



DOE/FE-0533

## Clean Coal Technology Programs: Program Update 2009

Includes Power Plant Improvement Initiative (PPII)  
and Clean Coal Power Initiative (CCPI) Projects

As of June 2009

October 2009

U.S. Department of Energy  
Assistant Secretary for Fossil Energy  
Washington, DC 20585



U.S. DEPARTMENT OF  
**ENERGY**

Fossil  
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Executive Summary	0	1	2	3	4	5	
Chapter 1. Role of Clean Coal Technology Demonstrations	0	1	2	3	4	5	
Chapter 2. Funding and Costs	0	1	2	3	4	5	
Chapter 3. Projects	0	1	2	3	4	5	
Appendix A. Historical Perspective, Legislative History, and Public Laws	0	1	2	3	4	5	
Appendix B. CCTDP Financial History	0	1	2	3	4	5	
Appendix C. NEPA Actions and Status for Active Projects	0	1	2	3	4	5	
Appendix D. Acronyms, Abbreviations, and Symbols	0	1	2	3	4	5	

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# Executive Summary

## Introduction

The purpose of the *Clean Coal Technology Programs: Program Update 2009* is to provide an updated status of the U.S. Department of Energy (DOE) commercial-scale demonstrations of clean coal technologies (CCT). These demonstrations have been performed under the Clean Coal Technology Demonstration Program (CCTDP), the Power Plant Improvement Initiative (PPII), and the Clean Coal Power Initiative (CCPI).

Activities under CCTDP concluded in 2006 and reporting activities for the final active project under PPII concluded in May 2009. Currently, there are five ongoing projects from the first two rounds of the CCPI program along with one successfully completed project. In addition, the selection of the first two projects from Round 3 was announced in July 2009 along with a re-opening of the Round 3 solicitation for additional project proposals. Selections from the re-opened Round 3 solicitation could be made as early as October 2009. Funding for the re-opened Round 3 solicitation was provided under the American Recovery and Reinvestment Act (ARRA) of 2009.

*Program Update 2009* provides: (1) a discussion of the role of clean coal technology demonstrations in improving the nation's energy security and reliability, while protecting the environment using the nation's most abundant energy resource—coal; (2) a summary of the funding and costs of the demonstrations; and (3) an overview of the technologies being demonstrated, along with fact sheets for projects that are active, recently completed, or recently discontinued.

## Role of Clean Coal Technology Demonstrations

Coal is the United States' most abundant fossil fuel and is recognized as a low-cost energy source that advances energy security and economic stability. Currently, coal-fired power plants generate nearly half of the nation's electricity and represent a majority of baseload generating capacity. The sustained use of the nation's coal reserves relies on developing technological solutions that address environmental concerns while maintaining coal's economic

advantage. These continually evolving and expanding technological solutions have been designated as "clean coal technologies."

For over twenty years, DOE has been co-funding large-scale demonstrations of emerging CCTs to hasten their adoption in the marketplace. Financial assistance was deemed necessary to reduce the risk associated with first-of-a-kind demonstrations. These demonstrations are part of an integrated CCT research, development, and demonstration (RD&D) program that contributes to the DOE's strategic theme of "Promoting America's energy security through reliable, clean and affordable energy."

Through the year 2030, the Energy Information Administration (EIA) forecasts electricity consumption will grow by approximately 1 percent per year. The ability of coal-fired generation to help meet this demand could be limited by concerns over greenhouse gas (GHG) emissions and the potential for future legislation to impose limits. While the CCT demonstrations performed to date have made significant gains in terms of environmental performance and efficiency, the greatest challenges may lie ahead from restrictions on carbon dioxide (CO<sub>2</sub>) emissions. To address concerns over GHG emissions, carbon capture and storage (CCS) technologies are the exclusive focus of the initial and re-opened CCPI Round 3 solicitation.

For the foreseeable future, coal will continue to provide the majority of the nation's baseload generation capacity. If CCS technologies are able to provide an economical solution to CO<sub>2</sub> emissions, the nation will continue to benefit from coal's competitive electric generation costs, the security of its domestic availability, and its relative price stability in comparison to other fuels.



## Clean Coal Technology Demonstrations

Since 1985, DOE has shared in the funding of commercial-scale demonstration projects through the CCTDP, PPII, and CCPI. While the specific technologies and focus of the programs continued to evolve over time, all three programs shared similar general provisions and administrative principles.

The CCTDP focused on:

- Commercializing processes that reduced emissions of sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>);
- Demonstrating more efficient and environmentally friendly alternatives to traditional pulverized coal boilers;
- Demonstrating coal preparation and conversion technologies leading to cleaner fuels; and
- Demonstrating improved industrial technologies for clean coal use.

With 33 successfully completed projects, the CCTDP yielded technologies that met or exceeded environmental regulatory requirements while providing the reliability and competitive costs necessary for success in the marketplace.

Following the power blackouts and brownouts experienced in 1999 and

2000, Congress directed establishment of the PPII to provide for the commercial-scale demonstration of technologies to assure the reliability of the nation's energy supply from existing and new electric generating facilities. The single solicitation required participants to offer significant improvements in power plant performance, thereby leading to enhanced electric reliability. Of the five projects awarded, four were successfully completed.

The CCPI was initiated in 2002 to advance a broad spectrum of promising technologies that target today's most pressing environmental, economic, and energy security challenges. The first CCPI solicitation (CCPI-1) was open to "any technology advancement related to coal-based power generation that results in efficiency, environmental, and economic improvement compared to currently available state-of-the-art alternatives."

In February 2004, the second CCPI solicitation (CCPI-2) was issued seeking proposals to demonstrate advances in coal gasification systems, technologies that permit improved management of carbon emissions, and advancements that reduce mercury and other power plant emissions.

In August 2008, the third solicitation (CCPI-3A) was issued specifically focused on the capture and sequestration,



or beneficial reuse, of CO<sub>2</sub> emissions from coal-based electricity production. From the proposals submitted in January 2009, DOE selected Basin Electric Power Cooperative's *Antelope Valley Station CO<sub>2</sub> Capture and Sequestration Project* and Hydrogen Energy International LLC's *Commercial Demonstration of Advanced IGCC with Full Carbon Capture*.

Following the passage of ARRA, DOE announced the intent to re-open the third solicitation. On June 9, 2009, DOE issued an amendment that provided for a second application due date (CCPI-3B) of August 24, 2009. Applicants that accepted selection under CCPI-3A will not be considered for selection under CCPI-3B. Selections could be announced as early as October 2009.

## Clean Coal Technology Demonstration Funding

CCPI funding during fiscal year 2009 exceeded \$1 billion dollars. Of that amount, \$800 million was apportioned

under ARRA with the additional funds provided under the Omnibus Appropriations Act, 2009. These funds, along with uncommitted funds from prior year appropriations, result in a total of approximately \$1.4 billion available for awards under CCPI-3A and CCPI-3B. The total DOE share of the two projects selected under CCPI-3A was \$408 million.

It is anticipated that projects selected under CCPI-3A and -3B could be funded, in whole or in part, from funds appropriated under ARRA. Projects receiving ARRA funding will require special tracking and reporting requirements as specified under the ARRA legislation.

As with prior CCPI solicitations, funding for the entire DOE share of the project must be available before a project may be selected. Unlike prior CCPI solicitations, if funds become available as a result of unsuccessful negotiations, or in the event of withdrawals, DOE may decide to select one or more additional projects under CCPI-3B.

## Clean Coal Technology Projects

*Program Update 2009* provides project fact sheets for the five ongoing, two recently completed, and two recently discontinued projects. One of the completed projects is from the PPII and the rest are CCPI. As of yet, fact sheets are unavailable for the two recently selected projects.

The fact sheets are organized by the following market sectors: (1) emissions control for existing and new power plants; (2) advanced power systems for repowering existing plants and providing new generating capacity; (3) clean coal fuels for converting the nation's vast coal resources to low-emission fuels; and (4) industrial applications for coal and coal by-products. Exhibit ES-1 groups the projects by market sector and indicates the demonstration program, participant, status, and page number of the fact sheet for each project. The following text provides highlights of the two recently completed projects.

Exhibit ES-1 Projects by Market Sector				
Project	Program	Participant	Status	Page
<b>Emissions Control</b>				
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	CCPI-1	NeuCo, Inc.	Completed	3-10
Greenidge Multi-Pollutant Control Project	PPII	CONSOL Energy, Inc.	Completed	3-14
Mercury Specie and Multi-Pollutant Control	CCPI-2	NeuCo, Inc.	Operation	3-18
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	CCPI-1	Wisconsin Electric Power Company	Operation	3-20
<b>Advanced Power Systems</b>				
Demonstration of a Coal-Based Transport Gasifier	CCPI-2	Southern Company Services, Inc.	Design	3-24
Mesaba Energy Project – Unit 1	CCPI-2	MEP-I LLC	Design	3-26
<b>Clean Coal Fuels</b>				
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	CCPI-1	WMPI PTY., LLC	Discontinued	3-30
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	CCPI-1	Great River Energy	Construction	3-32
<b>Industrial Applications</b>				
Western Greenbrier Co-Production Demonstration Project	CCPI-1	Western Greenbrier Co-Generation, LLC	Discontinued	3-36

## **Greenidge Multi-Pollutant Control Project**

The PPII project demonstrated an integrated combination of pollution control technologies on a 107-MWe coal-fired unit at the AES Greenidge Power Plant located near Dresden, New York. The overall objective of the project was to demonstrate an affordable means for achieving deep reductions in the emissions of a number of pollutants for smaller, coal-fired electric generating units, allowing these units to continue to produce low-cost, reliable electricity under increasingly stringent air emissions regulations.

The project demonstrated an integrated system consisting of three major components:

- NO<sub>x</sub> control via a hybrid selective noncatalytic reduction (SNCR) and in-duct selective catalytic reduction (SCR) system;
- SO<sub>2</sub>, acid gas, and particulate matter control via the Turbosorp® circulating fluidized-bed dry scrubbing system and baghouse; and
- Mercury control via the supplemental benefits afforded by the NO<sub>x</sub> control and Turbosorp® systems, and activated carbon injection if needed.

Three series of tests were conducted through June 2008. Test results demonstrated that the combination of technologies met all of the emissions reduction goals of the project. The average SO<sub>2</sub> removal efficiency observed during commercial operation exceeded 96 percent. The average coal-to-stack mercury removal efficiency measured between March 2007 and June 2008 was 98 percent, without the need for activated carbon injection. The performance target of 95 percent SO<sub>3</sub> and HCl removal efficiency was achieved. Overall NO<sub>x</sub> emissions were reduced by over 50 percent relative to the pre-project baseline. The new baghouse reduced particulate emissions to less than 0.001 lb/mmBtu.



The multi-pollutant control system is capable of achieving deep reductions in NO<sub>x</sub> and SO<sub>2</sub> at a lower capital cost relative to conventional technologies. The capital cost is about 40 percent less than the estimated cost to retrofit conventional SCR and wet flue gas desulfurization (FGD) systems on smaller units. Mercury, acid gas, and primary particulate matter control are co-benefits of the NO<sub>x</sub> and SO<sub>2</sub> control systems and are provided at no additional cost.

### ***Demonstration of Integrated Optimization Software at the Baldwin Energy Complex***

The CCPI-1 project established the broadest application to date of advanced optimization software at Dynegy's three-unit, 1,768-MW Baldwin Energy Complex located in Baldwin, Illinois. NeuCo, Inc., the project's participant and technology provider, demonstrated five optimization products that were integrated through NeuCo's ProcessLink® technology. This technology uses neural networks, expert systems, and fuzzy logic to link the individual optimization modules to maximize specific performance objectives and operator priorities. These software products were developed to optimize the combustion

and soot blowing processes, reduce the ammonia consumed by SCR systems, and improve unit thermal performance and plant-wide availability.

The software installation was completed at the end of 2006 and was followed by a one year evaluation and documentation period. Quantitative project benefits included: reduced NO<sub>x</sub> emissions by 12–14 percent; improved average heat rate (fuel efficiency) by 0.7 percent; increased available megawatt hours (MWh) by an estimated 1.5 percent; reduced ammonia consumption by 15–20 percent; and commensurate reductions in GHG, mercury, and particulates. These benefits translated to lower costs, improved reliability, and greater commercial availability with significantly reduced environmental impacts.

The optimizers commercialized as part of this project are expected to pay for themselves in well under one year when deployed on typical plant types and fuel categories that comprise the U.S. fossil power industry. This represents a highly cost-effective way of addressing some of the industry's most pressing challenges and leverages the benefits of investments in SCR equipment, low-NO<sub>x</sub> systems, and modern control and instrumentation systems.

# 1. Role of Clean Coal Technology Demonstrations

## Introduction

Coal is the nation's most abundant fossil fuel and is recognized as a low-cost energy source that advances energy security and economic stability. Currently, coal-fired power plants generate nearly half of the nation's electricity and represent a majority of baseload generating capacity. In addition to the generation of electricity, coal represents a stable domestic energy source that can be used to produce environmentally friendly fuels such as hydrogen and synthetic natural gas, in addition to strategically important chemicals. The sustained use of the nation's coal reserves relies on developing technological solutions that address environmental concerns while maintaining coal's economic advantage. These continually evolving and expanding technological solutions have been designated as "clean coal technologies."

Federally sponsored research and development (R&D) for coal applications began in the 1970s. By the 1980s, many promising technologies had emerged. However, there was a realization that moving the technologies into the marketplace, where they could have an impact, required overcoming one major remaining hurdle—large-scale demonstration. Demonstration proves the competitive cost and performance of a clean coal technology (CCT) in a commercial setting in order to reduce risk to acceptable levels in the financial and technical arenas. To mitigate the risks at the demonstration stage, the U.S. Department of Energy (DOE) initiated the Clean Coal Technology Demonstration Program (CCTDP) in 1985. The CCTDP forged cost-sharing partnerships between DOE, non-fed-

eral public entities, and technology suppliers and users, which reduced the financial and technical risk facing participants to acceptable levels. CCTDP demonstrations were required to be at a scale and in an operational environment sufficient to determine their potential for satisfying technical, economic, and environmental needs.

The CCTDP comprised five competitive solicitations resulting in 33 successfully completed demonstration projects. In 2001, DOE implemented the Power Plant Improvement Initiative (PPII) in a single solicitation applying CCTDP principles for demonstrations addressing electric power reliability concerns. In 2002, DOE launched the comprehensive Clean Coal Power Initiative (CCPI) to address 21<sup>st</sup> century energy issues through multiple solicitations. DOE is currently conducting a third CCPI solicitation that will result in two sets of selected projects.

Collectively, these commercial demonstration programs, as part of an in-

tegrated CCT research, development, and demonstration (RD&D) program, contribute to the DOE strategic theme of "Promoting America's energy security through reliable, clean, and affordable energy."

Since the early beginnings of CCTDP, coal technologies have made significant gains in terms of environmental performance and efficiency; however, the greatest challenges may lie ahead with restrictions on carbon dioxide (CO<sub>2</sub>) emissions. To address concerns over greenhouse gas (GHG) emissions, carbon capture and storage (CCS) technologies have become the primary focus of future demonstration activities.

Through the year 2030, the Energy Information Administration (EIA) forecasts electricity consumption will grow by approximately 1 percent per year in EIA's *Annual Energy Outlook 2009 (AEO2009)* reference case. The reference case estimates that total electricity generation at coal-fired plants will increase by 19 percent by 2030



and coal's contribution to electricity generation will decrease modestly from 49 to 47 percent.

