Fossil Energy Research and Development
Proposed Appropriation Language

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95–91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), [$420,575,000] *$475,500,000*, to remain available until expended: Provided, That [$115,753,000] *$114,202,000* shall be available until September 30, [2015]*2016*, for program direction.[: Provided further, That for all programs funded under Fossil Energy appropriations in this Act or any other Act, the Secretary may vest fee title or other property interests acquired under projects in any entity, including the United States.]

Explanation of Changes

No changes.

Public Law Authorizations
Coal:
- Public Law 95-91

CCS and Power Systems:
- Public Law 95-91

Natural Gas Technologies:
- Public Law 91-91, "Department of Energy Organization Act", 1977
- Public Law 109-58, "Energy Policy Act of 2005"

Unconventional Fossil Energy Technologies:
- Public Law 95-91, "Department of Energy Organization Act", 1977
- Public Law 109-58, "Energy Policy Act of 2005"

Plan and Capital Equipment:
- Public Law 95-91, "Department of Energy Organization Act", 1977
- Public Law 108-153, "21st Century Nanotechnology Research and Development Act 2003"
- Public Law 109-58, "Energy Policy Act of 2005"
- Public Law 110-69, "America COMPETES Act of 2007"
- Public Law 110-140, "Energy Independence and Security Act 2007"
- Public Law 111-358, "America COMPETES Act of 2010"

Environmental Restoration:
- Public Law 95-91, "Department of Energy Organization Act", 1977
- Public Law 108-153, "21st Century Nanotechnology Research and Development Act 2003"
- Public Law 109-58, "Energy Policy Act of 2005"
- Public Law 110-69, "America COMPETES Act of 2007"
- Public Law 111-358, "America COMPETES Act of 2010"

Special Recruitment Programs:
- Public Law 95-91, "Department of Energy Organization Act", 1977
- Public Law 108-153, "21st Century Nanotechnology Research and Development Act 2003"
- Public Law 109-58, "Energy Policy Act of 2005"
- Public Law 110-69, "America COMPETES Act of 2007"
- Public Law 111-358, "America COMPETES Act of 2010"

Fossil Energy Research and Development

($K)			
FY 2013 Current	**FY 2014 Enacted**	**FY 2014 Current**	**FY 2015 Request**
498,715	561,931	561,931	475,500

Overview

The Office of Fossil Energy (FE) advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels which are essential to our Nation's security and economic prosperity. FE leads Federal research, development, and demonstration efforts on advanced carbon capture, and storage (CCS) technologies to facilitate achievement of the President's climate goals. FE also develops technological solutions for the prudent and sustainable development of our unconventional domestic resources. These Fossil Energy Research and Development (FER&D) programs create public benefits by 1) performing and managing research that reduces market barriers to the environmentally sound use of fossil fuels, 2) partnering with industry and others to advance fossil energy technologies toward commercialization, and 3) supporting the development of information and policy options that benefit the public.

Highlights and Major Changes in the FY 2015 Budget Request

In FY 2015, Fossil Energy Research and Development will continue to focus on carbon capture and storage and activities that increase the efficiency and availability of systems integrated with CCS.

CCS Demonstrations

In FY 2015, the $25 million requested would be competed to fund work that directly demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.

Carbon Capture/Storage

The request decreases funding for Carbon Capture by (-$15,000) while maintaining priority on post-combustion and pre-combustion capture for fossil fuel-fired plants. The requested funding for post combustion capture (-$15,000 continues to support the transition and scale-up of multiple, advanced CO_2 capture technologies up through large-scale pilot projects (10+ MWe) to validate performance and operation. Funding for Carbon Storage activities are decreased (-$28,682) while continuing the Storage Infrastructure activities on large-scale injection operation and monitoring activities and supporting small-scale field projects for other geologic storage formation classes. Funding for Geologic Storage Technologies is decreased while continuing to focus on understanding risks and addressing geo-mechanical impacts such as induced seismicity.

Advanced Energy Systems

In FY 2015, the funding request enables the program to continue the development of pressurized oxy-combustion and chemical looping combustion pilot-scale systems, materials engineering design for hydrogen turbines, and advanced gasification technology components such as oxygen membranes, warm gas cleanup and hydrogen separation at bench through pilot-scale. In addition, the request supports research on durable SOFC materials. The AES mission is to increase the availability and efficiency of fossil energy systems integrated with CO_2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, oxy-combustion, advanced turbines, and other energy systems.

Cross-Cutting Research

In FY 2015, Cross Cutting Research supports fundamental work in modeling and simulation, materials, water-energy nexus, grid technologies, sensors and controls, and university research. These activities serve as the scientific foundation for RD&D of technologies at various stages of development within Carbon Capture, Carbon Storage, and Advanced Energy Systems. The request increases the amount for Coal Utilization Science by (+$14,850), including Computational System Dynamics and the Focus Area for Computational Energy Science. This funding level will support the Carbon Capture Simulation Initiative (CCSI) to facilitate more rapid development and commercialization of capture technologies, and Grid Tech to enable fossil-based facilities to better integrate with advanced grid technologies.

Natural Gas Impacts

The increase in funding for Gas Hydrates will allow for the progression from laboratory and modeling-based research to field based projects. These public sector-led efforts will evaluate the occurrence, nature, and behavior of naturally occurring gas hydrates and the resulting resource, hazard, and environmental implications.

Fossil Energy Research and Development
Funding by Congressional Control ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Adjustments	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Coal						
CCS Demonstrations						
Natural Gas Carbon Capture and Storage	0	0	0	0	25,000	25,000
CCS and Power Systems						
Carbon Capture	63,725	92,000	0	92,000	77,000	-15,000
Carbon Storage	106,745	108,766	0	108,766	80,084	-28,682
Advanced energy systems	92,438	99,500	0	99,500	51,000	-48,500
Cross-cutting research	45,618	41,925	0	41,925	35,292	-6,633
NETL Coal Research and Development	33,338	50,011	0	50,011	34,031	-15,980
Total, CCS and Power Systems	**341,864**	**392,202**	**0**	**392,202**	**277,407**	**-114,795**
Total, Coal	**341,864**	**392,202**	**0**	**392,202**	**302,407**	**-89,795**
Natural Gas Technologies	**13,865**	**20,600**	**0**	**20,600**	**35,000**	**14,400**
Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies	**4,621**	**15,000**	**0**	**15,000**	**0**	**-15,000**
Program Direction	**114,201**	**120,000**	**0**	**120,000**	**114,202**	**- 5,798**
Plant & Capital Equipment	**15,982**	**16,032**	**0**	**16,032**	**15,294**	**-738**
Fossil Energy Environmental Restoration	**7,515**	**5,897**	**0**	**5,897**	**7,897**	**2,000**
Special Recruitment Programs	**667**	**700**	**0**	**700**	**700**	**0**
Subtotal, Fossil Energy R&D	**498,715**	**570,431**	**0**	**570,431**	**475,500**	**-94,931**
Use of Prior Year Balances	0	-8,500	0	-8,500	0	8,500
Total, Fossil Energy R&D	**498,715**	**561,931**	**0**	**561,931**	**475,500**	**-86,431**
Federal FTEs[2]	**671**	**655**	**0**	**655**	**651**	**-4**

SBIR/STTR:

- FY 2013 Transferred: SBIR: $8,393; STTR: $1,088
- FY 2014 Projected: SBIR $9,892; STTR: $1,413
- FY 2015 Request: SBIR $8,221; STTR: $1,131

[1] Funding reflects FY 2013 SBIR/STTR funds which were transferred from FER&D to Science.

[2] Includes Federal FTEs in the following Programs: NETL Coal Research and Development (FY 2013 Current: 195, FY 2014 Enacted: 192, FY 2015 Request: 189) and Program Direction (FY 2013 Current: 671, FY 2014 Enacted: 655, FY 2015 Request: 651).

Coal

Overview

The mission of the CCS and Power Systems R&D activities is to support secure, affordable, and environmentally acceptable near-zero emissions fossil energy technologies. This will be accomplished via research, development, and demonstration to improve the performance of advanced CCS technologies. Commercial availability of CCS technologies will provide an option to use fossil fuel resources to provide energy and meet the President's climate goals.

The Department's September 2011 Quadrennial Technology Review (QTR) outlined three challenges, energy security, environmental protection, and economic competitiveness to which FE's Coal Program aligns its activities: 1) Deploy the Technologies that have significant technical headroom, yet could be demonstrated at commercial scale within a decade and 2) Discover the New Solutions We Need like technologies that could have a consequential impact on meeting national energy goals in two decades, and 3) technologies that could be expected to be adopted by the relevant markets, understanding that these markets are driven by economics shaped by public policy.

The Clean Coal Power Initiative (CCPI) program has provided government co-financing for new coal technologies that have helped utilities cut sulfur, nitrogen and mercury pollutants from power plants and aims to reduce greenhouse gas emissions by boosting plant efficiencies and capturing and storing carbon dioxide. The CCPI was initiated in 2002 to advance a broad spectrum of promising technologies. Through three solicitations, many projects were selected and developed. There are currently four active CCPI projects remaining. Of these, three projects are under development and one is completing construction activities and plans to be operational in CY14.

In addition to the CCPI program, FER&D manages two American Recovery and Reinvestment Act CCS demonstration programs: FutureGen 2.0 and the Industrial Carbon Capture and Storage program. FutureGen 2.0 represents the world's first commercial-scale repowering effort with oxy-combustion technology to capture and store approximately one million metric tons of CO2 per year. FutureGen is currently under development. The ICCS addresses CO2 emissions from the industrial sector that accounts for approximately one-quarter of total U.S. emissions. While the ICCS program encompasses a broad range of projects and technologies, CCS Demonstrations include only the large-scale demonstrations performed by Air Products, Archer Daniels Midland (ADM), and Leucadia. Air Products' CO2 capture and storage project applied to hydrogen production is currently operational and plans to achieve the cumulative storage of over 1,000,000 metric tons of CO2 during FY 2014. The ADM and Leucadia projects are currently under development.

The ability to demonstrate advanced technologies at scale that have been developed in the FER&D or other R&D programs is an important benefit of the demonstration programs. In addition, successful completion of the existing projects will help in meeting the President's broad national energy goal for reducing greenhouse gas emissions by 17 percent by 2020 and 83 percent by 2050, from a 2005 baseline.

Highlights of the FY 2015 Budget Request

Natural Gas Carbon Capture and Storage Demonstration

In FY 2015, the $25 million requested would be competed to fund work that demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.

Advanced Energy Systems (AES)

In FY2015, the funding request enables the program to continue the development, through design and construction, of pressurized oxycombustion and chemical looping combustion pilot-scale systems. Continue development of materials and engineering design for hydrogen turbines. Continue advanced gasification technology component development such as oxygen membranes, warm gas cleanup and hydrogen separation at bench through pilot-scale. Initiate core technology effort in the SOFC Program to focus on durable SOFC materials. The AES mission is to increase the availability and efficiency of fossil energy systems integrated with CO_2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, oxy-combustion, advanced turbines, and other energy systems.

