	85,000
FutureGen	52,504	74,317	156,000
Fuels and Power Systems	303,176	349,702	382,732
Total, Strategic Goal 1.21 (Coal)	414,438	493,382	623,732

Annual Performance Results and Targets

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
GPRA Unit Program Goal 1.2.08.00 (Near-Zero Atmospheric Emissions Coal-Based Electricity and Hydrogen Production)					
Clean Coal Power Initiative					
Made go/no go decisions regarding award of cooperative agreements for up to 5 Round 1 CCPI projects and issued a Round 2 CCPI solicitation. (MET GOAL)	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. 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.	Begin construction of two 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. (The goal to begin construction of at least one major CCPI project is for FY09 not FY08, referring back to FY08 Congressional Budget and MYP.)
FutureGen					
		Issued initial site selection solicitation and evaluated sites. (MET GOAL)	Site selection for FutureGen (NOT MET)	*	*
Fuels and Power Systems					
Innovations for Existing Plants					
Completed bench- and pilot-scale testing of five novel mercury control concepts capable of achieving ≥90% mercury capture by 2010 and initiated seven new projects under second phase of field testing of mercury control technology capable of achieving	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)	Program activity will be redirected to the development of technology to reduce CO2 emissions from pulverized coal (PC) power plants. Annual performance targets are under development.	Program activity will be redirected to the development of technology to reduce CO2 emissions from pulverized coal (PC) power plants. Annual performance targets are under development.

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
50-70% mercury capture. (MET GOAL)					
Advanced Integrated Gasification Combined Cycle					
Completed Ion Transport Membrane (ITM) designs with target oxygen production of 95% purity, to obtain engineering data for further technology scale-up, ultimately leading to cost reductions of $75-$100/KW, and efficiency improvements of 1-2 points by 2010. (NOT MET) Completed at least 250 hours of high efficiency desulfurization process units operating with coal-derived synthesis gas. Eventual process units improvements are targeted to contribute a 60-80 $/KW capital cost reduction and a 1 point efficiency gain to the gasification system performance by 2010. (NOT MET) Initiated testing on advanced hydrogen separation membranes in simulated coal gasification product streams and completed design of a hydrate pilot-scale slipstream test unit. Advanced hydrogen separation technologies target eventual sequestering of CO_2 with a less than 10% increase in electricity cost by 2012. (MET GOAL) Performed modeling, facility modifications, and conducted pilot-scale tests for identifying technology opportunities to increase reliability, improved performance and increased feed flexibility of advanced gasifiers. Gasification improvements target eventual capital cost	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 efficiency. (MET GOAL)	Began construction and testing of advanced gas separation technologies. In FY 2006, the Gasification Technologies program moved gas separation, including ceramic membrane, hydrogen separation, CO2 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. (MET GOAL)	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. $1150/kW capital cost of advanced, coal-based, gasification energy plants of (in constant 2003 dollars). Performance is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation, and turbine technology.	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. $1100/kW capital cost of advanced, coal-based, gasification energy plants (in constant 2003 dollars). Performance is measured by validating technology improvements in gasifier feed (oxidizer and/or fuel), gasifier, gas cleanup, air separation and turbine technology.

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
reductions and a 90% single train availability by 2010. (MET GOAL)					
Advanced Turbines					
Performed a thermal analysis of syngas turbine blades, initiated testing of an H2 delivery system, and perform a systems study of an optimized IGCC turbine design. Ultimately by 2008 these and follow-on efforts will reduce IGCC NOx emissions toward 2 ppm, reduce turbine cost by 10-20% by increasing specific power output, increase turbine firing temperature and combined cycle integration to improve efficiency by 2-3 percentage points and reduce emissions associated with high hydrogen fuels. (MET GOAL)	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^{o} F vs. design inlet temperature of 2500^{o} 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."	*
Carbon Sequestration					
Designed and tested multiple concepts for efficient, low-cost, advanced CO2 separation and capture including on oxy-fuel combustion, membranes, and hydrates for CO2 separation. Conducted field activities that evaluate sequestration opportunities in depleted oil reservoirs and saline aquifers. Collaboratively explored with the National Academy of Sciences novel and revolutionary means of storing greenhouse gases. This portfolio of over 22 projects targets reducing the cost of carbon dioxide separation and capture by 75% by 2012 compared to year 2000 systems. (MET GOAL) Developed instrumentation and	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 CO2 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 permanently sequester greenhouse gas emissions through small scale validations tests. (MET GOAL)	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)	Complete site selection, reservoir modeling, site characterization, and begin injection at depleted oil reservoir, unmineable coal seam, and saline formation to demonstrate that storage of CO_2 in geologic formations is a viable greenhouse gas mitigation option to develop technologies that can safely and economically store carbon dioxide from coal-based energy systems Award initial round of Phase III (deployment) of the Regional Carbon Sequestration Partnerships, conduct site selection, and complete NEPA activities for at least four large volume field tests through the use of industry partnerships,	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 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.

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
initiate field tests of advanced monitoring and verification methods for carbon inventories for geologic and terrestrial sequestration. Completed a database for mid-continent geological storage projects and initiate a framework for U.S. wide project planning. Through regional partnerships, begin U.S.-wide infrastructure development of MMV protocols for carbon accounting to ensure permanence of long-term storage of CO_2. (MET GOAL)				bringing the best emerging new coal-based power generating technologies to deployment. 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.	Inject 0.5 million metric tons CO2 total at 1 or more large-volume field test sites to demonstrate the formations capacity to sequester carbon by developing technologies that can safely and economically store carbon dioxide from coal-based energy systems.
Fuels					
Prepared and communicated a Hydrogen from Coal R&D program strategy and develop solicitation research guidance for technology innovation to reduce the cost of producing hydrogen from coal. (MET GOAL)	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 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.	Complete long term testing of bench scale 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.
Fuel Cells					
Relative to FY 2003 baseline of 145mWatt/cm2 power density @800C, demonstrated a 20% improvement in fuel cell stack power density for Solid State Energy Conversion Alliance (SECA) system design. (MET GOAL) Relative to FY 2003 baselines of 900 for cathode performance and 174 for interconnect performance in area specific resistance units of mohms-cm2	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	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 clean coal fired plants (Integrated Gasification Combined Cycle plants). $225/kW capital cost of solid oxide fuel cell (SOFC) stack modules. Projected stack	$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 clean coal fired plants ((Integrated Gasification Combined Cycle plants). 300 mW/cm2 Economic Power Density of solid oxide fuel cell

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
@750C, completed 20% improvements in cathode performance and in the service life of electrical interconnect s and transfer technology advances to the SECA industry teams to facilitate systems cost reduction and efficiency goals of $400/kW and 40-60 percent. Annual stakeholder workshops and semi-annual peer reviews will communicate progress and define future R&D requirements. (MET GOAL)	relative to FY 2004. These validations will aid SECA industry teams in achieving cost reduction and energy efficiency goals. (MET GOAL)			manufacturing cost is modeled by validating technology improvements to the SECA fuel cell stack system to reduce the cost and environmental impact of new clean coal fired plants (Integrated Gasification Combined Cycle plants). 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 clean coal fired plants (Integrated Gasification Combined Cycle plants).	(SOFC) with specific size and fuel type, SOFC on syngas fuel in short stack test system to reduce the cost and environmental impact of new clean coal fired plants (Integrated Gasification Combined Cycle plants).
Advanced Research					
				Complete prototype demonstration of distributed fiber optic sensors capable of selective and accurate gas detection of H_2 and CO in high temperature (500oC), high pressure (200 psi) 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 near-zero emission power plants.	Complete prototype demonstration of distributed fiber optic sensors capable of selective and accurate gas detection of H_2 and CO in high temperature (500oC), high pressure (200 psi) and 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 near-zero emission power plants.
				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	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

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Targets	FY 2008 Targets	FY 2009 Targets
				power systems by reducing the cost and development time required for new clean coal fired power plants.	power systems by reducing the cost and development time required for new clean coal fired power plants.
				Maintain total administrative overhead costs in relation to total program costs of less than 17 percent. Baseline for administrative overhead rate currently being validated.	Maintain total administrative overhead costs in relation to total program costs of less than 13 percent. Baseline for administrative overhead rate currently being validated.
Efficiency Measures				Administrative costs as a percent of total program costs. Less than 17 percent.	Administrative costs as a percent of total program costs. Less than 13 percent.

***** Under development

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.

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 its mission:

- 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 external reviews and audits. FE's programmatic activities are subject to continuing review by the Congress, the General Accounting Office, the Department's Inspector General, the 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.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The Coal program has incorporated feedback from OMB into the FY 2009 Budget Request and has taken or will take the necessary steps to continue to improve performance. FE has continued to work with OMB on addressing the PART improvement plan and working toward completing the actions.

In the past, the Coal program had the President's Coal Research Initiative and Other Power Systems areas PART reviewed separately. In the FY 2007 PART (completed in FY 2006 for the FY 2007 budget) the Coal program submitted a single Coal Energy Technology PART which combines these two areas. In this PART for Coal Energy Technology, the program scored relatively high on Program Purpose & Design, Strategic Planning, and Program Management sections of the PART, with ratings of 80 percent, 70 percent, and 75 percent respectively. The program was given an overall rating of "Adequate."

In addition to working at the Fossil Energy level to develop a framework for analyzing cost and benefits for R&D investments (see Overview section), the program has provided OMB with briefings and reports on assumptions used to calculate projected benefits.

CCPI

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
CCPI			
CCPI	58,758	69,363	85,000
SBIR/STTR (non-add)	0	(2,044)	(2,350)
Total, CCPI	58,758	69,363	85,000

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.

Background

CCPI demonstrations respond to the National Energy Policy call to 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 technology 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 would result in efficiency, environmental, and economic improvement compared to the state-of-the-art. Eight projects were selected and two withdrew. Current Round I projects include: We Energies/TOXECON, Great River Energy, Western Greenbrier, and WMPI. Round II of the CCPI focused on technologies that were applicable to gasification technology and advanced clean-up systems (including mercury control). Current Round II projects include: Southern, Excelsior/Mesaba, and Pegasus. In FY 2008, the solicitation for Round III will be issued, and awards will be made in FY 2009. Round III will focus on developing projects that utilize carbon sequestration technologies and/or beneficial reuse of carbon dioxide.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Clean Coal Power Initiative	**58,758**	**69,363**	**85,000**

For FY 2009, continue ongoing Clean Coal Power Initiative (CCPI) Round 1 and Round 2 projects and Power Plant Improvement Initiative (PPII) 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 to support the President's Coal Research Initiative. In FY 2008, the solicitation for a third round of projects will be issued.

For FY 2007, continue ongoing Clean Coal Power Initiative (CCPI) Round 1 (five projects remaining) and Round 2 (three projects remaining) and Power Plant Improvement Initiative (PPII) projects to support the President's Coal Research Initiative.

SBIR/STTR (non-add)	**0**	**(2,044)**	**(2,350)**

In FY 2007, $1,336,000 and $160,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Total, CCPI	**58,758**	**69,363**	**85,000**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
CCPI	
The increase will enable the CCPI program to make project selection in early FY 2009. This activity includes evaluating proposals and making project selections to assemble the initial portfolio of advanced technology systems that capture carbon dioxide for sequestration and beneficial reuse.	+15,637
SBIR/STTR (non-add)	
The increase in SBIR/STTR is due to an increase in research funding.	(+306)
Total Funding Change, FutureGen/CCPI	**+15,637**

FutureGen

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
FutureGen			
FutureGen	52,504	74,317	156,000
SBIR/STTR (non-add)	--	(2,994)	(4,320)
Total, FutureGen	52,504	74,317	156,000

Description

The FutureGen program will build first-of-a-kind commercial demonstration prototype plants that will produce electricity while achieving near-zero emissions, including carbon dioxide, a greenhouse gas. The FutureGen program responds to the National Energy Policy call to address the reliability and affordability of the Nation's electricity supply, particularly from its coal-based generation, and is a key component of the President's commitment to research and development of clean coal technologies to meet this challenge.

In 2008, FutureGen is being restructured in a way that accelerates the commercial use of near-zero emissions clean coal technologies through multiple demonstration projects. FutureGen's restructured approach proposes multiple 300-600 Megawatt (MW) commercial-scale demonstration clean coal power plants, built in partnership with the private sector, each producing electricity and capturing and safely sequestering at least one million metric tons each of CO2 annually. This restructured approach does away with the previously proposed single 275MW R&D facility, and the planned R&D work will be accomplished in other aspects of the fossil energy program.

Although this revised approach delays the initial operations of FutureGen from 2012 to 2015, the initial operations in the revised approach are immediately applied commercially, unlike the previous proposal. The focus on commercial demonstration aspects will answer the critical questions up front concerning commercial deployment, including feasibility of integrating IGCC with carbon capture and sequestration, and the siting and permitting issues, thus accelerating broad commercial deployment of IGCC-CCS.

Background

The FutureGen program is aimed at establishing the technical capability and potential economic feasibility of co-producing electricity from coal with near-zero atmospheric emissions. The program enhances the continued and expanded use of our most abundant and lowest cost domestic energy resource, coal. FutureGen will require integration of subsystems and components currently being developed commercially, such as gasification and power generation, with low cost CO_2 capture and storage technology that involves risk.

The objective of FutureGen is to demonstrate the integrated operation of these systems and components. The proposed Federal cost-share in the revised proposal is only for demonstration and integration of the

carbon capture and storage portions of the demonstration projects, which will be selected competitively. FutureGen will be supported by a robust clean coal R&D effort focused on all the key technologies needed, such as carbon sequestration, membrane technologies for oxygen and hydrogen separation, advanced turbines, fuel cells, coal-to-hydrogen conversion, gasification systems, and other technologies.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
FutureGen	**52,504**	**74,317**	**156,000**

In FY 2009, FutureGen activities will include completing proposal reviews and evaluations, announcing project selections, and the commencement of project award negotiations and National Environmental Policy Act (NEPA) compliance activities. Project negotiations will be completed during FY 2010. These are all critical path activities. *Participants include: To be determined.*

In FY 2008, activities will include drafting and finalizing a new FutureGen program plan, coordination of the new program plan/approach with international participants, development and issuance of a competitive Request for Information and, subsequently following receipt of public comments, a Funding Opportunity Announcement (FOA). FOA proposals will be submitted by industry, and proposal evaluations will begin during FY 2008 and be completed during FY 2009. *Participants include: To be determined.*

NEPA and permitting activities will continue. Project definition activities will continue toward approval of the preliminary baseline range for the project. Site characterization work will continue for the basis of site selection from among the best candidate sites. Technology assessment activities. *Participants include: FutureGen Industrial Alliance, Inc.*

SBIR/STTR (non-add)	**—**	**(2,994)**	**(4,320)**

In FY 2007, $1,336,000 and $160,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Total, FutureGen	**52,504**	**74,317**	**156,000**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
FutureGen	
The increase reflects scheduled activities as the program is redefined and is needed to execute *multiple* commercial scale FutureGen carbon capture & storage demonstrations. FY 2009 activities include the following: complete proposal evaluations, announce project selections, and initiate award negotiations and NEPA compliance activities.	+81,683

	FY 2009 vs. FY 2008 ($000)
SBIR/STTR (non-add)	
The increase in SBIR/STTR is due to an increase in research funding.	(+1,326)
Total Funding Change, FutureGen	**+81,683**

Fuels and Power Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Fuels and Power Systems			
Innovations for Existing Plants	15,626	36,081	40,000
Advanced Integrated Gasification Combined Cycle	55,468	53,509	69,000
Advanced Turbines	19,475	23,782	28,000
Carbon Sequestration	97,228	118,908	149,132
Fuels	21,513	24,773	10,000
Fuel Cells	61,653	55,490	60,000
Advanced Research	32,213	37,159	26,600
SBIR/STTR (non-add)	--	(7,566)	(10,881)
Total, Fuels and Power Systems	303,176	349,702	382,732

Description

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

Background

The National Energy Policy recommends that the Department continue to develop advanced clean coal technology with a goal of deploying high efficiency coal power plants achieving near-zero atmospheric emissions. The President's Clear Skies Initiative is embodied in the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR), which were promulgated by the U.S. Environmental Protection Agency in March 2005. Promulgation of CAIR and CAMR provided a market incentive for developing many advanced, cost-effective emissions controls and has ended the need for Federally funded R&D for conventional pulverized coal (PC) plant technology in the areas of NO_x, SO_2, and mercury emissions control. The Climate Change Technology Program is supported over the longer term through technology for advanced power plants that can nearly double the average efficiency of today's fleet of coal power plants, thereby significantly reducing carbon emissions. The growing national economy relies on electricity supply that is secure, affordable, and reliable. This is especially true in the face of electricity generation market restructuring. Further, new technology is needed to develop much cleaner and more efficient plants to replace and augment an aging power generation infrastructure. Electricity demand from both natural gas and coal is projected to increase significantly through the year 2015. (Annual Energy Outlook, 2006).

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, Advanced Turbines, Carbon Sequestration, Fuels, Advanced Research and Fuel Cells.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Innovations for Existing Plants (IEP)	**15,626**	**36,081**	**40,000**

The IEP activity will be redirected 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 and permanently store CO_2 that can be economically and effectively employed on PC power plants.

- **Carbon Capture and Storage (CCS)** **0** **36,081** **40,000**

In FY 2009, the program will continue the research initiated in FY 2008 on post-combustion capture, separation, and compression of CO2, which is applicable to utility boilers in pulverized coal power plants. Conduct R&D at the laboratory through pilot-scale on promising concepts for cost-effective post-combustion capture of CO2 emissions, including from pulverized coal power plants and beneficial uses of CO_2. In addition, for more mature technologies and system components, initiate pre-commercial slip-stream (field) testing at coal-fired power plants in order to bring concepts to commercial-demonstration readiness. Further, conduct research on optimizing power plant water use as it related to CO_2 capture efficiency and optimization.

In FY 2008, the IEP program will be refocused to develop advanced technology for post-combustion capture, separation, compression, and beneficial uses of CO2, which is applicable to pulverized coal power plants.

- **Fine Particulate Control/Air Toxics** **13,654** **0** **0**

In FY 2009, the program will be redirected to the development of post-combustion CO2 capture technology, which is applicable to pulverized coal (PC) power plants.

- **National Labs-Competitive** **472** **0** **0**

In FY 2009, no additional funding is requested.

In FY 2008, no additional funding is requested.

In FY 2007, a major focus of the research conducted at NETL and/or other national laboratories was on mercury removal technologies. In addition, mercury sorbents and oxidizing agents to enhance the capture of mercury were tested at the laboratory scale. Work continued in developing a computational fluid dynamics (CFD) model of mercury emission and control. These research activities are in support of the Clear Skies Initiative. *Participants include: NETL And TBD.*

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
▪ **Projects – Innovations for Existing Plants**	**1,500**	**0**	**0**
• **Powerspan Electro Catalytic Oxidation Project**	**500**	**0**	**0**

Powerspan Electro Catalytic Oxidation Project for multipollutant (SO_2, NO_x, and Hg) control will be conducted.

• **Hardin Generating Station Coal Fired Power Plant Mercury Emission Control Demo Project**	**1,000**	**0**	**0**

ADA-ES will conduct field testing of activated carbon injection to control Hg emissions from the Hardin Generating Station.

▪ **SBIR/STTR (non-add)**	**--**	**794**	**1,107**

In FY 2007, $347,000 and $42,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and 2009 amount shown are an estimate of requirement for the continuation of the SBIR and STTR program.

Advanced Integrated Gasification Combined Cycle	**55,468**	**53,509**	**69,000**

The IGCC activity is developing advanced gasification-based technologies to reduce the cost of coal-based IGCC plants, to improve the thermal efficiency, and to achieve near-zero atmospheric emissions of all pollutants, including carbon dioxide, SO_2, NO_x, and mercury. The technologies being developed will be an integral part of carbon capture and storage demonstration projects. Technologies currently being considered for testing include Ion Transport Membrane (ITM) air separation, and high-temperature gas cleaning.

In FY 2009, 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 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 IGCC technologies for the production of electricity for use by utilities, independent power producers, and other industrial stakeholders, while supporting technology advances for carbon capture and storage.

▪ **Gasification Systems Technology**	**34,419**	**49,545**	**64,000**

(a) Gasification: This activity focuses specifically on technology developments related to the gasification system and targets improvements in electrical efficiencies of 1-3 percent, capital cost reductions of $100/kWe, improved availabilities of >5 percent, and up to a 10 percent reduction in operating and maintenance costs. In FY 2009, to achieve these targets, activities will focus on the advanced transport gasifier, coal/biomass co-feeding and gasification, advanced refractory materials, and computational fluid dynamic modeling and dynamic simulation of IGCC plants.

(dollars in thousands)

FY 2007	FY 2008	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 bituminous and other 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 also focus 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.

Work will continue on the investigation of methods of preparing biomass for co-feed operations such as torrefaction and pyrolysis. 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. The impact of biomass constituents on the performance of refractory materials will also be assessed. 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 carbon capture demonstrations for training plant personnel and others. *Participants include: SCS, NETL, UNDEERC, WRI*

Activities will also include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2 million – non-add) and will focus on projects utilizing technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions.