Growth in coal-fired generation is limited by concerns about GHG emissions and the potential for future legislation to impose limits. In the *AEO2009* reference case, 3 percentage points were added to the cost of capital for new coal-fired capacity that reduced the competitiveness of coal compared to other fuel and technology alternatives.

In April 2009, EIA issued a revised *AEO2009* reference case primarily due to the potential effects of the American Recovery and Reinvestment Act (ARRA). Under the revised *AEO2009* reference case, coal's contribution to electricity generation in 2030 decreased slightly from the original estimate of 47 percent to 46 percent, largely due to incentives made available under ARRA for renewable generation. ARRA also provided \$3.4 billion for additional R&D into of fossil energy technologies pertaining to CCS research and demonstration.

For the foreseeable future, coal will continue to provide the majority of the nation's baseload generation capacity. If CCS technologies are able to provide an economical solution to CO<sub>2</sub> emissions, the nation will continue to benefit from coal's competitive electric generation costs, the security of its domestic availability, and its relative price stability in comparison to other fuels.

## CCTDP

Begun in 1985, the CCTDP was an ambitious government-industry initiative to demonstrate inventive approaches to address environmental concerns and otherwise advance the utilization of the nation's abundant coal resources. The program's goal was to demonstrate the best, most innovative technology at a scale large enough so that industry

could determine whether the new processes had commercial merit.

Projects proposed by industry were selected through a series of five competitions aimed at attracting promising technologies that had not been demonstrated at commercial scale. Projects selected included sulfur dioxide (SO<sub>2</sub>) control systems; nitrogen oxides (NO<sub>x</sub>) control technologies; fluidized-bed combustion; gasification; advanced coal processing technologies to produce clean fuels; and coal utilization for industrial applications. These technologies have allowed U.S. reliance on coal to continue, while cutting multiple pollutant emission levels by anywhere from 30–95 percent. More than 20 of the technologies tested in the original program have achieved commercial success. The final CCTDP project ended in 2006.

Early on, the CCTDP responded to concerns over acid rain, which is formed by sulfur and nitrogen pollutants emitted by coal-burning power plants. In March 1987, President Reagan announced the endorsement of the recommendations of the *Special Envoys on Acid Rain*, calling for additional funding for industry/government demonstrations of innovative control technology.

Along with acid rain concerns, there was an emerging issue in the area of hazardous air pollutants (HAPs). To assess the impacts on coal-based power generation, CCTDP projects were leveraged to obtain data through an integrated effort among the DOE, EPA, the Electric Power Research Institute (EPRI), and the Utility Air Regulatory Group. Through this effort, concerns about HAPs relative to coal-based power generation have been significantly mitigated, enabling focus on but a few flue gas constituents.

The CCTDP introduced a number of innovative approaches and principles that advanced the effectiveness of government-industry partnerships, including:

- Strong and stable financial commitment for the life of a project, including full appropriation of the government’s share of the costs;
- Multiple solicitations spread over a number of years enabling clean coal technologies to address a broad range of national needs with a portfolio of evolving technologies;
- Demonstrations conducted at commercial-scale in actual user environments, allowing clear assessment of a technology’s commercial potential;
- Clearly defined roles of government and industry, reflecting the degree of cost-sharing required;
- A requirement for at least 50 percent cost-sharing throughout all project phases, enhancing participants’ commitment;
- A requirement for industry to commit to commercialize the technology;
- A requirement for repayment up to the government’s cost-share; and
- A review of environmental impacts of a project according to National Environmental Policy Act (NEPA) requirements.

Nearly all of these approaches and principles employed for the CCTDP were carried over to the PPII and CCPI programs. A requirement for repayment was waived for CCPI Round 3.

## PPII

When U.S. consumers were confronted in 1999 and 2000 with blackouts and brownouts of electric power in major regions of the country, Congress responded by directing DOE to issue “a general request for proposals for the commercial-scale demonstration of technologies to assure the reliability of the nation’s energy supply from existing and new electric generating facilities... .”

On February 6, 2001, DOE issued a solicitation for proposals under the program known as the PPII. By the deadline of April 19, 2001, some 24 candidate projects had been submitted for government cost-shared financial assistance.

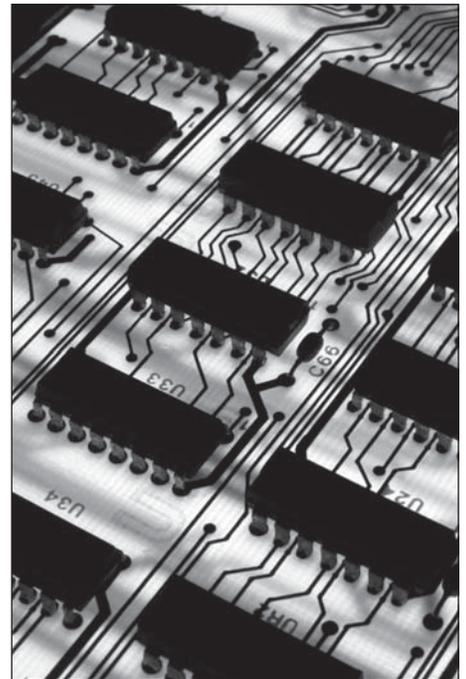
On September 28, 2001, DOE selected eight projects. Subsequently, three of the eight projects were withdrawn by their industrial sponsors, and a fourth project was discontinued. The four remaining projects were successfully completed.

## CCPI

In the 21<sup>st</sup> century, additional environmental concerns have emerged: the potential health impacts of trace emissions of mercury, the effects of microscopic particles on people with respiratory problems, and the global climate-altering impact of GHGs. With coal likely to remain the predominant fuel for electric power generation for the foreseeable future, DOE remains committed to demonstrating the latest clean coal technologies that will continue to reduce the environmental impact of the lowest-cost domestic fuel resource.

The CCPI is closely linked with R&D activities that are focused on ultra-clean, fossil-fuel-based energy complexes in the 21<sup>st</sup> century. In January 2004, the Clean Coal Technology Roadmap was developed cooperatively with the coal and power industry to address short- and long-term coal technology needs. Consistent with the Energy Policy Act of 2005, projects selected under the CCPI advance efficiency, environmental performance, and cost competitiveness well beyond that of technologies that are currently in commercial service.

Following the general principles of the original CCTDP, the CCPI was initiated in 2002 to advance a broad



spectrum of promising technologies that target today's most pressing environmental, economic, and energy security challenges. The first CCPI solicitation (CCPI-1) was open to "any technology advancement related to coal-based power generation that results in efficiency, environmental, and economic improvement compared to currently available state-of-the-art alternatives." In many respects, CCPI-1 was intended to capture a snapshot of the full range of technological advancements made since the last major clean coal technology solicitation had been issued in 1992.

Of the eight projects initially selected under CCPI-1, five awards were made. Two of the awarded projects ended prior to successful completion. Of the remaining three, one project is complete, one is in operation, and one is nearing completion of construction activities. The completed project demonstrated a relatively low-cost, advanced software-based application that was responsible for reduced emissions and improved plant efficiency. The two active projects are focused on improving the fuel use efficiency of lignite coals and a sorbent injection process to capture mercury and reduce other flue gas emissions.

In February 2004, the second CCPI solicitation (CCPI-2) was issued seeking proposals to demonstrate advances in coal gasification systems, technologies that permit improved management of carbon emissions, and advances that reduce mercury and other power plant emissions. In October 2004, DOE announced the selection of four projects from 13 proposals. Subsequently, one project withdrew during negotiations while the remaining three are ongoing. The three active projects are valued at nearly \$3.8 billion, with DOE commitments of \$335.8 million. Two projects involve integrated gasification combined-cycle (IGCC) and the third addresses controlling mercury and other power plant emissions.

On August 11, 2008, DOE issued the Funding Opportunity Announcement for the third solicitation (CCPI-3A). CCPI-3A specifically focused on the capture and sequestration, or beneficial reuse, of CO<sub>2</sub> emissions from coal-based electricity production (minimum 50 percent gross energy output as electricity). Proposals were required by January 20, 2009 and the selection of two projects was announced on July 1, 2009. DOE established the following requirements for commercial-scale demonstration:

- Technologies must capture and sequester, or put to beneficial reuse, a minimum of 300,000 tons per year of CO<sub>2</sub> emissions;
- Technologies must attain 90 percent CO<sub>2</sub> capture efficiency in the flue gas being treated; and
- Technologies must show significant progress toward CO<sub>2</sub> capture and sequestration with less than 10 percent increase in electricity costs for gasification systems, and less than 35 percent for combustion and oxycombustion systems.

Following the passage of ARRA, DOE announced the intent to re-open the third solicitation. On June 9, 2009, DOE issued an amendment that provided for a second application due date (CCPI-3B) of August 24, 2009, along with several programmatic and administrative revisions. Of particular note, revisions included a reduction in the carbon capture efficiency from 90 to 50 percent and a reduction in the minimum coal or coal refuse energy input requirement from 75 to 55 percent. Projects that accept selections under CCPI-3A will not be considered for selection

under CCPI-3B. DOE anticipates making selections in October 2009.

Projects selected under CCPI-3A and -3B will be funded, in whole or in part, from funds appropriated under ARRA. Projects receiving ARRA funding will require special tracking and reporting requirements as specified under the ARRA legislation and related Office of Management and Budget (OMB) guidance. Unlike prior CCPI solicitations, if funds become available as a result of unsuccessful negotiations, DOE may decide to select one or more additional projects under the CCPI-3B solicitation. However, any additional selections would still be subject to the expedited expenditure requirement of ARRA.

A total of \$1.4 billion will be available for awards under CCPI-3A and -3B. Of the total amount, approximately \$800 million was provided under ARRA with the remainder provided through the annual congressional appropriations process.



# 2. Funding and Costs

## Introduction

Funding for the Clean Coal Technology Demonstration Program (CCTDP) and Power Plant Improvement Initiative (PPII) was provided through the annual appropriations bills for the Department of the Interior and Related Agencies. Current funding for the Clean Coal Power Initiative (CCPI) is provided under the Energy and Water Development Appropriations Act.

Congress has appropriated a net amount of \$1.75 billion for the CCTDP based on appropriations bills that began in fiscal year 1986. These funds were committed to demonstration projects selected through five competitive solicitations. The CCTDP has concluded with 33 successfully completed projects. The last active project submitted its Final Report in March 2007.

A single PPII solicitation was conducted in 2001, with funding provided by appropriations for FY01 that established a transfer of \$95 million

in funding that previously had been appropriated for the CCTDP. The PPII has concluded with four successfully completed projects. Three projects withdrew during the negotiation phase prior to contract award. One project withdrew after award, but prior to successful completion.

In addition to the \$95 million made available for PPII, nearly \$1.8 billion has been appropriated for CCPI projects. Exhibit 2-1 summarizes the funding by fiscal year for the PPII and CCPI programs. The amount of appropriated funds available for project awards is reduced by Program Support, the Small Business Innovation Research (SBIR) program, the Small Business Technology Transfer (STTR) program, and other adjustments. Program Support provides for a share of the DOE administrative expenses of the programs. The SBIR program implements the Small Business Innovation Development Act of 1982, and provides funding for small, innovative firms in selected research and development (R&D) areas. The

STTR program implements the Small Business Technology Transfer Act of 1992, which provides funding for small business concerns performing cooperative R&D efforts. Other adjustments include across-the-board general and omnibus reductions imposed by Congress. Starting in FY09, the CCPI program is exempt from SBIR/STTR adjustments.

The Round 1 CCPI (CCPI-1) solicitation was conducted in 2002 based on funding provided by appropriations for FY02 and FY03. The Round 2 CCPI (CCPI-2) solicitation was conducted in 2004 with funding provided by appropriations for FY04 and FY05, along with uncommitted funds from prior CCPI and PPII appropriations. As of June 30, 2009, one CCPI project was complete and five were ongoing. Four projects did not progress beyond the negotiation phase and two projects withdrew after award. In addition, two projects were selected in July 2009 under the initial closing date of the third solicitation (CCPI-3A).

**Exhibit 2-1**  
**Funding for the CCPI and PPII Programs**  
**(Dollars in Thousands)**

	Fiscal Year									Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009 <sup>a</sup>	
PPII Projects	93,843									93,843
CCPI-1 Projects		144,565	143,626							288,191
CCPI-2 Projects				163,471	47,446					210,917
CCPI-3 Projects <sup>b</sup>						47,633	58,154	66,599	1,081,476	1,253,863
Program Support	948	1,500	1,490	1,701	493	495	604	694	6,304	14,228
SBIR & STTR		3,935	3,909	4,709	1,367	1,372	1,675	1,918		18,885
Other Adjustments <sup>c</sup>	209		975	2,119	694	500		789	394	5,680
<b>Total</b>	<b>95,000</b>	<b>150,000</b>	<b>150,000</b>	<b>172,000</b>	<b>50,000</b>	<b>50,000</b>	<b>60,433</b>	<b>70,000</b>	<b>1,088,174</b>	<b>1,885,607</b>

<sup>a</sup> Includes FY09 Appropriations and American Recovery and Reinvestment Act (ARRA) funding

<sup>b</sup> Projects awarded under CCPI-3A and -3B could be funded, in whole or in part, from funds appropriated under ARRA

<sup>c</sup> General and Omnibus Reductions and Defense Contract Audit Agency (DCAA) charges

## CCTDP

Congress has appropriated a net amount of \$1.75 billion for CCTDP project awards and program administration expenses. These funds were committed to demonstration projects selected through five competitive solicitations. The CCTDP has concluded with 33 successfully completed projects. The final active project withdrew prior to completion in March 2006 and submitted a Final Report of activities in March 2007. The successfully completed projects resulted in a combined investment by the federal government and the private sector of \$3.25 billion. DOE contributed \$1.3 billion toward these projects, representing approximately 40 percent of the total project costs. Project participants contributed the majority of the project costs, averaging 60 percent for the 33 successfully completed projects.

Appendix B provides a financial history of the CCTDP.

## PPII

The PPII was established by appropriations made for FY01 (Public Law 106-291) through a transfer of \$95 million in funding previously appropriated for the CCTDP. Funds were committed to demonstration projects from a single solicitation issued in February 2001. Eight projects were selected for negotiation in September 2001 among 24 applications.

The PPII has concluded with four successfully completed projects. Three projects withdrew during the negotiation phase prior to contract award. One project withdrew after award, but prior to successful completion. No additional solicitations are planned, and unused funds are authorized for use under CCPI.

The DOE funding commitments for the PPII projects total over \$30 million. The total funding commitment for the projects is over \$70 million. Participants have funded 57 percent of the total project costs. Exhibit 2-2 summarizes the project costs and financial status of the PPII projects. The financial status for the individual projects is provided under the “DOE Obligated” and “DOE Cost” columns in Exhibit 2-2. The amount shown under “DOE Obligated” indicates the amount DOE has funded toward the total DOE share of the project. The costs indicate the amount invoiced to DOE for payment.

**Exhibit 2-2**  
**PPII Project Costs and Financial Status**  
**(Dollars)**

	Total Project Costs	DOE Share	DOE Obligated	DOE Cost
Achieving NSPS Emission Standards Through Integration of Low-NO <sub>x</sub> Burners with an Optimization Plan for Boiler Combustion (project discontinued)	3,005,169	1,387,530	1,387,530	1,387,530
Big Bend Power Station Neural Network-Sootblower Optimization (project complete)	2,381,614	905,013	905,013	905,013
Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash (project complete)	19,581,734	7,224,000	7,224,000	7,224,000
Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology (project complete)	13,353,288	6,490,585	6,490,585	6,490,585
Greenidge Multi-Pollutant Control Project (project complete)	32,742,976	14,341,423	14,341,423	14,341,423
<b>Total PPII</b>	<b>71,064,781</b>	<b>30,348,551</b>	<b>30,348,551</b>	<b>30,348,551</b>

## CCPI

The CCPI is a cost-shared partnership between government and industry to demonstrate advanced coal-based technologies, with the goal of accelerating commercial deployment of promising technologies to ensure the nation has clean, reliable, and affordable electricity. Thus far, three solicitations have been issued (CCPI-1, CCPI-2, and CCPI-3). Following submission of proposals for the initial CCPI-3 solicitation (CCPI-3A), the solicitation was re-opened with minor amendments for another round of proposals (CCPI-3B).