Carbon Capture

In FY 2015, the funding request increases support for up to 3 pilot scale projects testing advanced carbon capture technologies from natural gas power systems. The request reduces funding for post-combustion capture from fossil fuel - fired systems. This funding allows continued scale-up of advanced technologies up through large-scale pilot tests (10MWe+) that will focus on addressing the key issues of lowering the cost of carbon capture and reducing the energy

penalty. Additionally, funding continues to support R&D of promising transformational technologies such as those previously developed by ARPA-E and the EFRCs.

Carbon Storage

Funding for Carbon Storage continues to focus on Storage Infrastructure efforts such as those by the RCSPs and other small and large-scale field tests to validate the long-term permanent storage of CO_2, and existing and novel technologies to provide the necessary knowledge and data to support regulatory requirements. The request also continues critical core R&D efforts that will lower the cost of geologic storage and monitoring of $CO_2$and supports small-scale characterization and field projects in offshore and onshore unconventional reservoirs.

Cross-Cutting Research

The funding will allow for R&D efforts in the Sensor and Controls, Materials and the Nation Risk Assessment Partnerships (NRAP) and Carbon Capture Simulation Initiative (CCSI) programs. Funding for CCSI will continue sorbent based models for capture technologies. Funding for NRAP will continue model development for quantifying risk profiles associated with long-term storage of CO_2 within saline reservoirs with three National Laboratories.

Coal
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Coal					
CCS Demonstrations					
Natural Gas Carbon Capture and Storage	**0**	**0**	**0**	**25,000**	**+25,000**
Total, CCS Demonstrations	**0**	**0**	**0**	**25,000**	**+25,000**
CCS and Power Systems					
Carbon Capture					
Post-Combustion Capture Systems	51,336	80,000	80,000	65,000	-15,000
Pre-Combustion Capture Systems	12,389	12,000	12,000	12,000	0
Total, Carbon Capture	**63,725**	**92,000**	**92,000**	**77,000**	**-15,000**
Carbon Storage					
Storage Infrastructure (formerly Regional Carbon Sequestration Partnerships)	76,961	71,866	71,866	60,084	-11,782
Geologic Storage Technologies	13,845	16,300	16,300	8,500	-7,800
Monitoring, Verification, Accounting, and Assessment	6,229	10,000	10,000	4,500	-5,500
Carbon Use and Reuse	719	800	800	0	-800
Focus Area for Carbon Sequestration Science	8,991	9,800	9,800	7,000	-2,800
Total, Carbon Storage	**106,745**	**108,766**	**108,766**	**80,084**	**-28,682**
Advanced Energy Systems					
Advanced Combustion Systems	14,790	18,500	18,500	15,000	-3,500
Gasification Systems	36,051	36,000	36,000	22,000	-14,000
Hydrogen Turbines	13,866	15,000	15,000	11,000	-4,000
Coal and Coal Biomass to Liquids	4,621	5,000	5,000	0	-5,000
Solid Oxide Fuel Cells	23,110	25,000	25,000	3,000	-22,000
Total, Advanced Energy Systems	**92,438**	**99,500**	**99,500**	**51,000**	**-48,500**
Cross-cutting Research					
Plant Optimization Technologies					
Sensors and Controls	12,629	6,525	6,525	4,542	-1,983
Cross-cutting Materials R&D	0	500	500	1,500	1,000
Advanced Ultrasupercritical	0	5,000	5,000	500	-4,500
Water Management R&D	0	5,000	5,000	500	-4,500

[1] Funding reflects the transfer of SBIR/STTR from Coal to Science.

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Subtotal Plant Optimization Technologies	**12,629**	**17,025**	**17,025**	**7,042**	**-9,983**
Coal Utilization Science					
Computational System Dynamics	10,907	9,500	9,500	11,800	2,300
Focus Area for Computational Energy Science	12,386	9,500	9,500	11,750	2,250
Subtotal Coal Utilization Science	**23,293**	**19,000**	**19,000**	**23,550**	**4,550**
Energy Analyses					
Environmental Activities	428	450	450	450	0
Technical and Economic Analyses	476	500	500	400	-100
System Analysis/Product Integration	3,807	0	0	0	0
Subtotal Energy Analyses	**4,711**	**950**	**950**	**850**	**-100**
University Training and Research					
University Coal Research	2,774	2,500	2,500	2,000	-500
HBCU's, Education, and Training	925	1,100	1,100	750	-350
Subtotal University Training and Research	**3,699**	**3,600**	**3,600**	**2,750**	**-850**
International Activities					
Coal Technology Export	619	650	650	500	-150
International Program Support	667	700	700	600	-100
Subtotal International Activities	**1,286**	**1,350**	**1,350**	**1,100**	**-250**
Total, Cross-cutting Research	**45,618**	**41,925**	**41,925**	**35,292**	**-6,633**
NETL Coal Research and Development	**33,338**	**50,011**	**50,011**	**34,031**	**-15,980**
Total, CCS and Power Systems	**341,864**	**392,202**	**392,202**	**277,407**	**-114,795**
Total, Coal	**341,864**	**392,202**	**392,202**	**302,407**	**-89,795**

SBIR/STTR:

- FY 2013 Transferred: SBIR: $7,909; STTR: $1,025
- FY 2014 Projected: SBIR: $8,954; STTR: $1,280
- FY 2015 Request: SBIR $7,267: STTR: $1,000

Coal
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
CCS Demonstrations: Natural Gas CCS supports work that demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.	**+25,000**
CCS and Power Systems	
Carbon Capture: Post-Combustion (-$15,000) continues to pursue advanced technology development of post- and pre-combustion capture for fossil fuel-fired plants. Funding will support the transition of some advanced CO_2 capture technologies up through large-scale slipstream tests (10+ MWe) and continue the development of transformational capture technologies (e.g., those previously pursued by the ARPA-E and EFRC programs) at laboratory and bench-scale.	**-15,000**
Carbon Storage Storage Infrastructure (Formerly Regional Carbon Sequestration Partnerships) (-$11,782) continues funding for key Storage Infrastructure projects such as the Regional Carbon Sequestration Partnerships (RCSPs) and supports characterization and small-scale field projects for offshore and unconventional geologic reservoirs. Funding continues to support Core R&D areas such as geologic storage and monitoring, verification, and accounting technologies, but defers funding for CO_2 Use and Reuse to the outyears. Geologic Storage (-$7,800) Continues funding for projects focused on understanding of geomechanical effects/induced seismicity, and natural system leakage detection and intervention (Monitoring, Verification, Accounting, Assessment (-$5,500) Funding supports only existing projects. (Focus Area for Carbon Sequestration Science (-$2,800) Prioritizes funding for current research needs.	**-28,682**
Advanced Energy Systems: Advanced Combustion Systems (-$3,500) will enable the program to continue the development, through design and construction, of pressurized oxy-combustion and chemical looping combustion pilot-scale systems. Gasification Systems (-$14,000) allows continued support of development of advanced oxygen production, dry feed technologies for low rank coal use, warm-gas cleanup, and hydrogen separation. Hydrogen Turbines (-$4,000) will accommodate a phase-in of component development activities for high pressure ratio and high temperature turbine technologies. Coal and Coal Biomass to Liquids (-$5,000) will continue collaboration with the DOD, but no funds are requested in FY 2015 for this activity. Solid Oxide Fuel Cells (-$22,000) will narrow the focus to materials research essential to commercial viability.	**-48,500**
Cross-cutting Research and Development: For Plant Optimization Technology (-$9,983) the requested funding level will continue to support the current scope of activities. The requested in the Coal Utilization Science ($4,550) area where work will be done to deploy tools to assess and verify 99% storage permanence for a variety of sites and basins. Work will also be done to demonstrate 25% reduction in uncertainty for risk management.	**-6,633**

	FY 2015 vs FY 2014 Enacted
NETL Coal Research and Development: The reduction in the NETL Coal R&D budget line is two-fold. The FY 2014 Enacted amount included $15,000 to perform an assessment and analysis of the feasibility of economically recovering rare earth elements and coal byproduct streams, such as fly ash, coal refuse, and aqueous effluents. This area is not included in the FY 2015 request. Also, the amount requested for the on-going portion of this budget line is reduced by $980 due to a reduction in contractor support and the monitoring of new hires in support of the in-house research and development operations.	**-15,980**
Total CCS and Power Systems	**-114,795**
Total, Coal	**-89,795**

CCS Demonstrations
Natural Gas Carbon Capture and Storage

Description
In FY 2015, the $25 million requested would be competed to fund work that demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.

Natural Gas Carbon Capture and Storage

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Natural Gas Carbon Capture and Storage		
No funding was requested in FY 2014.	Requested amount would be competed to fund work that demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.	Requested funding level is needed for work to support the demonstration.

CCS and Power Systems
Carbon Capture

Description

The Carbon Capture activity is focused on the development of post-combustion and pre-combustion CO_2 capture and compression technologies for new and existing fossil fuel-fired power plants and industrial sources. Post-combustion CO_2 capture technology R&D is focused on capturing CO_2 from flue gas after the fuel has been consumed/combusted. Pre-combustion CO_2 capture is applicable to systems that capture and separate the CO_2 from mixed gas streams prior to combustion or utilization of the gas.

Post-Combustion Capture Systems

The Post-Combustion subactivity focuses specifically on developments related to 2nd generation technologies that can achieve CO_2 capture at $40/tonne CO_2 capture cost for new and existing fossil fuel-fired power plants. 2nd generation technologies are those that are not currently in commercial application at any scale or level of integration, but have potential to improve the efficiency or reliability of carbon capture processes. Significant improvements in both cost and efficiency of CO_2 separation and compression will be required to achieve this goal. Critical R&D milestones have been achieved by laboratory- through pilot-scale testing of a broad spectrum of CO_2 capture approaches including advanced solvents, sorbents, and membranes since 2008; and initiation of multiple, small-scale (0.5-1 MWe) slipstream tests of the most promising of these CO_2 capture technologies that began in 2010. FY 2015 activities continue support of second generation and transformational technologies for fossil fuel-fired plants, and initiation of larger-scale pilot tests of advanced post-combustion capture concepts and components.

Pre-Combustion Capture Systems

The Pre-Combustion subactivity focuses on development of 2nd generation and transformational technologies for pre-combustion capture that achieve CO_2 capture at $40/tonne removed CO_2 capture cost. Significant improvements are required to reduce parasitic energy load and cost, and many technologies that are available in the near-term have not been scaled up or applied to fossil fuel-powered generation systems. FY 2015 funding continues the support of laboratory, bench, and small slipstream-scale tests of 2nd generation and transformational technologies, such as advanced solvents, sorbents, and membranes, including process intensification efforts which incorporate two or more technology concepts.