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. Testing of the feed injector flame monitoring device will be completed at a commercial gasification site. 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. Solids transport testing of the gasification/combustion chemical looping concept in the pilot-scale unit will be completed and the results used to complete the design of a prototype facility (~1,000 lb/hr of coal) dependent upon test results. 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.*

In FY 2007, emphasis will be on improving the reliability and performance of the gasifier in an IGCC plant and the development of novel process concepts. Installation of a new riser section on the transport gasifier and the Continuous Coarse Ash Depressurization system at the PSDF will be completed. A long-term gasification test on a low-rank coal will be conducted to demonstrate the performance of the newly installed equipment and other modification, such as that to the coal

feed system, to support IGCC technology development. UNDEERC will investigate improvements to the cyclone dipleg design and loop seal for the transport gasifier to improve cyclone efficiency and carbon conversion and establish solids concentration profiles along the riser for various coals to support the design of the gasifier. Empirical relationships for transport properties in the transport gasifier will be developed from tracer testing and sampling probes on a cold flow model. Cold flow testing of advanced feed injectors will be conducted and fabrication of the compact gasifier pilot plant will be initiated to demonstrate improved carbon conversion, thermal efficiency, cost, and reliability. Construction of a pilot plant for integrated testing of the various loops within the chemical looping gasification technology will continue. Testing of the acoustic high temperature measurement device at a commercial gasification plant will be completed. Coated metal components and welded joints similar to those found in tube sheets and coarse filters will be tested in a commercial gasifier as coupons. Final report on chromium refractory and thermocouple research for slagging gasifiers, including performance in commercial coal gasifiers, will be completed.

(b) Gas Cleaning/Conditioning: This activity focuses on developing advanced technologies for achieving near-zero emissions of all pollutants including SO_2, NO_x, particulates, mercury, arsenic, selenium, and cadmium while simultaneously reducing the capital cost of an IGCC plant by at least $250/kWe and increasing plant efficiency by 3-4 percent. In FY 2009, detailed design and construction of the 50 MWe high temperature desulphurization test unit will be initiated if a technology development partner is secured to satisfy the cost-sharing requirements. 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, and other heavy trace metals will continue with testing of promising materials at the PSDF or other suitable sites. Coal/biomass co-gasification and its impacts on gas cleaning operation processes will be assessed and mitigation protocols established. *Participants include: NETL, RTI*

In FY 2008, continue development of advanced sorbents/catalyst and other concepts for removal of sulfur, ammonia, chlorides, mercury, arsenic, cadmium, and selenium in multi-contaminant removal processes to reduce capital cost. 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. Assuming a go decision is made at the completion of the Phase I bench-scale test program of the University of California Sulfur Recovery Process (UCSRP), design and construction of a larger reactor system for testing on coal-derived synthesis gas will begin. For trace metals removal, the design and construction of a semi-moving bed reactor system for TDA's multi-contaminant removal process will commence assuming successful completion of initial field testing using fixed-bed reactors. Pilot-scale testing of a novel monolith sorbent for trace metals removal from synthesis gas at high temperatures will be performed using coal-derived synthesis gas. Validate CFD model for coupled transport desulfurizer/regenerator using data obtained from the test unit at Eastman Chemical. The design of a 50 MWe equivalent scale unit to evaluate the performance of the high temperature desulfurization and direct sulfur recovery process will be completed and construction at a commercial gasification site will commence depending upon host site. *Participants include: NETL, UNDEERC, GTI, TDA, RTI,*

Eastman Chemical, and TBD.

In FY 2007, focus will be on achieving near-zero atmospheric emissions from coal-based gasification plants. Development of novel sorbents for mercury, ammonia, and chloride removal from synthesis gas will continue and testing of promising materials on coal-derived synthesis gas will be initiated. Continue development of improved catalysts for the Selective Catalytic Oxidation of Hydrogen Sulfide process to improve selectivity of carbonyl sulfide (COS) removal and suppress side reactions. Development of multi-contaminant control technologies for sulfur, chloride, ammonia, and trace metals removal will continue. Laboratory-scale process units will be designed and construction initiated to demonstrate proof-of-principle of the novel concepts. *Participants include: SCS, NETL, UNDEERC, Alstom, GTI, TDA, RTI, Rocketdyne, Arizona Public Service, ARC, and VPI.*

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2 million – non-add). FE's APP efforts within Gasification Systems Technology will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

(c) 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 2009, the 150-ton/day ITM intermediate-scale test unit (ISTU) will begin commissioning to provide engineering performance and design data for integrated operation with a gas turbine for the design of a commercial-scale module for carbon capture. 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 for testing at in carbon capture demonstrations. *Participants include: APCI, Cerematec*

In FY 2008, work will continue on the development of the Ion Transport Membrane (ITM) technology for air separation. The design of the 150 tpd engineering prototype unit will be completed and equipment orders will begin to be placed for construction of the unit at a commercial gasification site. 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.*

Activities include support of the APP ($2 million – non-add). FE's APP efforts within Gasification Systems Technology will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System

studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

In FY 2007, ITM research on development of membranes for converting natural gas and air to synthesis gas and hydrogen was funded under the Fuels line item.

- **Systems Analysis/Product Integration** **4,488** **3,964** **5,000**

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 carbon 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. Work with industry to identify ways to reduce construction cost, through process modularization and/or intensification. Conduct informational workshops 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 gasification database to reflect the current status of gasification-based project and to incorporate newly announced projects.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($500 thousand – non-add). FE's APP efforts within Systems Analysis/Product Integration will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.*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 carbon capture demonstrations. Development of the three dimensional dynamic simulation model of an IGCC plant both with and without carbon dioxide 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.*

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($500 thousand – non-add). FE's APP efforts within Systems Analysis/Product Integration will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a

wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

In FY 2007, work will continue on assessing the economics of advanced process concepts in support of near-zero atmospheric emissions plants (including carbon capture). Studies will focus on advanced multi-contaminant synthesis gas cleaning technologies, novel process concepts/technologies for hydrogen/power and SNG/power to quantify performance and cost benefits and define R&D targets. Development of a three dimensional dynamic simulation model of an IGCC plant with and without carbon dioxide capture will be initiated with the goal of having the model available for control room simulation and operation of carbon capture demonstrations and other IGCC facilities. Gasification workshops will continue to be conducted in conjunction with the gasification industry and focus on both the regulatory and financial community to assist in the deployment of the technology. The world-wide gasification database will continue to be updated. *Participants include: NETL, RDS, TAMS, Mitretek, and GTC.*

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($500 thousand – non-add). FE's APP efforts within Systems Analysis/Product Integration will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

- **Vision 21** **16,561** **0** **0**

In FY 2009 and FY 2008, ongoing projects are grouped into one of the three categories listed above (gasification, gas cleaning/conditioning, and gas separation).

In FY 2007, work will focus primarily on scaling up technologies for incorporation into near-zero atmospheric emissions plants (including carbon capture) as either a full-scale repeatable module or as subsized module for the test beds. Definition of the 25-150 tons per day (TPD) ion transport membrane (ITM) air separation unit and the required manufacturing infrastructure to support the wafer and module production for this scale of operation will be completed and all major equipment will be ordered. Performance testing of the transport desulfurizer and Direct Sulfur Reduction Process (DSRP) technologies will continue based on successful operation at Eastman Chemical. These efforts will be focused on scaling up the technology for incorporation into carbon capture demonstrations as a full-scale module. Bench-scale development of the Unmixed Fuel Process will be completed and feasibility of further scale-up of the technology will be evaluated. Modification to the PSDF will be made to prepare for testing of advanced hydrogen/carbon dioxide separation technologies in support of carbon capture demonstrations. *Participants include: APCI, RTI, NETL, SCS, and GE.*

- **SBIR/STTR (non-add)** **—** **(1,498)** **(1,932)**

In FY 2007, $1,325,000 and $159,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the

(dollars in thousands)

FY 2007	FY 2008	FY 2009

continuation of the SBIR and STTR program.

Advanced Turbines **19,475** **23,782** **28,000**

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 carbon 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. In FY 2008, work will continue to address technical issues and ultimately provide turbine technology for burning up to 100 percent hydrogen. This advanced hydrogen burning, near-zero atmospheric emissions, turbine technology will be available for carbon capture and storage demonstrations and will contribute to achieving the 2010 Advanced Power Systems performance goal.

- **Hydrogen Turbines** **17,975** **23,782** **28,000**

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 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.

Work on advanced CO_2 compression technology with Southwest Research Institute and Ramgen Power Systems will be concluded. 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 will continue in FY 2008 to develop advanced turbine based technologies for the compression of large quantities of CO_2 produced in coal-based power plants. This work has the potential to significantly reduce (20 to 40 percent) the parasitic power consumption penalty associated with CO_2 compression in carbon capture power plants. In FY 2008, Phase II funding will be completed with Southwest Research Institute to support the design and development of turbo machinery for minimizing the power consumption of CO_2 compression systems.

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

In FY 2007, 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 Turbine solicitation will contribute to significantly increasing combined cycle efficiency, reducing NO_x emissions, and dramatically reducing CO_2 emissions from hydrogen fueled, coal-based power systems, including carbon dioxide.

In FY 2007, work by Siemens Westinghouse will be nearing conclusion and result in catalytic

combustion technology capable of emitting only 2 ppm NO_X for deployment in existing and developmental hydrogen fueled turbines. Work will continue under NETL on research to assess combustor designs and the fundamentals associated with hydrogen combustion. GE and Siemens Westinghouse will be working to develop a new generation of gas turbine machinery that will be capable of firing hydrogen produced from coal, while meeting a 2 ppm NO_x limit, to be available for demonstration as part of carbon capture demonstrations.

Clean Energy Systems will conduct activities directed toward the development of an oxy-fired Rankine cycle turbine capable of firing coal-derived syngas, and other work will cover aspects of combustion and materials development required for the demonstration of IGCC systems with near-zero atmospheric emissions. Coordinated work will continue with the national laboratories to address high heat flux and material issues associated with the combustion of high hydrogen fuels. Work will continue and new work will be initiated with the government led university-industry consortium with a fundamental focus on combustion, aerodynamics, heat transfer, systems/cycles and material issues in machines designed for high hydrogen fuels for systems with near-zero atmospheric CO_2 emissions. *Participants include: GE, University of California Irvine, Precision Combustion, Inc., Clean Energy Systems, Parker Hannifin, Siemens Westinghouse, Gas Technology Institute, University Turbine Systems Research (Clemson), SwRI, NETL, ORNL, Ames Lab, LBNL.*

- **Projects – Advanced Turbines** **1,500** **0** **0**
  - **Ramgen Engine Development** **1,500** **0** **0**

    FY 2007 funding supported work on the gas compression potential of the system. Initial air tests for the Rampressor II prototype have been completed and the design of an advanced prototype for CO_2 compression was initiated.

- **SBIR/STTR (non-add)** **—** **(608)** **(772)**

  In FY 2007, $469,000 and $56,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Carbon Sequestration **97,228** **118,908** **149,132**

The mission of the Carbon Sequestration activity is to create public benefits by discovering and developing ways to economically separate and permanently store (sequester) emissions. 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.

- **Greenhouse Gas Control** **81,936** **108,999** **141,997**

  All Greenhouse Gas Control activities will provide support for carbon capture demonstrations,

Carbon Sequestration Leadership Forum (CSLF) and the President's strategy to reduce the greenhouse gas intensity of the economy.

The Regional Carbon Sequestration Partnerships (CSRP) program has been implemented in 3 Phases: I) Characterization phase; II) Validation phase and III) Deployment 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, scheduled to commence in FY 2008, will demonstrate on a large scale that CO_2 capture, transportation, injection, and storage can be achieved safely, permanently , and economically. Public outreach and education have been an important component of each of these phases.

In FY 2009, the CSRP Phase II will complete remaining CO_2 injections, continue monitoring, and publish results from the 25 geologic sequestration tests involving CO_2 injection and monitoring, mitigation, and verification (MMV) 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. Depending on the results of a scientific needs assessment being conducted in FY 2008 and the ability of additional project proposals to meet those needs, additional projects may be awarded in FY 2008 or FY 2009. Injection will be occurring at three of the large-scale sequestration projects and will include the procurement of the CO_2 and the conduct of MMV 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 will have been applied for the remaining large-scale field sites. At least seven deep injection and 15 monitoring wells will be drilled and completed at the field sites during FY 2009. Construction of major infrastructure including CO_2 compression equipment, pipelines, and injection equipment will be installed at the remaining large-scale projects sites.

MMV of the CO_2 is an extremely important tool in addressing public acceptance, regulatory and liability issues related to sequestration. MMV has received emphasis in all field tests and will continue to be emphasized in all tests to ensure carbon dioxide containment. A comprehensive intensive effort will be initiated in FY 2009 to prepare for and augment the MMV being conducted in the large-scale sequestration tests in Phase III of the Regional Partnerships. This effort will utilize existing tools and models and will develop and implement new technologies based on sound scientific basis to facilitate large-scale deployment of carbon capture and

sequestration (CCS) projects. This will include collaboration among national laboratories, university and industry.

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 others 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, minimizing this factor is critical to cost effective CCS. Carbon capture projects awarded in FY 2007 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.

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. Research is continuing the development path of several new concepts to lower the cost of CO_2 capture. 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. Ionic liquid absorbents are another potential development that could help reduce CO_2 capture costs. Additionally, these sorbents could be used for both post or pre combustion CO_2 capture due to their high CO_2 absorption capacity that allows for wider opportunities. Metal organic frameworks (MOFs) also show potential for CO_2 capture and will be continued to be developed. MOFs have the potential to operate at high CO_2 pressures and therefore can be utilized for both precombustion and postcombustion capture.

Precombustion CO_2 capture, applicable to mainly new plants, has the potential for significant cost reduction related to CO_2 capture costs. The CO_2 is recovered from some process stream before the fuel is burned and has several advantages over post-combustion capture in that the stream can be at high pressure and with a higher CO_2 concentration. This results in an increased driving force for separation and a potential for reduction in compression costs. Projects will be selected and awarded from a competitive solicitation to further research and development in precombustion CO_2 capture.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2.25 million – non-add). FE's APP efforts within Greenhouse Gas Control will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

(dollars in thousands)

FY 2007	FY 2008	FY 2009

Participants include: University of North Dakota - EERC,Montana State University, Univ. of Kansas, Battelle, Babcock and Wilcox, CMU, BOC Group, Praxair, ARI, SRI, RTI, Univ. of Akron, Membrane Technology & Research, UOP, Notre Dame, Carbozyme, BP, MIT, Consol, IEA, Univ. of Illinois, SSEB, New Mexico Institute of Mining and Technology, California Energy Commission, NETL, LANL, SNL, LLNL, LBNL, PNNL, INEEL, 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. The high demand for oil and its rising cost has caused field service costs related to drilling and materials to rise substantially. The rising field service and commodity costs directly impact the implementation of the CSRP field tests. FY 2008 funding will also ensure that the CSRP provides coverage throughout the United States in areas that have potential storage opportunities.

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. In coordination with the current partnerships, the program will determine the "highest potential" opportunities for the initial expedited round of large-scale sequestration tests in saline, coal, and/or oil and gas bearing formations. Depending on the results of a scientific needs assessment being conducted in FY 2008 and the ability of additional project proposals to meet those needs, additional projects may be awarded in FY 2008 or FY 2009. Phase III work will begin with a physical characterization of the surface and subsurface, reservoir modeling, and collection of information to satisfy NEPA requirements.

Carbon capture projects that will be 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. 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.

Being able to capture CO_2 at the lowest possible cost is critical to minimizing total sequestration costs in the future. Research is continuing to lower the capture costs of CO_2 and helps to expedite commercialization at large-scale sources. Pilot-scale testing of two oxycombustion projects

(Babcock and Wilcox and BOC Group) will be conducted in FY 2008. Oxycombustion is a promising carbon capture technology that uses oxygen rather than air for combustion, thereby resulting in a highly pure CO_2 exhaust stream that can be captured at relatively low cost and sequestered.

Two sequestration field tests will continue in FY 2007 with the goals of understanding the trapping mechanisms for CO_2 storage and to develop best practice procedures for large volume sequestration tests and carbon capture and storage demonstrations. The second phase of the Weyburn Project will be underway investigating CO_2 storage, protocols, and modeling and analysis in conjunction with economic enhanced oil recovery operations expanding into an adjacent oil field. An unmineable coal seam will continue to be investigated with a planned injection of 26,000 tons of CO_2 to verify sequestration potential in a West Virginia coal seam. This injection will be completed and results from the field test will be used to develop best management practices for future coal seam sequestration projects.

Emphasis on field-scale MMV and modeling will continue to provide tools and protocols to verify the permanence of CO_2 storage. Geophysical tools such as Vertical Seismic Profiling (VSP), time lapse seismic, crosshole seismic, and crosshole electromagnetics will be integrated with other tools such as well logs, geochemical analysis of reservoir fluids, use of tracers, and reservoir modeling to monitor and predict distribution of the plume, and verify carbon dioxide containment. Many projects will be coordinating with the CSRP to field test new technologies and protocols for monitoring CO_2 in geologic formations.

NATCARB will continue to enhance and upgrade the functionality of the Relational Database Management System covering the United States. Enhancements to NATCARB will include development of improved online tools to provide real-time display and analysis of CO_2 sequestration data. In addition, the current webpage will be enhanced to include more advanced query capabilities. Furthermore, NATCARB will add a National online water geochemical system for evaluating saline formations. Transition of the national carbon sequestration database to the NETL and University Consortium will begin to consolidate and improve the systems information, tools, and functionality.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2.25 million – non-add). FE's APP efforts within Greenhouse Gas Control will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

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

In FY 2007, the CSRP Phase II began and will continue field validation experiments involving

CO_2 injection and MMV operations in saline reservoirs, depleted oil and gas fields, and coalbed methane seams. Sites include the acid gas injection project in Zama, Alberta; Central Valley of California depleted gas reservoir; Illinois basin coal seam; and an industrial-scale enhanced oil recovery and CO_2 sequestration test in southern Utah. These sites represent a diverse geology and will prove important to validating the potential for these sinks to be used to store and mitigate greenhouse gas emissions. Formation modeling, site selection, and baseline MMV studies will have been completed at these and several other field validation sites. Best management practice manuals will be initiated from these tests to help plan and implement future sequestration tests.

Numerous technologies in the area of CO_2 capture were either continued or pilot-scale testing phases were initiated to validate substantial potential for cost reduction and performance improvement. Several oxyfuel combustion technologies, including pulverized coal oxycombustion system, oxycombustion systems, and retrofit analysis of existing pulverized coal fired power plants, were continued. In addition, during FY 2007, several new projects began from a FY 2006 solicitation aimed at funding capture and separation projects including novel concepts, system analysis, bench-scale, and pilot-scale projects in an effort to reduce the cost associated with capturing the CO_2 for sequestration.

The microporous silica membrane stability has been demonstrated (e.g. reduction of CO_2 permeance of less than 25 percent) for at least 120 hours of continuous operation at 100-130^{o}C. An ionic liquid that will have a significant increase in the CO_2 carrying capacity of the benchmark ionic liquid has been synthesized and tested. Modeling has been completed to determine the potential for alternative solvent compositions to be used to capture CO_2 from the existing fossil fuel power generating fleet.

Initial site characterization at two field sites for the Midwest Regional Partnerships will have been completed in Ohio and Michigan (Battelle). Site characterization has been completed and CO_2 injection initiated at a depleted oil field in the Illinois basin to estimate the sequestration and enhanced oil recovery potential of the region (University of Illinois). CO_2 injection began at the Aneth depleted oil field in Southern Utah in collaboration with an industrial partner where nearly 500,000 tons of CO_2 were injected (New Mexico Institute of Mining and Technology). Baseline assessment and characterization of the Grande Ronde Basalt formation in Washington state were initiated to determine the suitability of the formation to store CO_2 in basalt formations throughout the United States (University of Montana – Bozeman). UNDEERC developed an injection plan for lignite coal tests in the Williston Basin of North Dakota to demonstrate the relatively high loading capacity of lignite coals. Los Alamos National Laboratory (LANL) developed an open path instrument capable of measuring leaks of CO_2 at the surface that have the ability to differentiate between natural sources and injected CO_2. Computer models were developed and validated to predict transport of CO_2 in the different formations and interactions with caprock materials.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2.25 million – non-add). FE's APP efforts within Greenhouse Gas Control will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider

range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations.

Participants include: Montana State University, UNDEERC, Univ. of Kansas, Battelle, Babcock and Wilcox, CMU, BOC Group, Carbozyme, Texas BEG, Univ. of Minnesota, UOP, Notre Dame, Harvard, Arizona State, Indiana Univ., Univ. of Georgia, Velocys, Winrock, Dakota Gasification, ARI, SRI, RTI, California Technical Institute, Stephen F. Austin, Univ. of Massachusetts, Univ. of Michigan, Univ. of Delaware, Univ. of North Carolina-Charlotte, Nature Conservancy, BP, Kansas State, Univ. of KY, Univ. of TX, MIT, Consol, IEA, Univ. of Illinois, SSEB, Univ. Of NM,

New Mexico Institute of Mining and Technology, California Energy Commission, Univ. of Utah, NETL, LANL, SNL, LLNL, LBNL, PNNL, ORNL, INEEL, TBD.

- **Focus Area for Carbon Sequestration Science** **12,848** **9,909** **7,135**

In FY 2009, the 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. A variety of techniques to ensure permanent storage will be applied at the field sites. Since Phase III involves large-scale CO_2 injections, the monitoring area will be much greater than compared to Phase II efforts. Cost-effective techniques such as unmanned helicopter flyovers and wireless sensor networks will be employed.

Reservoir simulations of Phase III field sites will be performed. Seismic survey results will be correlated with laboratory measurement of acoustic rock velocities to determine a much clearer picture of subsurface structure. Access to this more specific subsurface information should greatly enhance the capabilities of the reservoir simulators. Efforts to parallelize the reservoir simulators will allow more detailed simulations to be performed without a significant increase in time.

During FY 2009 a quantitative risk assessment of a regional partnership field site will be performed. 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. This new type of CO_2-philic compound, which is being tested in FY 2008, studies separation of CO_2/H_2 mixtures at high pressure within a reactor. 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. As an alternative technology, a magnesium-based material will also be investigated for a similar sorbent-based CO_2 removal from syngas. Based on a systems analysis study and experimental data from FY 2008, these sorbents have a potential to simplify CO_2 removal in syngas at elevated temperature.