Funding provided by appropriations for FY02 and FY03 served as the basis for the CCPI-1 solicitation. The initial CCPI competition began in March 2002 when DOE issued a solicitation offering \$330 million in federal matching funds for industry-proposed projects. In January 2003, DOE announced that eight projects, valued at more than \$1.3 billion, would make up the first round of the CCPI. Subsequently, three projects were withdrawn. Of the remaining five projects, two are ongoing, one is

complete, and two awarded projects were discontinued. As of June 30, 2009, the total cost of the five projects was estimated at about \$121 million, with the DOE share being approximately \$56 million.

Exhibit 2-3 summarizes the project cost and financial status of the CCPI-1 projects.

Funding for CCPI-2 was provided by an appropriation of \$172 million for FY04 and an appropriation of \$50 million for FY05, along with uncommitted funds from prior CCPI and PPII appropriations. In February 2004, DOE issued the CCPI-2 solicitation offering approximately \$280 million in federal funds. In October 2004, four projects were selected. Subsequently, one project has withdrawn and three are under way.

Exhibit 2-4 summarizes the project costs and financial status of the CCPI-2 projects.

In August 2008, DOE issued a Funding Opportunity Announcement (FOA) for the third solicitation (CCPI-3A) that focused exclusively on the capture

**Exhibit 2-3  
CCPI-1 Project Costs and Financial Status  
(Dollars)**

	<b>Total Project Costs</b>	<b>DOE Share</b>	<b>DOE Obligated</b>	<b>DOE Cost</b>
Advanced Multi-Product Coal Utilization By-Product Processing Plant (project discontinued)	1,245,305	621,407	621,407	617,366
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex (project complete)	19,904,733	8,592,630	8,592,630	8,592,630
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	31,512,215	13,518,737	13,518,737	13,306,011
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	52,978,115	24,859,578	24,859,578	21,736,758
Western Greenbrier Co-Production Demonstration Project (project discontinued)	16,256,940	8,128,470	8,128,470	7,861,662
<b>Total CCPI-1</b>	<b>121,087,308</b>	<b>55,720,822</b>	<b>55,720,822</b>	<b>52,114,427</b>

**Exhibit 2-4**  
**CCPI-2 Project Costs and Financial Status**  
**(Dollars)**

	<b>Total Project Costs</b>	<b>DOE Share</b>	<b>DOE Obligated</b>	<b>DOE Cost</b>
Demonstration of a Coal-Based Transport Gasifier	1,625,082,040	293,750,000	293,750,000	23,547,938
Mercury Specie and Multi-Pollutant Control	15,560,811	6,079,479	6,079,479	6,079,479
Mesaba Energy Project – Unit 1	2,155,680,783	36,000,000	22,245,505	17,776,616
<b>Total CCPI-2</b>	<b>3,796,323,634</b>	<b>335,829,480</b>	<b>322,074,984</b>	<b>47,404,033</b>

and sequestration, or beneficial reuse, of CO<sub>2</sub> emissions from coal-fueled electricity production. Proposals were submitted in January 2009. In July 2009, DOE selected two projects for negotiation. Funds appropriated for FY06 through FY09 were available for CCPI-3A, along with uncommitted funds from previous solicitations and funds appropriated under the American Recovery and Reinvestment Act (ARRA) of 2009.

In May 2009, DOE issued a Notice of Intent to Issue an amendment for the third CCPI solicitation. On June 9, 2009, DOE issued an amendment that provided for a second application due date (CCPI-3B) of August 24, 2009. While the focus remained the same as under CCPI-3A, there were several programmatic and administrative revisions. DOE anticipates making selections in October 2009. Unlike prior CCPI solicitations, if funds become available as a result of unsuccessful

negotiations, or in the event of withdrawals, DOE may decide to select one or more additional projects.

Projects selected under CCPI-3A and -3B could be funded, in whole or in part, from funds appropriated under ARRA. Projects receiving ARRA funding will require special tracking and reporting requirements as specified under the ARRA legislation. DOE anticipates that \$1.4 billion will be available for awards under CCPI-3A and -3B. Of the total amount, approximately \$800 million was provided under ARRA.



## General Provisions and Project Administration

Similar requirements and oversight apply to projects in CCTDP, PPII, and CCPI. A principal characteristic of the demonstration projects is the cooperative funding agreement between the participant and the federal government referred to as cost-sharing. This cost-sharing approach was introduced in Public Law 99-190, An Act Making Appropriations for the Department of the Interior and Related Agencies for the Fiscal Year Ending September 30, 1986, and for Other Purposes. General concepts and requirements of the cost-sharing principle, as applied to the demonstration projects, include the following elements:

- The federal government may not finance more than 50 percent of the total costs of a project;
- Cost-sharing by the project participant is required throughout all phases of the project (design, construction, and operation);
- The federal government may share in project cost growth (within the scope of work defined in the original cooperative agreement) up to 25 percent of the originally negotiated government share of the project;
- The participant's cost-sharing contribution must occur as project expenses are incurred, and cannot be offset or delayed based on prospective project revenues, proceeds, or royalties; and
- Investments in existing facilities, equipment, or previously expended R&D funds are not allowed for the purpose of cost-sharing.

Another principal characteristic of the demonstration projects is an agreement made by the participant for the federal government to recoup up to the full amount of the federal government's

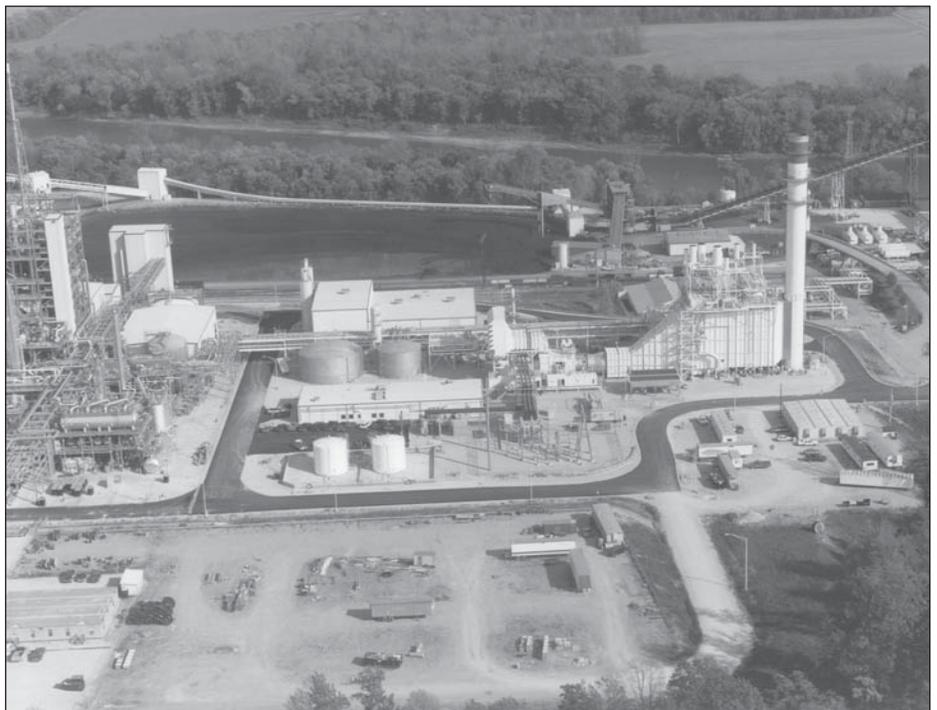
contribution. This approach enables taxpayers to benefit from commercially successful projects. This is in addition to the benefits derived from the demonstration and commercial deployment of technologies that improve environmental quality and promote the efficient use of the nation's coal resources.

While the specific repayment terms have varied to some degree between the solicitations, the repayment requirement was present from the first CCTDP solicitation through the second CCPI solicitation. The repayment provision was dropped for the CCPI-3A and -3B solicitations. The duration of the repayment period was usually 20 years following the end of the project demonstration period. In accordance with congressional direction, funds obtained from repayment agreements will be retained by DOE for future activities.

In terms of day-to-day oversight of the projects, the participant has responsibility for project management activities. The federal government monitors proj-

ect activities, provides technical advice, and assesses progress by periodically reviewing project performance with the participant. The federal government also participates in decision making at key project junctures. These junctures are used to divide most projects into several time and funding intervals known as budget periods. The number of budget periods is determined during the negotiation process for each project prior to contract award.

At the beginning of each budget period, DOE makes available the incremental amount of federal funds necessary to cover the government's cost-share for that period. This procedure limits the government's financial exposure and assures that DOE fully participates in the decision to proceed with each major phase of project implementation. Through these activities, the federal government ensures the efficient use of public funds in the achievement of individual project and overall program objectives.



*Wabash River Generating Station IGCC Facility.*



# 3. Projects

## Introduction

This chapter provides fact sheets reflecting status as of June 30, 2009 on clean coal technology demonstration projects encompassing the Power Plant Improvement Initiative (PPII) and Clean Coal Power Initiative (CCPI).

The project fact sheets are organized by market sector rather than program to better enable stakeholders to see the scope of activity in key areas of interest. These market sectors are: (1) emissions control for existing and new power plants; (2) advanced power systems for repowering existing plants and providing new generation capacity; (3) clean coal fuels for converting the nation's vast coal resources to low-emission fuels; and (4) industrial applications for coal and coal by-products.

Two-page fact sheets are presented for 7 of the 9 projects covered in the report that are ongoing or have ended prior to completion or contract award. In addition to providing an overview of the technology and accomplishments to date, the two-page fact sheets identify the project participants; team members; location; funding; objectives; benefits; and schedule.

Four-page fact sheets are provided for two projects that have completed final documentation of project activities. These fact sheets include key findings and sufficient project discussion to establish a context for the findings. The *Demonstration of Integrated Optimization Software at the Baldwin Energy Complex* project completed operations in November 2007. The *Greenidge Multi-Pollutant Control Project* completed operations in October 2008.

## Technology Overview

Following is an overview of major technology areas, underlying drivers, and associated challenges that have served as the focus of clean coal technologies.

### Emissions Control

**Advanced NO<sub>x</sub> Controls.** Advanced nitrogen oxides (NO<sub>x</sub>) controls address the need to comply with stringent emission requirements resulting from the following regulations/legislation: (1) the U.S. Environmental Protection Agency (EPA) Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone 1998 (commonly referred to as the NO<sub>x</sub> SIP Call); (2) EPA's Standards of Performance for Electric Utility Steam Generating Units, et al., dated 2/27/06; (3) EPA's Clean Air Interstate Rule (CAIR); and (4) EPA's Clean Air Visibility Rule (CAVR).

Advanced NO<sub>x</sub> control technologies include:

- Next generation low-NO<sub>x</sub> burners and reburning systems that limit NO<sub>x</sub> formation by staging the introduction of air in the combustion process (combustion modification);
- Selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and other chemical processes that act upon and reduce NO<sub>x</sub> already formed (post-combustion processes); and
- Oxygen-enhanced combustion that displaces a portion of the air with oxygen in low-NO<sub>x</sub> burners.

Low-NO<sub>x</sub> burners: (1) limit the amount of air available in the initial stages of combustion when fuel-bound nitrogen is volatilized; (2) lengthen the flame to avoid hot spots; (3) usually are integrated with overfire air (air ports located above the combustion zone) to complete combustion in a cooler zone; and (4) can be used with neural network controls for optimum load-following performances. Reburning systems inject fuel into flue gas to strip oxygen away from the NO<sub>x</sub> and introduce



*Advanced optimization software for enhanced emissions control was demonstrated at Dynegy Midwest Generation's Baldwin Energy Complex in Baldwin, Illinois.*

overfire air to complete combustion. SCR and SNCR use ammonia/urea to transform  $\text{NO}_x$  into nitrogen and water. SCR typically requires an array of catalysts in a reactor vessel to operate at relatively low post-boiler application temperatures, whereas SNCR simply involves ammonia/urea injection in the boiler where temperatures are high. Oxygen-enhanced combustion reduces available nitrogen and enables deeper staging through increased combustion efficiency.

While the PPII and CCPI programs have several projects that were recently completed or currently ongoing that address  $\text{NO}_x$  emissions as part of a multi-pollutant approach, DOE's  $\text{NO}_x$  emissions control research and development (R&D) activity ended in 2007.

**Mercury Controls.** Mercury controls address regulations regarding mercury emissions from coal-based power generation, which represents roughly one-third of U.S. mercury emissions. In February 2008, EPA's Clean Air Mercury Rule (CAMR) was vacated by the D.C. Circuit Court of Appeals. Until the EPA replaces CAMR with another regulatory approach, there is no federal

mandate to regulate mercury emissions. However, approximately half of the states have mercury regulations in place, some more stringent than under the previous EPA rule. Mercury control technologies include:

- Sorbents and oxidizing agents to transform mercury into a solid to be removed along with fly ash in electrostatic precipitators (ESP) or fabric filter dust collectors (FFDCs), also referred to as “baghouses;”
- Oxidizing agents in conjunction with wet flue gas desulfurization (FGD) scrubbers to capture mercury in sulfate by-products; and
- Real-time measurement of mercury species and total mercury, for process control and validation.

Solid sorbents adsorb the mercury and then are removed in either an ESP or FFDC. Oxidizing agents or mechanisms convert vapor-state elemental mercury to a solid-state mercury oxide that can be captured in ESPs, FFDCs, or wet FGDs. For plants equipped with wet FGDs, the oxidizing agent can be incorporated with the scrubber slurry used for sulfur capture. Mercury instrumentation and controls measure both elemental and oxidized mercury species entering the control device, and the total mercury entering the stack.

While DOE has ended R&D activities for mercury control to focus on carbon dioxide ( $\text{CO}_2$ ) control technologies, a number of recently completed and ongoing CCPI projects continue to provide commercial demonstrations of mercury control technologies.

**Particulate Matter Controls.** EPA regulations require control of particulate matter (PM), including PM equal to or less than 2.5 microns in size ( $\text{PM}_{2.5}$ ). The objective of the PM control program is to develop technology for coal-based sources that will result in substantial reductions in primary PM, its secondary precursors [sulfur dioxide ( $\text{SO}_2$ ) and  $\text{NO}_x$ ], and problematic acid



*TOXECON™, a multi-pollutant control technology providing high mercury capture efficiency, is being demonstrated at Wisconsin Electric's Presque Isle Power Plant in Marquette, Michigan.*

gases that can cause localized plume opacity and visibility impairment. Control technologies include:

- ESP/FFDC hybrids to leverage the best features of both  $\text{NO}_x$  and  $\text{SO}_2$  removal;
- Flue gas preconditioning to enhance ESP performance;
- Concentration of PM at ESP outlets for recycle;
- Alkaline injection for sulfur trioxide ( $\text{SO}_3$ ) acid aerosol precursor control; and
- Continuous  $\text{SO}_3$  analyzers for process control and validation.