Carbon Capture

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Post-Combustion Capture Systems		
• Complete construction and begin field testing of up to five bench-scale slipstream projects. • Begin design of small pilot-scale slipstream post-combustion capture projects. • Continue funding for the National Carbon Capture Center to support testing of DOE and industrial sponsored projects at bench-scale to small pilot-scale on actual flue gas.	• Continue field testing of up to five bench-scale slipstream projects. • Plan to complete design and begin construction of small pilot-scale slipstream projects selected in FY 2014. • Solicit and award at least one large pilot-scale project for post-combustion capture.	Continue scale-up of 2nd generation technologies through large-scale pilot projects and laboratory and bench-scale testing of transformational technologies for fossil-fuel-fired plants. This will include additional projects selected from competitive solicitation including at least one large scale pilot project for a 2nd generation capture. The scale and number of projects is dependent on the research and development and solicitation submittals in FY 2014.
Pre-Combustion Capture Systems		
• Continues advanced laboratory scale and small slipstream R&D for FY 2014 awarded pre-combustion capture projects. • Continue funding for the National Carbon Capture Center to support testing of DOE and industrial sponsored projects at bench-scale on actual synthesis gas.	• Continue to support laboratory and bench scale projects selected in FY 2014 which are focused on developing advanced pre-combustion capture technologies. Solicit and award small pilot-scale projects for advanced pre-combustion capture technologies	Activities continued the support and testing of advanced pre-combustion capture slipstream projects through support of the national carbon capture center and solicitations focused on scaling up advanced technologies to the small pilot scale. The scale and number of projects is dependent on results from FY 2014 activities.

CCS and Power Systems
Carbon Storage

Description
The overall goal of the Carbon Storage Program is to develop and validate technologies to ensure safe and permanent geologic storage of captured CO_2. Development and validation of these technologies is critical to ensure industry and regulatory agencies have the capability to assess, monitor and mitigate storage risks for CO_2 onshore and offshore and ensure the viability of carbon storage as an effective technology solution that can be implemented on a large-scale to mitigate carbon emissions. Applied R&D and field projects are being conducted in five primary storage types (saline formations, oil and natural gas reservoirs, unmineable coal seams, basalts, and organic shales) in geologic reservoirs across eleven different geologic storage formation classes. Technologies developed and validated through the Carbon Storage Program will improve storage efficiency and reduce the overall cost of CCS with a goal of ensuring the cost effective ability to ensure 99 percent storage permanence of injected CO_2 in all storage types while minimizing the environmental footprint of carbon storage activities.

Storage Infrastructure (formerly Regional Carbon Sequestration Partnerships)
In FY 2015 the Regional Carbon Sequestration Partnership (RCSPs) sub-activity will be renamed Storage Infrastructure to better represent the characterization and field activities that occur in the RCSPs and other small and large-scale field projects in a variety of geologic reservoirs in onshore and offshore settings.

The Storage Infrastructure sub-activity focuses on development and validation of technologies, infrastructure, and human capital through the RCSPs and other small- and large-scale field projects. These field projects conduct regional and site-specific characterization and validation; simulation and risk assessment; and application of monitoring, verification, accounting and assessment (MVAA) technologies for various storage reservoirs. They aim to improve our understanding of CO_2 injection, fluid flow and pressure migration, and geomechanical and geochemical impacts from CO_2 injection, and develop a "commercial toolbox" for cost-effective monitoring in all storage types. These field projects are critical to ensuring deployment of safe and permanent storage and monitoring.

Field projects conducted under this technology area are implemented in three phases: (i) Regional and Site Characterization; (ii) Site Development and Injection Operations; and (iii) Post-Injection Monitoring Operations. Regional characterization activities are focused on identifying regional opportunities for CCS, CO_2 sources, and priority opportunities for field sites. Site characterization evaluation builds on previous characterization with greater detail to ensure a field project site is qualified with suitable geologic characteristics for safe injection and post-injection operations. Both small- and large-scale field projects can integrate CO_2 capture, transportation, injection, and storage such that it can be achieved safely and permanently. As part of the field projects, project developers and regulatory agencies are addressing regulatory and public outreach and education issues associated with carbon storage. Resource assessment is also a critical component of this effort, regional understanding of storage types and estimated storage potential aids in the development of carbon mitigation plans and provides the foundation for first-mover projects. All of this information is made available to the public through the DOE's NATCARB geographic information system, Best Practices Manuals and updates to the Carbon Storage Atlas.

Geologic Storage Technologies
The Geologic Storage Technologies sub-activity is focused on developing and validating storage and simulation and risk assessment technologies that have the potential to safely, permanently, and cost effectively store CO_2 in geologic reservoirs for onshore and offshore project settings. This area involves developing technologies to: ensure well integrity, CO_2 resistant construction materials and novel well completions; detect, mitigate, and identify potential CO_2 leakage pathways; assess and manage fluid flow, pressure and water at field and basin-scale; and assess and minimize negative geochemical and geomechanical processes and impacts at field and basin-scale. The simulation and risk assessment models integrate storage technologies with field operations for CO_2 flow and trapping mechanisms, geochemical changes, and geomechanical impacts within the geologic formations reducing potential risks and providing the foundation for future MVAA plans. These technologies assist in assessing and mitigating potential storage risk while maintaining the integrity of the storage operations to ensure 99 percent storage permanence and optimizing storage capacity.

Monitoring, Verification, Accounting and Assessment
The Monitoring, Verification, Accounting, and Assessment (MVAA) sub-activity focuses on developing robust technologies to monitor the transport and fate of injected CO_2. MVAA technologies are necessary to address safety and environmental

concerns; verify CO_2migration to meet regulatory requirements; and account for greenhouse gas (GHG) emissions mitigation. Technologies being developed and validated in onshore and offshore field projects improve our ability to monitor CO_2 at atmospheric, near-surface and subsurface levels for integration into an intelligent monitoring system. Research focuses on developing technologies such as advanced optical detection, remote sensing and spatial averaging over large field areas; real-time monitoring; advanced geophysical techniques; and integrated autonomous intelligent monitoring systems. These technological advances improve our ability to ensure 99 percent storage permanence and optimize storage capacity.

Carbon Use and Reuse

The Carbon Use and Reuse subactivity focuses on technologies, other than enhanced hydrocarbon recovery, that have the potential to reduce CO_2 emissions by developing beneficial uses for the CO_2. These beneficial uses include the conversion of CO_2 to chemicals, plastics, building materials, and curing for cement. To focus on addressing the key challenges associated with geologic storage, no funding is requested for this area of research in FY 2015.

Focus Area for Carbon Sequestration Science

The Focus Area for Carbon Sequestration Science supports the Carbon Storage Program through targeted research needs identified to support program activities and technology validation in field projects. Activities in this area focus on:

(1) Reservoir and seal performance
(2) Geologic storage site optimization and operations
(3) Reservoir capacity and storage efficiencies
(4) Integrated reservoir modeling and monitoring technologies
(5) Resource assessment and geospatial data management
(6) CO_2 use, re-use and conversion

Carbon Storage

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Storage Infrastructure (formerly Regional Carbon Sequestration Partnerships)		
• Continue implementation of eight large-scale field projects that will cumulatively inject 5 million metric tons of CO_2 since 2009 to evaluate methodologies and validate technologies at the large-scale to demonstrating safe and permanent storage. In FY 2014, 6 sites will be actively injecting, and 2 sites preparing for injection. • Continue three existing small-scale field tests to evaluate methodologies and validate technologies (geologic storage, risk assessment, simulation and MVAA) to ensure safe permanent storage of CO_2. • Issue solicitation and select up to 12 projects to evaluate CO_2 storage in enhanced oil recovery (EOR) fields/operations or improved EOR technologies to increase storage efficiency.	• FY 2015 plans are to continue implementation of eight large-scale field projects that will cumulatively inject 6 million metric tons of CO_2 since 2009 to evaluate methodologies and validate technologies at the large-scale to demonstrating safe and permanent storage. In FY 2015, one additional large-scale project plans to initiate injection. • Continue support to the three existing small-scale field tests to evaluate methodologies and technologies to ensure safe permanent storage of CO_2. • Issue solicitation and select up to three offshore storage site characterization projects. • Issue solicitation and select up to three additional small-scale injection field projects or one large-scale field project to address key technical research issues (storage capacity, injectivity, and containment) associated with carbon storage. • Projects selected in FY 2014 to evaluate CO_2 storage in enhanced oil recovery (EOR) fields/operations or improved EOR technologies to increase storage efficiency will continue under existing FY 2014 funding.	Funding maintains current path for continuation of RCSP large-scale field projects and three existing small-scale field tests. Allows storage characterization and field projects for offshore and additional onshore small-scale field projects in geologic reservoirs. The scale and number of projects is dependent on the research and development and solicitation submittals in FY 2014. No funding is planned in FY 2015 for CO_2 storage in EOR fields or for improved EOR technologies to increase storage efficiency.
Geologic Storage Technologies		
• Continue applied R&D projects focused on development and validation of tools and technologies that assess and mitigate storage risk. • Issue solicitation and select five to nine projects to evaluate geomechanical effects (e.g., induced seismicity), seal behavior, and fluid/pressure fronts in fractured reservoirs.	• Continue applied R&D projects focused on development and validation of tools and technologies that assess and mitigate storage risk. • Continue projects selected from the FY 2014 solicitation to evaluate geomechanical effects (e.g., induced seismicity), seal behavior, and fluid/pressure fronts in fractured reservoirs	Depending on the progress and outcome of FY 2014 research, the FY 2015 funding level focuses resources on current activities that are conducting initial development of the most promising tools and technologies to deliver safe and permanent storage options for CO_2.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Monitoring, Verification, Accounting and Assessment		
• Continue existing applied R&D focused on tools and technologies for accurate, high-resolution measurement of CO_2 saturations, plumes and pressure fronts; and identification of potential or actual CO_2 leakage pathways.	• Continue funding existing applied and lab-scale R&D projects developing advanced tools and technologies to improve resolution and better track plume migration and optimize storage efficiency cost effectively. • Prepare for field validation phase of tools and technologies for accurate, high-resolution measurement of CO_2 saturations, plumes and pressure fronts; and identification of potential or actual CO_2 leakage pathways.	Depending on the progress and outcome of FY 2014 research, FY 2015 request continues funding for R&D projects and initiate preparation for field validation tests. Reduced funding maintains priority on targeted program research on most successful monitoring, verification and accounting and assessment projects.
Carbon Use and Reuse		
• Continue existing applied R&D projects selected from prior solicitation.	• Plan is to complete existing applied R&D projects.	No new projects. Existing projects are funded with prior year obligations and planned to be completed in FY 2015.
Focus Area for Carbon Sequestration Science		
• Continue funding existing focused R&D in identified targeted areas: 1) multiphase flow; (2) fundamental processes and properties of geologic storage; (3) development and refinement of modeling methodologies; (4) modeling and development of tools to investigate coupled effects and predict location of leakage and verify storage permanence, as well as enhance integration and interpretation of MVAA data; (5) resource and geospatial data resources and management; (6) fundamental science and engineering support of novel CO_2 use, re-use and conversion.	• Continue funding existing projects addressing targeted research needs from FY 2014 activities: 1) Reservoir and seal performance; 2) Geologic storage site optimization and operations; 3) Reservoir capacity and storage efficiencies; 4) Integrated reservoir modeling and monitoring technologies; 5) Resource assessment and geospatial data management; and 6) CO_2 use, re-use and conversion.	The funding level reflects refocused efforts on targeted key technical challenges (e.g., shifted one MVA effort from CO_2 and pressure plume monitoring to reservoir and seal performance, mechanical and pressure) identified in FY 2014.