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. Based on test data gathered in FY08, a decision for how to use the ionic liquid solvent will be made. Depending on results of FY08 studies, the focus area will also continue development and scale-up of a membrane using an ionic liquid impregnated in a high-temperature substrate. This is an alternative method to use the benefits of ionic liquid solvent, but with a simple membrane approach for CO_2 separation.

The Focus Area will also evaluate approaches to use chemical looping to directly produce hydrogen from coal syngas, or as an alternate route to coal combustion. Chemical looping has potential advantages for producing CO_2 for sequestration because the process can inherently separate CO_2 while producing heat for power generation or hydrogen fuel. *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 laboratory-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. Reservoir simulations will be completed for at least one and possibly two Partnership field sites. The development of a site-specific Bayesian Belief Network will be completed for one of the Regional Sequestration sites, to help design and interpret data from near-surface monitoring networks. The NFFLOW code will be modified to simulate two-phase flow and incorporate coal shrinkage and swelling and applied to a Regional Sequestration Field Project in a coal seam.

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. This quantitative model will be able to incorporate information from the Bayesian Belief Network that is being developed for designing monitoring networks. *Participants include: NETL, West Virginia University, University of Pittsburgh, and Carnegie Mellon University.*

In FY 2007, the Focus Area for Carbon Sequestration will continue to use a combination of engineering analysis and numeric models to determine the best approach to use solid adsorbents for CO_2 capture in pulverized coal power plants. The Focus Area will work to reach a decision for continued research on ammonia-based scrubbing, depending on results of laboratory-scale testing, and pilot-scale testing in a Cooperative Research and Development Agreement with Powerspan, Inc. An evaluation of promising membrane technology developed in FY 2006 for IGCC applications will be used to define continued developments for coal gasification applications. With participation from local universities (*see participants, below*), the Focus Area will evaluate several new approaches to further reduce the energy required for CO_2 capture, and

form a group devoted to defining needed experiments and analysis of these ideas.

The Storage Assessment activities will continue to develop a scientific basis to allow successful modeling and simulation of geological sequestration field demonstrations, based on reliable information from laboratory-scale experiments. Simulation and experimental work will continue to support the regional partnership field projects. A plan will be developed for conducting 3-D (and 4-D) seismic surveys at one or more Regional Partnership sites, for characterization and monitoring purposes. Coal core samples obtained (if available) from regional partnership sites will undergo sorption and desorption experiments and be scanned with the new CT equipment. Work is continuing on the development and use of models for the shrinkage and swelling of coal in the presence of CO_2. The Storage Assessment Group will also continue its focus on flow through fractured media. Simulations of flow through an actual fracture (obtained through CT scan) will be performed.

The Permanence Assessment Group plans to continue to develop and apply methods to accurately detect and locate abandoned wells in a variety of reservoir types, and conduct research on tools and methods to ensure the permanence of geologically sequestered carbon through the use of surface monitoring techniques based on chemical tracers, CO_2 and possibly both CH_4 and Radon soil flux rates, and geophysical data. Mitigation strategies will be explored. Experiments on cement degradation under CO_2 sequestration conditions will continue with a study of commonly used additives. Under the advisement of NETL's industry partners (Chevron and Exxon Mobil), several cement formulations will be chosen which include the most commonly used additives. A series of short-term and long-term experiments will be conducted to determine the effect that these additives have on the kinetics of cement degradation.

Risk assessment activities for geologic sequestration will begin. A plan will be developed for identifying risks associated with sequestration, most likely following the features, events, processes models that have developed for risk assessment elsewhere. A key component of the risk assessment performed will be to work with at least one of the regional partnerships to identify the risks associated with an individual field project. Additionally, the plan will include tying modeling and monitoring techniques to the risk assessment model as means of identifying potential events and probabilities of events. This change reflects the progression of testing, analyses, and modeling efforts to quantify and reduce uncertainties and address issues associated with CO_2 in geologic storage formations. *Participants include: NETL, West Virginia University, University of Pittsburgh, and Carnegie Mellon University.*

- **Center for Zero Emissions Research and Technology** **1,944** **0** **0**

The Zero Emission Research and Technology Center is a research collaborative focused on understanding the basic science of underground (geologic) carbon dioxide storage to mitigate greenhouse gases from fossil fuel use and to develop technologies that can ensure the safety and reliability of that storage. In FY 2009 and FY 2008, no funding is requested. In FY 2007, research was conducted focused on understanding the basic science of underground (geologic)

(dollars in thousands)

FY 2007	FY 2008	FY 2009

carbon dioxide storage to mitigate greenhouse gases from fossil fuel use.

- **Projects – Carbon Sequestration** **500** **0** **0**
  - **Utah Center for Ultra-Clean Coal Utilization** **500** **0** **0**

    The Center conducts research into technologies for the retrofit of existing coal-fired power plants. In FY 2007, all research at the Utah Center for Ultra-Clean Coal Utilization was completed. The Center's mission is the generation of scientific and technical breakthroughs that allow coal to be used as an energy source in a carbon-constrained world. Key research areas target the elimination of pollutants, greenhouse gases, and safeguarding human health and environment.

- **SBIR/STTR (non-add)** **—** **(2,186)** **(4,122)**

  In FY 2007, $2,475,000 and $297,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Fuels **21,513** **24,773** **10,000**

The Fuels activity is a component of the President's Hydrogen Fuel Initiative. The Fuels activity helps reduce technological market barriers for the reliable, efficient and environmentally sound conversion of coal to hydrogen. 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.

- **Hydrogen from Coal Research** **15,113** **24,773** **10,000**

  In FY 2009, continue to support the Hydrogen Fuel Initiatives 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.

(dollars in thousands)

FY 2007	FY 2008	FY 2009

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, Ohio State University, Worcester Polytechnic Institute, Southwest Research Institute, 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. These activities are important for addressing the Hydrogen Fuel Initiative. 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.*

In FY 2007, research was performed in the development of novel technology to: 1) separate hydrogen from mixed gas streams to remove remaining impurities prior to utilization; 2) produce substitute natural gas from coal for distributed hydrogen production; 3) store and deliver hydrogen/liquid hydrogen carriers, and; 4) utilize high-speed computation science to provide the technical foundation to facilitate the development of advanced system components associated with the production, delivery, storage and utilization of hydrogen from coal. System engineering studies were conducted to determine optimum strategies for scale-up of advanced separation membranes. Also, in FY 2007, activities were initiated to move 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 systems. These activities are important for the Hydrogen Fuel Initiative. *Participants include: Ohio State University, Media Process & Technology, Pennsylvania Sate University, ICRC/Syntroleum, Gas Technology Institute, Wright-Patterson AFB, Eltron Res., Inc., ORNL, ANL, RTI, West Virginia University, Arizona Public Service, Advanced Materials Corp., REB, Univ. of Michigan, NETL, Headwater Group, GE, Univ. of Kentucky, Aspen Products Group, United Technologies Group, Univ. of Wyoming, Univ. of Lehigh, UNDEERC, TBD.*

▪ **Projects – Fuels**	**6,400**	**0**	**0**
• **Center for Advanced Separation Technologies**	**500**	**0**	**0**

Completed research at the Center for Advanced Separation Technologies (CAST) to explore solid-solid and solid-liquid separations important to the coal and minerals industries.

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
• **Continuous Solvent Extraction Processes for Coal Derived Carbon Projects at WVU**	**700**	**0**	**0**
Completed study of coal based extract as a source of material for producing high-value carbon products at West Virginia University.			
• **WVU Coal Liquefaction Study in China**	**700**	**0**	**0**
Completed review and environmental assessment for the Direct Liquefaction commercial demonstration being built in China using American developed technology.			
• **ITM/Syngas Project**	**2,000**	**0**	**0**
Completed Air Products and Chemicals research on development of membranes for converting natural gas and air to synthesis gas and hydrogen.			
• **National Center for Hydrogen Technology**	**2,500**	**0**	**0**
Completed work at UNDEERC on multifaceted research to develop centrally produced and decentralized hydrogen from low-rank coal, storage and end use application.			
▪ **SBIR/STTR (non-add)**	**__**	**(277)**	**(277)**
In FY 2007, $548,000 and $66,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.			
Fuel Cells	**61,653**	**55,490**	**60,000**
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 carbon and air pollutants in central station applications. The objectives also include providing the technology base to permit grid-independent distributed generation applications.			

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
▪ **Innovative Systems Concepts/SECA**	**55,903**	**55,490**	**60,000**

In FY 2009, the Solid State Energy Conversion Alliance (SECA) will continue 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 will continue 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 will continue cost-reduction activities focused on the $400/kW goal by 2010. Research and development will proceed 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 will demonstrate advances important to delivering 10 - 50 MW fuel cell capacity for high-efficiency coal power plants. Tests will include 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 will be fully integrated. Two teams will additionally pursue auxiliary power system 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 will continue cost-reduction activities focused on the $400/kW goal by FY 2010. Research and development will proceed to address the key technical issues identified by industry and government managers. Activities will be 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 will proceed 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.*

In FY 2007, continue work on three SECA Industrial Teams targeting 3-10 kW prototype demonstrations with a cost of $400/kW. Continue work on three SECA Coal-Based Fuel Cell projects focused on scaling solid-oxide fuel cells for high-efficiency coal power plants. Complete the last Phase I SECA prototype test, validating successful industrial teams achievements of SECA Phase I technical requirements for low-cost fuel cell systems. Also, continue SECA core technology R&D to resolve remaining crosscutting technical issues, such as seals and

(dollars in thousands)

FY 2007	FY 2008	FY 2009

interconnects and to enhance individual subsystem components and overall system performance to position teams to achieve Phase II goals and the final SECA system 2010 goal of $400/kW. Continue MW-scale SECA fuel cell work in support of coal-syngas based, near-zero atmospheric emissions fuel cell systems. Continue R&D addressing barrier issues with respect to the performance and manufacturability of larger-size fuel cells suitable for use in multi-MW applications. *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 business, TBD.*

- **Projects – Fuel Cells** **5,750** **0** **0**
  - **MW-Scale Oxide Fuel Cell Gas Turbine Hybrid System** **2,500** **0** **0**

    Completed MW-Scale Oxide Fuel Cell Gas Turbine Hybrid System Project.

  - **MW-Scale Solid Oxide Fuel Cell Stationary Power Generation** **250** **0** **0**

    Completed MW-Scale Solid Oxide Fuel Cell Stationary Power Generation Project.

  - **High Temperature Electrochemistry Center** **3,000** **0** **0**

    Completed exploration of advanced energy processes using a fuel cell architecture

- **SBIR/STTR (non-add)** **—** **(1,712)** **(2,072)**

  In FY 2007, $1,517,000 and $182,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Advanced Research **32,213** **37,159** **26,600**

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.

- **Coal Utilization Science** **11,063** **12,377** **11,225**
  - **Coal Utilization Science (Core)** **10,738** **0** **0**

    In FY 2008 and FY 2009, the Coal Utilization Science Core activity has two areas of focus: Sensors & Controls Innovations and Computational Systems Dynamics, that address more complex operational requirements of advanced coal plants, which are designed to be integrated with carbon capture subsystems.

    In FY 2008, the Coal Utilization Science Core activity was restructured into Sensors & Controls Innovations and Computational Systems Dynamics to address more complex

operational requirements of advanced coal plants designed to integrate with carbon capture subsystems.

In FY 2007, conduct research aimed at innovations and advanced concepts that support development of highly efficient and clean power plants focusing on the reduction or elimination of adverse environmental impacts of coal use.

Continue to develop a new class of sensors that are capable of monitoring key parameters under harsh operating conditions of coal power systems with near-zero atmospheric emissions, including carbon capture. Revolutionary concepts for Enabling Technologies will continue to develop projects initiated in FY 2006 targeting priority areas of power plants with near-zero atmospheric emissions, including carbon capture. Continue mechanistic 3D modeling and stochastic modeling and model integration development for advanced power systems. Continue to investigate basic combustion and gasification chemistry to discern rates and mechanisms that affect emissions behavior of coal under advanced and conventional combustion/gasification conditions to minimize criteria pollutants. Continue to investigate the fundamental parameters involved in mineral sequestration, i.e., kinetics and thermodynamics.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2 million – non-add). FE's APP efforts within Coal Utilization Science will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations. *Participants include: SNL, CMU, AML, Nuonics, ARC, General Electric, New Mexico Tech., REI, Texas A&M Univ., Univ. of Utah, Ames, Fluent, NETL, and TBD.*

- **Mercury Control** **325** **0** **0**

Beginning in FY 2008, the Coal Utilization Science Mercury Control activity will be included under the new subprogram Sensors & Controls Innovations.

In FY 2007, complete projects relating to fundamental mechanisms that affect mercury control and initiate technology transfer activities for mercury continuous emission monitors. *Participants include: SNL, Purdue University, GTI, University of Arizona; URS.*

- **Sensors and Controls Innovations** **0** **9,421** **8,269**

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 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. Design and analyze sensor networks for advanced process control of fossil energy systems and expand validation of sensor network designs. Solicit for new sensor developments that address key measurement needs and new technologies that address barriers

in measurement technology including high temperature materials and sensor designs. Conduct investigations of innovations that seek to minimize the adverse environmental impacts of coal utilization. Initiate technology transfer of sensors with capability of monitoring key parameters in harsh environment conditions and evaluate commercial potential of these new technologies for coal power systems with near-zero atmospheric emissions, including carbon capture. Projects included are fiber optic gas sensor, nanocrystalline clad silica fiber gas sensor, modified sapphire fiber sensor and high temperature MEMs (Micro Electro-Mechanical Systems) sensors.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2 million – non-add). FE's APP efforts within Sensors and Controls Innovations will focus on RD&D projects concerning technologies jointly applicable domestically and to APP partner nations. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations. *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. Projects included are fiber gas sensor, nanocrystalline clad silica fiber gas sensor and modified sapphire fiber sensor. Design and analyze sensor networks for advanced process control of fossil energy systems and expand validation of sensor network designs. Among these are participants selected under the 2006 solicitation for sensor network design. Conduct investigations of innovations that seek to increase the utilization of coal and minimize its adverse environmental impacts.

Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($2 million – non-add). FE's APP efforts within Sensors and Controls Innovations will focus on projects concerning technologies jointly applicable domestically and to APP partner nations. Topics will also include R&D on adaptation and application of existing technologies to a wider range of deployment conditions. System studies may be conducted on technologies jointly applicable domestically and to APP partner nations. *Participants include: NETL, SNL, ARC, New Mexico Tech, Univ. of Utah, Ames Lab, GE, VPI, and TBD.*

In FY 2007, the activities described above were included in the Coal Utilization Science Core activity.

- **Computational System Dynamics** **0** **2,956** **2,956**

Advanced simulation techniques will enable more rapid development of advanced, highly efficient, low-emission power plants.

In FY 2009, continue 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. Integrate co-simulator models with the virtual engineering plant walk-through environment models. Conduct efforts to expand and validate multiphase fluid flow

models for simulation of advanced coal based power systems. Investigate basic combustion and gasification chemistry to determine mechanisms that affect emissions behavior or coal under advanced and conventional combustion/gasification. 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, Fluent, University of Colorado, Ames Lab, and TBD.*

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. Integrate co-simulator models with the virtual engineering plant walk-through environment models. Conduct efforts to validate multiphase fluid flow models for simulation of carbon capture systems. Investigate basic combustion and gasification chemistry to determine mechanisms that effect emissions behavior or coal under advanced and conventional combustion/gasification. This information will be used to validate combustion/gasification models. *Participants include: SNL, CMU, Fluent, Ames Lab, and TBD.*

In FY 2007, the activities described above were included in the Coal Utilization Science Core activity.

- **High Performance Materials** **7,325** **8,813** **7,010**
  - **High Temperature Materials Research** **3,328** **3,469** **3,055**

In FY 2009, continue development and evaluation of structural alloys for improved performance of high temperature alloys and components in advanced, combined cycle and coal combustion systems. Develop a multi-stage process that can be used for alloy selection for high temperature applications. Evaluate thermodynamic and structural stability of potential materials, with subsequent composition refinement for more detailed study. Evaluate material performance in oxidizing and corrosive atmospheres. This work will provide fundamental information on structural and functional materials that can be used in advanced high temperature, low-emission, high-efficiency energy systems utilizing fossil fuels. Develop nondestructive evaluation techniques that can assess the performance of high-temperature gas separation membranes, solid oxide fuel cells, 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 CO2 and in steam-CO2 environments pertinent to carbon emission reduction and carbon sequestration systems. *Participants include: ANL, INEEL, ORNL, and Ames Lab. .*

In FY 2008, develop and evaluate structural alloys for improved performance of high temperature alloys and components in advanced, combined cycle and coal combustion systems, with emphasis on cycles operating at temperatures of 700^{o}C and higher. 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 possible with conventionally-strengthened alloys. Develop a detailed understanding of the behavior of ODS alloys in certain phases of their use, including 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.*

In FY 2007, develop high-strength, oxidation- and corrosion-resistant metallic and intermetallic alloys for use as hot components in advanced fossil energy conversion and combustion systems to help meet the efficiency and clean power generation goals of near-zero atmospheric emissions plants (including carbon capture). These alloys are needed to improve thermal efficiency through increased operating temperatures and decreased cooling requirements. They are needed to provide materials for applications ranging from process monitoring (e.g. thermowells) to structural components or protective coatings in aggressive environments such as those encountered in coal gasification systems (e.g. molten salt, slag, ash, sulfidation, etc.) The development effort is based on increasing performance through

fundamental understanding, manipulation, and control of the phases of the metallic and intermetallic structures. *Participants include: ANL, INEEL, ORNL, Ames, and NETL.*

- **Materials for Ultra Supercritical and other Advanced Fossil Energy Power Generation Systems** **3,997** **5,344** **3,955**

In FY 2009, develop materials for fire-side and steam-side ultra-supercritical (USC) boiler steam conditions and ultra-supercritical 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. The program will develop heat treatment conditions to optimize microstructural stability and mechanical properties of steam turbine materials. Oxy-fuel combustion processes produce CO_2 as a more concentrated stream in the flue gas that is easier to capture. Work on the combustion in oxygen rather than in air (oxy-fuel combustion) 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, Babcock and Wilcox, EPRI, NETL, and PNNL.*

In FY 2008, long term effects of fire-side and steam-side corrosion on ultra supercritical boiler materials will be investigated. Establish heat treatment conditions needed to optimize

microstructural stability and mechanical properties of steam turbine materials. Initiate work on the concept of combustion in oxygen rather than in air (oxy-fuel combustion). The oxy-fuel combustion process produces CO_2 as a more concentrated stream in the flue gas that is lot easier to capture. The combination of USC technology and oxy-fuel combustion is 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. ESA is key to reducing energy consumption and cost compared to conventional pressure swing adsorption. *Participants include: ORNL, PNNL, Energy Industries of Ohio, NETL, Ames Lab, and LANL.*

In FY 2007, develop materials technology for USC steam turbines to match USC boiler steam conditions. USC plants become even more attractive when combined with oxyfuel boiler combustion technology to facilitate sequestering CO_2. All of these areas will be addressed.

In the area of gas separations, the objective is to develop a metal supported membrane having both high permeance and selectivity for hydrogen. Early prototype membranes will go through various characterization steps to estimate the average pore size and evaluate them for leak flow. Several techniques have been developed to minimize the leaks and these processes will be applied to the tubes to evaluate the most effective treatment. *Participants include: ORNL, PNNL, Energy Industries of Ohio, ARC, Ames, and LANL.*

- **Coal Technology Export** **984** **613** **720**

In FY 2009, initiate activity with the G8 Plus Five Countries to advance US interest in environmental protection by promoting deployment of clean energy systems through training conferences, site visits and information and technical exchange on clean power systems, best practices, privatization with targeted utilities and governments, and advising countries on identification and elimination of barriers for deployment of cleaner coal and power systems. Promote the deployment of carbon capture storage technologies.

Provide global outreach on advanced clean coal technology for climate change and energy security in multilateral forums including: The International Energy Agency, United Nations, World Energy Council, and bilateral with key countries such as China and India.

Ensure that U.S. policy is reflected in International Energy Agency support for G8 initiatives on highly efficient coal-fired power generation and carbon capture and storage technology. Generate international support for near-zero atmosphere emission technology for coal (in general) and FutureGen (specifically). Work with the World Energy Council to promote the development of new policies and business models to create self-sustaining markets for financing of clean fossil fuel system infrastructure projects. Promote accelerated development and international uptake of transformational energy technologies that are cleaner and more efficient. Continue to work with

international organizations to facilitate access to U.S. climate technology and energy services in the developing world, especially China and India.

In FY 2008, sustain momentum for low/near-zero atmospheric emission technology in multilateral organizations including International Energy Agency, United Nations, World Energy Council, and the Carbon Sequestration Leadership Forum and bilateral with key countries such as China and India. Identify opportunities for U.S. industry in fast growing markets such as India and China and continue to facilitate the pathways to keep the clean coal option open through U.S. technology to enhance energy security and global environmental protection.

Ensure that U.S. policy is reflected in International Energy Agency support for G8 initiatives on highly-efficient coal-fired power generation and carbon capture and storage technology. Generate international support for Near-Zero Atmospheric Emissions Technology for coal in general and FutureGen in specific. Work with the World Energy Council to promote the development of new policies and business models to create self-sustaining markets for financing of clean fossil fuel system infrastructure projects. Promote accelerated development and international uptake of transformational energy technologies that are cleaner and more efficient. Continue to work with international organizations to facilitate access to U.S. climate technology and energy services in the developing world, especially China and India.