ESPs electrically charge PM for capture on collection plates. FFDCs use fabric filter bags that receive and collect PM on the outside surface, and then are pulsed internally with jets of air to disengage the collected particulate. Preconditioning agents either lower resistivity or induce agglomeration of incoming PM. Alkaline injection converts  $\text{SO}_2$  and  $\text{SO}_3$  acid precursors into readily captured sulfate particulates, and neutralizes other acid gases such as hydrochloric and hydrofluoric acids.  $\text{SO}_3$  analyzers measure input and output levels for control and validation.

DOE has ended R&D activities for controlling PM. However, several PPII and CCPI projects have provided commercial demonstrations that address PM emissions in terms of both removal efficiency and cost savings compared to conventional technologies.

### **Advanced Power Systems**

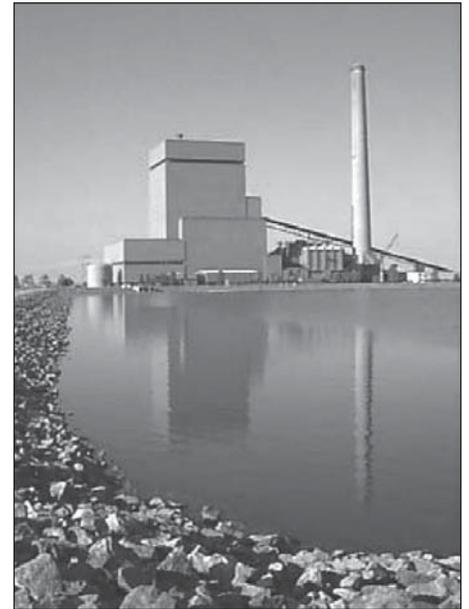
Advanced power systems address global climate change by enhancing power generation efficiency, producing near-zero pollutant emissions, and providing for hydrogen separation and carbon capture and sequestration (CCS). Advanced power technologies include:

- Integrated gasification combined-cycle (IGCC) systems that con-

vert coal to a clean synthesis gas (syngas) amenable for use by gas turbines and advanced fuel cells; provide conversion to chemicals and clean transportation fuels, and separation into hydrogen and  $\text{CO}_2$ ; and transform residual gases and solids into salable by-products;

- Circulating fluidized-bed (CFB) combustion systems that utilize low-grade fuels and waste materials to generate power at high efficiency and very low emissions, without the parasitic power drain of add-on environmental controls; and
- Advanced combustion techniques that use oxygen in lieu of air or chemical means, such as chemical looping, to effect the equivalent of combustion.

IGCC uses a gasifier to convert hydrocarbon feedstocks into largely gaseous components by applying heat under pressure in the presence of steam. Partial oxidation of the feedstock, typically with pure oxygen, provides the heat. Together the heat and pressure break the bonds between feedstock constituents and cause chemical reactions, producing syngas—primarily hydrogen and carbon monoxide. Minerals in the feedstock (ash), separated in the gasifier, are largely salable. Sulfur emerges from the gasifier primarily as hydrogen sulfide, which is easily converted to either a pure sulfur or sulfuric acid by-product. CFBs use jets of air to support combustion, effectively mix feedstocks with  $\text{SO}_2$  absorbents, and entrain the mixture. The entrained mixture is transported to a cyclone that separates the solids from the flue gas. Hot separated solids are returned to the CFB combustor. Relatively clean flue gas goes to a heat exchanger to produce steam that drives a steam turbine. The mixing and recycling action of the CFB allows high combustion efficiency at temperatures below the thermal  $\text{NO}_x$  formation temperature, and achieves high-efficiency  $\text{SO}_2$  capture through lengthy and direct sorbent/ $\text{SO}_2$  contact.



*An advanced hybrid particulate collector was demonstrated at Otter Tail Power Company's Big Stone Power Plant in Big Stone City, South Dakota.*



*Lignite fuel upgrading is being demonstrated at Great River Energy's Coal Creek Station in Underwood, North Dakota.*



*Conversion of spray dryer ash to lightweight aggregate for construction materials was demonstrated at the Birchwood Power Facility in King George, Virginia.*

The challenge is to move today's coal-based advanced power systems from roughly 40 percent efficiency to between 45 and 50 percent.

### **Clean Coal Fuels**

**Upgrading.** Upgrading coal quality enhances power plant efficiency and reduces emissions per kW of electricity produced, which supports CAIR, CAMR, and global climate change initiatives. Upgrading technologies include coal drying and ash removal methods to significantly increase coal energy density.

The challenge in coal drying and ash removal is to realize a net energy benefit in using the upgraded product; and for processes that export the product, a significant challenge resides in maintaining stability (preventing spontaneous combustion) of the product after removing in-situ water.

**Conversion.** Conversion of coal to clean liquid fuels, chemicals, or hydrogen includes coal liquefaction, which involves converting coal gasification-derived synthesis gas into zero-sulfur, aromatic-free transportation fuels using the Fischer-Tropsch process; and hydrogen-from-coal processing techniques, which currently are under development.

The challenge is to reduce process costs so that products are competitive with transportation fuels in the world market and reduce the GHG impact to a level equal to or less than petroleum refining.

### **Industrial Applications**

**Direct Coal Use.** Efforts under this area address substitution of coal for premium fuels in industrial applications such as coal for coke in steel making operations, and coal for oil or natural gas in energy production.

**By-product Use.** Efforts under this area address utilization of the vast amount of solid residue that is the by-product of

coal cleaning and combustion—coal utilization by-products (CUBs). There are two primary targets: (1) abandoned coal waste piles from old mining operations, and (2) ash produced from existing coal-fired plants. Coal waste represents both a groundwater contamination threat and a potential source of energy. Coal ash, which represents a relatively untapped resource for construction materials is, to a large extent, disposed of in landfills that are in increasingly short supply. By-product use technologies include:

- Coal waste reuse in power production to support reclamation of abandoned coal waste piles; and
- Conversion of coal ash to cement substitutes or additives and construction-grade aggregates.

The challenge is to demonstrate and document successful application of CUBs to provide the impetus for increased industry acceptance, leading to increased utilization.

## Project Fact Sheets

An index to project fact sheets by market sector is provided in Exhibit 3-1. An index by program (PPII, CCPI-1, and CCPI-2) is provided in Exhibit 3-2. Within these categories, projects are listed alphabetically by project name. Exhibit 3-3 is a map showing the location of the projects. Exhibit 3-4 presents the project schedules by market sector.

General project information is provided in sidebars and headers surrounding the more detailed project information in each fact sheet. On the first page above each schematic, specific technical thrusts within the four market sectors are indicated by a filled-in box (appears as a black box). At the top of the second page of each fact sheet, the project duration and period of operation are indicated in months. The project duration is the time from project award to the operation completed date. The

schedule is shown based on the functional phases of the project. The phases are represented in a non-overlapping manner above a time line that encompasses the full duration of the project. The month and year are provided for the beginning and ending date of each phase. A status arrow indicates the progress to date.

All project fact sheets contain schematics of the demonstrated technology to help convey understanding. The portion of the process or facility central to the demonstration is denoted by a shaded area. For projects that have successfully completed the operation phase, the term *Demonstration Operations Complete* is shown directly below the project title. Projects that have been discontinued are also noted as such below the project title.

## Other Information Sources

Other sources of information complement this document, allowing interested parties to follow programs and projects as they unfold. The home page of the DOE Office of Fossil Energy Web site is at <http://www.fossil.energy.gov>. The National Energy Technology Laboratory (NETL) implements the clean coal technology programs, and provides another source of program and project information at <http://www.netl.doe.gov>, including a comprehensive repository for the latest published information known as the *CCT Compendium* at <http://www.netl.doe.gov/technologies/coalpower/cctc/index.html>. The latest versions of the individual project fact sheets can be viewed by following the appropriate CCT program link (CCPI or PPII) from the web address above, selecting a particular project, and clicking on the “Project Brief” link.

The *Clean Coal Today* newsletter offers readers a quarterly look at clean coal

technologies and related issues, highlighting key events, the latest project status, and listing the latest publications and upcoming events. Current and past editions of the *Clean Coal Today* newsletter can be found at <http://www.netl.doe.gov/technologies/coalpower/cctc/newsletter/newsletter.html>.

As projects unfold, NETL publishes *Topical Report* documents at critical junctures, highlighting particular technological advantages, project plans, and expected outcomes. Upon project completion, *Project Performance Summary* documents are published, providing synopses of the projects and highlighting operational, environmental, and economic performance. NETL also publishes a DOE assessment of each completed project.

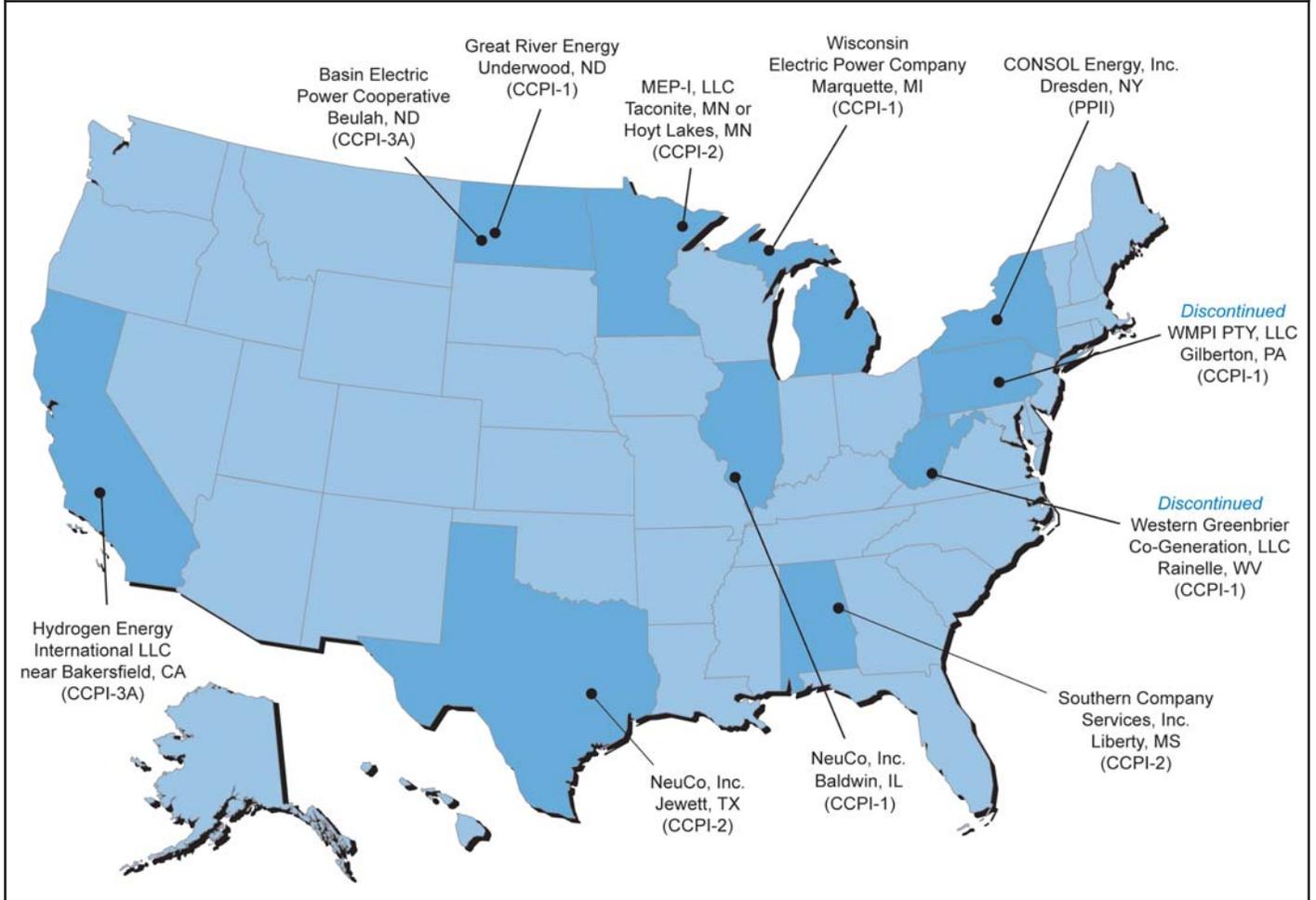
**Exhibit 3-1**  
**Project Fact Sheets by Market Sector**

Project	Program	Participant	Status	Page
<b>Emissions Control</b>				
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	CCPI-1	NeuCo, Inc.	Completed	3-10
Greenidge Multi-Pollutant Control Project	PPII	CONSOL Energy, Inc.	Completed	3-14
Mercury Specie and Multi-Pollutant Control	CCPI-2	NeuCo, Inc.	Operation	3-18
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	CCPI-1	Wisconsin Electric Power Company	Operation	3-20
<b>Advanced Power Systems</b>				
Demonstration of a Coal-Based Transport Gasifier	CCPI-2	Southern Company Services, Inc.	Design	3-24
Mesaba Energy Project – Unit 1	CCPI-2	MEP-I LLC	Design	3-26
<b>Clean Coal Fuels</b>				
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	CCPI-1	WMPI PTY., LLC	Discontinued	3-30
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	CCPI-1	Great River Energy	Construction	3-32
<b>Industrial Applications</b>				
Western Greenbrier Co-Production Demonstration Project	CCPI-1	Western Greenbrier Co-Generation, LLC	Discontinued	3-36

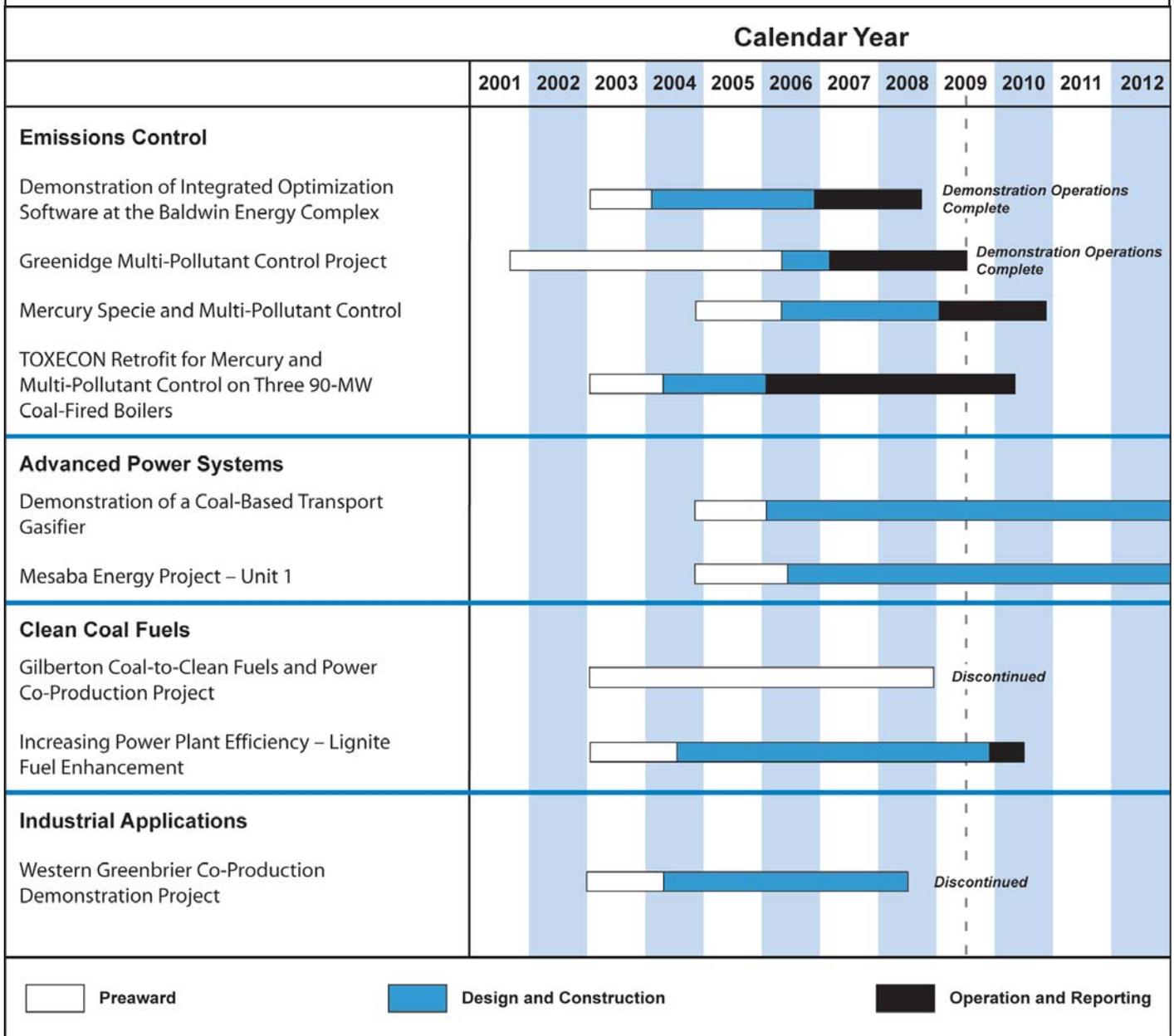
**Exhibit 3-2**  
**Project Fact Sheets by Program**