CCS and Power Systems
Advanced Energy Systems

Description
The Advanced Energy Systems (AES) mission is to increase the availability and efficiency of fossil energy systems integrated with CO_2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, oxy-combustion, advanced turbines, and other energy systems. While the primary focus is on coal-based power systems, improvements to these technologies will result in positive spillover benefits that also reduce the cost of converting other carbon-based materials, such as biomass, petcoke or natural gas, into power and value-added products in an environmentally-acceptable manner.

Advanced Combustion Systems
This sub-activity focuses on development of advanced combustion technologies, such as pressurized oxy-combustion and chemical looping processes, which have the potential to achieve $40/tonne CO_2 capture cost. These advanced technologies are applicable to new and existing power plants. Advanced Combustion Systems also focuses on high performance materials R&D activities to validate the performance of the alloys developed in the Cross-Cutting Materials R&D through application in ultrasupercritical and oxy-combustion power plant environments which operate at significantly higher temperatures and pressures relative to current technologies.

Gasification Systems
This sub-activity focuses on technology developments to increase gasification efficiency and availability to improve the performance of systems that convert fossil fuels to electricity and marketable by-products. Research activities aim to increase, through design and plant integration, the efficiency of fuel and oxygen feed to IGCC power systems with CO_2 capture; improve high-pressure solid feed systems to enable use of low-rank coals in high-pressure gasifiers, facilitate co-feeding of coal with biomass or waste; encourage more efficient high-pressure operation of dry feed gasifiers; and, further develop Ion Transport Membrane (ITM) technology to lower the capital requirements of oxygen production resulting in more efficient IGCC plants. In addition, this sub-activity supports development of durable refractory materials, creates models to better understand the kinetics and particulate behavior of fuel inside a gasifier, and develops solutions to mitigate the plugging and fouling of syngas coolers.

A major cost element in gasification plants is converting raw syngas into a pure and specific gas used to create the plant's output of electricity and other byproducts. High hydrogen, low methane syngas is versatile and can be used for power production with CO_2 capture, fuels or chemicals production, and for many polygeneration applications. The technologies being developed improve the efficiency of moderate to high temperature processes and clean syngas of all contaminants.

Hydrogen Turbines
The Hydrogen Turbines sub-activity focuses on the development of turbine component technologies capable of withstanding the high temperatures and aggressive environments that are predicted for high-hydrogen content syngas combustion. Current activities support development of key turbine system components capable of achieving a 4-5 percentage point efficiency increase relative to existing combined cycle turbines. Specifically, research focuses on rig testing of materials and components to be used in commercial scale machines, including combustor components, rotating parts, and cooling systems. These technologies will reduce interstage leakage via improved sealing designs, optimize airfoil heat flux with reduced cooling flows, improve material architectures for higher temperature operation, and result in superior airfoils for more efficient expansion with higher throughput.

Hydrogen from Coal
No funding is requested for this activity.

Coal and Coal-Biomass to Liquids
No funding is requested for this activity.

Solid Oxide Fuel Cells
This sub-activity focuses on the research and development to enable the generation of efficient, cost-effective electricity from coal with near-zero atmospheric emissions of CO_2 and air pollutants and minimal use of water in central power generation applications that can be integrated with carbon capture and storage. FY 2015 activities will focus on advanced materials development.

Advanced Energy Systems

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Advanced Combustion Systems		
In FY 2014, activities include the initiation of bench scale testing of pressurized oxy-combustion and chemical looping technologies. Of the eight projects selected in the FY 2012 FOA work will focus on continuing the four most promising projects according to performance and other project merits.	In FY 2015, the program plans to initiate design and construction of pilot-scale projects focused on pressurized oxy-combustion and chemical looping combustion systems. The number of projects is dependent upon the results achieved in FY 2014.	Requested funding level is sufficient for planned pilot-scale development, design, and construction of 2nd generation capture technology including pressurized oxy-combustion and chemical looping combustion systems.
Gasification Systems		
In FY 2014, activities include the conclusion of an ammonia study associated with the RTI Warm Gas Cleanup Project, continued support of the construction of the 100 TPD ITM oxygen plant and R&D activities in coal dry feed systems and hydrogen membrane separation.	FY 2015 activities include: continuation of data generation from gasification systems at pilot-scale and syngas component testing; production testing of advanced oxygen system modules for use in large industrial application (500+ TPD); and the expansion of DOE-developed multiphase flow codes to include predictive means to optimize plant reliability.	The decrease in funding reflects the conclusion of key activities associated with the RTI and ITM projects in FY 2014. Requested funding level is sufficient to maintain stated level of activities.
Hydrogen Turbines		
In FY 2014, activities include the completion of component testing to demonstrate efficiency goals of Phase II of GE Hydrogen Turbine Project.	FY 2015 activities include: final component testing to demonstrate efficiency goals of Phase II of Siemens Hydrogen Turbine Project; testing of components in the new Aero-Thermal Rig developed under the NETL ORD; and solicitation and selection of projects focused on high temperature, high pressure combustion and materials development.	The decrease in funding reflects the conclusion of Phase II Hydrogen Turbine projects and the initiation of smaller scale projects focused on high temperature, high pressure combustion and materials development.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Coal and Coal-Biomass to Liquids		
The Coal and Coal/Biomass to Liquids program effort is focused on technologies to foster the commercial adoption of coal and coal/biomass gasification and the production of affordable liquid fuels and hydrogen with excellent environmental performance.	Complete existing projects funded with prior year obligations.	No funding is requested.
Solid Oxide Fuel Cells		
FY 2014 activities prioritize near-term CCS technologies through SECA Core Technology R&D. The program will solicit and select projects through new Core Technology and Industrial Team FOA.	FY 2015 activities will restart the SOFC Program to focus on durable SOFC materials development.	The requested funding reduction reflects the narrowed focus of the program to materials research on seals, anodes, and cathodes. The program will continue its focus on the current portfolio of 2nd generation technologies and limit the R&D efforts on transformational technologies.

CCS and Power Systems
Cross-cutting Research

Description

The Cross-cutting Research activity fosters the development of innovative systems for improving availability, efficiency, and environmental performance of advanced energy systems with carbon capture and storage. The Program serves as a bridge between basic and applied research by targeting concepts that offer the potential for transformational breakthroughs and step change benefits in the way energy systems are designed, constructed, and operated. This Cross-cutting research portfolio encompasses: 1) Sensors and Controls, 2) Advanced Materials, and 3) Computational sciences and Modeling. In addition, the Cross-cutting Research Program leads efforts that support University-based energy research including science and engineering education at minority colleges and universities.

Plant Optimization Technologies

Sensors, Controls and Other Novel Concepts

The Sensors & Control element focuses on the development of real time measurements critical to the operation and optimization of advanced power systems. The development of sensors focuses on measurements (temperature, pressure, and gas composition) that need to be made in the high temperature, high pressure, and/or corrosive environments of a power system or underground injection system (). Sensor development also includes technologies that are low cost, embeddable, or easily deployable for condition monitoring and system operation. Transformational research in process control and optimization centers on self-organizing information networks and distributed intelligence for decision making and the ability to optimize a highly integrated plant in real time. This area also explores other novel concepts such as direct power extraction concepts and the application of additive manufacturing towards constructing complex components (e.g. turbine blades) with embedded sensing capability.

Cross-cutting Material R&D

Cross-cutting Materials R&D encompasses the spectrum of fundamental materials design through qualification of functional materials that support the next generation of advanced power generation. New computational techniques are being developed to design materials that are needed for advanced combustion and gasification systems. This computational work decreases the time and cost to develop the new materials and is projected to lead to classes of improved high performance materials.

Advanced Ultra-supercritical Materials R&D

The Advanced Ultra-supercritical Materials research and development focuses on research and development to validate materials that support the technical and economic feasibility of Advanced-Ultra Supercritical, oxycombustion and gasification power generation. This work has shown to be essential for transitioning new materials (e.g. complete pre-competitive data generation/validation) and lays the ground work for commercialization of high performance materials in component technology. This ongoing work is not only enabling advance power plant development in the United States, but is also providing information that will develop the U.S. supply chain and help build a domestic manufacturing base.

Water Management R&D

The Water Management research and development focuses on optimizing the efficient use of water in energy production and electricity generation such as more efficient utilization of waste heat at power plants and advances in cooling systems to reduce water use. Research areas include use of non-traditional water, water recovery and reuse, waste heat recovery, and power plant water management through improved sensors, data collection, and information management.

Coal Utilization Science

Computational Systems Dynamics

The Computational System Dynamics element develops immersive, interactive visualization technology as well as data communication optimization methods to improve the design and operation of advanced power systems with carbon capture and sequestration. This element builds computer-aided design tools for the Advanced Energy Systems activity so that novel concepts can be explored and analysis can be conducted on pre-commercial systems. Furthermore, these tools will be used to optimize data handling and exploit information technology in the design of advanced energy systems with carbon capture. This element also supports a multi-laboratory initiative described as the National Risk Assessment Partnership (NRAP). NRAP harnesses the breadth of capabilities across the DOE national lab system to

develop defensible, science-based quantitative methodologies for determining risk profiles at carbon dioxide (CO_2) storage sites. These collaborative efforts will accelerate carbon capture and storage (CCS) development and support the goal to enable commercial deployment of CCS technologies by 2020.

Computational Energy Science

The Computational Energy Science element introduces first principal and physics based modeling of phenomenon for complex energy conversion and carbon capture processes. The element further supports tools and techniques to transform these computationally intensive models into reduced order and fast user enabled models for the purposes of study, development, and validation. Activities in this element include multi-scale, multi-physics simulation capabilities that couple fluid flow, heat and mass transfer, and complex chemical reactions for optimizing the design and operation of heat engines, combustors, gasifiers, chemical reactors, and other unit processes in advanced power generation systems. MFIX (Multiphase Flow with Interphase eXchanges) is a computer code developed at the National Energy Technology Laboratory (NETL) and used for describing the hydrodynamics, heat transfer and chemical reactions in fluid-solids systems. The code is used for testing and developing multiphase flow constitutive equations. The Carbon Capture Simulation Initiative focuses on capture technologies, risk assessment, and integrated multi-scale physics-based simulations designed to support the applied research conducted in the carbon capture activity. These activities are intended to accelerate carbon capture and storage development and to enable commercial deployment of carbon capture and storage technologies by 2020.

Energy Analyses

Environmental Activities

Analyses include potential environmental impacts (e.g., on water quality, air emissions, solid waste disposal, climate change) of fossil fuel use and large-scale deployment of different generations of CCS. Of particular interest are the life cycle environmental emissions for existing and advanced fossil fuel technologies.