In FY 2007, continue to facilitate the development and deployment of advanced U.S. clean coal and other fossil energy technologies in global markets. Many of these were developed with DOE funding. These global markets are large, rapidly-growing, and highly competitive. Work funded in this area involves a wide range of bilateral and multilateral activities to advance U.S. interests with various countries and international organizations. This work promotes U.S. clean coal technologies, near-zero atmospheric emissions technologies and carbon capture and storage technologies. DOE works closely with U.S. industry to accomplish this. Especially notable are activities to promote the use of U.S. clean coal and carbon capture and storage technologies in China, the world's largest and fastest-growing energy market. Another major activity is participation in the World Energy Council Committee on Cleaner Fossil Fuel Systems (CFFS). The CFFS brings together a wide range of stakeholders from around the world for collaborative activities to promote research, development, demonstration and deployment of cleaner fossil fuels systems.

- **Bioprocessing of Coal** **1,148** **0** **0**

In FY 2009 and FY 2008, no funding is requested due to the completion of the activity.

In FY 2007, complete bioremediation of coal to reduce mercury emissions from power plants. Evaluate processes for generating hydrogen from coal waste and fossil fuels. Complete development of biosensors for detection of pollutants using light emitting proteins. Investigate novel bioprocessing research with application to waste stream remediation in advanced power systems. Discontinue investigations of global and natural CO_2 sequestration. *Participants include: ORNL, INEEL, Penn State, NETL, and TBD.*

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
▪ **Environmental Activities**	**1,722**	**700**	**700**

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

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

In FY 2007, on a lesser scale continue analysis of issues associated with global climate change. Discontinue analysis of oil and gas regulatory issues. Continue emission trends and forecast studies. *Participants include: ANL, ICF, Resource Dynamics, TMS, and PNNL.*

▪ **Technical and Economic Analyses**	**787**	**560**	**900**

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

In FY 2007, continued 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, "leapfrog" technologies, and advanced concepts that are applicable to fossil energy systems, and have the potential to improve their efficiency, cost, and/or environmental performance. *Participants include: ANL, ICF, EIA, Resource Dynamics, and TMS.*

▪ **International Program Support**	**1,970**	**706**	**706**

In FY 2009, ensure that U.S. policy is reflected in the implementation of G8 initiatives regarding Near-term opportunities for carbon capture and storage. 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 International Energy Agency Clean Coal Center (IEACCC). This activity is a significant and highly-visible international initiative to advance coal technologies. It substantially leverages the internal fossil energy activities of DOE. The Center is the pre-eminent international research institution on Clean Coal Technologies. It produces numerous reports each year on international

coal technology developments that are highly relied-upon by the U.S. government and by U.S. industry. DOE, with input from U.S. stakeholders such as the Electric Power Research Institute (EPRI), the National Mining Association (NMA), Southern States Energy Board (SSEB) and the Edison Electric Institute (EEI), has the major role in the direction of the Centre and uses this role to ensure that the Centre meets U.S. needs. Promote the deployment of carbon capture and storage

technologies worldwide. Continue to provide leadership direction and coordination of coal outreach activities with state governments and energy trade associations.

In FY 2008, 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. It substantially leverages the internal fossil energy activities of DOE. The Centre is the pre-eminent international research institution on Clean Coal Technologies. It produces numerous reports each year on international coal technology developments that are highly-relied-upon by the U.S. government and by U.S. industry. DOE, with input from U.S. stakeholders such as the Electric Power Research Institute (EPRI), the National Mining Association (NMA), Southern States Energy Board (SSEB) and the Edison Electric Institute (EEI), has the major role in the direction of the Centre and uses this role to ensure that the Centre meets U.S. needs. Enhance the expansion of cleaner energy technology power systems activities in China, India, and other targeted countries. Promote the deployment of carbon capture and storage technologies worldwide. Influence opportunities for cleaner power systems and fuels from coal in selected countries, particularly China and India.

In FY 2007, continued U.S. commitment to the International Energy Agency (IEA) fossil fuel activity. This activity is a significant and highly-visible international initiative to advance fossil energy technologies. It substantially leverages the internal fossil energy activities of DOE. Two major IEA commitments are in this area. The first is to the IEA Clean Coal Centre. The Centre is the pre-eminent international research institution on Clean Coal Technologies. It produces numerous reports each year on international coal technology developments that are highly-relied-upon by the U.S. government and by U.S. industry. DOE, with input from U.S. stakeholders such as the Electric Power Research Institute (EPRI), the National Mining Association (NMA), Southern States Energy Board (SSEB) and the Edison Electric Institute (EEI), has the major role in the direction of the Centre and uses this role to ensure that the Centre meets U.S. needs. The second IEA commitment is to the IEA Working Party on Fossil Fuels (WPFF), which the United States provides key leadership. The WPFF, at the urging of the United States, is carrying out an ongoing initiative to promote near-zero atmospheric emissions technologies for fossil fuels. It also provides direction to several ongoing IEA task forces working in the fossil energy area.

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
▪ **Focus Area for Computational Energy Science**	**2,578**	**2,224**	**2,113**

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. A Collaboratory for Multi-phase Flow Research including collaborators from academia, national labs and industry will be conducting research and outreach activities for accelerating the development and usage of multi-phase science-based simulations for the design, operation, and troubleshooting of multiphase flow devices in fossil fuel processing plants. Continue research, development, training, and education activities in the Collaboratory for Process and Dynamic Systems Modeling, to accelerate the application of advanced process systems engineering methods and tools which will help achieve the aggressive design and operational goals for next-generation fossil energy systems. These systems including IGCC power plants and polygeneration facilities such as the near-zero atmospheric emissions (including carbon capture) hydrogen and power production plant. 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 demonstrations, with respect to coupled fluid dynamics, heat and mass transfer, and related chemical and physical phenomena. *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 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. A Collaboratory for Multi-phase Flow Research including collaborators from academia, national labs and industry will be conducting research and outreach activities for accelerating the development and usage of multi-phase science-based simulations for the design, operation, and troubleshooting of multiphase flow devices in fossil fuel processing plants. Continue research, development, training, and education activities in the Collaboratory for Process and Dynamic Systems Modeling, to accelerate the application of advanced process systems engineering methods and tools to better achieve the aggressive design and operational goals for next-generation fossil energy systems, including IGCC power plants and polygeneration facilities such as a near-zero atmospheric emissions hydrogen and power production plant. 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 power plants, with respect to coupled fluid dynamics, heat and mass transfer, and related chemical and physical phenomena.

In FY 2007, continue the development of virtual simulations capability to model the performance of advanced power plant systems using mathematical computational simulations and computer-based models. This capability will greatly accelerate development time and substantially reduce the costs required to design viable near-zero atmospheric emissions coal energy options. Continue development of next-generation multi-phase flow with interphase exchanges (MFIX).

(dollars in thousands)

FY 2007	FY 2008	FY 2009

Continue analysis of fuel cell-gas turbine hybrid systems to provide detailed information on the complex interaction between fuel cells and gas turbines that have been coupled together to achieve ultra high efficiency in electrical generation. Continue to extend these steady-state capabilities to develop simulations of dynamic or time-varying models. The ability to study these advanced power systems as they vary in time will help in optimizing operations such as startup, shutdown and systems upsets. At a reduced level of effort, continue the Supercomputing Science Consortium support activities for advanced simulations by providing high performance computing, internet access, technical support and visualization development. *Participants include: NETL, CMU, West Virginia University, State of West Virginia, Penn. Supercomputing Center and University of Pittsburgh.*

- **University Coal Research** **2,679** **2,434** **2,413**

In FY 2009, 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 FutureGen, the hydrogen from coal initiative, global climate change, development of advanced materials, sensors and controls, and fuel cells, and to improve the technological development of Advanced Coal Systems. Advanced Coal Systems envision futuristic, 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. Five to six grants are anticipated to be awarded, depending on the number of meritorious proposals submitted. Each participating university will be required to provide at least one student with grant support. Allocated funding will also be used to reduce existing mortgage 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 continued to support grants at U.S. colleges and universities by emphasizing longer-term research for achieving Fossil Energy's strategic objectives. Applications were solicited from individual universities in the Enabling Advanced Modeling and Simulation for Fuel-Flexible Combustors key research area. Selected projects were eligible for a maximum of $276,264 in DOE funding for a three year project period. Subsequently, two projects were selected for award with the requirement that at least one student be supported on the grant.

In FY 2007, the UCR Program continued to support grants at U.S. colleges and universities by emphasizing longer-term research for achieving Fossil Energy's strategic objectives. The FY 2007 solicitation focused on three research areas that accelerate technology development and address potential breakthrough technologies for the next century. These were advanced materials; instrumentation, sensors and controls; and computational energy science.

Collaborative proposals were solicited from groups of three to five participants, either all universities, or universities jointly with an industrial partner. Selected projects were eligible for

(dollars in thousands)

FY 2007	FY 2008	FY 2009

funding of $300,000 to $1 million for a three year period. Three to five grants were awarded, depending on the number of meritorious proposals submitted. Additionally, at least one student from each participating university were required to receive grant support.

- **HBCUs, Education and Training** **957** **805** **813**

  The Historical Black Colleges and Universities (HBCU) and other minority institutions (OMI) education and training program plans to continue awarding 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 of high interest to fossil energy programs. 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; in FY 2007 six grants were made.

- **Liquefied Natural Gas (LNG) Report** **0** **7,927** **0**

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

- **Projects – Advanced Research** **1,000** **0** **0**
  - **Arctic Energy Office** **1,000** **0** **0**

    Issued competitive solicitation for fossil energy-related Arctic projects.

- **SBIR/STTR (non-add)** **0** **(491)** **(599)**

  In FY 2007, $585,000 and $70,000 were transferred to the SBIR and STTR programs respectively. The FY 2008 and FY 2009 amounts shown are estimated requirements for the continuation of the SBIR and STTR program.

Total, Fuels and Power Systems **303,176** **349,702** **382,732**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Innovations for Existing Plants	
▪ **CO_2 Carbon Capture and Storage (CCS)**	
The increase will raise the number of projects and widen the scope of research included in the Carbon Capture and Storage activity, which will develop technologies for post-combustion CO_2 capture. Activities include: 1) Initiation of slipstream CO_2 control efforts to investigate or improve the capabilities of technologies to recover,	+3,919

	FY 2009 vs. FY 2008 ($000)

reuse, and/or dispose of CO_2 emissions; 2) Conducting several slipstream tests for post-combustion CO_2 capture on different boiler configurations; and 3) Selecting promising concepts to examine the feasibility of innovative approaches to mitigate CO_2 emissions including post-combustion capture, oxy-fuel combustion, and efficiency improvements.

Advanced Integrated Gasification Combined Cycle

- **Gasification Systems Technology**

  The increase in funding supports the construction and commissioning of the 150-ton/day integrated gas turbine/Ion Transport Membrane (ITM) air separation unit to provide engineering design data for scale-up for carbon capture demonstrations, scale-up of the ITM membrane fabrication process to support membrane development for carbon capture demonstration, enhancement of coal/biomass gasification R&D, enhancement of the development of the dynamic simulator, and the design and construction of the 50 MWe sulfurization test unit. +14,455

- **Systems Analysis/Product Integration**

  The increase in funding allows for more engineering design studies on advanced process concepts. +1,036

Total, Advanced Integrated Gasification Combined Cycle +15,491

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 leakage, improve efficiency, and increase power output. +4,218

Carbon Sequestration

- **Greenhouse Gas Control**

  The increase funds many activities, including site selection and characterization, regulatory permits, community outreach, and completion of site operations plan. The increased funding will permit the large-scale injections to continue towards injection and remaining infrastructure development. Specific activities include the following: Permit large-scale sequestration projects in the Regional Carbon Sequestration Partnerships (RCSP) Deployment Phase (Phase III) to continue a pace to set more infrastructure to get to injection sooner. These projects will be in various stages of

	FY 2009 vs. FY 2008 ($000)
development and all will have significant activities. CO_2 injection occurs at three of the large-scale sequestration projects; activities include procurement of CO_2 and monitoring, mitigation, and verification (MMV) operations to determine the fate of the CO_2.	
The funding permits further work to be conducted on precombustion capture projects. Precombustion CO_2 capture, applicable to mainly new plants, has the potential for significant cost reduction related to CO_2 capture costs. The CO_2 is recovered from some process stream before the fuel is burned and has several advantages over post-combustion capture in that the stream can be at high pressure and with a higher CO_2 concentration. This results in an increased driving force for separation and a potential for reduction in compression costs. Projects will be selected and awarded from a competitive solicitation to further research and development in precombustion CO_2 capture.	
Initiate an effort to prepare for and augment the MMV being conducted in the Phase III tests. Other FY 2009 activities include: completion of all NEPA requirements for the initial large-scale field projects; completion of baseline characterization at the remaining large-scale field project sites; and application of all underground injection permits.	+32,998
• **Focus Area for Carbon Sequestration**	
Continue collaborative research with Regional Partnerships including a quantitative risk assessment of a regional partnership field site, and undertake reservoir simulations of various Phase III filed sites.	-2,774
Total, Carbon Sequestration	+30,224
Fuels	
▪ **Hydrogen from Coal**	
Continue Hydrogen from Coal research to develop novel technology for the production of ultra-pure hydrogen including the initiation of research scale-up technologies which will simultaneously produce and separate coal-derived hydrogen from membrane or chemical looping advanced concepts. Decrease reflects the elimination of integrated coal-biomass processing for carbon emissions research, elimination of substitute natural gas and hydrogen/liquid fuels (hydrogen carriers) production research.	-14,773

	FY 2009 vs. FY 2008 ($000)

Fuel Cells

- **Innovative Systems Concepts/SECA**

  The increased funding will enable four Solid State Energy Conversion Alliance (SECA) Teams to develop systems supporting delivery of $400/kW fuel cell systems capable of capturing greater than 90 percent carbon in an integrated coal plant. This increased effort will explore the different concepts available, including ambient and pressurized systems using a variety of carbon capture and heat recovery technologies in addition to fully exploring four important fuel cell technologies selected based on the SECA phase I results. +4,510

Advanced Research

- **Coal Utilization Science (Core)**

  Sensors and Controls Innovations: Funding for projects focused on advanced sensors will be re-scoped. -1,152

- **High-Performance Materials**

  Funding to projects focused on membrane development for hydrogen and air separation will be suspended. -1,803

- **Coal Technology Export**

  Initiate activity with the G8 Plus Five Countries to advance U.S. interest in environmental protection. Workscope includes training conferences, site visits, and information and technical exchange on clean power systems; best practices; privatization with targeted utilities and governments; and advising countries on identification and elimination of barriers for deployment of cleaner coal and power systems. The work will promote deployment of clean energy systems and will provide leadership direction and coordination of coal outreach activities with state governments and energy trade associations. +107

- **Technical and Economic Analyses**

  The funds increase studies that support multi-year strategic planning and studies to identify challenges, technologies, and advanced concepts that are applicable to fossil energy systems and that have the potential to improve their efficiency, cost, and/or environmental performance. +340

	FY 2009 vs. FY 2008 ($000)
▪ **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.	-111
▪ **University Coal Research**	
The decrease will still enable three to four additional grants to be awarded in FY09 than in FY08 due to less funds needed to pay off existing mortgages.	-21
▪ **HBCUs, Education and Training**	
In FY 2009, five grants may be awarded to support critical research. The increased funding enables the award of up to one more university grant over the four FY 2008 grants.	+8
▪ **Liquefied Natural Gas (LNG) Report**	
In FY 2009, no funds requested.	-7,927
Total, Advanced Research	-10,559
SBIR/STTR (non-add)	
The increase in SBIR/STTR is due to an increase in research funding.	(+8,413)
Total Funding Change, Fuels and Power Systems	**+33,030**

Natural Gas Technologies

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Natural Gas Technologies					
Natural Gas Technologies	11,709	20,000	-182	19,818	0
Total, Natural Gas Technologies	11,709	20,000	-182	19,818	0

Preface

The Natural Gas Technologies Program developed policies and environmentally friendly technologies that would have stimulated a diverse supply of natural gas, both in North America and around the world, so that the market can function to the benefit of all Americans. Budget discipline necessitated close scrutiny of all Fossil Energy programs, using strict guidelines to determine their effectiveness and compare them to other program offering more clearly demonstrated and substantial benefits. Consistent with the FY 2006, FY 2007, and FY 2008 Budgets, the Natural Gas Technologies program is being terminated in FY 2009.

Strategic and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. 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.

Funding by Strategic and GPRA Unit Program Goal

	dollars in thousands		
	FY 2007	FY 2008	FY 2009
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.09.00, Natural Gas Technologies, Abundant Affordable Gas			
Gas Hydrates	11,709	14,864	0
Effective Environmental Protection	0	4,954	0
Total, Strategic Goal 1.1 (Natural Gas Technologies)	11,709	19,818	0

Annual Performance Results and Targets

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Targets	FY 2009 Targets
GPRA Unit Program Goal 1.1.09.00 (Natural Gas Technologies, Abundant Affordable Gas)					
Conduct laboratory studies and feasibility analyses necessary to justify the next stage of R&D for a drilling vibration monitoring and control system, a novel mud hammer, high-temperature high-pressure cements, gas resources in the Uinta and Anadarko basins, and high- temperature electronics. This is accomplished by completing prototype development and validation testing of data fusion algorithms, a power amplifier, and simulating software for fractured reservoirs prior to field trials.(MET GOAL)	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)	*	No activities – program terminated.
Complete field tests and analysis of stripper well technologies, a jet assisted drilling system, advanced fracture stimulation designs, natural fracture predictions, and downhole power and communications systems to determine the overall technical and cost efficiency of the technology and the next step(s) to be taken, i.e., commercialization, additional modifications and testing, or termination. (MET GOAL)					
Efficiency Measure				Administrative costs as a percent of total program costs. Less than 17 percent.	

*Under development

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 methane hydrate activities have a Federal Advisory Committee, which oversees the efforts.

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

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

Planned Program Evaluation: The Office of Oil and Natural Gas annually performed an internal review of the R&D portfolio as an integral part of annual budget preparation. Projects were evaluated periodically at contractor review conferences and as part of road-mapping workshops to determine R&D gaps. National Energy Technology Laboratory (NETL) individually monitored projects with status and major milestone reporting documented in a NETL project database.

Program Assessment Rating Tool (PART)

The Program Assessment Rating Tool (PART) was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. A PART assessment of the Natural Gas R&D program was conducted for the FY 2004 Budget and a reassessment was conducted for the FY 2005 Budget. The program was rated "Ineffective" in the PART analysis based primarily on not demonstrating clear results of the research effort.

Natural Gas Technologies

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Natural Gas Technologies			
Gas Hydrates	11,709	14,864	0
Effective Environmental Protection	0	4,954	0
SBIR/STTR (non-add)	0	(507)	0
Total, Natural Gas Technologies	11,709	19,818	0

Detailed Justification

Description

The program focused on technology to find and produce gas from non-conventional reservoirs and reduce the environmental impact of resource development.

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

The Effective Environmental Production activity sought to reduce the environmental impacts of produced water related to gas operations and reduce the cost of environmental compliance through a combination of technology development, risk assessment, and regulatory streamlining.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Gas Hydrates	**11,709**	**14,864**	**0**

No Activity in FY 2009.

In FY 2008, conduct basic research to understand how gas hydrates form and respond to imaging and production technologies. Work continues on field projects in Alaska North Slope and the Gulf of Mexico to develop technologies to locate, quantify, and produce methane from hydrates. A drilling program is planned in the Gulf of Mexico in 2008. Program will initiate competitively selected projects on Alaska North Slope hydrates and the role of gas hydrates in Global Climate Change. Graduate fellowships will continue to be competitively awarded. *Participants include: Chevron JIP,*

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009

BPXA, USGS, NRL, NSF, NIST, WVU, NETL, and TBD.

In FY 2007, the program drilled, sampled, and flow tested a dedicated gas hydrate research well on the Alaska North Slope with research partners BP Exploration (Alaska) and the U.S. Geological Survey (USGS). The DOE's Gulf of Mexico program, conducted with the Chevron-led Joint Industry Project and with the Minerals Management Service and the USGS, completed a survey of Gulf of Mexico data. A series of sites were selected to test the occurrence of gas hydrate in reservoir-quality sands for future drilling. The program furthered its collaboration with India, developed new collaborations with China and Korea, and established a dedicated graduate fellowship program with the National Academies. *Participants included: Texas A&M, Battelle, Chevron JIP, Stanford U. BPXA, U. of Texas-Austin, Woods Hole O.I., Rice University, Baylor Univ. GTI, RSI, USGS, NRL, NIST, WVU, NETL, and National Laboratories.*

Effective Environmental Protection	**0**	**4,955**	**0**

No activity in FY 2009.

In FY 2008, conduct a program to reduce the impact of produced water associated with natural gas operations and develop technologies to treat produced water for beneficial use. *Participants include: National Laboratories.*

No activity in FY 2007.

SBIR/STTR (non-add)	**0**	**(507)**	**0**

In FY 2008, $507,327 will be transferred to the SBIR and STTR programs. In FY 2007, $260,000 and $31,000 were transferred to the SBIR and STTR programs respectively.

Total, Natural Gas Technology	**11,709**	**19,818**	**0**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Natural Gas Technology	
• Budget discipline necessitated close scrutiny of all Fossil Energy programs, using strict guidelines to determine their effectiveness and compare them to other programs offering more clearly demonstrated and substantial benefits. As a result, the 2009 Budget will terminate the program in FY 2009.	-19,818
Total Funding Change, Natural Gas Technology	**-19,818**

Petroleum - Oil Technology

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Petroleum - Oil Technology					
Oil Technology	2,625	5,000	-46	4,954	0
Total, Petroleum - Oil Technology	2,625	5,000	-46	4,954	0

Preface

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. Budget discipline necessitated close scrutiny of all Fossil Energy programs, using strict guidelines to determine their effectiveness and compare them to other programs offering more clearly demonstrated and substantial benefits. Consistent with the FY 2006, FY 2007, and FY 2008 Budgets, the Oil Technology program is being terminated in FY 2009.