Project	Participant	Status	Page
<b>PPII</b>			
Greenidge Multi-Pollutant Control Project	CONSOL Energy, Inc.	Completed	3-14
<b>CCPI-1</b>			
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	NeuCo, Inc.	Completed	3-10
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	WMPI PTY., LLC	Discontinued	3-30
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	Great River Energy	Construction	3-32
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	Wisconsin Electric Power Company	Operation	3-20
Western Greenbrier Co-Production Demonstration Project	Western Greenbrier Co-Generation, LLC	Discontinued	3-36
<b>CCPI-2</b>			
Demonstration of a Coal-Based Transport Gasifier	Southern Company Services, Inc.	Design	3-24
Mercury Specie and Multi-Pollutant Control	NeuCo, Inc.	Operation	3-18
Mesaba Energy Project – Unit 1	MEP-I LLC	Design	3-26

### Exhibit 3-3 Geographic Locations of Projects



## Exhibit 3-4 Project Schedules by Market Sector



# **Emissions Control**

# Demonstration of Integrated Optimization Software at the Baldwin Energy Complex

**Demonstration Operations Complete**

## Participant

NeuCo, Inc.

## Additional Team Members

Dynegy Midwest Generation—host

## Location

Baldwin, Randolph County, IL (Dynegy Midwest Generation’s Baldwin Energy Complex)

## Technology

Advanced optimization software, building on NeuCo’s ProcessLink® technology

## Project Capacity/Production

1,768 MW

## Coal

Powder River Basin (PRB) subbituminous

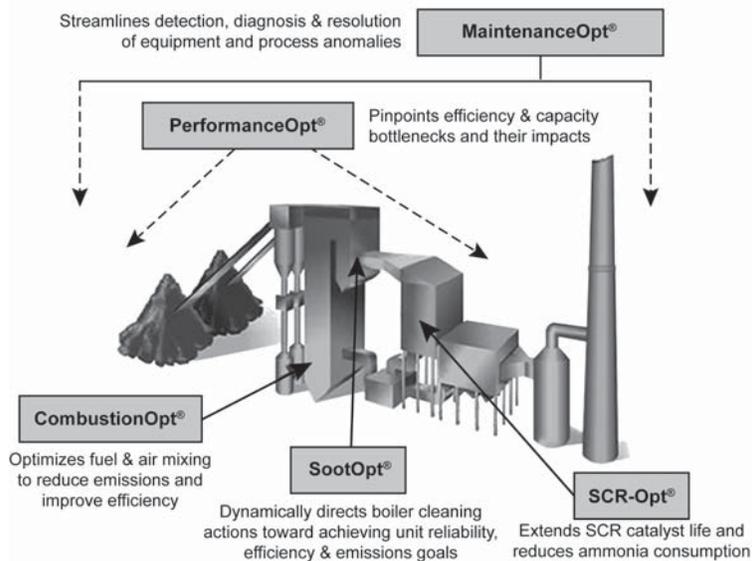
## Project Funding

Total	\$19,094,733	100%
DOE	8,592,630	45
Participant	10,502,103	55

## CCPI-1

## Emissions Control

Mercury	■	NO <sub>x</sub>	■
SO <sub>2</sub>	■	PM <sub>2.5</sub>	■



## Objectives

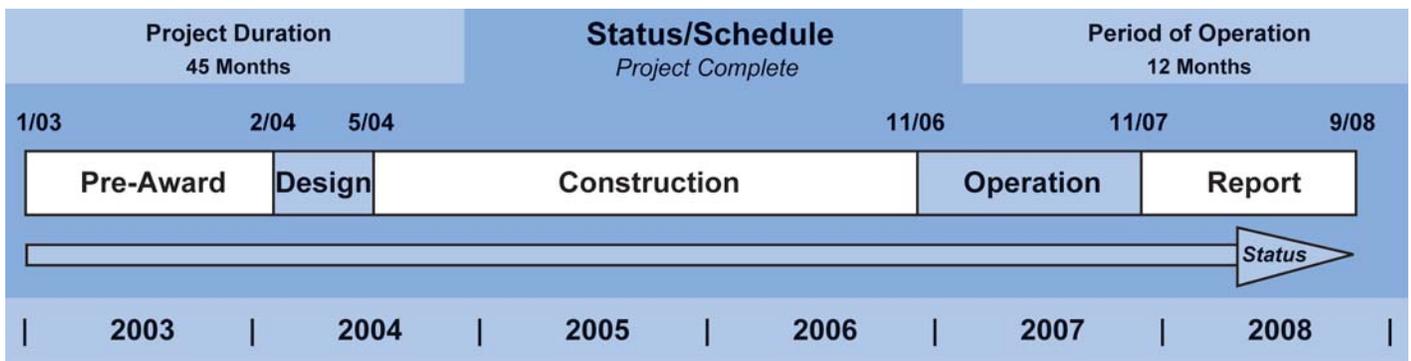
To design and apply individual on-line optimization products at the Baldwin Energy Complex for combustion, sootblowing, selective catalytic reduction (SCR) operations, overall unit thermal performance, and plant-wide economic optimization; to integrate individual optimizers through NeuCo’s ProcessLink® platform; and to reduce the Baldwin Energy Complex nitrogen oxides (NO<sub>x</sub>) emissions by 5 percent, increase efficiency by 1.5 percent, and improve reliability and availability, thereby increasing net annual electrical power production by 1.5 percent.

## Technology/Project Description

The project demonstrated an integrated optimization control system, incorporating inputs from two 585-MW cyclone-fired boilers with SCR and a 595-MW tangentially fired boiler with low-NO<sub>x</sub> burners (LNBs). Optimization products were developed and operated in a non-manual, neural control (closed loop) mode for control of combustion, sootblowing, and SCR operations. In addition, products were developed for overall unit thermal performance and plant-wide maintenance optimization. These five optimization systems were integrated through NeuCo’s ProcessLink® architectural platform that includes neural networks, genetic algorithms, and “fuzzy logic” techniques. ProcessLink® capabilities enable the various optimization techniques at the Baldwin Energy Complex to be linked to each other, leveraging the existing control network. Each product was designed, installed, and individually tested to verify effectiveness before being integrated with the other products.

## Benefits

NeuCo’s ProcessLink® architecture offers plant operators a highly flexible control platform. Optimization products can be designed and applied to individual subsystems in a plant, leveraging existing sensors, actuators and networked computational resources, and then linked to other individual subsystems to afford overall integration of controls responsive to plant operator and corporate criteria. As plant complexity increases through retrofit and repowering applications, the introduction of new technologies, and plant modifications, this integrated process optimization approach can be an important tool for plant operators.



## Status/Accomplishments

The project was awarded on February 18, 2004. The National Environmental Policy Act (NEPA) requirements were met with a Categorical Exclusion (CX) at the time of award.

During the course of the project, NeuCo deployed five optimization products that were integrated through the ProcessLink® architectural platform. Different combinations of the optimization products were installed on each of the three units depending on the boiler type and configuration as shown below:

Unit 1 (Cyclone-fired)	Unit 2 (Cyclone-fired)	Unit 3 (Tangentially-fired)
• CombustionOpt®	• CombustionOpt®	• CombustionOpt®
• MaintenanceOpt®	• MaintenanceOpt®	• MaintenanceOpt®
• PerformanceOpt®	• PerformanceOpt®	• SootOpt®
• SCR-Opt®	• SCR-Opt®	
	• SootOpt®	

CombustionOpt® continuously evaluates and adjusts numerous boiler settings to improve the mixing of the fuel and air in the furnace seeking to optimize the combustion process and reduce NO<sub>x</sub> formation. SCR-Opt® closely coordinates with CombustionOpt® to minimize NO<sub>x</sub> formation, thereby reducing the amount of ammonia needed for SCR operations, and also determines the precise amount of ammonia needed for the desired NO<sub>x</sub> rate. PerformanceOpt® identifies problems that are causing performance deficiencies, and determines the impacts of each problem. SootOpt® regulates cleaning actions on heat transfer surfaces to minimize unnecessary cleaning operations. MaintenanceOpt® monitors a broad spectrum of data looking for anomalies that might indicate the presence of reliability, capacity, or efficiency problems.

The optimization systems were integrated with existing equipment and digital controls, followed by an evaluation, refining, and documentation period. The operation phase of the project was completed in November 2007. The Final Technical Report was approved in September 2008.

## Results Summary

The Baldwin Energy Complex consists of two cyclone-fired boilers configured with SCR systems (Units 1 and 2) and a tangentially-fired boiler (Unit 3). The three units were equipped with state-of-the-art instrumentation and Digital Control System (DCS) prior to the start of the project. All three units were initially designed to fire high-sulfur Illinois coal. In 2000, the units were switched to Powder River Basin (PRB) coal for sulfur emissions compliance. This switch complicated the relationships among various parameters and operator activities including: sootblowing; SCR operations; combustion optimization; and minimizing unit heat rate.

The project far exceeded the targets for NO<sub>x</sub> reduction with average reductions of between 12 and 14 percent.

The project realized lower operating costs, improved reliability, and greater commercial availability while reducing greenhouse gases, mercury, and particulate emissions.

The integrated optimizers commercialized as part of this project are expected to yield well under a one-year payback for average-sized coal units across all unit types and fuel categories comprising the U.S. power industry.

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Five optimization products were developed, addressing combustion, sootblowing, SCR operations, overall unit thermal performance, and plant-wide availability optimization. The initial goals were to establish each system and demonstrate their integration in unified plant optimization. The optimizers and settings were improved and refined based on input from plant personnel, overall objectives, and actual experiences.

Initially, optimization activity was focused on achieving improved control of the 28 cyclone burners on Units 1 and 2 and the numerous fuel-air and auxiliary air dampers on Unit 3. The major challenge for the cyclone units was moving toward reduced stoichiometry (lower  $\text{NO}_x$  production) without losing good cyclone slag flow. Cyclone function is largely based around the physics and chemistry of slag formation and flow. The PRB coal has higher ash content than high sulfur Illinois coal and a much narrower range of temperatures over which slag (molten ash) flows well. PRB coal also has a lower overall energy density, requiring more flow through the combustor to provide the same heat release. For these reasons, boilers are typically derated after switching to PRB coal.

To avoid derating, stoichiometry, temperature, and mass flow have to be controlled within narrow ranges. The consequence of failing to meet these combustion control challenges is clogging a cyclone with hardening slag, a condition that often requires an outage. The project was able to meet these challenges and avoid derating of the boilers.

Improvement of sootblowing operations also provided multiple benefits towards project goals. The project achieved a 33 percent reduction of boiler cleaning actions (via water

cannons and soot blowers). Frequent sootblowing operations increase steam usage and can increase the frequency of tube failures. Less steam usage for sootblowing improves heat rate. Tube failures can result from erosion and thermal shock that occur when high-pressure, relatively cool steam impinges clean tubes. Tube failures are a significant cause of forced outages.

The project demonstrated that multiple optimization products could be integrated into a single software architecture and coordinated to achieve plant-wide objectives. The overall results of the project are discussed below.

- **$\text{NO}_x$  Reduction:** The 5 percent target for  $\text{NO}_x$  reduction was exceeded with  $\text{NO}_x$  reduction between 12 and 14 percent.
- **Heat Rate Improvement:** The optimization systems delivered an average heat rate improvement of approximately 0.7 percent. This was less than the 1.5 percent target and fell short primarily due to greater emphasis on  $\text{NO}_x$  reduction. With a different prioritization of objectives, it is believed the project would have achieved the target heat rate improvement. The plant's desire to maintain a safe margin of error with respect to a 30 day average  $\text{NO}_x$  rate cap led them to prioritize  $\text{NO}_x$  reduction over heat rate improvements.
- **Increased Annual Available MWh:** Although difficult to measure precisely, the target of increasing available MWh by 1.5 percent was met by providing prioritized alerts and knowledge-based diagnostics for a wide array of plant equipment and process anomalies; helping the plant to move from Illinois coal to PRB coal without derating of the boilers; and improved manage-

ment of cyclone flame quality and reduced slag buildup.

- **Commensurate Reductions in Greenhouse Gases, Mercury, and Particulates:** Reductions in all three of these indices can be associated directly with the optimization leverage observed in the heat rate and  $\text{NO}_x$  reductions.
- **Commensurate Benefits from Lower Costs, Improved Reliability, and Greater Commercial Availability:** These benefits are mostly due to the previously described achievements. Also playing a role were the sustained operation of the cyclones while using less expensive fuel; improved catalytic reduction of  $\text{NO}_x$ ; and the reduced time required to discover, prioritize and diagnose equipment issues.

The optimizers commercialized as part of this project are expected to pay for themselves in well under one year when deployed on typical plant types and fuel categories that comprise the U.S. fossil power industry. This represents a highly cost-effective way of addressing some of the industry's most pressing challenges and leverages the benefits of investments in SCR equipment, low- $\text{NO}_x$  systems, and modern control and instrumentation systems.

## Project Summary

The project established the broadest application to date of advanced optimization software. The project demonstrated five optimization systems that were integrated through NeuCo's ProcessLink® technology. This technology uses neural networks, expert systems, and fuzzy logic to best achieve specific performance objectives and operator priorities. The systems have the ability to "learn" the various interactions and tradeoffs between multiple plant control settings and optimize operator objec-

tives based on real-time and historical data from actual plant operation.

The project was performed in two phases. During the first phase, a suite of integrated online optimization systems was installed and integrated with plant operations. The second phase focused on improving the products and quantifying the benefits of the integrated system. A series of updated optimizers was issued during both phases of the project based on actual experience and input from plant personnel.