Technical and Economic Analyses

The Technical and Economic Analyses element supports program strategic planning by identifying major challenges, technologies, and advanced concepts that have the potential to improve the efficiency, cost, and/or environmental performance of fossil energy systems. These analyses include technical and economic studies such as benefit cost analysis and CCS deployment projections.

University Training and Research

University Coal Research

The University Coal Research (UCR) program provides grants to colleges and universities to support research consistent with the goals of Fossil Energy and the Cross-cutting Research Program. Key research areas that will be supported include, but are not limited to, advanced power generation with carbon capture capability; computationally based initiatives; advanced high performance materials; novel sensing and control concepts; and advanced power cycle concepts. This element provides a two-fold benefit in directed energy research for the Department as well as provides for support the education and research capability of the next generation of scientists and engineers.

HBCU's Education and Training

The Historical Black Colleges and Universities (HBCU) and Other Minority Institutions (OMI) education and training program awards research grants to qualifying Universities and Institutions. The program targets research capability and education programs related to advanced energy systems with carbon capture and storage capability. This is an area consistent with the goals of Fossil Energy and the Cross-cutting Research Program. Key research areas include advanced power generation with carbon capture capability; computationally based initiatives; advanced high performance materials; novel sensing and control concepts; and advanced power cycle concepts. Grants awarded under this program are intended to maintain and upgrade educational, training and research capabilities of HBCUs/OMIs in the fields of science and technology, with project results being used to further DOE's commitment to Fossil Energy research.

International Activities

Coal Technology Export

The Coal Technology Export element works with international organizations to facilitate export of U.S. climate technology and energy services to the developing world. The element engages multilateral organizations including the

IEA, United Nations, WEC, and the Carbon Sequestration Leadership Forum while managing bilateral agreements with key countries such as China and India.

International Program Support

The International Program Support element supports FE's commitment to the International Energy Agency Clean Coal Center (IEACCC) to enhance the competitiveness and adoption of U.S. Clean Coal Technologies in targeted countries that will help protect the local and global environment. It will also preserve and enhance active relationships with national and international organizations by focusing on expanding cleaner energy technology power systems activities globally.

Cross-cutting Research

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Plant Optimization Technologies		
• Initiate study of 2nd. Gen fiber-based sensors; Laser based and micro sensors for real time detection; and harsh environment sensor packaging. • Initiate field testing of sensors and bench scale testing of advanced control methodologies. • Complete initial production and testing of high temperature (>800 °C) alloys. • Continue development of structural materials manufacturing processes and joining techniques for high temperature alloys. • Initiate research on water management improvements in thermoelectric systems and inform stakeholders of research results.	*Sensors and Controls* • Continue field testing of sensors and bench scale testing of advanced control methodologies. • Initiate research on advanced control technologies capable of self-organizing sensor networks for improved performance of complex power systems. *Cross-cutting Materials R&D* • Apply structural materials manufacturing processes and joining techniques for high temperature alloys to components for advanced power generation systems. • Develop materials capable of withstanding rapid ramping of thermoelectric power plant start-ups *Advanced Ultrasupercritical* • Verify materials capable of operating under advanced steam cycle conditions (760°C/5000 psi), and gas turbine performance to 1465°C. Assess increased plant efficiency and availability • Verify high temperature (>800 °C) alloy performance under advanced ultra supercritical conditions and other potential extreme environments for ASME Code performance. *Water Management R&D* • Integrate research activities on water management improvements in thermoelectric systems with a Department-wide research and development effort focused on identifying and mitigating challenges in water use and reuse.	*Sensors and Controls* • Requested funding level will continue to support scope of 2nd gen sensors and controls R&D activities and the current transformation technology R&D will be evaluated and only the most promising will be persuaded. *Advanced Ultrasupercritical* • Materials R&D, supply chain development will cease. *Water Management R&D* • Power plant water management will cease.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Coal Utilization Science		
• Complete reduced order reservoir models to predict pressures and saturation over time to within 10% of prediction from detailed models for major storage formation types and demonstrated on at least 2 actual storage formations. • Complete high fidelity multi-scale kinetic/diffusion model for amine based solid sorbents.	*Computational System Dynamics* • NRAP will initiate development of a basin component model (long-term behavior, ROM) • NRAP will initiate development of a wellbore component model (geomechanics, chemistry, valid/calibration, ROM) *Focus Area for Computational Energy Science* • CCSI will develop models for solving technical challenges in 2nd generation solid sorbent, solvent and oxy-combustion technologies • CCSI will develop toolset software infrastructure required for simulating 2nd generation technologies.	*Computational System Dynamics* • NRAP will develop Integrated Assessment Model Development with Monitoring and Mitigation for Risk-based Monitoring and Mitigation Protocols for Long-Term Carbon Storage. In addition the Area of Review (AoR) and Post-Injection Site Care (PISC) Risk-based Methodology and Tool Development for Induced Seismicity Protocol will be initiated. *Focus Area for Computational Energy Science* • CCSI will develop and deploy a 2nd gen CCSI Toolset to industry users to ensure that its capabilities are effectively utilized to accelerate the development of carbon capture.
Energy Analyses		
• Participate in DOE studies focusing on the role of fossil power plants and CCS in grid modernization.	• Carry out analyses of options and barriers for incorporating CCS on gas-fueled power plants.	Scope of activities will decrease.
University Training and Research		
• Select and award up to 14-18 university-based projects focused on oxy-combustion, sensors and controls, or monitoring, verification, and accounting technologies.	• Select and award up to 9-12 university-based projects focused on oxy-combustion, sensors and controls, or monitoring, verification, and accounting technologies.	Continue to support grants for university-based research, but 5 to 6 fewer grants will be awarded in FY 2015.
International Activities		
• Work through the Carbon Sequestration Leadership Forum (CSLF) Policy and Technical groups to promote activities and analysis to accelerate the international deployment of CCS.	• Organize the 2015 CLSF Ministerial featuring a significant increase in international policy initiatives.	Scope of activities will decrease.

CCS and Power Systems
NETL Coal Research and Development

Description
The on-going portion of this budget line supports the NETL staff directly associated with conducting in-house research activities for the Coal Research and Development programs. The in-house research and development activities are conducted by a staff of scientists, engineers, technicians and administrative personnel. NETL in-house research supports program specific activities in Carbon Capture, Carbon Storage, Advanced Energy Systems, and Cross-cutting Research. Funding also provides for travel, training, contractor support, and supplies/equipment to support the in-house R&D efforts.

NETL Coal Research and Development
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
NETL Coal Research and Development					
Salaries and Benefits	26,587	26,700	26,700	26,880	+180
Travel	1,172	1,000	1,000	1,000	0
Support Services	5,579	22,311	22,311	6,151	-16,160
Total, NETL Coal Research and Development	**33,338**	**50,011**	**50,011**	**34,031**	**-15,980**
Federal FTEs[1]	**195**	**192**	**192**	**189**	**-3**

[1] Federal FTEs are also in Program Direction (FY 2013 Current: 671, FY 2014 Enacted: 655, FY 2015 Request: 651).

NETL Coal Research and Development

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
NETL Coal Research and Development		
This funding directly supports the NETL staff associated with conducting in-house research activities for the Coal R&D programs. Funding also provides for travel, training, contractor support, and supplies/equipment to support the in-house R&D efforts. In the FY 2014 Enacted Omnibus Appropriations Act, $15M was provided to perform an assessment and analysis of the feasibility of economically recovering rare earth elements from coal and coal byproduct streams, such as fly ash, coal refuse, and aqueous effluents. Includes $15,000,000 to perform an assessment and analysis of the feasibility of economically recovering rare earth elements from coal and coal byproduct streams, such as fly ash, coal refuse, and aqueous effluents.	Request continues funding that directly supports the NETL staff associated with conducting in-house research activities for the Coal R&D programs. Funding will also provide for travel, training, contractor support, and supplies/equipment to support the in-house R&D efforts.	The reduction is two-fold. The FY 2014 Enacted amount included $15M to perform an assessment and analysis of the feasibility of economically recovering rare earth elements and coal byproduct streams, such as fly ash, coal refuse, and aqueous effluents. This area is not included in the FY 2015 request. Also, the amount requested for the ongoing portion of this budget line is reduced by $980K due to a reduction in contractor support and the monitoring of new hires in support of the in-house research and development operations.

CCS and Power Systems
Performance Measures

In accordance with the GPRA Modernization Act of 2010, the Department sets targets for, and tracks progress toward, achieving performance goals for each program. For more information, refer to the Department's FY 2013 Annual Performance Report.

	FY 2013	FY 2014	FY 2015
Performance Goal (Measure)	CCS Demonstrations - Initiate construction of CCS demonstration projects.		
Target	2 CCS projects initiated	1 CCS project initiated	1 CCS project initiated
Result	2 CCS projects initiated	Not applicable	Not applicable
Endpoint Target	Operations initiated at a minimum of five commercial scale CCS demonstrations by 2019 including the Clean Coal Power Initiative (CCPI), FutureGen 2.0, and the Industrial CCS Demonstration projects (funded by both annual appropriations and the American Recovery and Reinvestment Act). At least two of the five demonstrations to initiate operations by 2019 will be CCPI projects.[1]		
Performance Goal (Measure)	Carbon Capture and Advanced Energy Systems - Achieving the target shows the CCS & Power Systems program is continuing to make progress in meeting its goal of developing cost-effective, reliable CCS technologies for pre-combustion, post-combustion, and oxy-combustion capture applications.		
Target	55 $ per tonne CO2 Captured	53 $ per tonne CO2 Captured	51 $ per tonne CO2 Captured
Result	55 $ per tonne CO2 Captured	Not applicable	Not applicable
Endpoint Target	Advanced Energy Systems with CO2 capture at no more than $40 per tonne of CO2 captured by 2020.		
Performance Goal (Measure)	Carbon Storage - Inject CO_2 in large-volume field test sites to demonstrate the formations' capacity to permanently, economically, and safely store carbon dioxide.		
Target	4 MMTs injected (since 2009)	5 MMTs injected (since 2009)	6 MMTs injected (since 2009)
Result	4 MMTs injected (since 2009)	Not applicable	Not applicable
Endpoint Target	Inject 9.0 million metric tons of CO2 in large-volume field test sites representing different storage classes, since January 2009, to demonstrate and monitor for the formations' capacity to permanently, economically, and safely store carbon dioxide. A long-term goal is to ensure the cost effective ability to measure and account for 99 percent of injected CO2 in all storage types while minimizing the environmental footprint of carbon storage activities.		

[1] The endpoint target was previously 5 to 10 demonstrations up and running by 2016.

Natural Gas Technologies

Overview

The mission of the Natural Gas program is to support DOE missions in energy, environment, and national security. The Natural Gas Technologies program is comprised of three subprograms: Environmentally Prudent Development, Emissions Reductions from Midstream Natural Gas Infrastructure, and Gas Hydrates. Environmentally Prudent Development supports a multiagency research effort with Department of the Interior, and Environmental Protection Agency to address high-priority challenges to safe and prudent development of unconventional resources. Midstream Natural Gas Infrastructure will develop technologies and communicate results to stakeholders to mitigate methane emissions from natural gas transmission, distribution, and storage facilities. Gas Hydrates conducts research to evaluate the occurrence, nature, and behavior of naturally occurring gas hydrates and the resulting resource, hazard, and environmental implications.