Strategic and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Oil Technology program 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.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.10.00, Oil Technology, Abundant Oil			
Exploration and Production	2,625	4,954	0
Total, Strategic Goal 1.1 (Petroleum - Oil Technology)	2,625	4,954	0

Annual Performance Results and Targets

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Targets	FY 2009 Targets
GPRA Unit Program Goal 1.1.10.00 (Oil Technology, Abundant Oil)					
Enhance access to remaining domestic oil resources using advanced technology by focusing on high-risk research (award 3 projects—Micro-hole technology); issuing competitive solicitation and awarding three projects. Initiate Russian cooperative Research Program; and conduct model integration peer review and industry strategic program review. (MET GOAL)	Develop technologies through 4 projects which will contribute to increasing domestic oil supplies in an environmentally friendly manner. MET GOAL.	Develop technologies through up to 4 programs which will contribute to increasing domestic oil supplies in an environmentally friendly manner. MET GOAL		*	
Advance the state-of-the-art in oil recovery processes by conducting bench tests in surfactant behavior (2 projects); modeling on-conventional reservoirs, studying gel control of water production, developing seismic algorithms to better identify hydrocarbon targets; testing 2 prototypes (3-phase separator and micro-hole completion), modeling sweep efficiency for enhanced oil recovery technologies to increase the amount of oil that can be recovered from discovered reservoirs, and completing tundra modeling and pond work, conducting wetability studies as well as initiating fracture development study. (MET GOAL)					
Efficiency Measure				Administrative costs as a percent of total program costs. Less than 17 percent.	

* Under Development

Validation and Verification

The Oil Program has impacted the domestic oil supply by performing R&D activities in partnership with universities, State and local governments, industry, and other stakeholders; using cost-share projects and diverse technology paths to improve chances of success, and to create a direct technology transfer component and seeking synergy of the capabilities of multiple governmental agencies, including the unique capabilities of National Laboratories and industry collaborating with other agencies to effectively promulgate and transfer domestic production technologies to the public.

To validate and verify program performance, FE 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.

External Factors Affecting Performance: These factors include world oil prices, corporate mergers and acquisitions, availability and cost of capital, and new and evolving environmental legislation and regulation.

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.

Program Assessment Rating Tool (PART)

The Program Assessment Rating Tool (PART) was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. A PART assessment of the Oil R&D program was conducted for the FY 2004 Budget and a reassessment was conducted for the FY 2005 Budget. The program was rated "Ineffective" in the PART analysis based on not demonstrating clear results of the research effort.

Oil Technology

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Petroleum - Oil Technology			
Exploration and Production	2,625	4,954	0
SBIR/STTR (non-add)	—	(137)	—
Total, Petroleum - Oil Technology	2,625	4,954	0

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
	2,625	**4,954**	**0**

Exploration and Production

Budget discipline necessitated close scrutiny of all Fossil Energy programs, using strict guidelines to determine their effectiveness and compare them to other programs offering more clearly demonstrated and substantial benefits. As a result, the 2009 Budget will terminate the program in FY 2008.

In FY 2008, support the Risk-based Data Management. Program will also conduct work to improve recovery from unconventional oil sources and marginal oil fields, including Enhanced Oil Recovery. *Participants include: Groundwater Protection Council.* In FY 2007, implemented limited activities to conclude the program with a focus on independent and small producers. *Participants include: PTTC, Penn State University, and University of Illinois*.

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

In FY 2008, $137, 325 will be transferred to the SBIR and STTR programs. In FY 2007, $67,000 and $8,000 were transferred to the SBIR and STTR programs respectively.

Total, Petroleum - Oil Technology	**4,954**		**0**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Petroleum - Oil Technology	
No funds requested.	-4,954
Total Funding Change, Petroleum - Oil Technology	**-4,954**

Program Direction

Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2007	FY 2008	FY 2009
Indirect Program Direction			
Headquarters Indirect			
Salaries and Benefits	16,519	16,998	17,885
Travel	822	806	750
Support Services	500	495	104
Other Related Expenses	10,670	9,533	10,156
Total, Headquarters Indirect	28,511	27,832	28,895
Full Time Equivalents	122	122	122
NETL Indirect			
Salaries and Benefits	43,908	41,178	41,941
Travel	1,617	1,488	1,512
Support Services	13,861	24,493	14,513
Other Related Expenses	12,843	23,198	13,746
Total, NETL Indirect	72,229	90,357	71,712
Full Time Equivalents	362	358	358
Total Indirect Program Direction			
Salaries and Benefits	60,427	58,176	59,826
Travel	2,439	2,294	2,262
Support Services	14,361	24,988	14,617
Other Related Expenses	23,513	32,731	23,902
Total, Indirect Program Direction	100,740	118,189	100,607
Full Time Equivalents	484	480	480
NETL Coal Research and Development Direct Program Direction			
Salaries and Benefits	16,494	21,388	19,854
Travel	469	550	515
Support Services	0	4,312	3,411
Total, NETL Coal Research and Development Direct Program Direction	16,963	26,250	23,780
Full Time Equivalents	145	184	184
Loan Guarantee for Alaska Natural Gas Transportation Project[a]			
Salaries and Benefits	800	721	0
Travel	100	99	0

[a] No funding is requested for this program because existing balances are sufficient to conduct FY 2009 activities.

(dollars in thousands/whole FTEs)

	FY 2007	FY 2008	FY 2009
Other Related Expenses	1,400	1,490	0
Total, Loan Guarantee for Alaska Natural Gas Transportation Project	2,300	2,310	0
Full Time Equivalents	5	5	5
Import/Export Authorization			
Salaries and Benefits	1,280	1,310	1,322
Travel	20	20	20
Other Related Expenses	500	518	523
Total, Import/Export Authorization	1,800	1,848	1,865
Full Time Equivalents	14	14	14
Advanced Metallurgical Research			
Salaries and Benefits	7,010	0	0
Travel	90	0	0
Other Related Expenses	900	0	0
Total, Advanced Metallurgical Research	8,000	0	0
Full Time Equivalents	77	0[a]	0
Total Program Direction			
Salaries and Benefits	86,011	81,595	81,002
Travel	3,118	2,963	2,797
Support Services	14,361	29,300	18,028
Other Related Expenses	26,313	34,739	24,425
Total, Program Direction	129,803	148,597	126,252
Total, Full Time Equivalents	725[b]	683	683

Mission

The Program Direction and Management Support function provides the Federal staff with resources that assist the Office of Fossil Energy 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.

As stated in the Departmental Strategic Plan, DOE's Strategic and General Goals will be accomplished not only through the efforts of the major program offices in the Department but with additional efforts from offices which support the programs in carrying out the mission. Fossil Energy performs functions that directly support the mission of the Department. These functions focus on technological investigations and research concerning the use of fossil energy substances.

[a] Beginning in FY 2008, the Advanced Metallurgical Research was funded from out of the NETL Indirect and NETL Coal Research and Development Direct Program Direction accounts.

[b] The 725 FTEs includes 227 FTEs that were direct funded in the programmatic accounts in FY 2006 versus program direction. These FTEs and related expenses were all consolidated in program direction in FY 2007.

Overview

Beginning in FY 2007, the FY 2006 Energy and Water Development Appropriations Act (P.L. 109-103) directed that all the funds supporting Federal employees be consolidated in the program direction account. This consolidation will portray the total costs of activities conducted by Federal employees within Fossil Energy. Prior to FY 2007, funding for direct research activities conducted by Federal employees (now funded as NETL Coal Research and Development Direct Program Direction) was provided under each program; and the Advanced Metallurgical Research account and Import/Export Authorization account were separate non-program direction accounts.

- Headquarters/NETL Indirect - To carry out the Program Direction and Management Support function, the Headquarters staff is responsible for providing overall guidance/direction of the program offices. This guidance/direction includes implementing DOE policy, communicating guidance consistent with the policies to the FE field offices, establishing program objectives, developing program plans, evaluating alternative program strategies, reviewing procurement plans, monitoring work progress, and approving revisions in work plans. In addition to the Headquarters staff, the NETL performs the day-to-day project management functions of the FE programs. These functions include monitoring Fossil Energy contracts and FE activities at the National Laboratories. NETL is also responsible for developing project budgets, implementing procurement plans, and other programs and site support activities necessary to achieve their program objectives.

- NETL Coal Research and Development Direct Program Direction - The funding of $23.8 million supports Federal staff who are directly associated with conducting research activities of the Coal Research and Development program. This staff includes technicians, engineers and scientists who support the NETL Office of Research and Development (in-house research and development) and the NETL Albany site. Activities of the staff include in-house research in support of the following program areas: Integrated Gasification Combined Cycle; Advanced Turbines; Carbon Sequestration; Fuels; Fuel Cells; and Advanced Research. In addition, beginning in FY 2008, in-house advanced metallurgical research is also performed in support of the aforementioned program areas.

- 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.

- Office of Import/Export Authorization (OIEA) – OIEA manages the regulatory review of natural gas imports and exports. In addition, the program exercises regulatory oversight of the conversion of existing oil- and gas-fired 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 pursuant to the provisions of the amended FUA.

- Advanced Metallurgical Research –FY 2007 funding supported Federal staff directly associated with conducting the research activities of the Advanced Metallurgical Research program. This staff included technicians, engineers and scientists who support the NETL Office of Research and Development (in-house research and development) located at the NETL Albany site. Activities included in-house research in support of the following program areas: Integrated

Gasification Combined Cycle, Turbines, Carbon Sequestration, Fuels, Fuel Cells, and Advanced Research. The Advanced Metallurgical Research expertise will continue research contributions to increase component service life through the development of affordable materials and processes, carbon dioxide containment through enhancement of natural geologic formation seals, and support to the Solid State Energy Conversion Alliance (SECA) through material development, fabrication, and performance evaluation for solid oxide fuel cell applications. To improve management efficiencies, beginning in FY 2008, this activity was incorporated into the NETL Indirect and Coal Research and Development Direct Program Direction accounts.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Indirect Program Direction	**100,740**	**118,189**	**100,607**
Headquarters Indirect	**28,511**	**27,832**	**28,895**
Salaries and Benefits	**16,519**	**16,998**	**17,885**

The funding supports 122 FTEs in FY 2009, FY 2008, and FY 2007 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 and Gas programs in FY 2008.

Travel	**822**	**806**	**750**

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**	**500**	**495**	**104**

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

Other Related Expenses	**10,670**	**9,533**	**10,156**
▪ **Technical and Management Support Services**	**4,920**	**4,142**	**4,200**

Provide for contractual services that are generic to the entire FE program. Activities include support of the Asia-Pacific Partnership on Clean Development and Climate (APP) ($750 thousand – non-add).

▪ **Computer Systems and Support**	**1,550**	**1,031**	**1,031**

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** **4,200** **4,360** **4,925**

  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 **72,229** **90,357** **71,712**

Salaries and Benefits **43,908** **41,178** **41,941**

The funding supports 358 FTEs per year in FY 2009 and FY 2008, and 362 FTEs in FY2007 at NETL. Activities of the staff include project management, product development, contract management, and other services activities related to program, administration, and site support. The net reduction in staff is the result of a lower level of effort required to conduct the termination of the Oil and Gas programs. This reduction is partially offset by the incorporation of the indirect staff that was previously included in the Advanced Metallurgical Research activity for FY 2007. It is anticipated that 80 FTEs in each fiscal year will be paid via reimbursable agreements. Therefore, salaries and benefits and the associated FTEs for this reimbursable staff are not included in the budget estimate.

Travel **1,617** **1,488** **1,512**

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 **13,861** **24,493** **14,513**

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 **12,843** **23,198** **13,746**

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.

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
NETL Coal Research and Development Direct Program Direction	**16,963**	**26,250**	**23,780**
Salaries and Benefits	**16,494**	**21,388**	**19,854**

Provide funds for 184 FTEs in FY 2009 and FY 2008, and 145 FTEs in FY 2007 such as technicians, engineers and scientists who support the NETL Office of Research and Development (in-house research and development). The increases in FY 2008 and FY 2009 are due to the incorporation of the Direct FTEs that were previously funded in the Advanced Metallurgical Research activity. Activities include in-house research in support of the following program areas: Integrated Gasification Combined Cycle, Turbines, Carbon Sequestration, Fuels, Fuel Cells, and Advanced Research.

Travel	**469**	**550**	**515**

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

Support Services	**0**	**4,312**	**3,411**

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

Alaska Natural Gas Transportation Project	**2,300**	**2,310**	**0**
Salaries and Benefits	**800**	**721**	**0**

Provide funds for 5 FTEs for the Loan Guarantee Program Office that administers Loan Guarantee activities for the Alaska Natural Gas Transportation Project. In FY 2009, Federal staff will be funded using prior year balances.

Travel	**100**	**99**	**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	**1,400**	**1,490**	**0**

The FY 2009 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	**1,800**	**1,848**	**1,865**
Salaries and Benefits	**1,280**	**1,310**	**1,322**

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

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
Travel	**20**	**20**	**20**
Provide funds for both domestic and international travel in support of the activities that support the mission of FE.			
Other Related Expenses	**500**	**518**	**523**
Provide funds for contractual services in support of the OIEA.			
Advanced Metallurgical Research	**8,000**	**0**	**0**
Salaries and Benefits	**7,010**	**0**	**0**
Provided funds for 77 FTEs in FY 2007 for research conducted at the NETL Albany site associated with corrosion performance in existing and advanced power generation systems, carbon capture and sequestration research, and to support the development of solid oxide fuel cell materials through development, fabrication, and performance evaluation. Research projects are conducted in support of the following program areas: Innovations for Existing Plants, Integrated Gasification Combined Cycle, Turbines, Carbon Sequestration, Fuels, Fuel Cells, and Advanced Research. In FY 2008 and FY 2009, funding for this activity will be incorporated into the NETL Indirect and NETL Direct Coal Research and Development budget lines.			
Travel	**90**	**0**	**0**
Provided funds for both domestic and international travel in support of the activities that support the mission of FE.			
Other Related Expenses	**900**	**0**	**0**
Provided other services which include utilities, communications, maintenance, and other site operation services at the Albany, Oregon site.			
Total, Program Direction	**129,803**	**148,597**	**126,252**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Indirect Program Direction	
Headquarters Indirect	
Salaries and Benefits	
The increase reflects projected Cost of Living Adjustments and increases in costs associated with benefits, promotions, and within-grade increases for 122 FTEs.	+ 887
Travel	
The decrease is due to reduced travel expenses resulting from increasing the use of teleconferencing capabilities and also eliminating lower-priority travel requirements.	-56

	FY 2009 vs. FY 2008 ($000)
Support Services	
The cost of ongoing E-Government Initiatives has decreased because the initial start-up has been completed and the system is operating at maximum efficiency.	-391
Other Related Expanses	
The increase is due to inflation and also additional costs for I-MANAGE activities.	+623
Total, Headquarters Indirect	**+1,063**
NETL Indirect	
Salaries and Benefits	
The increase is mainly due to estimated cost of living adjustments for 358 FTEs.	+763
Travel	
The increase is due to escalation.	+24
Support Services	
The change reflects a significant decrease in support for facility, operations, maintenance, finance, information automation, administrative, and 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.	-9,980
Other Related Expenses	
The change reflects a significant decrease in other services, supplies and materials, communications, utilities, and maintenance/service agreements.	-9,452
Total, NETL Indirect Program Direction	**-18,645**
Total, Indirect Program Direction	**-17,582**
NETL Coal Research and Development Direct Program Direction	
Salaries and Benefits	
The labor mix within the R&D organization has been restructured, resulting in decreases due to the departure of higher pay grade employees being replaced with employees at a lower pay grade.	-1,534
Travel	
The decrease is due to reduced travel requirements resulting from increase use of video conferencing for meetings and on-site training.	-35
Support Services	
The decrease is due to increased efficiencies within the support contracts, such as back filling vacancies with lower-salaried employees and limiting overtime.	-901
Total, NETL Coal Research and Development Direct Program Direction	**-2,470**

	FY 2009 vs. FY 2008 ($000)
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.	-2,310
Import/Export Authorization	
The increase due to inflation.	+17
Total Funding Changes, Program Direction	**-22,345**

Support Services by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Technical Support			
Surveys Or Reviews of Technical Operations	500	500	104
Economic and Environmental Analysis	865	925	945
Test and Evaluation Studies	0	3,500	2,759
Total, Technical Support	1,365	4,925	3,808
Management Support			
Management Studies	600	650	664
ADP Support	2,232	6,410	2,357
Administration Support Services	10,164	17,315	11,199
Total, Management Support	12,996	24,375	14,220
Total, Support Services	14,361	29,300	18,028

Other Related Expenses by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Other Related Expenses			
Other Services	16,961	25,499	14,590
Operations and Maintenance of Equipment	1,600	1,090	1,081
Working Capital Fund	4,200	4,400	4,925
Training	494	550	562
Rental Space	590	625	638
Software Procurement/Maintenance Activities/Capital Acquisitions	2,468	2,575	2,629
Total, Other Related Expenses	26,313	34,739	24,425

Congressionally Directed Projects

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Congressionally Directed Projects					
Congressionally Directed Projects	0	48,900	-782	48,118	0
Total, Congressionally Directed Projects	0	48,900	-782	48,118	0

Description

The FY 2008 Omnibus Act included 26 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)

	FY 2007	FY 2008	FY 2009
Congressionally Directed Projects			
▪ Carbon Sequestration Study (OH)	0	984	0
▪ Center for Instrumented Critical Infrastructures (PA)	0	984	0
▪ Center for Zero Emissions Technology, Montana State University, Clean Coal Technologies (MT)	0	5,904	0
▪ Coal Fuels Alliance (KY)	0	1,427	0
▪ Direct Carbon Fuel Cell Prototype (CA)	0	738	0
▪ Eastern Illinois University Power Plant (IL)	0	492	0
▪ Fuel Research and Development at Northern Illinois University (IL)	0	984	0
▪ ITM Reaction-Driven Ceramic Membrane Systems (PA)	0	984	0
▪ NE Ohio Carbon Sequestration Pipeline Scoping Study (OH)	0	984	0

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
▪ Ohio River Clean Fuels CO2 Production & Emissions Study (OH)	0	246	0
▪ Stripper Well Consortium (PA)	0	1,476	0
▪ The Gulf Petro Initiative (LA)	0	738	0
▪ Colorado School of Mines, Golden, CO., Colorado Center for Sustainable Energy at the Colorado School of Mines (CO)	0	984	0
▪ North Dakota Energy and Environmental Center, Grand Forks, ND, Fossil Fuel Cooperative Research & Development (ND)	0	3,936	0
▪ Ramgen, Bellevue, WA, CO2 Compression Initiative Utilizing Shockwave/Ramjet Compression Technology (WA)	0	1,181	0
▪ North Dakota Energy and Environmental Center, Grand Forks, ND, National Center for Hydrogen Technology (ND)	0	2,952	0
▪ West Virginia University, Advanced Coal Technology (Liquefaction) in China (WV)	0	344	0
▪ Interdisciplinary Clean Energy Program at the University of Utah (UT)	0	3,444	0
▪ Shallow Carbon Sequestration Pilot Demonstration (MO)	0	2,460	0
▪ Gulf of Mexico Hydrates Research Consortium at the University of Mississippi (MS)	0	984	0
▪ Membrane Technology for Produced Water at Lea County, New Mexico (NM)	0	1,476	0
▪ University of Wyoming Carbon Sequestration Monitoring Activities (WY)	0	1,624	0
▪ Penn State University, Solid Oxide Fuel Cells (PA)	0	3,936	0
▪ Arctic Energy Office (AK)	0	6,888	0
▪ Center for Advanced Separation Technologies (VA)	0	984	0
▪ Arrowhead Center at New Mexico Univ. to Promote Prosperity and Public Welfare in NM Through Economic Development (NM)	0	984	0
Total, Congressionally Directed Projects	**0**	**48,118**	**0**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Congressionally Directed Projects	
No funding requested	-48,118
Total, Congressionally Directed Projects	**-48,118**

Plant and Capital Equipment

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Plant and Capital Equipment					
Capital Line Item	8,000	8,000	-73	7,927	0
General Plant Projects	4,000	5,000	-45	4,955	5,000
Total, Plant and Capital Equipment	12,000	13,000	-118	12,882	5,000

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.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Capital Line Item	**8,000**	**7,927**	**0**

No funding is requested for Capital Line Item construction projects in FY 2009 budget.

In FY 2008, Congress appropriated $7.927 million for construction projects at NETL. The funds will be used for completion of the building projects at the National Energy Technology Laboratory sites.

In FY 2007, Congress appropriated $8 million for the Technology Support Facility (TSF) which is under construction in the NETL Morgantown, West Virginia site.

General Plant Projects	**4,000**	**4,955**	**5,000**

FY 2009 Request will be used to address environmental, safety, and health risks and liabilities caused by more stringent energy and building standards and aging facilities. The projects are located at three NETL field sites (Albany, Morgantown, and Pittsburgh).

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.