During the course of the project, the following five products were developed:

- **CombustionOpt<sup>®</sup>**: This product continuously evaluates and adjusts numerous boiler settings to improve the mixing of the fuel and air in the furnace seeking to optimize the combustion process and reduce NO<sub>x</sub> formation. For example, the bias and trim settings are manipulated by CombustionOpt<sup>®</sup> to fine tune the relative proportion of primary air delivered to the burners and secondary air delivered to the flame just above each burner. Changes to the relative proportion of primary to secondary air have a significant effect on the properties of the flame, particularly its temperature and oxygen distribution, both of which impact the formation of NO<sub>x</sub>. Other manipulated boiler settings include the proportion of the total coal flow between the upper and lower elevations of the furnace; biases that control the overall air/fuel ratio for the boiler; and the amount of over-fire air delivered to the final stages of the furnace combustion process. On a typical unit, CombustionOpt<sup>®</sup> manipulates between 25 and 50 of these types of biases, making small step changes, once every few minutes.
- **SCR-Opt<sup>®</sup>**: SCR uses a catalyst with ammonia as a reagent to reduce NO<sub>x</sub> emissions from combustion exhaust gases leaving the boiler. SCR-Opt<sup>®</sup> allows the operator to set the desired NO<sub>x</sub> rate and the optimizer determines the precise amount of ammonia needed. SCR-Opt<sup>®</sup> is closely integrated with CombustionOpt<sup>®</sup> and optimization is coordinated so that CombustionOpt<sup>®</sup> is focused on minimizing the amount of ammonia needed for SCR operations. For example, changes made to the mixing of the fuel and air in the furnace to reduce NO<sub>x</sub> formation also increased SCR efficiency.
- **SootOpt<sup>®</sup>**: This product regulates cleaning actions on heat transfer surfaces throughout the furnace to improve control of steam and exit gas temperatures and minimize unnecessary cleaning operations. The overall solution results in improved consistency and quality of soot-cleaning decisions, improved insight into soot-cleaning activity and its effects on unit performance, and improved bottom line performance of emissions, heat rate, and reliability indicators.
- **PerformanceOpt<sup>®</sup>**: This product is a predictive performance management system that identifies problems that are causing performance deficiencies, and determines the impacts of each problem. Following problem identification and prioritization, PerformanceOpt<sup>®</sup> facilitates the analysis needed to determine the root cause and identify remedial action by providing the operators with detailed information on measured as well as estimated process conditions and equipment performance.
- **MaintenanceOpt<sup>®</sup>**: This product continuously monitors process and equipment health data looking for

anomalies that might indicate the presence of reliability, capacity, or efficiency problems. MaintenanceOpt<sup>®</sup> can detect both slowly developing problems and problems that could have a critical near-term reliability impact. When anomalies are detected, the system's heuristics knowledge base supports the identification of the most likely causes of the anomalies.

The user interface is specific to the particular product; however, each provides the operator with further optimization advice, a summary of recent actions the model had taken and why, and graphs of actual optimization performance for key benchmarks over time. In addition, the optimizers offer a variety of analysis screens that provide greater details and insight to the operators.

Each optimizer can address a variety of operating situations and rapidly accommodate changing conditions and objectives. The optimizers can be easily modified or expanded to incorporate new controls and objectives, or to address additional optimization goals.

The suite installation was completed at the end of 2006 and was followed by a one year evaluation and documentation period. Quantitative project benefits included: reduced nitrogen oxides (NO<sub>x</sub>) emissions by 12–14 percent; improved average heat rate (fuel efficiency) by 0.7 percent; increased available megawatt hours by an estimated 1.5 percent; reduced ammonia consumption by 15–20 percent; and commensurate reductions in greenhouse gases, mercury, and particulates. These benefits translated to lower costs, improved reliability, and greater commercial availability with significantly reduced environmental impacts.

# Greenidge Multi-Pollutant Control Project

**Demonstration Operations Complete**

## Participant

CONSOL Energy Inc.

## Additional Team Members

AES Greenidge, LLC—host

Babcock Power Environmental, Inc.—[Engineering, Procurement, and Construction (EPC) Contractor]

## Location

Dresden, NY (AES Greenidge Unit 4)

## Technology

Hybrid selective non-catalytic reduction (SNCR)/in-duct selective catalytic reduction (SCR) in combination with low-NO<sub>x</sub> burners to control NO<sub>x</sub> and a Turbosorp® circulating fluidized-bed dry scrubbing system to control SO<sub>2</sub>, mercury, acid gases, and particulate matter (PM)

## Plant Capacity/Production

107 MW (Unit 4)

## Coal

Bituminous coal (>2% sulfur) co-fired with up to 10% biomass

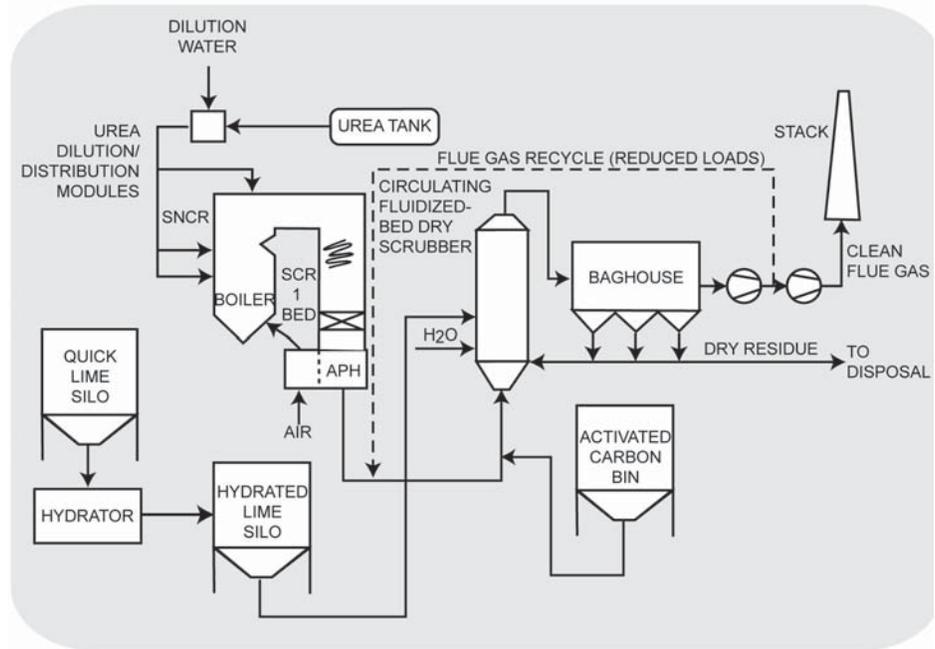
## Project Funding

Total	\$32,742,976	100%
DOE	14,341,423	43.8
Participant	18,401,553	56.2

## PPII

## Emissions Control

Mercury	■	NO <sub>x</sub>	■
SO <sub>2</sub>	■	PM <sub>2.5</sub>	■

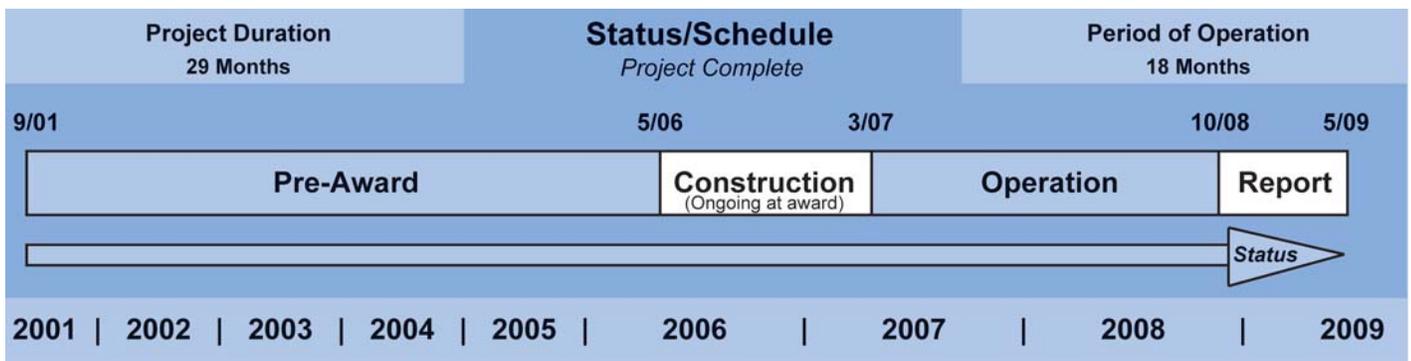


## Objectives

To demonstrate cost-effective multi-pollutant control for relatively small, coal-fired power plants using a hybrid selective non-catalytic reduction (SNCR)/in-duct selective catalytic reduction (SCR) system in combination with low-NO<sub>x</sub> burners and a Turbosorp® circulating fluidized-bed dry scrubbing system with baghouse ash recycling and activated carbon injection. To control nitrogen oxides (NO<sub>x</sub>) emissions to 0.10 lb/10<sup>6</sup> Btu at full load, and reduce sulfur dioxide (SO<sub>2</sub>) by 95 percent, mercury by 90 percent, and acid gases by 95 percent while the unit fired coal containing greater than 2 percent sulfur; and to evaluate the impact of biomass co-firing on the performance of the hybrid SNCR/SCR and Turbosorp® systems.

## Technology/Project Description

The project demonstrated a hybrid SNCR/SCR system in combination with low-NO<sub>x</sub> burners and a Turbosorp® system using baghouse ash recycling and activated carbon injection to cost-effectively reduce emissions of NO<sub>x</sub>, SO<sub>2</sub>, mercury, and acidic gases to levels equal to or lower than those required by regulation at an existing 107-MW plant. To complement existing low-NO<sub>x</sub> burners, SNCR was employed upstream of a single-bed in-duct SCR. Urea injection required for the SNCR provides the ammonia slip for the SCR. Having the SCR downstream of the SNCR allows the SNCR to operate at lower temperatures than normal (usually avoided to protect against ammonia slip) to enhance performance. The Turbosorp® system uses a reactor vessel to facilitate contact of flue gas with separately injected dry hydrated lime, activated carbon, and water. The activated carbon adsorbs mercury, and the hydrated lime reacts with the sulfur dioxide (SO<sub>2</sub>) and sulfur trioxide (SO<sub>3</sub>), hydrogen chloride (HCl), and hydrogen fluoride (HF) gases to form benign solids that are captured in the baghouse. Lime and activated carbon sorbents captured in the baghouse are recycled to the Turbosorp® fluidized-bed to enhance utilization.



## Benefits

The U.S. power industry is seeking lower cost and more compatible multi-pollutant control alternatives to SCR and wet scrubbers for the approximately 400 domestic coal-fired generating units with capacities ranging from 50–300 MW. Economies of scale that make SCR and wet scrubbers viable for large plants do not apply to these relatively small units, and small units often are space constrained, making it difficult to install conventional SCR and wet scrubbers. AES Greenidge Unit 4 is representative of the small, coal-fired electricity generating units that together represent almost one-fifth of the U.S. coal-fired generating capacity. The hybrid NO<sub>x</sub> control technology and Turbosorp® system each represent significant capital costs savings in comparison to a conventional SCR unit and wet scrubber. Also, the acid gas control afforded by the Turbosorp® system removes the precursors to acid aerosols, which can form PM less than 2.5 microns in diameter (PM<sub>2.5</sub>) once emitted. Moreover, biomass co-firing may improve overall emissions performance through reduced fuel-bound nitrogen and sulfur levels, increased volatile content, and general combustion characteristics.

## Status/Accomplishments

Following protracted negotiations, the project was awarded on May 19, 2006, with design and construction activities already under way. The system was integrated with the unit during a seven-week tie-in outage. The project moved to the operations and testing phase in March 2007. At the end of June 2007, the project met the performance guarantee levels for NO<sub>x</sub>, SO<sub>2</sub>, SO<sub>3</sub>, HCl, mercury, and ammonia slip. During the first year of operation, the project sought to resolve a problem involving large particle ash accumulating in the SCR catalyst bed. Through the addition of a large particle ash screen, sootblowers, and vacuum ports, ash deposit accumulation was reduced to an acceptable level.

Three series of tests were conducted through June 2008. Test results demonstrated that the combination of technologies met all of the emissions reduction goals of the project. Moreover, the systems were installed with roughly 40 percent lower capital costs than conventional SCR and wet scrubbers, and they required only about 0.4 acre of space.

## Results Summary

The overall objective of the project was to demonstrate an affordable means for achieving deep reductions in the emissions of a number of pollutants from smaller, coal-fired electric generating units, allowing these units to continue to produce low-cost, reliable electricity under increasingly stringent air emissions regulations.

The Turbosorp® system demonstrated over 96 percent SO<sub>2</sub> emission reductions from high-sulfur coals.

As a result of the success of the demonstration, three additional deployments of the technology have been announced.

The multi-pollutant control system achieved 98 percent mercury removal without the need to employ activated carbon injection.

Unlike wet flue gas desulfurization, the Turbosorp® system has relatively few moving parts, and does not require slurry handling, exotic materials of construction, or a corrosion-resistant stack.

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The project achieved the performance target of 95 percent SO<sub>2</sub> removal efficiency during both short-term and long-term testing. The average SO<sub>2</sub> removal efficiency observed during commercial operation exceeded 96 percent. The coal sulfur content averaged 3.6 lb/mmBtu during this period; however, removal efficiencies of 95 percent were achieved for coals containing up to 4.8 lb/mmBtu.

The performance target of 90 percent mercury removal efficiency was exceeded during both short-term and long-term testing. No activated carbon injection was required to achieve this removal efficiency. The average coal-to-stack mercury removal efficiency measured between March 2007 and June 2008 was 98 percent.

Initial tests suggested that activated carbon injection did not contribute any additional, measurable mercury removal to the already-high level achieved by the other components of the multi-pollutant control system. Apart from these initial tests, AES Greenidge operated without activated carbon injection.

The performance target of 95 percent SO<sub>3</sub> and HCl removal efficiency was achieved during both short-term and long-term testing. Inlet HF concentrations were too low to demonstrate attainment of the performance target.

The multi-pollutant control system achieved the performance target for high-load NO<sub>x</sub> emissions of 0.10 lb/mmBtu during short-term (guarantee) testing, but fell short of this goal during long-term operation. The average high-load NO<sub>x</sub> emission rate observed was 0.14 lb/mmBtu. The higher NO<sub>x</sub> emissions occurred because AES Greenidge had to reduce the aggressiveness of low-NO<sub>x</sub> firing in order to attain suitable combustion characteristics for routine operation. Nevertheless, over-

all NO<sub>x</sub> emissions (lb/mmBtu) were reduced by about 52 percent relative to the pre-project baseline.

Ammonia slip from the hybrid SNCR/SCR system was generally greater than expected during the first year-and-a-half of operation. The higher-than-expected ammonia slip did not significantly affect plant operations.

The new baghouse reduced PM emissions to less than 0.001 lb/mmBtu. Product ash from the Turbosorp<sup>®</sup> system is the only significant by-product and can be disposed of in a landfill or used as fill material for construction projects.

Biomass (waste wood) co-firing did not have any discernible effect on the performance of the multi-pollutant control system. However, the extent (<5 percent of total heat input) and duration of co-firing were too limited to permit a thorough evaluation.

Operation of the system was hindered by the accumulation of large particle ash (LPA) in the in-duct SCR catalyst, requiring numerous outages for catalyst cleaning during the first year of operation. However, the severity of the problem was reduced by the installation of an LPA removal system (outside of the scope of the DOE project), including a screen, soot blowers, and vacuum ports. Additional operating experience is expected to confirm the long-term effectiveness of this system.

The multi-pollutant control system affords lower capital costs in exchange for somewhat higher variable operating and maintenance costs relative to conventional technologies that are capable of achieving deep reductions in NO<sub>x</sub> and SO<sub>2</sub>. The capital cost (including the combustion modifications and LPA removal system) was about 40 percent less than the estimated cost to retrofit the unit with conventional SCR and wet

FGD systems. Mercury, acid gas, and primary PM control are co-benefits of the NO<sub>x</sub> and SO<sub>2</sub> control systems, and added no incremental cost.