Highlights of the FY 2015 Budget Request

The Natural Gas program will focus on continued implementation of priority collaborative research and development, together with EPA and DOI, to ensure that shale gas development is conducted in a manner that is environmentally sound and protective of human health and safety. In FY 2015, the Natural Gas program will continue implementation of the collaborative research plan in such areas as water quality, water availability, air quality, induced seismicity, and mitigating the impacts of development (e.g. wellbore integrity, improve environmental footprint, and reduce water use). The program will fund targeted subsurface characterization and mitigation research and development. In addition, the program will support life cycle analysis on water and unconventional oil and gas.

The Natural Gas program will initiate a midstream natural gas infrastructure subprogram focused on reducing methane emissions from the wellhead to the utility distribution system. In FY 2015, we plan to develop advanced cost-effective technologies and communicate results to stakeholders to mitigate methane emissions from natural gas transmission, distribution, and storage facilities.

The Natural Gas program, through public sector-led efforts, will also evaluate the occurrence, nature, and behavior of naturally occurring gas hydrates and the resulting resource, hazard, and environmental implications. In FY 2015, the program intends to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrate bearing areas. These public sector-led efforts will be designed to evaluate the occurrence, nature and behavior of naturally occurring gas hydrates and resulting resource, hazard, and environmental implications.

Natural Gas Technologies
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Natural Gas Technologies					
Environmentally Prudent Development (formerly Effective Environmental Protection)	9,244	12,600	12,600	15,300	+2,700
Emissions Mitigation from Midstream Infrastructure	0	0	0	4,700	+4,700
Gas Hydrates	4,621	8,000	8,000	15,000	+7,000
Total, Natural Gas Technologies	**13,865**	**20,600**	**20,600**	**35,000**	**+14,400**

SBIR/STTR:

- FY 2013 Transferred: SBIR $363: STTR: $47
- FY 2014 Projected: SBIR $543: STTR: $77
- FY 2015 Request: SBIR $954: STTR: $131

[1] Funding reflects the transfer of SBIR/STTR from Natural Gas Technologies to Science.

Natural Gas Technologies
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Environmentally Prudent Development (formerly Effective Environmental Protection): This subprogram was renamed "Environmentally Prudent Development" because the new name more accurately describes the work being conducted and consistent with the multiagency collaboration. The increase in funding for Environmentally Prudent Development (+$2,700) will allow continued implementation of the collaborative research on water quality and availability, air quality, induced seismicity, and mitigating the impacts of shale gas development, plus life cycle analysis on water and unconventional oil and gas.	**+2,700**
Emissions Mitigation from Midstream Infrastructure: (+$4,700) is necessary to initiate a midstream natural gas infrastructure program focused on reducing methane emissions from the wellhead to the utility distribution system.	**+4,700**
Gas Hydrates: The increase in funding for Gas Hydrates (+$7,000) will allow for the progression from laboratory and modeling-based research to include field-based scientific testing to evaluate the occurrence, nature and behavior of naturally occurring gas hydrates.	**+7,000**
Total, Natural Gas Technologies	**+14,400**

Natural Gas Technologies

Description

Environmentally Prudent Development (formerly Effective Environmental Protection)
The Environmentally Prudent Development subprogram will focus on the continued implementation of priority collaborative research and development, together with the EPA and DOI, to address high-priority challenges to safe and prudent development of unconventional resources. This collaborative research and development is consistent with recommendations from the White House's "Blueprint for a Secure Future" and the Secretary of Energy Advisory Board's (SEAB) August 2011" Shale Gas Production Subcommittee Ninety-day Report."

The Program will ensure that the Federal government's understanding of risks associated with oil and gas operations and unconventional gas keeps pace with advancements in production technology. This will be accomplished through scientific assessment of the risks, potential impacts, and adequacy of current stimulation prevention and mitigation technologies. By conducting research, in the public interest, to quantify the risks of hydraulic fracturing and other shale gas production techniques, DOE can bring a greater sense of confidence to the public and assist state authorities in crafting regulations that effectively mitigate risks.

The Natural Gas program will focus on continued implementation of the collaborative research plan in such areas as water quality, water availability, air quality, induced seismicity, and mitigating the impacts of development. The program will fund targeted subsurface characterization and mitigation research and development. In addition, the program will support life cycle analysis on water and unconventional oil and gas.

Emissions Mitigation from Midstream Infrastructure
Natural gas infrastructure emissions represented just over 12% of total US anthropogenic methane emissions and 51% of Natural Gas System related methane emissions in 2011 and totaled about 72 teragrams CO2 equivalent. The Department is committed to developing advanced cost-effective technologies to mitigate methane emissions from natural gas transmission, distribution, and storage facilities.

The focus of the new subprogram will be to improve emissions detection and mitigation technology and communicate results on methane emissions mitigation to stakeholders. The program contributes to the DOE Strategic Plan portfolio of low-carbon energy options to develop advanced technologies to better address fugitive methane emissions in support of the President's Climate Action Plan.

Gas Hydrates
The Gas Hydrates subprogram, through public sector-led efforts, will also evaluate the occurrence, nature, and behavior of naturally occurring gas hydrates and the resulting resource, hazard, and environmental implications. In FY 2015, the program intends to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrate bearing areas. These public sector-led efforts will be designed to evaluate the occurrence, nature and behavior of naturally occurring gas hydrates and resulting resource, hazard, and environmental implications.

Natural Gas Technologies

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Environmentally Prudent Development (formerly Effective Environmental Protection)		
• Focus on implementation of the collaborative research plan in such areas as water quality, water availability, air quality, induced seismicity, and mitigating the impacts of development (e.g. wellbore integrity, improve environmental footprint, and reduce water use).	• Focus on continued implementation of the collaborative research plan in such areas as water quality, water availability, air quality, induced seismicity, and mitigating the impacts of development (e.g. wellbore integrity, improve environmental footprint, and reduce water use).	• The increase will fund a small increase in the collaborative research plus a life cycle analysis on water and unconventional oil and gas. The number of new projects will depend on the size of the proposed projects.
• **Emissions Mitigation from Midstream Infrastructure**		
• Not applicable	• Solicit and select projects that develop advanced cost-effective technologies to detect and mitigate methane emissions from natural gas transmission, distribution, and storage facilities • Communicate results on methane emissions mitigation to stakeholders.	• The increase will fund the initiation of a midstream natural gas infrastructure program focused on reducing methane emissions. The number of new projects will depend on the size of the proposed projects.
Gas Hydrates		
• Evaluate results of the 14 resource characterization, modeling, and the response of methane hydrate systems to natural environmental change research projects initiated from the FY 2012 FOA. • Solicit and select projects to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrate bearing areas. • Presentation of initial analyses and findings from the Ignik Sikumi Arctic test conducted in FY 2012 in a series of papers at conferences. • Complete Chevron Joint Industry Project (JIP). • Complete Consortium for Ocean Leadership project.	• Evaluate results of the 7 University-lead resource characterization, modeling, and the response of methane hydrate systems to natural environmental change research projects that were initiated from the FY 2013 FOA. • A total of 21 research projects were funded through the FY 2012 and FY 2013 FOAs. We anticipate 50% of those projects will be completed by the end of FY 2015. • Solicit and select projects to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrate bearing areas. • Anticipated peer reviewed journal publication of final compilation of scientific findings from the Ignik Sikumi Arctic test conducted in FY 2012.	• The increase will fund higher cost field-based projects. The number of new projects will depend on the size of the proposed projects.

Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies

Overview

The mission of the Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies Program is to provide information and technologies that will assure sustainable, reliable, affordable, and environmentally sound supplies of domestic unconventional fossil energy resources.

Consistent with prior Budget Requests, in FY 2015 no funding is requested for the Unconventional FE Technologies program from Petroleum – Oil Technologies. Although no funding was requested in FY 2014, $15 million was Congressionally directed for oil and natural gas research in unconventional, offshore, and small producers.

All awards under this program are fully funded. As a result, multi-year research does not require support by out-year funds after the appropriation year.

Highlights of the FY 2015 Budget Request

No Activity is proposed for FY 2015.

Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies	4,621	15,000	15,000	0	-15,000
Total, Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies	**4,621**	**15,000**	**15,000**	**0**	**-15,000**

SBIR/STTR:

- FY 2013 Transferred: SBIR $121; STTR $16
- FY 2014 Projected: SBIR $395; STTR $56
- FY 2015 Request: SBIR $0; STTR $0

[1] Funding reflects the transfer of SBIR/STTR from Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies to Science.

Program Direction

Overview

Program Direction provides for the Headquarters and field Federal workforce and contractor support responsible for the overall direction and administrative support of the FE program. The Federal staff provides program/project management and guidance, contract administration, and budget formulation and execution duties, etc. FER&D's primary mission is to support technological innovation that enables clean, affordable energy from fossil resources while enhancing economic, environmental, and energy security. The mission of the program is to create technology and technology-based policy options for the public benefit. The program is also responsible for projects and reporting requirements related to the American Recovery and Reinvestment Act (ARRA) activities. Funding is also provided for the coordination of the Energy portfolio by the Office of the Under Secretary for Science and Energy.

The Headquarters staff is responsible for providing overall guidance and direction for the program offices. The NETL staff performs the day-to-day project management functions of the FE programs. NETL is also responsible for developing project budgets, implementing procurement plans, and other programs and site support activities necessary to achieve their program objectives. NETL has sites in Morgantown, WV; Pittsburgh, PA; Sugar Land, TX, Albany, OR; and Anchorage, AK. These sites include 117 buildings and 14 major research facilities on nearly 242 acres.

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

Highlights of the FY 2015 Budget Request

FE has been undergoing an effort on work force restructuring and optimization. Management optimization efforts have been put in place to meet government objectives of reducing costs for service activities. In FY 2015 FE will continue to utilize Program Direction in an effective and efficient manner to minimize the impact of shrinking budgets. In FY 2014 the Ultra-Deepwater program is anticipated to sunset. In FY 2015 FE Program Direction will need to be utilized to provide support and monitoring for the on-going projects related to this program. Also, FY 2015 will be the final year for efforts under the Recovery projects. Therefore, Program Direction funding will need to be utilized to provide project management and contractor support to these projects as they come to completion. Also, additional requirements are being placed on the HQ Program Direction by way of additional projects being funded under the DOE working capital fund.