In FY 2007, Congress appropriated $4 million for GPP. The funds were used to renovate facilities located in Pittsburgh, Morgantown, and Albany. Work included replacing major infrastructure

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
components, and improving site access to maximize reduction of environmental, safety, and health risks to employees.			
Total, Plant and Capital Equipment	**12,000**	**12,882**	**5,000**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Capital Line Item	
No funds requested in FY 2009	-7,927
Total Funding Change, Cooperative R&D	**-7,927**

Fossil Energy Environmental Restoration

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Fossil Energy Environmental Restoration					
CERCLA[a] Remedial Actions	1,155	1,135	-10	1,125	1,155
RCRA[b] Remedial Actions	3,120	3,000	-28	2,972	3,105
Other ES&H Actions	5,440	5,435	-49	5,386	5,440
Total, Fossil Energy Environmental Restoration	9,715	9,570	-87	9,483	9,700

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; Tulsa, Oklahoma; Fairbanks, Alaska; and Albany, Oregon sites.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
CERCLA Remedial Actions	**1,155**	**1,125**	**1,155**
▪ **Rock Springs Sites**	**575**	**525**	**600**

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

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

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).*

In FY 2007, conducted full-scale operation and maintained the *in-situ* aerobic bioremediation systems at Rock Springs Sites 4, 6, 7, 9, and 12 to remove BTEX compounds from Tipton aquifer ground water, as required by the WDEQ. Conducted periodic ground water sampling events to determine progress in removing contaminants. Plugged and abandoned approximately nine groundwater wells that are no longer required in the monitoring system. Finalized plans to initiate a one–year stability study at Site 9 to assess contaminant rebound potential. *Participants include: Army Corps of Engineers.*

- **Hoe Creek Site** **275** **248** **250**

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 (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.*

In FY 2007, plugged and abandoned 90 monitoring wells and reclaimed the Hoe Creek II site surface. Continued the shut-down mode at the Hoe Creek III site, which included conducting limited sparging operations at six well locations. Performed periodic ground water surveillance activities to ensure stabilization of background BTEX concentrations. *Participants include: U.S. Army Corps of Engineers.*

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
▪ **Hanna Site Revegetation**	**40**	**40**	**30**

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.

In FY 2007, evaluated revegetation success at the DOE Hanna Site and initiated closeout activities that included submitting bond release documentation to WDEQ, providing information to the general public and obtaining land owner final approval of reclamation results. Received final release of liability and reclamation performance bond release for the Rocky Mountain Underground Coal Gasification Site at Hanna, Wyoming from the WDEQ. License # R&D 15 is now terminated.

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

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 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.

In FY 2007, continued to investigate/support Foster Wheeler's former R&D site in Livingston, NJ, 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**	**0**	**10**	**10**

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).

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009

No activity in FY 2007.

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

In FY 2007-2009, 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	**3,120**	**2,972**	**3,105**
▪ **NETL On-Site Remediation**	**1,605**	**1,585**	**1,605**

The funding supports the current schedule to cleanup the beryllium-contaminated area at the Albany site. In FY 2007-2009, 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 RCRA**	**1,515**	**1,387**	**1,500**

In FY 2007-2009, 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 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	**5,440**	**5,386**	**5,440**
▪ **Other ES&H Actions at NETL**	**3,750**	**3,736**	**3,750**

In FY 2007-2009, 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.

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
▪ **ES&H Corrective Action at NETL Tulsa Site**	**15**	**15**	**15**
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**	**1,600**	**1,561**	**1,600**
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**	**75**	**74**	**75**
Fund technical and program management support.			
Total, Fossil Energy Environmental Restoration	**9,715**	**9,483**	**9,700**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
CERCLA Remedial Actions	
The increase will plug and abandon an additional 22 monitoring wells in Wyoming (total number of monitoring wells is 32). Investigation of former NETL support sites will be decreased because initial investigations were completed in FY 2008.	+30
RCRA Remedial Actions	
The increase is due to escalation.	+133
Other ES&H Actions	
The increase is due to an increase in general ES&H activities at the Albany site.	+54
Total Funding Change, Fossil Energy Environmental Restoration	**+217**

Special Recruitment Programs

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Special Recruitment Programs					
Special Recruitment Programs	656	656	-6	650	656
Total, Special Recruitment Programs	656	656	-6	650	656

Mission

The Office of Fossil Energy 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 "Pipeline Universities" program and the Mickey Leland Energy Fellowship program.

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

The Mickey Leland Energy Fellowship program is a ten-week summer internship program that offers minority students majoring in math, science, and engineering an opportunity to learn about fossil energy programs and initiatives. In addition, Fossil Energy works closely with historically black colleges and universities, Hispanic serving institutions, and Tribal colleges and universities to encourage minority students (who are studying in academic disciplines related to the Fossil Energy mission,) to pursue careers with the Federal government.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Special Recruitment Programs	**656**	**650**	**656**

In FY 2009, FY 2008 and FY 2007, applicants will be recruited and selected to participate in the technical career intern program and the Mickey Leland Energy Fellowship program.

Total, Special Recruitment Programs	**656**	**650**	**656**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Special Recruitment Programs	
No significant change in level of effort from FY 2008 to FY 2009	+6
Total Funding Change, Special Recruitment Programs	**0**

Cooperative Research and Development

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Cooperative Research and Development					
Cooperative Research and Development	0	5,000	-46	4,954	0
Total, Cooperative Research and Development	0	5,000	-46	4,954	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). In FY 2007, funding for this work was provided through the Advanced Research subprogram.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Cooperative Research and Development	**0**	**4,954**	**0**

In FY 2008, 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. The increase reflects a shift of funding from the Advanced Research line item to the Cooperative R&D Program. The funds were moved out of the Cooperative R&D and placed in the Advanced Research line for FY 2007. Prior to FY 2007 the funds were listed in the Cooperative R&D line as well.

In FY 2009, the Department anticipated that these centers would compete successfully for Fossil Energy funding through the competitive solicitation process.

SBIR/STTR (non-add)	**—**	**(+138)**	**—**

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

Total, Cooperative Research and Development	**0**	**4,954**	**0**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Cooperative R&D	
In FY 2009, the Department anticipated that these centers would compete successfully for Fossil Energy funding through the competitive solicitation process.	-4,954
Total Funding Change, Cooperative R&D	**-4,954**

Naval Petroleum & Oil Shale Reserves

Naval Petroleum & Oil Shale Reserves

Naval Petroleum and Oil Shale Reserves

Proposed Appropriation Language

For expenses necessary to carry out naval petroleum and oil shale reserves' activities, including the hire of passenger motor vehicles, [$20,472,000] *$19,099,000* 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, 2008.)*

Naval Petroleum and Oil Shale Reserves
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments[a]	FY 2008 Appropriation	FY 2009 Request
Naval Petroleum and Oil Shale Reserves					
Naval Petroleum and Oil Shale Reserves	21,316	20,472	-200	20,272	19,099
Total, Naval Petroleum and Oil Shale Reserves	21,316	20,472	-200	20,272	19,099

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 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 of which are in 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.

Mission

The NPOSR mission has evolved to completing environmental remediation activities and equity finalization at NPR-1, while simultaneously operating NPR-3 and providing RMOTC as a field demonstration facility.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Naval Petroleum and Oil Shale appropriation 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 disruptions and increasing the flexibility of the market to meet U.S. needs.

[a] Includes a rescission of $200,000 in accordance with P.L. 110-161, Consolidated Appropriations Act, 2008.

The programs funded within the Naval Petroleum and Oil Shale Reserves appropriation have one GPRA Unit Program Goal that contributes to the Strategic Goals in the "goal cascade". This goal is:

GPRA Unit Program Goal 1.1.11.00. Petroleum Reserves: Expand the SPR to drawdown at a sustained rate of 5.9 million barrels for 90 days within 11-15 days notice by the President consistent with the expansion cost, schedule, and performance baseline. Maintain a 2-million barrel reserve of home heating oil in the U.S. Northeast. Continue closeout and equity finalization activities related to NPR-1, including completion of any obligation of the United States relating to its Settlement Agreement with the State of California with respect to its claims to "school lands."

Contribution to Strategic Goal

The programs within the NPOSR appropriation contribute to Strategic Goal 1.1 by ensuring completion of environmental remediation, cultural resource activities, equity finalization, and the school lands Settlement Agreement payments.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves	21,316	20,272	19,099
Total, Strategic Goal 1.1 (Naval Petroleum and Oil Shale Reserves)	21,316	20,272	19,099

Means and Strategies

NPOSR will use various means and strategies to continue its mission and achieve program goals. The program continues work to close the remaining environmental findings, as required by the agreement between DOE and the California Department of Toxic Substance Control (DTSC). NPR-3 will be operated in a cost-effective manner and will provide small businesses, inventors, energy companies, academia, and other Government researchers a place to perform hands-on applied research (testing and demonstration).

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.

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 2007	FY 2008	FY 2009
Naval Petroleum and Oil Shale Reserves			
NPR – 3	400	446	400
Total, Direct-Funded Maintenance and Repair	400	446	400

Naval Petroleum and Oil Shale Reserves
Office of Fossil Energy

Funding by Site by Program

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
NPR Wyoming	11,902	11,446	11,612
NPR California	5,406	0	0
Washington Headquarters	4,008	8,826	7,487
Total, Naval Petroleum and Oil Shale Reserves	21,316	20,272	19,099

Site Description

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

Naval Petroleum Reserve – California
The NPR-California field office is responsible for completing closeout activities, environmental remediation, and cultural resource assessment from the sale of the Elk Hills site. In FY 2005, management of the program moved from Bakersfield, California to Washington, DC.

Washington Headquarters
The headquarters office located in Washington, DC supports NPR-1 closeout as well as Elk Hills equity finalization activities. There are geologic, petrophysical, and reservoir engineering services required to prepare and support the Government's equity position before an Independent Petroleum Engineer and the Assistant Secretary for Fossil Energy.

Naval Petroleum and Oil Shale Reserves

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments [a]	FY 2008 Current Appropriation	FY 2009 Request
Naval Petroleum and Oil Shale Reserves					
Production and Operation	13,079	11,316	-103	11,213	8,185
Management	8,237	9,156	-97	9,059	10,914
Total, Naval Petroleum and Oil Shale Reserves	21,316	20,472	-200	20,272	19,099

Public Law Authorization:
P.L. 94-258, "Naval Petroleum Reserves Production Act" (1976)

Mission

The NPOSR mission has evolved to complete environmental remediation activities and complete equity finalization at NPR-1 and operate NPR-3, while providing RMOTC as a field demonstration facility.

Background

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 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

[a] Includes a rescission of $200,000 in accordance with P.L. 110-161, Consolidated Appropriations Act, 2008.

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.

DOE retains the Naval Petroleum Reserve No. 3 (NPR-3) in Wyoming (Teapot Dome field). The NPR-3 Program's primary focus has been to apply conventional oil field management and operations to produce the stripper field to its economic limit. The President must authorize continued production every three years, with production currently authorized through April 2009. Although it is expected that profitable operations at NPR-3 will continue, the field will remain partially shut down in FY 2009. Limited well work and facility maintenance will be performed. Co-located with NPR-3, the Rocky Mountain Oilfield Testing Center (RMOTC) provides opportunities for field-testing and demonstration of upstream oil and gas technologies, environmental products, and energy efficient, geothermal, and other renewable technologies as they relate to oil and gas operations.

Production and Operations

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Production and Operations			
NPR-1 Closeout	4,438	3,433	1,000
NPR-3 Operations	4,513	3,717	2,885
NPR-3 Environmental Remediation	0	99	1,000
Rocky Mountain Oilfield Testing Center	4,128	3.964	3,300
Total, Production and Operations	13,079	11,213	8,185

Description

The mission of the Production and Operations subprogram includes:

- Environmental remediation and cultural resource activities required as a result of the Elk Hills sale agreement. The commitments were formalized in several legal agreements between DOE, Occidental, Chevron, and the State of California. Activities include completing environmental cleanup and assessing sites.

- NPR-3 - Ongoing conventional oil field management and operations at NPR-3. The program's primary focus has been to operate NPR-3 to its economic limit. In October 2005, the President authorized continued production through April 5, 2009. Favorable oil prices and application of new oil field strategies and technologies, some of which were proven through the testing and demonstration programs at RMOTC, have temporarily arrested the steep decline in production at this marginally economic field. Although NPR-3 will partially shut down, it is expected that it will operate at a profit in FY 2009. NPR-3 also provides the facilities for RMOTC field testing and demonstration of oil and gas technologies, environmental products, and energy efficient, geothermal and other renewable technologies as they relate to oil and gas operations. Those facilities that are no longer useful for either testing operations or profitable for future production operations will be environmentally remediated.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
NPR-1 Closeout	**4,438**	**3,433**	**1,000**

Continue Elk Hills environmental closeout activities. Following completion of Risk Assessments, complete appropriate Corrective Action Studies to determine cleanup in the field. Completion of Risk Assessments and Corrective Action Studies is scheduled for FY 2009. Continue negotiations with Chevron on the disposition of sites listed on Exhibit H of the Unit Plan Contract Termination Agreement.

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009

FY 2008 and FY 2009 continue human health and ecological Risk Assessments on the 131 California Department of Toxic Substances Control (DTSC) areas of concern. FY 2008 activities include the continued development of site models, completion of the project to clean-close three inactive permitted landfills, and initiation of site-specific sampling. A library was assembled of analytical and assessment documents to ensure consistency and non-duplication of results previously generated to assess environmental contamination.

NPR-3 Operations **4,513** **3,717** **2,885**

Operate and maintain roughly half of the potentially producing wells. Perform maintenance to key production facilities, and support infrastructure buildings, electrical distribution system, roads and produced waste water facility. Efforts will focus on those repairs and preventative maintenance activities that are necessary to keep equipment from being damaged and personnel from being harmed. Production is expected to average 157 barrels of oil per day, resulting in $4.5 million of revenues deposited to the U.S. Treasury. Facilities include 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 100 miles of roads.

FY 2008 funding supports maintenance and production of 400 wells (approximately 40 percent of the producing well will be temporarily shut-in). Production is expected to average 185 barrels of oil per day, resulting in $5.4 million of revenues deposited to the U.S. Treasury. Maintain approximately 100 miles of road throughout the facility.

FY 2007 funding supported maintenance and production of 730 wells (well shut-ins begun in late FY 2007), resulting in $6.0 million in revenues deposited to the U.S. Treasury. Minimized maintenance of rolling stock and equipment to only that required to alleviate safety/environmental risks. Because the liquid extraction portion of the Low Temperature Separation Gas Plant was not economical to repair, it was taken off line, resulting in discontinuance of liquid product sales. Maintained approximately 100 miles of road throughout the field.

NPR-3 Environmental Remediation **0** **99** **1,000**

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 18-20 wells will also be plugged and abandoned.

Rocky Mountain Oilfield Testing Center **4,128** **3,964** **3,300**

Supports testing partners seeking to use the facility for development and demonstration of new technologies. The technologies tested at RMOTC include: 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.

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
FY 2007 and FY 2008 funding supports testing partners seeking to use the facility for development and demonstration of new technologies.			
Total, Production and Operations	**13,079**	**11,213**	**8,185**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Production and Operations	
▪ **NPR-1 Closeout** The decrease is due to the completion of the Risk Assessment and Corrective Active Studies to determine the cleanup requirements of the Elk Hills site.	-2,433
▪ **NPR-3 Operations** This decrease is due to a reduction in operating and facility maintenance costs since half of the potential producible wells will be produced instead of the 60 percent of producible wells in FY 2008.	-832
▪ **NPR-3 Environmental Remediation** The increase is due to implementation of some remediation activities identified in the Environmental Liabilities Study. Activities include asbestos remediation of NPR-3 buildings, soil remediation, removal of some unnecessary tanks and plugging and abandonment of approximately 18-20 wells.	+901
▪ **Rocky Mountain Oil Field Testing Center** The decrease is due to fewer projects being supported and a reduction in support to smaller companies. Instead, emphasis will be placed on supporting those testing partners that have resources to pay a higher cost share to test and demonstrate their technologies in an applied research environment. Some repairs and preventive maintenance to key equipment and facilities will be performed.	-664
Total Funding Change, Production and Operations	**-3,028**

Management

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
Management			
Program Direction	5,056	3,902	4,036
Equity	1,487	857	4,000
Business Management and Support	1,694	2,332	2,878
Congressionally Directed Projects	0	1,968	0
Total, Management	8,237	9,059	10,914

Description

Management supports all business management activities associated with NPR-1 closeout, as well as supporting the finalization of equity of the Government and Chevron (who is the other owner of Elk Hills). The program supports 28 full-time federal equivalents (FTEs), including the 17 FTE's at NPR-Wyoming who provide IT/ADP, 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 FTE's working in support of NPR-1 and Headquarters activities. Contractor personnel provide analytical 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. Contractor staff also provide information technology support by maintaining servers, hardware, and software.

Benefits

The finalization of equity will involve all four of the NPR-1 commercially producing zones. Financial adjustments will occur after the final decisions have been made. Funding allows NPR-3 to comply with regulations and policies, attracting industry customers, and protect property and personnel while operating in a safe and environmentally friendly manner.

Detailed Justification

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
Program Direction	**5,056**	**3,902**	**4,036**

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

- **Salaries and Benefits** **3,808** **3,029** **3,246**
  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 2007	FY 2008	FY 2009
▪ **Travel**	**212**	**196**	**149**
Provides travel for resolution of equity issues, western energy issues, testing and demonstration business development and agreements, thereby assuring the accomplishment of NPR-1 closeout activities.			
▪ **Support Services**	**199**	**202**	**110**
Provide analytic support for policy decisions, ensure that the DOE safety programs are administered in accordance with OSHA policy, ensure environmental reporting is maintained, and provide information technology support.			
▪ **Other Related Expenses**	**837**	**475**	**531**
Major elements are communications, utilities, building leases, reproduction services, supplies, equipment and materials.			
Equity	**1,487**	**857**	**4,000**
Of the four applicable zones, the Dry Gas Zone and Carneros Zone are finalized. The Stevens Zone is expected to be completed in 2008. A final recommendation for the Shallow Oil Zone is pending.			
FY 2008 and FY 2009 funding supports the independent petroleum engineer, legal support, and expert technical analysis/ consultation required to support the final Fossil Energy decision.			
Business Management & Support	**1,694**	**2,332**	**2,878**
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	**0**	**1,968**	**0**
Support basin-scale environmental impacts for oil shale production.			
Total, Management	**8,237**	**9,059**	**10,914**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Management	
▪ **Program Direction**	
The increase is due to salary increases offset by a decrease in travel and support services.	+134

	FY 2009 vs. FY 2008 ($000)
▪ **Equity** The increase is due to the unexpected extension of equity finalization activities. In order to finalize the Shallow Oil Zone, updated maps and engineering/ geophysical analyses will be completed by the Independent Petroleum Engineer to support the final Fossil Energy decision.	+3,143
▪ **Business Management Support** The increase supports existing contractor staffing levels to operate and maintain the required quality assurance, environment, security, safety and health, IT/ADP, cyber security, finance, budget, property, and procurement programs which had been partially funded in FY 2008 by prior-year carryover. Additional environmental effort is necessary to support the increase in the environmental remediation program scope; and additional cyber security requirements will be funded.	+546
Congressionally Directed Projects No funds requested.	-1,968
Total Funding Change, Management Support	**+1,855**

Program Direction

Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2007	FY 2008	FY 2009
NPR - Wyoming			
Salaries and Benefits	1,967	1,932	2,028
Travel	141	149	100
Support Services	0	0	0
Other Related Expenses	427	245	421
Total, NPR- Wyoming	2,535	2,326	2,549
Full Time Equivalents	17	17	17
Washington, Headquarters			
Salaries and Benefits	1,841	1,097	1,218
Travel	71	47	49
Support Services	199	202	110
Other Related Expenses	410	230	110
Total, Washington, Headquarters	2,521	1,576	1,487
Full Time Equivalents	11	11	11
Total Program Direction			
Salaries and Benefits	3,808	3,029	3,246
Travel	212	196	149
Support Services	199	202	110
Other Related Expenses	837	475	531
Total, Program Direction	5,056	3,902	4,036
Total Full Time Equivalents	28	28	28

Support Services by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Management Support			
Preparation of Program Plans	199	202	110
Total, Support Services	199	202	110

Other Related Expenses by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Other Related Expenses			
Rent to GSA	15	0	15
Rent to Others	128	128	128
Communications, Utilities, Misc.	120	90	90
Printing and Reproduction	20	20	20
Other Services	444	127	168
Purchases from Gov. Accounts	20	20	20
Operation and Maintenance of Equipment	20	20	20
Supplies and Materials	60	60	60
Equipment	10	10	10
Working Capital Fund	0	0	0
Total, Other Related Expenses	837	475	531

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

	FY 2007		
	Production	Price	Revenues
Crude Oil (BOPD)	305	$54.70	$6,098
Liquid Products (GPD)	35	1.09	$14
Total, NPR-3			$6,112

	FY 2008		
	Production	Price	Revenues
Crude Oil (BOPD)	185	$80.63	$5,445
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$5,445

	FY 2009		
	Production	Price	Revenues
Crude Oil (BOPD)	157	$77.93	$4,466
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$4,466

	FY 2010		
	Production	Price	Revenues
Crude Oil (BOPD)	119	$76.86	$3,338
Liquid Products (GPD)	0	Na	$0
Total, NPR-3			$3,338

	FY 2011		
	Production	Price	Revenues
Crude Oil (BOPD)	69	$75.48	$1,901
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$1,901

	FY 2012		
	Production	Price	Revenues
Crude Oil (BOPD)	33	$73.70	$888
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$888

	FY 2013		
	Production	Price	Revenues
Crude Oil (BOPD)	17	$69.70	$432
Liquid Products (GPD)	0	na	$0
Total, NPR-3			$432

Note: Revenue projections are not an indication of economic life of the field as production is being constrained by funding. Revenues if fully funded would total $7.4 million in FY09 and decline to $4 million in FY 2013 with no drilling capital assumed.