## Project Summary

The project demonstrated an innovative, integrated combination of pollution control technologies on a relatively small coal-fired unit (107-MWe) at the AES Greenidge power plant. The project sought to demonstrate an emissions control system that is particularly well suited to meet the requirements of a significant number of small coal-fired units because of its:

- Deep emission reduction capabilities;
- Low capital costs;
- Small space demands;
- Applicability to high-sulfur coal;
- Low maintenance requirements; and
- Operational flexibility.

The multi-pollutant control system comprises a combination of technologies that were applied in a unique way and integrated for the first time. The system consists of three major components: NO<sub>x</sub> control via a hybrid SNCR/SCR system; SO<sub>2</sub>, SO<sub>3</sub>, HCl, HF, and PM control via a Turbosorp<sup>®</sup> system and baghouse; and mercury control via the supplemental benefits afforded by the NO<sub>x</sub> control and Turbosorp<sup>®</sup> systems, and activated carbon injection if required. The design includes turndown capabilities for the SNCR and Turbosorp<sup>®</sup> systems, enabling continued emissions reduction at reduced loads.

NO<sub>x</sub> control is the first step in the process and is accomplished using combustion modifications (installed outside of the scope of the DOE project) and urea-based SNCR in the furnace, followed by a single-layer SCR reactor

that is installed in a modified section of the ductwork between the unit's economizer and air heaters. The SCR process is fed by ammonia slip (excess ammonia) from the SNCR process. While the amount of NO<sub>x</sub> reduction achievable by the in-duct SCR is less than the amount achievable by a stand-alone SCR, the purpose is to consume ammonia slip and provide incremental NO<sub>x</sub> reduction.

To maximize performance of the in-duct SCR system, static mixers are installed just upstream to homogenize the velocity, temperature, and composition of the flue gas. The static mixers are designed to maintain ash entrainment and distribution across the SCR reactor, minimizing catalyst deactivation and pressure drop via fly ash plugging. For units that produce LPA, a screen is required to prevent LPA from accumulating in the catalyst.

Emissions of SO<sub>2</sub> and other acid gases are reduced in the Turbosorp® system. The fluidized bed absorber brings the flue gas into contact with water and dry hydrated lime (supplied from an on-site hydrator). The hydrated lime reacts with the acidic constituents of the flue gas (i.e., SO<sub>2</sub>, SO<sub>3</sub>, HCl, and HF) to form dry solid products that are

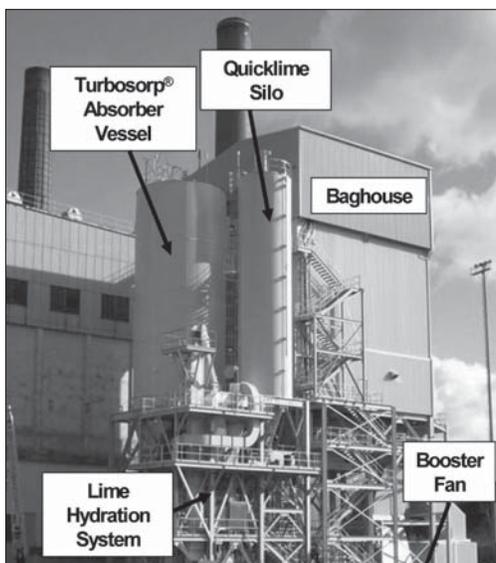
separated from the flue gas in a new pulse-jet baghouse and recycled to the absorber in order to maximize pollutant removal and lime utilization.

Mercury removal is provided as a co-benefit of the in-duct SCR, dry scrubber, and baghouse and, if required, by injection of activated carbon.

The commercial viability of the system was demonstrated during more than a year-and-a-half of routine operation. The system has enabled the unit to satisfy its permit requirements and continue in service. The integrated technology offers a number of advantages including:

- **Low Capital Costs:** The multi-pollutant control process was designed to achieve deep emission reductions while offering substantially reduced capital costs compared to conventional technologies. Savings result from employing a compact, single-layer SCR reactor; avoidance of expensive corrosion-resistant materials required for wet scrubbers; and the mechanical simplicity of the system.
- **Small Space Requirements:** The single-layer SCR reactor is installed in a modified ductwork section that requires minimal new support. Because the SCR is fed by ammonia slip from the SNCR, it does not require the ammonia storage and handling system and injection grid that are typically needed for stand-alone SCR installations. The arrangement of the circulating fluidized bed, baghouse, and associated equipment is also compact. The various pieces of equipment are vertically tiered to permit gravity-assisted transport of solids where possible, and require only approximately 0.4 acre of space for a 100 MW installation.

- **Applicability to High-Sulfur Coals:** The Turbosorp® system allows for a variable hydrated lime injection rate based on pollutant loading and desired emission reduction, without limitations imposed by the temperature or moisture content of the flue gas. As a result, the Turbosorp® system can be operated to achieve deep emission reductions (i.e., 98 percent or greater) for a wide range of fuels, including high-sulfur coals.
- **Low Maintenance Requirements:** The Turbosorp® process avoids the complexities and maintenance issues associated with wet scrubbers. Lime is injected into the absorber as a dry hydrate rather than as a slurry, and the solids collected in the baghouse are also completely dry and are recycled to the absorber. The system also includes few moving parts, and is less likely to cause plugging and binding of fabric filter bags as compared to a conventional spray dryer.
- **Operational Flexibility:** The process features turndown capabilities to permit continued emissions reductions at reduced operating loads. The Turbosorp® system achieved high removal efficiencies for SO<sub>2</sub>, mercury, acid gases, and PM across the unit's normal range of operating loads. Operation of the NO<sub>x</sub> control system varies with generator load, resulting in three distinct operating ranges: a high-load range in which NO<sub>x</sub> reduction is accomplished via SCR, SNCR, and low-NO<sub>x</sub> combustion (if applicable); an intermediate-load range in which NO<sub>x</sub> reduction is accomplished via SNCR and low-NO<sub>x</sub> combustion (but not SCR); and a low-load range in which NO<sub>x</sub> reduction is accomplished via low-NO<sub>x</sub> combustion (but not SCR or SNCR).



# Mercury Specie and Multi-Pollutant Control

## Participant

NeuCo, Inc. (acquired original participant, Pegasus Technologies)

## Additional Team Members

NRG Texas, LLC—collaborator and host

## Location

Jewett, Limestone County, TX (NRG Texas Limestone Plant)

## Technology

Pegasus Technologies’ sensors and neural network-based optimization and control system for enhanced mercury and multi-pollutant control

## Project Capacity/ Production

890 MW (gross); 14,500 tons of coal/day input

## Coal

Texas lignite and Powder River Basin (PRB) subbituminous

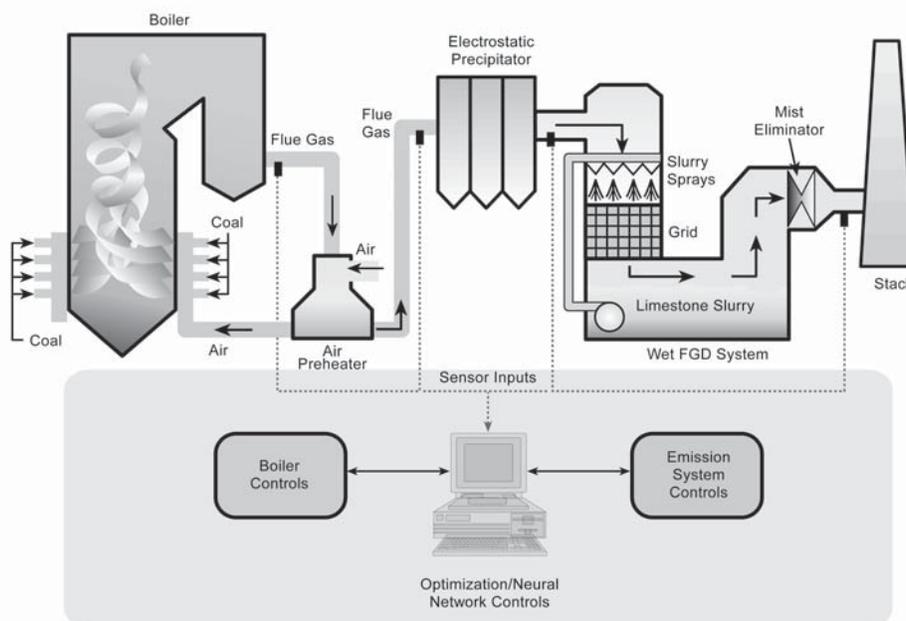
## Project Funding

Total	\$15,560,811	100%
DOE	6,079,479	39
Participant	9,481,332	61

## CCPI-2

## Emissions Control

Mercury	■	NO <sub>x</sub>	■
SO <sub>2</sub>	■	PM <sub>2.5</sub>	□

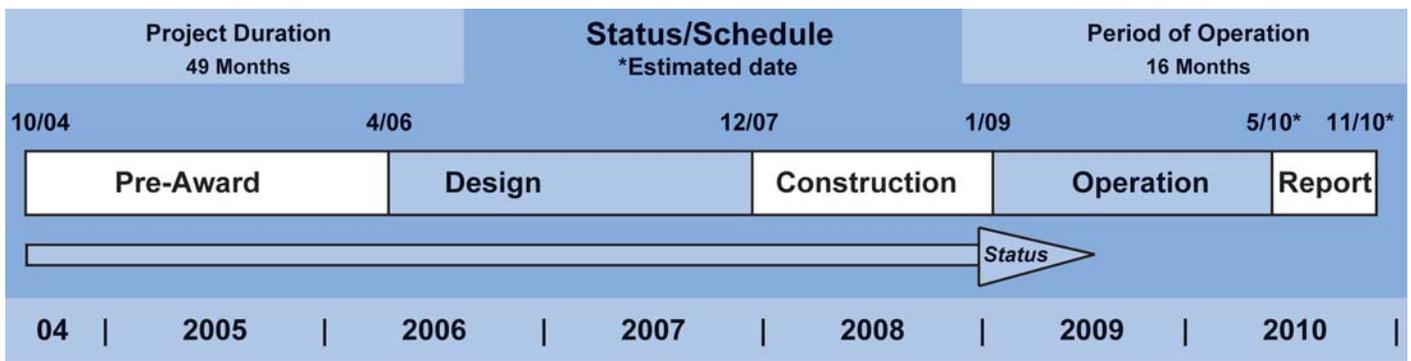


## Objectives

To demonstrate that state-of-the-art sensors and neural network-based optimization and controls can measure mercury species (elemental and oxidized mercury); control mercury emissions with existing flue gas desulfurization (FGD) and electrostatic precipitator (ESP) systems; and reduce pollutant emissions in general without major capital expenditure.

## Technology/Project Description

The project will demonstrate non-intrusive advanced sensors and neural network-based optimization and control technologies for enhanced mercury and multi-pollutant control on an 890-MW tangentially fired boiler at the NRG Texas Limestone Plant in Jewett, Texas. The plant is equipped with both a cold-side ESP rated at 99.8 percent particulate removal efficiency, and a wet limestone FGD system rated at 90 percent sulfur dioxide (SO<sub>2</sub>) removal efficiency. Both the ESP and wet FGD system are capable of high mercury capture efficiency if the mercury is in an oxidized solid state rather than elemental vapor state. The plant burns a blend of Texas lignite and PRB subbituminous coal, which are known to emit relatively high levels of elemental mercury under routine combustion conditions. NeuCo will apply sensors to evaluate the mercury species at key locations, develop optimization software that results in the best plant conditions to promote mercury oxidation and minimize emissions in general, and use neural networks to effect the optimization conditions.



## Benefits

The technology affords plant operators the means to: assess how plant operating parameters affect mercury species determination, and the capture efficiency of existing FGD and ESP systems; translate the data into optimization software that provides the lowest possible pollutant emissions; and effect optimization through neural networks. The technology allows operators to maximize emissions control with existing pollutant control systems. This capability reduces risk of non-compliance with minimal capital expenditure. The technology should have broad application to the existing fleet of coal-fired boilers and have minimal impacts on the quality of salable by-products, such as fly ash.

## Status/Accomplishments

The Categorical Exclusion (CX) for the project was signed in March 2005, and the cooperative agreement was signed in April 2006. During Phase I of the project, installation of all sensor equipment was completed. The only meaningful issues carried into Phase II, which began on December 14, 2007, were validation and system maintenance issues with the mercury continuous emission monitoring system (CEMS). These issues specifically include software updates in the Mercury Specie Control System; installation and commission of the model predictive control (MPC) specific closed-loop and graphical user interface (GUI) components of CombustionOpt® on the Advanced Intelligent Soot Blowing System; training on the coal flow sensors; installation of mercury analyzers and completion of third-party validation and verification; and calibration on the Advanced Electrostatic Precipitator.

By the end of Phase II, December 31, 2008, the Mercury Specie Control System was sufficiently reliable to support initial analysis and virtual on-line analyzer (VOA) development, and the MPC specific closed-loop and GUI components were in sustained service working on typical operating targets. Issues carried into Phase III include a major revision of the Advanced Flue Gas Desulfurization Optimization System to produce gypsum as a by-product instead of calcium sulfite. This has caused a delay in the major upgrade scheduled for the plant; however, optimization components are in place and can be utilized relatively quickly once the new system is online and stable.

In March 2009, NeuCo provided on-site operator training for the optimization systems, including the recently installed PerformanceOpt® product. PerformanceOpt® is a predictive system that can identify issues resulting in performance deficiencies. Significant work will continue on PerformanceOpt® while MaintenanceOpt® is running in sustained service. SootOpt® (NeuCo's sootblowing optimizer) is fully operational. NeuCo installed the latest version of their software platform (ProcessLink®) to provide a more stable and faster computing base for all their applications.

The project demonstrates a new multivariable process controller utilizing direct search optimization designed to facilitate test efficiency through direct learning combined with statistical tools.

Over thirty manipulated variables will be used to optimize NO<sub>x</sub> while the neural network will be monitoring and learning the effects of these variables on mercury.

The final phase of the project began in January 2009 and involves an operational demonstration of plant-wide optimization.