Program Direction
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Program Direction Summary					
Washington Headquarters					
Salaries and Benefits	16,259	16,371	16,371	16,259	-112
Travel	952	900	900	900	0
Support Services	81	85	85	66	-19
Other Related Expenses	11,003	12,322	12,322	11,071	-1,251
Total, Washington Headquarters	**28,295**	**29,678**	**29,678**	**28,296**	**-1,382**
National Energy Technology Laboratory					
Salaries and Benefits	44,831	44,750	44,750	45,250	+500
Travel	1,700	1,600	1,600	1,600	0
Support Services	20,045	22,629	22,629	20,025	-2,604
Other Related Expenses	17,316	19,260	19,260	17,018	-2,242
Total, National Energy Technology Laboratory	**83,892**	**88,239**	**88,239**	**83,893**	**-4,346**
Import / Export Authorization					
Salaries and Benefits	1,367	1,437	1,437	1,367	-70
Travel	21	22	22	20	-2
Other Related Expenses	626	624	624	626	+2
Total, Import / Export Authorization	**2,014**	**2,083**	**2,083**	**2,013**	**-70**
Total Program Direction					
Salaries and Benefits	62,457	62,558	62,558	62,876	+318
Travel	2,673	2,522	2,522	2,520	-2
Support Services	20,126	22,714	22,714	20,091	-2,623
Other Related Expenses	28,945	32,206	32,206	28,715	-3,491
Total, Program Direction	**114,201**	**120,000**	**120,000**	**114,202**	**-5,798**
Federal FTEs[1]	**476**	**463**	**463**	**462**	**-1**

[1] Federal FTEs are also in NETL Coal Research and Development (FY 2013 Current: 195, FY 2014 Enacted: 192, FY 2015 Request: 189).

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Support Services and Other Related Expenses					
Support Services					
Technical Support					
Headquarters	81	85	85	66	-19
NETL	4,209	4,890	4,890	4,279	-611
Total, Technical Support	4,290	4,975	4,975	4,345	-630
Management Support					
Headquarters	0	0	0	0	0
NETL	15,836	17,739	17,739	15,746	-1,993
Total Management Support	15,836	17,739	17,739	15,746	-1,993
Total, Support Services	**20,126**	**22,714**	**22,714**	**20,091**	**-2,623**
Other Related Expenses					
Headquarters	11,003	12,322	12,322	11,071	-1,251
NETL	17,316	19,260	19,260	17,018	-2,242
Import / Export Authorization	626	624	624	626	+2
Total, Other Related Expenses	**28,945**	**32,206**	**32,206**	**28,715**	**-3,491**

Program Direction

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Salaries and Benefits		
The funding supports Federal staff who monitor (oversight and audit) activities to ensure appropriate and cost-effective information protection measures are applied to the information and information technology assets.	Continue monitoring (oversight and audit) activities to ensure appropriate and cost-effective information protection measures are applied to the information and information technology assets.	The funding change is due to a decrease in the headquarters FTE count of 104 in FY 2014 to 103 in the FY 2015 Request.
The funding supports Federal staff at the National Energy Technology Laboratory. The staff provides management of the Lab; project management/implementation for the FE programs; legal support; public affairs; administrative services such as finance, procurement, human resources; and operational services such as information technology management, ES&H program execution, site management and maintenance.	The funding supports Federal staff at the National Energy Technology Laboratory. The staff provides management of the Lab; project management/implementation for the FE programs; legal support; public affairs; administrative services such as finance, procurement, human resources; and operational services such as information technology management, ES&H program execution, site management and maintenance.	The increase is due to promotions and with-in grades for the staff.
Travel		
Travel includes funding for trips for project monitoring/site visits, management meetings, training, etc. Instituted travel reductions to comply with the OMB directive for reduced travel from FY 2010 levels.	Travel includes funding for trips for project monitoring/site visits, management meetings, training, etc. Instituted travel reduction to comply with the OMB directive for reduced travel from FY 2010 levels.	No change.
Support Services		
Support Service at Headquarters includes; technical support, IT support, site operations support, administrative support, and grounds and maintenance support.	Support Service at Headquarters includes; technical support, IT support, site operations support, administrative support, and grounds and maintenance support.	The decrease in Support Service is due to result of cost savings and monitoring of requested increases from the contractual vendors.
Support services at the Lab include project management support, technical support, IT support, site operations support, administrative support, and grounds and maintenance support.	Support services at the Lab include project management support, technical support, IT support, site operations support, administrative support, grounds and maintenance support.	The decrease is due to limiting backfilling of contractor positions plus the consolidation of contractor functions

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Other Related Expenses		
The activities supported by this line item include E-Government initiatives, Working Capital fund, computer systems and support and contractual services.	The activities supported by this line item include E-Government initiatives, Working Capital fund, computer systems and support and contractual services.	Decreased cost is due to an actual offset of expenses to the contractual service to facilitate the working capital funds' new start which include health care services, overseas presences and Cyberone computer workstations and network infrastructure technology upgrades needed to improve operational efficiencies.
The activities supported by this line item include Lab operational expenses such as; rents, communications, utilities, services, training, supplies, equipment, maintenance, etc.	The activities supported by this line item include Lab operational expenses such as; rents, communications, utilities, services, training, supplies, equipment, maintenance, etc.	The decrease is the result of adjustments in facility services/operations and equipment purchases.

Plant and Capital Equipment

Overview

The National Energy Technology Laboratory (NETL) has 109 buildings and related infrastructure located in Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Albany, Oregon. The Plant and Capital Equipment program is essential for maintenance of these buildings, critical infrastructure, and for ensuring safety of NETL employees and the public. These facilities directly support fossil energy technology development and are critical for supporting the R&D necessary to meet DOE program goals for cost effective and efficient CO_2 capture and sequestration.

Highlights of the FY 2015 Budget Request

The FY2015 General Plant Projects (GPP) funding at NETL will be used to consolidate operations and address significant life safety deficiencies at its Albany, Oregon site; to correct critical infrastructure issues; and, to move toward compliance with DOE sustainability goals as specified in the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and Executive Orders 13423 and 13514. The 2015 GPP funding will support the Secretary's climate change technology goals and energy usage reduction goals per DOE Order 436.1. Additionally, these funds will contribute to the Secretary's priority for clean energy by maintaining and improving facilities and related infrastructure that support research to enabling development and deployment of clean, safe, low-CO_2 emissions energy sources. This funding level will also provide for the maintenance and improvement of NETL facilities while enabling a reduction in energy consumption by the end of FY 2015 of over 30 percent, relative to the to the 2003 baseline established by the EPAct 2005 legislation.

Plant and Capital Equipment
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
General Plant Projects	15,982	16,032	16,032	15,294	-738
Total, Plant and Capital Equipment	**15,982**	**16,032**	**16,032**	**15,294**	**-738**

Plant and Capital Equipment
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
General Plant Projects: A reduction of $738K from the FY 2014 level will result in a prioritization of activities in the implementation of the Albany site consolidation plan and critical upgrades to NETL's IT infrastructure and attainment of sustainability goals for energy conservation.	**-738**
Total, Plant and Capital Equipment	**-738**

Plant and Capital Equipment

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Plant and Capital Equipment		
• General Plant Projects (GPP) funding at NETL will be used to consolidate operations and address significant life safety deficiencies at its Albany, Oregon site; to correct critical infrastructure issues; and, to move toward compliance with DOE sustainability goals as specified in the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and Executive Orders 13423 and 13514.	• General Plant Projects (GPP) funding at NETL will be used to consolidate operations and address significant life safety deficiencies at its Albany, Oregon site; to correct critical infrastructure issues; and, to move toward compliance with DOE sustainability goals as specified in the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and Executive Orders 13423 and 13514.	A prioritization of activities in the implementation of the Albany site consolidation plan and critical upgrades to NETL's IT infrastructure and attainment of sustainability goals for energy conservation.

Plant and Capital Equipment
Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Plant Projects (GPP and IGPP) (<$10M)	n/a	n/a	15,982	16,032	16,032	15,294	-738
Total, Capital Operating Expenses	**n/a**	**n/a**	**15,982**	**16,032**	**16,032**	**15,294**	**-738**
Plant Projects (GPP and IGPP) (Total Estimated Cost (TEC) <$10M)							
Total Plant Projects (GPP/IGPP) (Total Estimated Cost (TEC) <$5M)	n/a	n/a	15,982	16,032	16,032	15,294	-738
Total, Plant Projects (GPP/IGPP) (Total Estimated Cost (TEC) <$10M)	**n/a**	**n/a**	**15,982**	**16,032**	**16,032**	**15,294**	**-738**
Total, Capital Summary	**n/a**	**n/a**	**15,982**	**16,032**	**16,032**	**15,294**	**-738**

Fossil Energy Environmental Restoration

Overview

FE Environmental Restoration activities ensure protection of workers, the public, and the environment in performing the FE mission of the NETL at the Morgantown, West Virginia; Pittsburgh, Pennsylvania; Houston, Texas; Fairbanks, Alaska; and Albany, Oregon sites.

This program supports actions and projects to correct or mitigate various ES&H deficiencies associated with the various infrastructure systems and processes across all NETL sites. The program also supports actions and projects to realize DOE's pollution prevention and energy management goals. Importantly, this program supports NETL's RCRA obligations at all NETL sites.

Highlights of the FY 2015 Budget Request

In FY 2015, the funding for the CERCLA subprogram will be used to continue active operation and maintenance of the air sparge remediation system at Rock Springs Sites 4, 6, 7, 9, and 12 as well as continue a 10-year surface revegetation at the Hoe Creek Site; both of these sites are in Wyoming.

In FY 2015, The RCRA subprogram will continue RCRA-related on-site regulatory, corrective, preventive, and maintenance activities, such as asbestos and lead abatement, waste minimization, and pollution prevention activities along with the NETL Albany site RCRA clean-up which includes: abating lead and asbestos exposures; resolving chemical storage issues; monitoring soil and ground water; maintaining ventilation and air pollution systems; improving air emission management, materials handling, facility equipment disposal, and waste disposal activities; regulatory ground water monitoring activities in conjunction with the Oregon Department of Environmental Quality (ODEQ) involving investigation; and risk assessment activities for the specific trichloroethylene (TCE) ground water contamination issue.

The Other ES&H subprogram will continue to 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). This will include: actions in support of addressing ES&H deficiencies associated with ventilation systems, waste pads, and gas cylinder storage areas; actions in support of achieving DOE's pollution prevention and energy management goals; and maintaining indoor air quality, ventilations systems, walking/working surfaces, personal protective equipment, and alarm infrastructure systems. It will also implement actions in support of personnel security, operational security, export/import controls, and the foreign national visitor and assignment programs.