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Strategic Petroleum Reserve

Proposed Appropriation Language

For necessary expenses for Strategic Petroleum 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.), [including the hire of passenger motor vehicles, the hire, maintenance and operation of aircraft, the purchase, repair, and cleaning of uniforms, the reimbursement to the General Services Administration for security guard services, $188,472,000] *$344,000,000* to remain available until expended, of which[$25,000,000] *$171,400,000 is for expansion of the Strategic Petroleum Reserve*. [shall be provided to carry out new site land acquisition activities consistent with the budget request]. *(Energy and Water Development and Related Agencies Appropriations Act, 2008).*

Explanation of Change

The increase reflects the completion of land acquisition activities for the Richton, Mississippi site in FY 2008 and addition of expansion activities at two existing sites and the new site in FY 2009.

Strategic Petroleum Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation[a]	FY 2009 Request
Strategic Petroleum Reserve					
Strategic Petroleum Reserve	164,441	188,472	-1,715	186,757	346,923
Subtotal, Strategic Petroleum Reserve	164,441	188,472	-1,715	186,757	346,923
Use of Prior-Year Balances	0	0	0	0	-2,923
Total, Strategic Petroleum Reserve	164,441	188,472	-1,715	186,757	344,000

Preface

The Strategic Petroleum Reserve is the cornerstone of the U.S. energy security program. It provides the United States with strategic and economic protection against disruptions in oil supplies. The program's goal is to mitigate the Nation's energy and security vulnerabilities. The subprograms within the Strategic Petroleum Reserve appropriation are:

- Facilities Development and Operations
- Management
  - Operations
  - Expansion
- Expansion

Mission

The mission of the Strategic Petroleum Reserve (SPR) is to store petroleum to mitigate a major petroleum supply interruption to the U.S. and to carry out obligations under the international energy program.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Strategic Petroleum Reserve appropriation 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 disruptions and increasing the flexibility of the market to meet U.S. needs.

[a] Includes a rescission of $1,715,000 in accordance with P.L. 110-161, the Consolidated Appropriations Act, 2008

The programs funded within the Strategic Petroleum Reserve appropriation have one GPRA Unit Program Goal that contributes to the Strategic Goals in the "goal cascade". This goal is:

GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves: Expand the SPR to drawdown at a sustained rate of 5.9 million barrels per day for 90 days within 11 - 15 days notice by the President consistent with the expansion cost, schedule, and performance baseline. Maintain a 2 million barrel reserve of home heating oil in the U.S. Northeast. Continue closeout and equity finalization activities related to NPR-1, including completion of any obligations of the United States relating to its Settlement Agreement with the State of California with respect to its claims to "school lands."

Contribution to Strategic Goal

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 inventory of 696.9 at the end of December 2007 provided 58 days of net import protection. With a projected inventory of 727 million barrels in 2009, the Reserve will provide 60 days of net import protection. The Energy Policy Act of 2005 directs 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. Legislation authorizing expansion to 1.5 billion barrels was introduced in May 2007. The 2009 Budget Request includes the 1.5 billion barrel expansion initiative, thereby doubling the protection the SPR provides.

Facilities Development and Operations subprogram funds all requirements associated with developing and maintaining facilities for the storage of petroleum, operations associated with placing petroleum into storage, and operational readiness initiatives associated with drawing down and distributing the inventory 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, Louisiana) and the Program Office (Washington, DC), as well as contract services required to support management and the technical analysis of program issues. The Expansion subprogram funds all activities to increase the size of the Reserve beyond 727 million barrels of storage and inventory to address vulnerabilities with import dependence.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves	164,441	186,757	344,000
Total, Strategic Goal 1.1, Strategic Petroleum Reserve	164,441	186,757	344,000

Annual Performance Results and Targets

FY 2004 Results	FY 2005 Results	FY 2006 Results	FY 2007 Results	FY 2008 Targets	FY 2009 Targets
Strategic Petroleum Reserve					
Increase crude oil inventory to 656 million barrels. (EXCEEDED GOAL: End of year inventory was 670 million barrels.)	Increase crude oil inventory to 690 million barrels. (GOAL EXCEEDED: Inventory of 700 million barrels was reached in August 2005).				
Commence full Degas Plant operations at a rate of 100,000 – 150,000 barrels per day by May 2004. (MET GOAL: Processing started April 16).					
Degas 23 MMB of crude oil inventory. (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.	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.	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	Ensure cost efficiency of SPR operations by achieving operating cost per barrel of $0.204.	Ensure cost efficiency of SPR operations by achieving operating cost per barrel of $0.213.

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. The Energy Policy Act of 2005 directs DOE to acquire oil to increase the SPR to one billion barrels as expeditiously as practical, without incurring excessive cost or appreciably affecting the price of petroleum products to consumers. The FY 2009 Budget supports the 1.5 billion barrel expansion initiative as further insurance against petroleum supply disruptions. In FY 2008, DOE will use $584 million in available balances for the purchase of additional SPR oil, and will continue to fill using Federal royalty oil until 727 MMB is achieved in FY 2009. Capacity expansion from 727 million barrels to 1.5 billion barrels will begin in FY 2008 with land acquisition activities.

The SPR placed a transportable degas plant into service at the Big Hill, Texas facility to ensure availability of crude oil inventories 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 plant was relocated to Bryan Mound in FY 2007.

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 draw down readiness quarterly reviews.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The current focus is to establish outcome- and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased energy security, and improved environmental conditions.

The PART for the SPR was conducted in FY 2005 and found the program to be effective - well designed with a clear mission. The total program score was 92 percent, with individual sections scoring as follows: Program Purpose and Design – 100 percent, Strategic Planning – 88 percent, Program Management – 100 percent, and Program Results – 87 percent.

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 2007	FY 2008	FY 2009
Strategic Petroleum Reserve	36,984	32,768	35,869
Total, Direct-Funded Maintenance and Repair	36,984	32,768	35,869

Strategic Petroleum Reserve
Office of Fossil Energy

Funding by Site by Program

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
SPR Project Management Office- New Orleans, LA	86,055	87,221	93,139
Big Hill Site, TX	24,064	17,262	19,715
Big Hill, TX (Expansion)	0	0	55,790
Bryan Mound Site, TX	19,404	20,884	21,641
West Hackberry Site, LA	17,382	16,897	16,901
Bayou Choctaw Site, LA	9,233	10,853	14,949
Bayou Choctaw, LA (Expansion)	0	0	70,590
Richton, MS (Expansion)	0	24,773	31,507
SPR Program Office, Washington, DC	4,276	4,781	4,955
Washington, DC (Expansion)	0	0	13,513
Sandia National Laboratory	2,780	2,812	2,909
National Energy Technology Laboratory	897	927	939
Oak Ridge National Laboratory	350	347	375
Total, Strategic Petroleum Reserve	164,441	186,757	346,923

Major Changes or Shifts by Site

Big Hill Site, Texas
- Initiate activities to create an additional 80 million barrels of cavern storage capacity and increase drawdown rate from 1.1 to 1.5 million barrels per day.

Bayou Choctaw Site, Louisiana
- Initiate activities to create an additional 33 million barrels of cavern storage capacity and increase drawdown rate from 0.5 to 0.6 million barrels per day.

Richton, Mississippi
- Land acquisition occurs in FY 2008. In FY 2009, initiate activities to create 160 million barrels of cavern storage capacity with a drawdown rate of 1.0 million barrels per day.

SPR Program Office, Washington, DC
- In FY 2009, begin the National Energy Policy Act (NEPA) environmental review process, conceptual designs of candidate sites, and geotechnical site investigations for the final 500 million barrels of storage.

Site Description

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

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

Bryan Mound Site, Texas
The Bryan Mound storage facility is three miles southwest of Freeport, Texas. The site has storage capacity of 251 million barrels.

West Hackberry Site, Louisiana
The West Hackberry storage facility is 25 miles southwest of Lake Charles, Louisiana. The site has storage capacity of 230 million barrels.

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

Richton, Mississippi (New)
The proposed Richton storage facility will be 18 miles east of Hattiesburg, Mississippi. The site is expected to have storage capacity of 160 million barrels.

SPR Program Office
The Program Office, located in Washington, DC, plans the overall program, establishes priorities, provides policy and guidance, and establishes technical performance. The Office is also responsible for providing public/private sector policy liaison, coordinating Headquarters interface activities, and retaining overall accountability for program success.

Sandia National Laboratory

The Sandia National laboratory, located in Albuquerque, New Mexico, provides technical, comprehensive, site-specific engineering research and development support for the planning, design, development, and monitoring of Strategic Petroleum Reserve (SPR) crude oil storage facilities.

National Energy Technology Laboratory
The National Energy Technology Laboratory (NETL) located in Morgantown, West Virginia, Pittsburgh, Pennsylvania and Tulsa, Oklahoma is a multipurpose laboratory, owned and operated by the U.S. Department of Energy. NETL conducts detailed analysis of crude oil streams, caverns, and storage cavern composites to ascertain the quality of stored oil on selected oil samples. These measurements include the vapor pressure and gas-oil ratio.

Strategic Petroleum Reserve

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Strategic Petroleum Reserve					
Facilities Development and Operations	146,950	145,303	-1,323	143,980	156,699
Management for Operations	17,491	18,169	-165	18,004	18,824
Management for Expansion	0	0	0	0	1,690
Expansion	0	25,000	-227	24,773	169,710
Total, Strategic Petroleum Reserve	164,441	188,472	-1,715	186,757	346,923

Mission

The mission of the Facilities Development and Operations subprogram is to provide for all requirements associated with developing and maintaining facilities for the storage of petroleum, operations associated with placing petroleum into storage, and operational readiness activities. Management funds personnel and administrative expenses related to maintaining the Project Management Office (New Orleans, Louisiana) and the Program Office (Washington, DC), as well as contract services required to support management and the technical analysis of program issues. The Expansion subprogram funds all activities to increase the size of the Reserve to address vulnerabilities with growing U.S. consumption and increased import dependence.

Facilities Development and Operations

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Facilities Development and Operations			
Security	19,296	19,415	20,932
Power	4,988	5,304	6,254
Operations and Maintenance	119,989	116,553	126,953
Support Services	2,677	2,708	2,560
Total, Facilities Development and Operations	146,950	143,980	156,699

Description

Facilities Development and Operations provides all requirements associated with developing and maintaining facilities for the storage of petroleum and the operations associated with placing petroleum into storage. Under this subprogram, the mission-essential facilities are 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, brine disposal wells, and crude oil storage caverns.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Security	**19,296**	**19,415**	**20,932**

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 2007 and FY 2008 reflect full funding for the protection force subcontract (207 FTEs), as well as acquisition and maintenance of weapons systems, conducting tactical training, and management of security and emergency operations.

Power	**4,988**	**5,304**	**6,254**

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 2007 and FY 2008 supports maximum rate systems test exercises at all sites as well as oil and brine transfers and brine disposal operations. FY 2008 also includes power for degas operations at the Bryan Mound site.

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
Operations and Maintenance	**119,989**	**116,553**	**126,953**

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 the SPR maintains compliance with laws, rules, regulations, and requirements.

FY 2007 includes construction projects for site facility upgrades at Big Hill, Bryan Mound, and West Hackberry as well as protective shelters for raw water and crude oil pumps at Big Hill. In FY 2008, there are security enhancement construction projects for drawdown critical areas, and upgrades to the ADAS system and fire protection system.

Support Services	**2,677**	**2,708**	**2,560**

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 supports subcontractor headcount (23 FTEs) to support these activities.

Total, Facilities Development and Operations	**146,950**	**143,980**	**156,699**

Explanation of Changes

	FY 2009 vs. FY 2008 ($000)
Facilities Development and Operations	
▪ **Security**	
The increase is due to the addition of 32 hours of annual training for offensive combatant standard employees beginning in FY 2009. The increase also reflects costs associated with the negotiated Collective Bargaining Agreement for protective force officers.	+1,517
▪ **Power**	
The increase is due to rate increases for power service that support process operations such as system test exercises (STEs), oil and brine transfers, and brine disposal operations at the sites.	+950

	FY 2009 vs. FY 2008 ($000)
▪ **Operations and Maintenance** The increase is due to: ➢ Scheduled predictive maintenance projects i.e., actuator replacements and tank repairs (+1,062k); ➢ Five-year smart pig test on the 40-inch pipeline from Bryan Mound to Texas City (+367k); ➢ Ultrasonic scan of Big Hill brine disposal pipeline to determine remaining wall thickness & expected life of the pipeline (+1,500k); ➢ Upgrade of portable radio equipment (+800k) and enterprise resource system (+425k); ➢ Additional contractor labor for the new Personal Identity Verification (PIV) II logical access networks (+3,049k) ➢ Scheduled major maintenance construction projects (+3,366) These increases are offset by a decrease in the number of wireline services (-169k)	+10,400
▪ **Support Services** The decrease reflects cost savings.	-148
Total Funding Change, Facilities Development and Operations	**+12,719**

Capital Operating Expenses and Construction Summary

Capital Operating Expenses

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Protective Shelters for Raw Water Pumps (BH-MM-263)	1,233	0	0
Upgrade Distributed Control System Controllers & Operator Interfaces (BM-MM-445/WH-MM-446)	1,006	0	0
Raw Water Pig Launcher, Receiver Doors and Valves (BH-MM-612)	662	0	0
Security Enhancements for Drawdown Critical Areas (BM-MM-729)	0	1,618	0
ADAS System Upgrade (BM-MM-551)	0	1,589	0
Replace 42-inch Raw Water Header (WH-MM-726)	0	1,182	0
Potable Water System Upgrades (BC-MM-435)	0	415	0
Crude Oil Pipeline Repair (WH-MM-561)	0	270	0
Clean, Inspect & Repair Tank (BM-MM-529)	0	0	1,300
Upgrade Site Security Detection Systems (BC-MM-586)	0	0	1,266
ADAS System Upgrade (BC-MM-549)	0	0	1,141
Capital Equipment	9,224	10,305	8,505
Total, Capital Operating Expenses	12,125	15,379	12,212

Construction Projects

(dollars in thousands)

	Total Estimated Cost (TEC)	Prior-Year Appro-priations	FY 2007	FY 2008	FY 2009	Unappropriated Balance
Site Building Upgrades (All sites)	1,985	0	1,398	0	0	0
Site-Wide Card Access Systems	1,718	0	1,209	0	0	0
HSPD-12 PIV-II Logical Access	1,420	0	0	0	1,000	0
Total, Construction Projects			2,607	0	1,000	

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

(dollars in thousands)

	Total Project Cost (TPC)	Total Estimated Cost (TEC)	Prior-Year Appro-priations	FY 2007	FY 2008	FY 2009	Completion Date
Protective Shelters for Crude Oil Pumps (BH-MM-610)		3,211	0	2,261	0	0	FY 2007
Upgrade Site Security Detection Systems (BM-MM-588)		2,560	0	0	1,803	0	FY 2008
Convert Tank 3 to External Floating Roof Tank (BM-MM-648)		4,470	0	0	2,148	0	FY 2008
Security Enhancements for Drawdown Critical Areas (BC-MM-727)		2,447	0	0	168	1,723	FY 2009
Total, Major Items of Equipment				2,261	4,119	1,723	

Management

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Management			
Management for Operations	17,491	18,004	18,824
Management for Expansion	0	0	1,690
Total, Management	17,491	18,004	20,514

Mission

The mission of Management is to provide for all costs of personnel and administration related to maintaining the Project Management Office in New Orleans, Louisiana and the Program Office in Washington, DC. Funding for contract services required to support management and the technical analysis of program issues is included. Beginning in FY 2009, funding is provided for an additional 12 full-time equivalent employees (FTE's) to support expansion efforts.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Salaries and Benefits	**13,818**	**14,040**	**16,193**
Funds salaries and benefits for 134 FTE's to assure achievement of Level 1 Performance criteria for drawdown and distribution. The total includes 12 FTEs for expansion activities. Provides for support and oversight of the management and operations contractor and subcontractor activities and program operations.			
Travel	**548**	**553**	**692**
Provides travel to assure capability to achieve Level 1 Performance criteria for drawdown and distribution and planned expansion of the Reserve.			
Support Services	**924**	**933**	**970**
Provide analytic support for SPR development, fill and distribution policy decisions. Includes distribution modeling maintenance.			
Other Related Expenses	**2,201**	**2,478**	**2,659**
Major elements are communications, building lease, and electric power for DOE-occupied space (New Orleans, Louisiana). Includes training, small purchases, personal computer hardware/software, supplies, and materials for federal staff.			
Total, Management	**17,491**	**18,004**	**20,514**

Explanation of Changes

	FY 2009 vs. FY 2008 ($000)
Management	
▪ **Management for Operations**	
The increase is due to escalation and scheduled purchase of hardware upgrades.	+820
▪ **Management for Expansion**	
The increase is due to addition of 12 FTEs for Expansion in FY 2009.	+1,690
Total Funding Change, Management	**+2,510**

Management
Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2007	FY 2008	FY 2009
Washington Headquarters			
Salaries and Benefits	3,247	3,318	3,447
Travel	166	167	174
Support Services	924	933	970
Other Related Expenses	752	710	739
Total, Washington Headquarters	5,089	5,128	5,330
Full Time Equivalents	27	27	27
Strategic Petroleum Reserve (SPR) Project Management Office			
Salaries and Benefits	10,571	10,722	11,337
Travel	382	386	468
Other Related Expenses	1,449	1,768	1,689
Total, SPR Project Management Office	12,402	12,876	13,494
Full Time Equivalents	95	95	95
Expansion			
Salaries and Benefits	0	0	1,409
Travel	0	0	50
Other Related Expenses	0	0	231
Total, Expansion	0	0	1,690
Full Time Equivalents	0	0	12
Total Management			
Salaries and Benefits	13,818	14,040	16,193
Travel	548	553	692
Support Services	924	933	970
Other Related Expenses	2,201	2,478	2,659
Total, Management	17,491	18,004	20,514
Total, Full Time Equivalents	122	122	134

Support Services by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Technical Support			
Economic and Environmental Analyses	924	933	970
Total, Support Services	924	933	970

Other Related Expenses by Category

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Other Related Expenses			
Rent to Others	478	492	515
Communications, Utilities, Misc	35	36	37
Other Services	1,440	1,694	1,930
Supplies and Materials	123	127	53
Equipment	125	129	124
Total, Other Related Expenses	2,201	2,478	2,659

Expansion

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Expansion			
Bayou Choctaw, LA	0	0	70,027
Big Hill, TX	0	0	55,227
Richton, MS	0	24,773	30,943
Expansion to 1.5 Billion Barrels	0	0	13,513
Total, Expansion	0	24,773	169,710

Description

The Energy Policy Act of 2005 directs 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. To increase the inventory to one billion barrels, DOE must expand two existing sites and add one new site. The FY 2009 Budget Request includes activities to expand the Reserve to 1.5 billion barrels, doubling the Nation's protection from oil import disruptions.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Bayou Choctaw, LA	**0**	**0**	**70,027**
The request supports expansion of the existing site by 20 million barrels. FY 2009 activities include engineering design and permit applications, and acquisition of real estate for new brine disposal wells.			
Big Hill, TX	**0**	**0**	**55,227**
The request supports expansion of the existing site by 80 million barrels. FY 2009 activities include engineering design and permit applications, and acquisition of real estate for proposed storage caverns.			
Richton, MS	**0**	**24,773**	**30,943**
The request supports development of a new 160-million barrel site. FY 2009 activities include geotechnical seismic of salt domes, engineering design and permit applications.			
FY 2008 activities include the acquisition of real estate for the proposed new facility.			
Expansion to 1.5 billion barrels	**0**	**0**	**13,513**
The FY 2009 activities include the National Energy Policy Act (NEPA) environmental review process (including conceptual designs of candidate sites and geotechnical site investigations).			
Total, Expansion	**0**	**24,773**	**169,710**

Explanation of Changes

	FY 2009 vs. FY 2008 ($000)
Expansion	
Bayou Choctaw	
The increase reflects start of site expansion activities in FY 2009.	+70,027
Big Hill	
The increase reflects start of site expansion activities in FY 2009.	+55,227
Richton	
The increase is due to initiation of site expansion activities beyond land acquisition in FY 2009.	+6,170
Expansion to 1.5 billion barrels	
The increase reflects start of the National Energy Policy Act (NEPA) environmental review process for the final 500 million barrels of the Reserve in FY 2008.	+13,513
Total Funding Change, Expansion	**+144,937**

Capital Operating Expenses and Construction Summary

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

	Total Project Cost (TPC)	Total Estimated Cost (TEC)	Prior-Year Appro-priations	FY 2007	FY 2008	FY 2009	Completion Date
Bayou Choctaw, LA Expansion		311,762	0	0	0	70,590	FY 2015
Big Hill, TX Expansion		602,610	0	0	0	55,790	FY 2015
Richton, MS Site Development		4,200,378	0	0	24,773	31,507	FY 2020
Expansion to 1.5 BBL		6,400,639	0	0	0	13,513	FY 2029
Total, Major Items of Equipment				0	24,773	171,400	

09-FE-100
SPR One Billion Barrel Expansion
Various Locations
Project Data Sheet is for PED/Construction

1. Significant Changes

The most recent DOE O 413.3A approved Critical Decision (CD) is CD-0, Mission Need Statement that was approved on August 3, 2007, with a preliminary total project cost of $5.123 Billion.

A Federal Project Director has been assigned to this project. The Project is pursing to fulfill the certification requirements.

This Project Data Sheet (PDS) is new for PED/Construction.

2. Design, Construction, and D&D Schedule

(fiscal quarter or date)

	CD-0	CD-1 (Design Start)	(Design/PED Complete)	CD-2*	CD-3 (Construction Start)	CD-4 (Construction Complete)	D&D Start	D&D Complete
FY 2007	8/3/2007			TBD	TBD	TBD	N/A	N/A
FY 2008		3QFY2008						
FY 2009			1QFY2009	TBD	TBD	TBD	N/A	N/A

*The schedules are TBD. The CD-4 completion preliminary schedule is FY2020.

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
CD-3 – Approve Start of Construction
CD-4 – Approve Start of Operations or Project Closeout

3. Baseline and Validation Status

The project does not have CD-2 approval. The preliminary TPC estimate range is $4.647 – $5.123 Billion

4. Project Description, Justification, and Scope

Project Description

This Billion Barrel Expansion Project (BBEP) provides for the expansion of the Strategic Petroleum Reserve (SPR) from 727 million (MMB) of storage capacity to 1 billion barrels and the increase in the SPR drawdown capability from 4.4 million to 5.9 million barrels per day (MMBD).

Project Justification

Expansion of the SPR to 1.0 billion barrels is essential to address the Nation's needs for increasing energy security associated with growing U.S. consumption and import dependence, to carry out its mission under the Energy Policy and Conservation Act (EPCA), to protect the nation from the adverse

impacts of petroleum oil supply disruptions and to comply with the nation's obligations under the International Energy Program (IEP).

In August 2005, Congress passed the *Energy Policy Act of 2005* (EPACT 2005), directing the Secretary of Energy to fill the SPR to its authorized 1 billion-barrel capacity "as expeditiously as practicable," without incurring excessive costs or appreciably affecting the market price of petroleum products to customers.

In January 2007, the need for the expansion of the Strategic Petroleum Reserve to 1 billion barrels was approved by the Secretary of Energy, the White House Principals Coordinating Committee, and the President of the United States. On January 23, 2007, the President announced in the State of the Union Address, his intent to further expand the Nation's Strategic Petroleum Reserve to 1.5 billion barrels to provide needed protection for our Nation's energy security.

Project Scope

Under the SPR Expansion Plan, the SPR's storage capacity will be increased to 1 billion barrels, through the development a new storage site at Richton, Mississippi and expansion of two of the SPR's existing sites, Big Hill in Texas and Bayou Choctaw in Louisiana.

The development of a new storage site at Richton, Mississippi involves the development of 160 MMB of underground storage capacity and the construction of associated infrastructure and pipelines to maintain a 1.0 MMBD drawdown rate. The site also requires the construction of two oil distribution terminals at Liberty, Mississippi and Pascagoula, Mississippi, to provide access to the Capline pipeline system and additional marine distribution capability.

The SPR's Big Hill site will be expanded by 80 MMB, from its current 170 MMB of storage capacity to 250 MMB. A new crude oil pipeline and site equipment upgrades will increase Big Hill's drawdown rate from 1.1 to 1.5 MMBD.

The SPR's Bayou Choctaw site will be expanded by 33 MMB, from the current 76 MMB of storage capacity to 109 MMB. Additional upgrades to the site's equipment will double Bayou Choctaw's crude oil receipt capability from 110 MMBD to 225 MMBD and increase its drawdown capacity from 0.5 to 0.6 MMBD.

The project is being conducted in accordance with the project management requirements in DOE O 413.3A and DOE M 413.3-1, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements have been met.

5. Financial Schedule

(dollars in thousands)

	Appropriations	Obligations	Costs
PED			
FY 2008	0	0	0
FY 2009	55,237	55,237	55,237
FY 2010	143,815	143,815	143,815
FY 2011	240,644	240,644	240,644
FY2012	97,316	97,316	97,316
FY2013	3,602	3,602	3,602
FY2014-2019	10,715	10,715	10,715
Total, PED	551,329	551,329	551,329

	(dollars in thousands)		
	Appropriations	Obligations	Costs
Construction			
FY2008*	24,773	24,773	24,773
FY2009**	102,650	102,650	102,650
FY2010	474,284	474,284	474,284
FY2011	777,351	777,351	777,351
FY2012	1,199,576	1,199,576	1,199,576
FY2013	782,328	782,328	782,328
FY2014-2019	1,202,459	1,202,459	1,202,459
Total, Construction	4,563,421	4,563,421	4,563,421
TEC			
FY2008	24,773	24,773	24,773
FY2009	157,887	157,887	157,887
FY2010	618,099	618,099	618,099
FY2011	1,017,995	1,017,995	1,017,995
FY2012	1,296,892	1,296,892	1,296,892
FY2013	785,930	785,930	785,930
FY2014-2019	1,213,174	1,213,174	1,213,174
Total, TEC	5,114,750	5,114,750	5,114,750
Other Project Cost (OPC)			
Prior FY Cost for NEPA & Site Selection	9,000	9,000	9,000
FY2008-2019	0	0	0
Total, OPC	9,000	9,000	9,000
Total Project Cost (TPC)			
Prior FY Costs	9,000	9,000	9,000
FY2008	24,773	24,773	24,773
FY2009	157,887	157,887	157,887
FY2010	618,099	618,099	618,099
FY2011	1,017,995	1,017,995	1,017,995
FY2012	1,296,892	1,296,892	1,296,892
FY2013	785,930	785,930	785,930
FY2014-2019	1,213,174	1,213,174	1,213,174
Total, TPC*	5,123,750	5,123,750	5,123,750

*Land acquisition activities for Richton, MS

** Reflects architect/engineer & drilling setup for contracts.

6. Details of Project Cost Estimate

**This project does not have CD-2 approval and is not baselined.

7. Schedule of Project Costs

For schedule of project costs, see Section 5, "Financial Schedule."

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy (fiscal quarter or date)	4QFY2020
Expected Useful Life (number of years)	N/A
Expected Future Start of D&D of this capital asset (fiscal quarter)	N/A

(Related Funding requirements)

The project does not have CD-2 approval. This is not applicable for PED.

9. Required D&D Information – N/A

10. Acquisition Approach

A. The BBEP acquisition strategy was developed to achieve the following objectives:

1. Meet all technical, cost and schedule requirements for expansion.

2. Promote effective use of competition and performance based contracting opportunities and support achievement of DOE and Strategic Petroleum Reserve Project Management Office (SPRPMO) socio-economic goals.

3. Meet requirements of DOE 413.3, Acquisition of Capital Assets and related guidance from Office of Engineering and Construction Management (OECM).

4. Provide for cost effective execution of SPR Expansion.

5. Maximize Budget Flexibility.

6. Optimize/minimize Federal staffing levels.

7. Meet objectives in Executive Order 13423 and Secretary's Transformational Efficiency Management Initiative.

B. Contract Administration

The SPRPMO will award and administer all contracts related to the execution of the BBEP. Activities for each planned acquisition may include the following:

1. Establishment of Business Strategy Groups.

2. Conducting market surveys.

3. Preparation of Requests for Proposals.

4. Conducting pre-proposal conferences.

5. Conducting price negotiations.

6. Participation in Integrated Project Team (IPT) meetings.

C. Acquisition and Contract Types

BBEP requirements were analyzed and a list of acquisitions identified as required for executing the project. The SPRPMO will award six new service contracts, six long-lead equipment contracts, and multiple cavern roof oil contracts. The new service contracts will include Architect-Engineering Services, Drilling Management Services, and Construction Management Services. The SPRPMO will also modify four existing service contracts and will issue a modification to an existing Interagency Agreement to implement the requirements of a Memorandum of Understanding entered into between the DOE Headquarters and the U.S. Army Corps of Engineers related to real estate support for expansion. For more details on the BBEP Acquisition Strategy, please refer to the Strategic Petroleum Reserve Billion Barrel Expansion Acquisition Strategy (Rev 1) dated January 2008.

D. Planned major procurements

Planned major DOE prime procurements include the following:

Services

1. Architect – Engineer
2. Construction Management Services Contractor (s)
3. Drilling Management Services Contractor(s)

Material and Equipment

1. API Line Pipe
2. Well Casing and Tubulars
3. Well Head components
4. Control System Hardware
5. Large Pumps
6. Large Motors

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, [$12,448,000}*$9,800,000* to remain available until expended. *(Energy and Water Development and Related Agencies Appropriations Act, 2008).*

Explanation of Change

The decrease reflects the one-time repurchase of heating oil in FY 2008 offset by an increase in commercial storage costs.

Northeast Home Heating Oil Reserve
Office of Fossil Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments[a]	FY 2008 Current Appropriation	FY 2009 Request
Northeast Home Heating Oil Reserve					
Northeast Home Heating Oil Reserve	5,000	12,448	-113	12,335	9,800
Budget Authority from Sales Receipts	+2,966	0	0	0	0
Prior Year Balances	+1,734	0	0	0	0
Subtotal, Northeast Home Heating Oil Reserve	9,700	12,448	-113	12,335	9,800
Use of Prior-Year Balances	-1,734	0	0	0	0
Total, Northeast Home Heating Oil Reserve	7,966	12,448	-113	12,335	9,800

Preface

The Energy Policy Act of 2000 amended the Energy Policy and Conservation Act (EPCA) of 1975 and authorized establishment of a two-million-barrel Northeast Home Heating Oil Reserve (NEHHOR) assuring a supply for the northeast states if there is a severe energy supply interruption. Two million barrels is sufficient for approximately 10 days, the time required for ships to carry heating oil from the Gulf of Mexico to New York Harbor.

Mission

NEHHOR's mission is to provide a short-term supplement to the Northeast systems' private supply of heating oil in the event of an actual or imminent supply interruption.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Northeast Home Heating Oil Reserve appropriation supports the following goals:

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

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

[a] Includes a rescission of $113,000 in accordance with P.L. 110-161, the Consolidated Appropriations Act, 2008

The program funds within the Northeast Home Heating Oil Reserve appropriation have one program goal that contributes to the General Goals in the goal cascade. This goal is:

GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves: Expand the SPR to drawdown at a sustained rate of 5.9 million barrels per day for 90 days within 11 - 15 days notice by the President consistent with the expansion cost, schedule, and performance baseline. Maintain a 2 million barrel reserve of home heating oil in the U.S. Northeast. Continue closeout and equity finalization activities related to NPR-1, including completion of any obligations of the United States relating to its Settlement Agreement with the State of California with respect to its claims to "school lands."

Contribution to Strategic Goal

The Northeast Home Heating Oil Reserve contributes to Strategic Goal 1.1 by assuring that it is maintained in a high state of readiness and capable of completing a drawdown of the heating oil inventory in 12 days. Assurance is measured by how quickly the program can respond to a Presidential direction to drawdown; how much of the inventory in storage is available; and the cost of operations.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.1, Energy Diversity			
GPRA Unit Program Goal 1.1.11.00, Petroleum Reserves	7,966	12,335	9,800
Total, Strategic Goal 1.1 (Northeast Home Heating Oil Reserve)	7,966	12,335	9,800

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. Oil repurchase is planned for FY 2008, but quantity is dependent on the price at the time of bid solicitation.

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 managers' site status meetings. Budget formulation/execution assessments are regularly conducted throughout the year, including annual budget validations. Other evaluations include: semiannual M&O contractor award fee performance assessment against Work Authorization Directives; on-site reviews to verify operational, maintenance and management performance data; and drawdown readiness quarterly reviews.

Northeast Home Heating Oil Reserve

Funding by Site by Program

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Hess (Woodbridge NJ)	4,320	4,560	4,800
Morgan Stanley (New Haven, CT)	3,510	3,427	3,496
Hess (Groton, CT)	1,441	1,140	1,200
Washington Headquarters	429	3,208	304
Subtotal, Northeast Home Heating Oil Reserve	9,700	12,335	9,800

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 Amerada Hess Terminal in the New York Harbor (Woodbridge, NJ) currently holds 965,000 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

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Northeast Home Heating Oil Reserve	7,966	12,448	-113	12,335	9,800

Mission

NEHHOR's mission is to provide a short-term supplement to the Northeast systems' private supply of heating oil in the event of an actual or imminent supply interruption.

Northeast Home Heating Oil Reserve

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Northeast Home Heating Oil Reserve			
Commercial Storage Leases	9,271	9,127	9,496
Information Technology Support	329	133	229
Quality Control & Analysis	100	75	75
Heating Oil Acquisition	0	3,000	0
Total, Northeast Home Heating Oil Reserve	9,700	12,335	9,800

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.

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 2007	FY 2008	FY 2009
Commercial Storage Leases	**9,271**	**9,127**	**9,496**

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

Information Technology Support	**329**	**133**	**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	**100**	**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	**0**	**3,000**	**0**

	(dollars in thousands)		
	FY 2007	FY 2008	FY 2009
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	**9,700**	**12,335**	**9,800**

Explanation of Changes

	FY 2009 vs. FY 2008 ($000)
Northeast Home Heating Oil Reserve	
▪ **Commercial Storage Leases**	
The increase is due to contract escalation from FY 2008 to FY 2009.	+369
▪ **Information Technology Support**	
The increase reflects software upgrades to the on-line sales system.	+96
▪ **Repurchase Heating Oil**	
Decrease reflects the FY 2008 repurchase of heating oil sold in FY 2007 to finance the new storage contracts. Quantity is dependent on price at time of bid solicitation.	-3,000
Total Funding Change, Northeast Home Heating Oil Reserve	**-2,535**

Clean Coal Technology

Clean Coal Technology

Clean Coal Technology

Proposed Appropriation Language

[Of the funds made available under this heading for obligation in prior years, $149,000,000 shall not be available until October 1, 2008: *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: *Provided further*, That $166,000,000 of uncommitted balances are transferred to Fossil Energy Research and Development to be used until expended.] *(Energy and Water Development and Related Agencies Appropriations Act, 2008.)*

Explanation of Change

Language is eliminated in the 2009 budget request because the transfer of funding is reflected in the Fossil Energy Research and Development appropriation language.

Clean Coal Technology

Overview

Appropriation Summary by Program

(dollars in thousands)

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

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

For FY 2009, the Department requests to transfer the $149 million which was deferred in FY 2008 to Fossil Energy R&D. All project funding commitments have been fulfilled and only project closeout activities remain.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science,

management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. The Clean Coal Technology appropriation supports the following goals:

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

Strategic Goal 1.2, Environmental Impacts of Energy: Improve the quality of the environment by reducing greenhouse gas emissions and environmental impacts to land, water, and air from energy production and use.

Contribution to Strategic Goal

Clean Coal Technology contributes to Strategic Goal 1.2 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 near-zero atmospheric emissions, including carbon capture, and generation efficiencies twice that of the existing coal fleet.

Funding by Strategic and GPRA Unit Program Goal

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Strategic Goal 1.2, Environmental Impacts of Energy			
Clean Coal Technology	0	-58,000	0
Total, Strategic Goal 1.2 (Clean Coal Technology)	0	-58,000	0

Clean Coal Technology

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Appropriation	FY 2009 Request
Clean Coal Technology			
Clean Coal Technology	0	-58,000	0
Total, Clean Coal Technology	0	-58,000	0

Mission

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 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 2007, the availability of $257 million was deferred to FY 2008.

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

For FY 2009, the department requests to transfer the $149 million which was deferred in FY 2008 to Fossil Energy R&D. All project funding commitments have been fulfilled and only project closeout activities remain.

Detailed Justification

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Clean Coal Technology	**0**	**-58,000**	**0**
	0	**-58,000**	**0**

- **Cooperative Agreements**

  For FY 2009, the Department requests to transfer the $149 million which was deferred in FY 2008 to Fossil Energy R&D. All project funding commitments have been fulfilled and only project closeout activities remain.

  For FY 2008, 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

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
million was transferred to Fossil Energy Research and Development.			
For FY 2007, the Final Report for the Clean Coal Diesel project was completed. Final closeout activities for completed and withdrawn projects are the only activities remaining for the Clean Coal Technology Demonstration Program. For FY 2007, the availability of $257 million was deferred to FY 2008. *Participants include: TIAX LLC.*			
Total, Clean Coal Technology	**0**	**-58,000**	**0**

Explanation of Funding Changes

	FY 2009 vs. FY 2008 ($000)
Clean Coal Technology	
CCT funding commitments are fulfilled. Prior-year balances were rescinded or transferred to Fossil Energy R&D.	-58,000
Total Funding Change, Clean Coal Technology	**-58,000**

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 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 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	0	50,000	50,000
Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	-50,000	-50,000	0	-50,000	-50,000
Repeal Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	0	0	-50,000
Repeal Receipts Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	0	0	50,000
Total, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund	0	0	0	0	0

Mission

The mission of the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund activities is 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 2007 and FY 2008. The FY 2009 Budget proposes to repeal the program through a legislative proposal. This policy is consistent with the decision to terminate the discretionary Oil and Natural Gas programs.

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

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
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 2007	FY 2008	FY 2009
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 **[**2008 **]***2009* 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 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) *In this section:*
(*1*) *The term "noncompetitive management and operating contract" means a contract that was awarded more than 50 years ago without competition for the management and operation of Ames Laboratory, Argonne National Laboratory, Lawrence Berkeley National Laboratory, Livermore National Laboratory, and Los Alamos National Laboratory.*
(*2*) 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.
(*c*) *For all management and operating contracts other than those listed in subsection (b)(1), none of the funds appropriated by this Act may be used to award a management and operating contract, 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. At least 60 days before a contract award for which the Secretary intends to grant such a waiver, the Secretary shall submit to the Committees on Appropriations of the House of Representatives and the Senate a report notifying the Committees 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) 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.**]**
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. WORKFORCE RESTRUCTURING. None of the funds appropriated by this Act may be used to—
(1) develop or implement a workforce restructuring plan that covers employees of the Department of Energy; or

(2) provide enhanced severance payments or other benefits for employees of the Department of Energy, under section 3161 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102-484; 42 U.S.C. 7274h).

SEC. 304. SECTION 3161 ASSISTANCE. None of the funds appropriated by this Act may be used to augment the funds made available for obligation by this Act for severance payments and other benefits and community assistance grants under section 3161 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102-484; 42 U.S.C. 7274h) unless the Department of Energy submits a reprogramming **[**request**]** *notification* to the appropriate congressional committees.

SEC. 305. 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. 306. 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. 307. 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. 308. 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 **[**2008 **]***2009* until the enactment of the Intelligence Authorization Act for fiscal year **[**2008 **]***2009*.

[SEC. 309. LABORATORY DIRECTED RESEARCH AND DEVELOPMENT. Of the funds made available by the Department of Energy for activities at government-owned, contractor-operator 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. 310. YIELD RATE. For fiscal year 2008, except as otherwise provided by law in effect as of the date of this Act or unless a rate is specifically set by an Act of Congress thereafter, the Administrators of the Southeastern Power Administration, the Southwestern Power Administration, and the Western Area Power Administration, shall use the "yield" rate in computing interest during construction and interest on the unpaid balance of the costs of Federal power facilities. The yield rate shall be defined as the average yield during the preceding fiscal year on interest-bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity.**]**

[SEC. 311. USE PERMIT. The Use Permit granted to the contractor for activities conducted at the Pacific Northwest National Laboratory by Agreement DE-GM05-00RL01831 between the Department of Energy and the contractor shall continue in effect during the term of the existing Operating Contract and the extensions or renewals thereof and shall be incorporated into any future management and operating contract for the Pacific Northwest National Laboratory and such Use Permit may not be waived, modified or terminated unless agreed to by both contractor and the Department of Energy.**]**

[SEC. 312. (a) ACROSS-THE-BOARD RESCISSIONS.—There is hereby rescinded—

(1) from discretionary accounts in this title that contain congressionally directed projects, an amount equal to 1.6 percent of the budget authority provided for fiscal year 2008 for such projects; and

(2) from all discretionary accounts in this title, an amount equal to 0.91 percent of the other budget authority provided for fiscal year 2008.

(b) DEFINITIONS.—For purposes of this section: (1) The term "congressionally directed project" means a congressional earmark or congressionally directed spending item specified in the list of such earmarks and items for this division that is included in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act).

(2) The term "other budget authority" means an amount equal to all discretionary budget authority, less the amount provided for congressionally directed projects.

(c) PROPORTIONATE APPLICATION TO OTHER PROGRAMS, PROJECTS, AND ACTIVITIES.—Any rescission made by subsection (a)(2) shall be applied proportionately—

(1) to each discretionary account; and

(2) within each such account, to each program, project, and activity (with programs, projects, and activities as delineated in the appropriation Act or accompanying reports for the relevant fiscal year covering such account).

(d) REPORT.—Within 30 days after the date of the enactment of this section, the Director of the Secretary of Energy shall submit to the Committees on Appropriations of the House of Representatives and the Senate a report specifying the account and amount of each rescission made pursuant to this section.**]**

SEC. *309. Section 312 of the Energy and Water Development Appropriations Act, 2004 (Pub. L. 108-137), is amended as follows: (1) In the first sentence by inserting between "the material" and "in the concrete silos", the words "formerly stored", by inserting before the period: "when such material is disposed at an Nuclear Regulatory Commission-regulated or Agreement State-regulated facility"; and (2) In the second sentence, striking "for the purpose" and everything that follows, and inserting; "after the material has been disposed at an NRC-regulated or Agreement materials being disposed as NRC-regulated or Agreement State-regulated facilities and shall not preclude the materials from otherwise being disposed at facilities operated by the Department of Energy so long as the materials meet the disposal facility's waste acceptance criteria." Not to exceed 5 per centum of any appropriation made available for Department of Energy activities funded in this Act or subsequent Energy and Water Development Appropriations Acts, not to exceed $5,000,000, 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 any such proposed transfers: Provided, That 15 days in advance of such transfer, notice shall be submitted to the Committees on Appropriations of the House and Senate.*

SEC. *310. Not to exceed 5 per centum of any appropriation made available for Department of Energy activities funded in this Act or subsequent Energy and Water Development Appropriations Acts may 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.*

SEC. *311. Section 311 of the Energy and Water Development Appropriations Act, 2008 is repealed. (Energy and Water Development and Related Agencies Appropriations Act, 2008.)*