Fossil Energy Environmental Restoration
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Fossil Energy Environmental Restoration					
CERCLA[1] Remedial Actions	190	200	200	525	+325
RCRA[2] Remedial Actions	1,615	1,697	1,697	1,697	0
Other ES&H[3] Actions	5,710	4,000	4,000	5,675	+1,675
Total, Fossil Energy Environmental Restoration	**7,515**	**5,897**	**5,897**	**7,897**	**+2,000**

[1] CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act (of 1980).
[2] RCRA = Resource Conservation and Recovery Act (of 1976)
[3] ES&H = Environmental Safety and Health

Fossil Energy Environmental Restoration
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
CERCLA Remedial Actions: Continuing activities include groundwater remediation at Rock Springs and a 10-year revegetation effort at Hoe Creek. Increases in funding requirements are directly related to manpower support requirements for variable work involving air sparging activities at the Rock Springs sites.	**+325**
RCRA Remedial Actions: Asbestos, lead abatement activities, and pollution prevention work at NETL continues to diminish. The only significant driver of costs in this activity remains the remediation of the groundwater contamination at the Albany site.	**0**
Other ES&H Actions: Concentrate on core ES&H activities while maintaining regulatory work with CERCLA and RCRA. Anticipate the need for increased air monitoring and particulate sampling for indoor air quality issues/concerns.	**+1,675**
Total, Fossil Energy Environmental Restoration	**+2,000**

Fossil Energy Environmental Restoration

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
CERCLA Remedial Actions		
Active operation and maintenance of the air sparge remediation system at Rock Springs Sites 4, 6, 7, 9, and 12 as well as a 10-year surface revegetation at the Hoe Creek Site.	Continue active operation and maintenance of the air sparge remediation system at Rock Springs Sites 4, 6, 7, 9, and 12 as well as a 10-year surface revegetation at the Hoe Creek Site	No change.
RCRA Remedial Actions		
RCRA-related on-site regulatory, corrective, preventive, and maintenance activities, such as asbestos and lead abatement, waste minimization, and pollution prevention activities along with the NETL Albany site RCRA clean-up.	Continue RCRA-related on-site regulatory, corrective, preventive, and maintenance activities, such as asbestos and lead abatement, waste minimization, and pollution prevention activities along with the NETL Albany site RCRA clean-up..	No change.
Other ES&H Actions		
Implement and improve baseline regulatory compliance, integrated safety management, and ISO 14001 programs. Also implement actions in support of personnel security, operational security, export/import controls, and the foreign national visitor and assignment programs.	Continue to implement and improve baseline regulatory compliance, integrated safety management, and ISO 14001 programs. Also continue implementation of actions in support of personnel security, operational security, export/import controls, and the foreign national visitor and assignment programs.	No change.

Special Recruitment Programs

Overview

The Office of Fossil Energy (FE) developed the Mickey Leland Energy Fellowship (MLEF) Program to provide students majoring in science, technology, engineering and mathematics disciplines the opportunity to enhance their education and knowledge of fossil fuels. The goal of the program is to support an increase in the number of females and under-represented minorities entering the scientific and engineering career fields within the U.S. workforce.

The MLEF program is a ten-week summer internship program that offers students in science, technology, engineering and mathematic disciplines the opportunity to learn about the programs and initiatives within the Office of Fossil Energy and the challenges in providing clean, affordable energy for future generations.

Highlights of the FY 2015 Budget Request

In FY 2015, a diverse group of undergraduate, graduate, and Ph.D. students in science, technology, engineering and mathematic majors will be recruited and selected to participate in the MLEF program.

Special Recruitment Programs
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Special Recruitment Programs	667	700	700	700	0
Total, Special Recruitment Programs	**667**	**700**	**700**	**700**	**0**

Special Recruitment Programs
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Special Recruitment Programs: There are no changes in funding; the program will continue ongoing FY 2014 efforts.	**0**
Total, Special Recruitment Programs	**0**

Special Recruitment Programs

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Special Recruitment Programs		
A diverse group of undergraduate, graduate, and Ph.D. students in science, technology, engineering and mathematic majors will be recruited and selected to participate in the MLEF program.	A diverse group of undergraduate, graduate, and Ph.D. students in science, technology, engineering and mathematic majors will be recruited and selected to participate in the MLEF program.	No change.

Fossil Energy Research and Development
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.

Costs for Direct-Funded Maintenance and Repair (including Deferred Maintenance Reduction) ($K)

	FY 2013 Actual Cost	FY 2013 Planned Cost	FY 2014 Planned Cost	FY 2015 Planned Cost
National Energy Technology Laboratory	22,766	19,397	13,145	13,539
Total, Direct-Funded Maintenance and Repair	22,766	19,397	13,145	13,539

Report on FY 2013 Expenditures for Maintenance and Repair

This report responds to legislative language set forth in Conference Report (H.R. Conf. Rep. No. 108-10) accompanying the Consolidated Appropriations Resolution, 2003 (Public Law 108-7) (pages 886-887), which requests the Department of Energy provide an annual year-end report on maintenance expenditures to the Committees on Appropriations. This report compares the actual maintenance expenditures in FY 2013 to the amount planned for FY 2013, including Congressionally directed changes.

Total Costs for Maintenance and Repair ($K)

	FY 2013 Actual Cost	FY 2013 Planned Cost
National Energy Technology Laboratory	22,766	19,397
Total, Direct-Funded Maintenance and Repair	22,766	19,397

Fossil Energy Research and Development
Research and Development ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Basic	3,544	4,256	3,105	-1,151
Applied	155,915	157,485	114,869	-42,616
Development	194,894	263,894	192,483	-71,411
Subtotal, R&D	**354,353**	**425,635**	**310,457**	**-115,178**
Equipment	15,982	16,032	15,294	-738
Construction	0	0	0	0
Total, R&D	**370,335**	**441,667**	**325,751**	**-115,916**

Fossil Energy Research and Development
Small Business Innovative Research/Small Business Technology Transfer (SBIR/STTR) ($K)

	FY 2013 Transferred	FY 2014 Projected	FY 2015 Request	FY 2015 vs FY 2014 Projected
Coal				
SBIR	7,909	8,954	7,267	-1,687
STTR	1,025	1,280	1,000	-280
Natural Gas Technologies				
SBIR	363	543	954	411
STTR	47	77	131	54
Unconventional Fossil Energy Technologies				
SBIR	121	395	0	-395
STTR	16	56	0	-56
Total, SBIR/STTR	**9,481**	**11,305**	**9,352**	**-1,953**

Fossil Energy Research and Development
Safeguards and Security ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Protective Forces	2,549	2,624	2,176	-448
Physical Security Systems	145	211	158	-53
Information Security	57	59	52	-7
Cyber Security	1,298	1,320	1,335	+15
Personnel Security	103	106	109	+3
Material Control and Accountability	0	0	0	0
Program Management	208	215	222	+7
Security Investigations	0	0	0	0
Transportation Security	0	0	0	0
Research and Development	5	5	5	0
Construction	0	0	0	0
Total, Safeguards and Security	**4,365**	**4,540**	**4,057**	**-483**

Department Of Energy
FY 2015 Congressional Budget
Funding By Appropriation By Site

($K)

Fossil Energy Research and Development	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
Ames Laboratory			
CCS and Power Systems			
Advanced Energy Systems	500	500	500
Cross Cutting Reasearch	1,545	1,117	775
Total, CCS and Power Systems	**2,045**	**1,617**	**1,275**
Total, Ames Laboratory	**2,045**	**1,617**	**1,275**
Lawrence Berkeley National Laboratory			
CCS and Power Systems			
Carbon Storage	133	1,135	900
Cross Cutting Reasearch	2,563	2,100	2,400
Total, CCS and Power Systems	**2,696**	**3,235**	**3,300**
Natural Gas Technologies			
Natural Gas Technologies	210	250	500
Total, Lawrence Berkeley National Laboratory	**2,906**	**3,485**	**3,800**
Lawrence Livermore National Laboratory			
CCS and Power Systems			
Cross Cutting Reasearch	2,453	2,000	2,400
Total, Lawrence Livermore National Laboratory	**2,453**	**2,000**	**2,400**
Los Alamos National Laboratory			
CCS and Power Systems			
Carbon Capture	600	600	600
Carbon Storage	97	705	838
Cross Cutting Reasearch	2,653	2,000	2,400
Total, CCS and Power Systems	**3,350**	**3,305**	**3,838**
Total, Los Alamos National Laboratory	**3,350**	**3,305**	**3,838**

Department Of Energy
FY 2015 Congressional Budget
Funding By Appropriation By Site

($K)

Fossil Energy Research and Development	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
National Energy Technology Lab			
CCS and Power Systems			
Carbon Capture	62,924	90,420	75,540
Carbon Storage	102,768	103,691	74,152
Advanced Energy Systems	91,002	98,019	49,250
Cross Cutting Reasearch	31,659	27,984	22,592
NETL Coal R&D	33,338	50,011	34,031
Total, CCS and Power Systems	**321,691**	**370,125**	**255,565**
Natural Gas Technologies			
Natural Gas Technologies	12,956	18,762	31,739
Program Direction			
National Energy Technology Center Program Direction	83,892	84,963	83,893
Fossil Energy Environmental Restoration			
Fossil Energy Environmental Restoration	6,164	4,477	6,477
CCS demonstrations			
Natural gas carbon capture and storage	0	0	25,000
Unconventional Fossil Energy Technologies			
Unconventional Fossil Energy Technologies	4,307	13,917	0
Total, National Energy Technology Lab	**429,010**	**492,244**	**402,674**
Oak Ridge National Laboratory			
CCS and Power Systems			
Advanced Energy Systems	936	981	1,250
Cross Cutting Reasearch	0	1,924	625
Total, CCS and Power Systems	**936**	**2,905**	**1,875**
Total, Oak Ridge National Laboratory	**936**	**2,905**	**1,875**
Pacific Northwest National Laboratory			
CCS and Power Systems			
Carbon Capture	201	980	860
Cross Cutting Reasearch	2,453	2,300	2,500
Total, CCS and Power Systems	**2,654**	**3,280**	**3,360**
Natural Gas Technologies			
Natural Gas Technologies	90	100	150
Total, Pacific Northwest National Laboratory	**2,744**	**3,380**	**3,510**
Sandia National Laboratories			
CCS and Power Systems			
Carbon Storage	445	291	184
Cross Cutting Reasearch	525	700	0
Total, CCS and Power Systems	**970**	**991**	**184**
Total, Sandia National Laboratories	**970**	**991**	**184**

Department Of Energy
FY 2015 Congressional Budget
Funding By Appropriation By Site

($K)

Fossil Energy Research and Development	**FY 2013 Current**	**FY 2014 Enacted**	**FY 2015 Request**
Washington Headquarters			
CCS and Power Systems			
Carbon Storage	3,302	2,944	4,010
Cross Cutting Reasearch	1,767	1,800	1,600
Total, CCS and Power Systems	**5,069**	**4,744**	**5,610**
Natural Gas Technologies			
Natural Gas Technologies	609	1,488	2,611
Program Direction			
Headquarters Program Direction	30,309	35,037	30,309
Fossil Energy Environmental Restoration			
Fossil Energy Environmental Restoration	1,351	1,420	1,420
Plant & Capital Equipment			
Plant & Capital Equipment	15,982	16,032	15,294
Special Recruitment Programs			
Special Recruitment Programs	667	700	700
Unconventional Fossil Energy Technologies			
Unconventional Fossil Energy Technologies	314	1,083	0
Total, Washington Headquarters	**54,301**	**60,504**	**55,944**
Total, Fossil Energy Research and Development	**498,715**	**570,431**	**475,500**