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# TOXECON™ Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers

## Participant

Wisconsin Electric Power Company (We Energies)

## Additional Team Members

ADA-ES—management support/design input

Cummins & Barnard—Architect/Engineer (A/E) services/construction management

Wheelabrator Air Pollution Control, Inc.—baghouse design and installation

Electric Power Research Institute—technology supplier

## Location

Marquette, Marquette County, MI (Wisconsin Electric’s Presque Isle Power Plant Units 7, 8, and 9)

## Technology

TOXECON™ sorbent injection process

## Capacity

270 MW

## Coal

Powder River Basin subbituminous

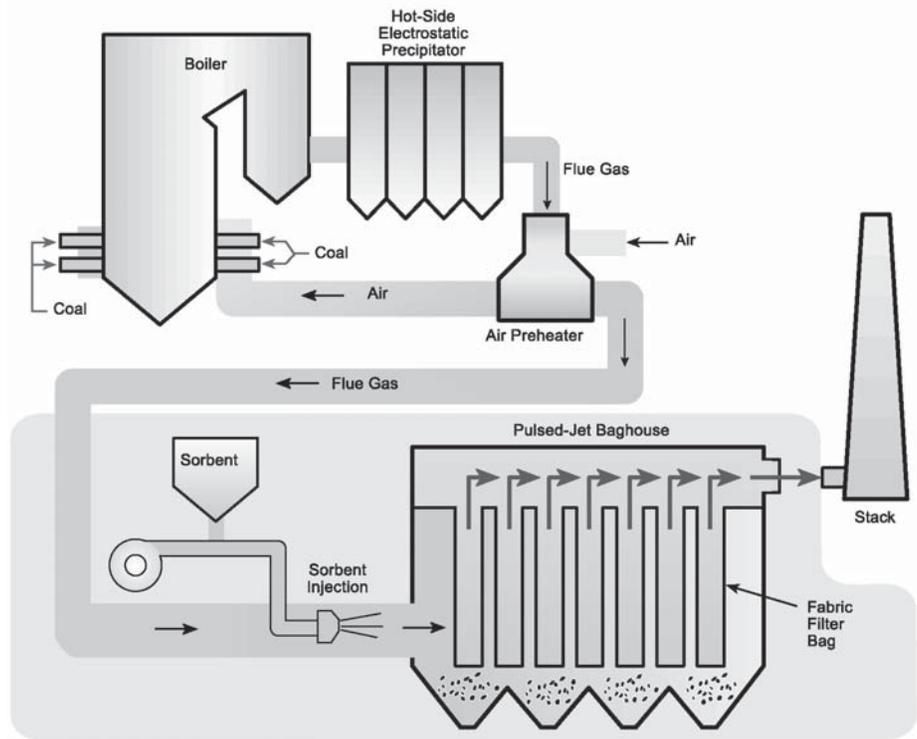
## Project Funding

Total	\$52,978,115	100%
DOE	24,859,578	47
Participant	28,118,537	53

## CCPI-1

## Emissions Control

Mercury	■	NO <sub>x</sub>	■
SO <sub>2</sub>	■	PM <sub>2.5</sub>	■

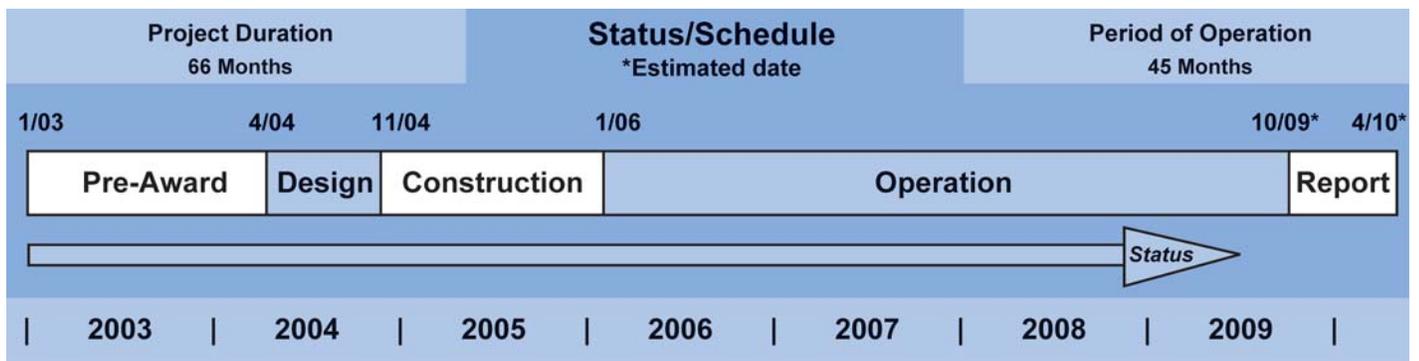


## Objectives

To achieve 90 percent mercury removal through injection of activated carbon; increase particulate matter (PM) collection efficiency (particularly for PM of 2.5 microns or less in size); to reduce already low sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) emissions at the plant by an additional 70 percent and 30 percent, respectively; to recover 90 percent of mercury captured in the sorbent; to achieve 100 percent fly ash utilization; to advance the reliability of mercury continuous monitors; and to successfully integrate the entire system.

## Technology/Project Description

The project will demonstrate the TOXECON™ sorbent injection process for multi-pollutant control of a combined flue gas stream from three units totaling 270 MW. TOXECON™, an Electric Power Research Institute (EPRI)-patented process, injects activated carbon and sodium-based sorbents into a pulsed-jet baghouse installed downstream of a plant’s PM control device, which in this application is a hot-side electrostatic precipitator. The primary PM control device removes the bulk of the PM. The TOXECON™ process is placed downstream of the air preheater to operate at relatively cool temperatures conducive to mercury and other pollutant absorption. Activated carbon and sodium-based sorbents are injected into the ductwork upstream of the pulsed-jet baghouse, where they mix and absorb pollutants in the flue gas. Upon entering the pulsed-jet baghouse, in-flight pollutant absorption continues and is significantly enhanced by fixed-bed absorption as pollutants pass through a sorbent filter cake that forms on the fabric filter bags in the baghouse. Sorbent captured in the baghouse is processed to recover up to 90 percent of the mercury to enable 100 percent fly ash utilization.



## Benefits

The TOXECON™ process leverages the high PM capture efficiency inherent in pulsed-jet baghouses and baghouse location to effectively utilize proven sorbents in achieving high mercury capture efficiency and added SO<sub>2</sub> and NO<sub>x</sub> control, and to retain the sales value of fly ash as a cement additive. The advantages of this approach include: affording enhanced contact between sorbents and dilute phase pollutants; providing a temperature regime conducive to pollutant absorption; and requiring application to only a small portion of the fly ash. Demonstrating the TOXECON™ process on Powder River Basin (PRB) coal is an excellent test of the technology and representative of a broad market application. PRB coal is widely used and, as with other western subbituminous coals, contains high percentages of elemental mercury that, because of its vapor state upon combustion, is more difficult to remove than solid state oxides of mercury (the form more common in bituminous coals). The TOXECON™ process has application to an estimated 167 gigawatts of existing coal-fired capacity. This TOXECON™ project alone is expected to remove 97 pounds of mercury, 4,020 tons of SO<sub>2</sub>, and 32 tons of fine PM annually.

## Status/Accomplishments

The project is demonstrating long-term reliability by continuously operating the powdered activated carbon (PAC) injection system. Over a two-year period, We Energies consistently demonstrated over 90 percent mercury removal based on monthly averages. Ash handling and dust control process issues have been resolved. Long-term testing indicates that frequent pulse cleaning of the baghouse keeps fresh, effective carbon on the bags and enhances mercury capture.

Results from injection testing using a sodium-based sorbent (hydrated sodium bicarbonate carbonate) indicated 70 percent SO<sub>2</sub> removal, no effect on NO<sub>x</sub>, and virtually no effect on opacity but a net decrease in mercury capture at the normal activated carbon injection rate. An activated carbon injection rate 2.5 times higher than normal was required to obtain 90 percent mercury capture while injecting the sodium-based sorbent.

The project is continuing to investigate cost improvements while maintaining greater than 90 percent mercury removal as well as improvements for control of PM, NO<sub>x</sub> and SO<sub>2</sub> emissions. Also, PM loading in the baghouse is being optimized for mercury removal efficiency.

The project has demonstrated over 90 percent mercury removal for over a two-year period.

The Superior Watershed Partnership in Marquette, Michigan presented its 2006 Corporate Conservation Award to We Energies in recognition of the project's significant mercury reduction accomplishments.

Ash from the TOXECON™ process is being evaluated for use in conductive concrete applications.

## Contacts

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# **Advanced Power Systems**

# Demonstration of a Coal-Based Transport Gasifier

## Participant

Southern Company Services, Inc.

## Additional Team Members

Mississippi Power Company—host utility

Kellogg Brown and Root, LLC (KBR)—technology supplier

## Location

Liberty, Kemper County, MS

## Technology

KBR air-blown transport gasifier fueled by low-rank coal in an integrated gasification combined-cycle (IGCC) application

## Capacity

2x1 system utilizing two combustion turbines and one steam turbine

## Coal

Mississippi lignite

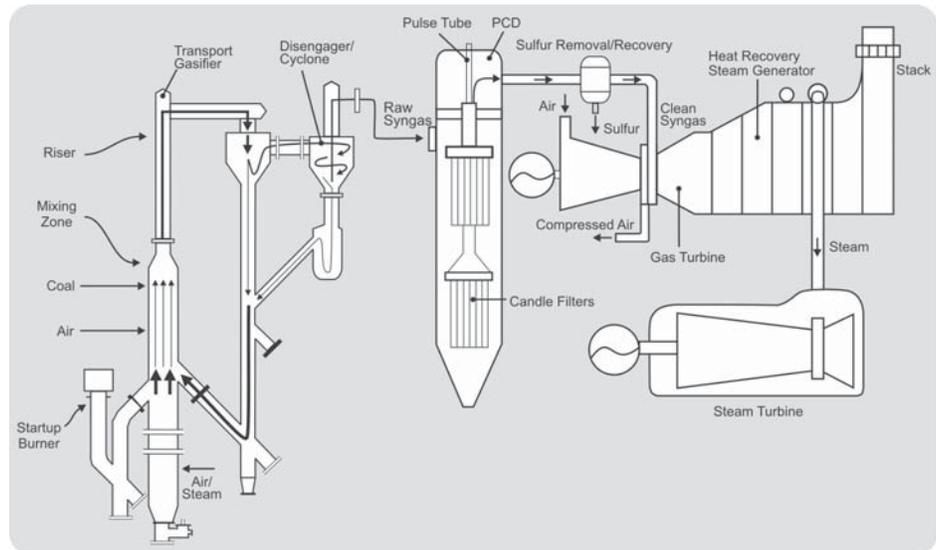
## Project Funding

Total	\$1,625,082,040	100%
DOE Share	293,750,000	18.1
Participant	1,331,332,040	81.9

## CCPI-2

## Advanced Power Systems

IGCC	■	CFB	<input type="checkbox"/>
Hybrid	<input type="checkbox"/>	Adv Comb	<input type="checkbox"/>

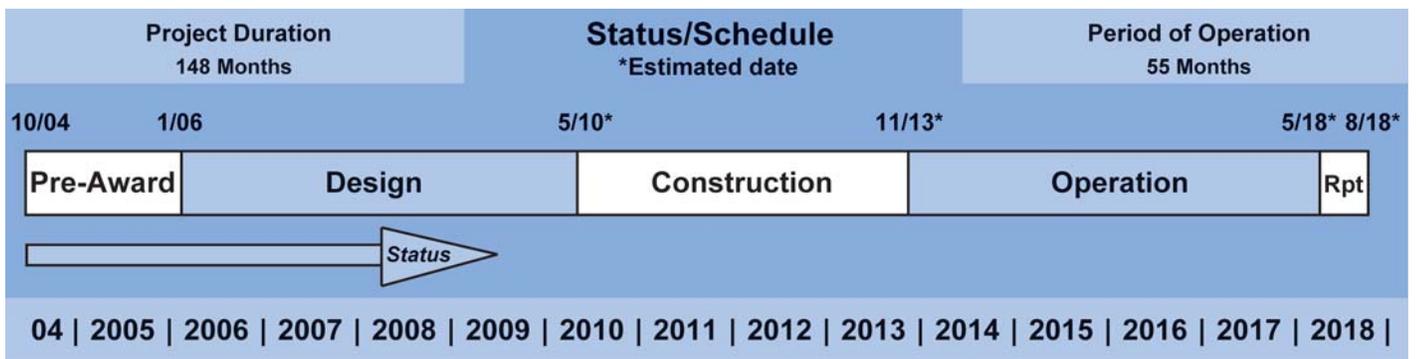


## Objectives

To assess the operational, environmental, and economic performance of the air-blown transport gasifier-based integrated gasification combined-cycle (IGCC) system with two transport gasifiers, two F class combustion turbines, and one steam turbine.

## Technology/Project Description

The project will demonstrate an IGCC unit applying transport gasification in an air-blown mode. The project will utilize two transport gasifier trains, each with its own coal feed and ash handling systems. The combined cycle will include two gas turbines, each with its own heat recovery steam generator, both feeding a single steam turbine. The transport gasifier consists of two sections: a short, larger-diameter mixing zone and a longer, smaller-diameter riser. Air is introduced at the bottom of the mixing zone to raise heat by burning the carbon in recirculated char. Coal and sorbent are fed to the top of the mixing zone to separate the coal from the oxidant and avoid burning volatile material produced when the coal is heated. All of the solids and gases are carried from the mixing zone into the riser where devolatilization and carbon-steam gasification reactions occur to produce synthesis gas (syngas). The majority of the unreacted char leaving the riser is captured by a disengager and cyclone assembly and recycled back to the mixing zone through a standpipe and a nonmechanical “J-valve.” The syngas and fine char that are not captured in the cyclone are cooled in a heat exchanger before entering a metallic candle-filter particulate collection device (PCD), which removes any remaining particulate matter from the gas. Beyond the candle-filter PCD, emission controls include a sulfur removal system, selective catalytic reduction (SCR), and a mercury removal system.



## Benefits

The transport gasifier is based on a simple, robust, and efficient technology similar in design to a fluidized catalytic cracking (FCC) unit that has been proven over 50 years in the petroleum refining industry. The transport gasifier operates at considerably higher circulation rates, velocities, and riser densities than does a conventional circulating fluidized-bed, resulting in higher throughput, better mixing, and higher mass and heat transfer rates. The recycling of solids increases the effective residence time and increases carbon conversion. Moreover, the transport gasifier represents a major efficiency gain relative to slagging gasifiers for applications using high-ash, high-melting point coals. It does not depend on slagging (melting) the ash to remove minerals from the process. Slagging requires a large amount of energy, which cannot be recovered. This process technology makes possible the cost effective production of syngas from low-rank, high-moisture, and high-ash coals, whereas most other gasification technologies cannot. Such coals make up half the proven reserves in both the United States and the world. The transport gasifier can also be operated on oxygen, which affords the option to produce chemicals.

## Status/Accomplishments

The cooperative agreement was awarded on January 30, 2006 for a single-train (285 MW net) demonstration unit to be built in Orlando, Florida. As initial construction was under way, the activities at Orlando were canceled over concerns for carbon capture and storage (CCS). CCS was not viewed as economical for the Orlando site due to the distance from suitable sequestration storage locations. In May 2008, DOE granted approval to relocate the demonstration to Kemper County, Mississippi for a dual train configuration. The DOE funding was unchanged.

Mississippi Power Company submitted a Need Determination with the Mississippi Public Services Commission (MPSC) on June 10, 2008. The Notice of Intent (NOI) to Prepare an Environmental Impact Statement (EIS) and Notice of Proposed Floodplain and Wetlands Involvement were published in the Federal Register on September 22, 2008. The Public Scoping Meeting was held October 14, 2008 in DeKalb, Mississippi. In January 2009, the Mississippi Power Company filed for a Certificate of Public Convenience and Necessity with the MPSC. Work is continuing on the preparation of the draft EIS.

The project will demonstrate an advanced syngas cleanup system that includes sulfur removal and recovery; high-temperature, high-pressure (HTHP) particulate filtration; ammonia recovery; and mercury removal.

The transport gasifier has a fuel-flexible design projected to have higher efficiency and lower capital and operating costs compared to oxygen-blown entrained-flow gasifiers.

The plant will design, build, and operate a CO<sub>2</sub> capture and compression system with the intent to capture and geologically sequester (and/or use for enhanced oil recovery) at least one million tons per year of CO<sub>2</sub>.

## Contacts

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## Mesaba Energy Project—Unit 1

### Participant

MEP-I LLC  
(Excelsior Energy, Inc.)

### Additional Team Members

ConocoPhillips—gasification technology licensor

Fluor—feasibility engineering

Granherne—owner's engineer

SEH—environmental/site assessment

URS—environmental/site assessment

TBD—Engineering, Procurement, and Construction (EPC)

### Location

Taconite, Itasca County, MN or Hoyt Lakes, St. Louis County, MN

### Technology

Advanced ConocoPhillips E-Gas™ technology applied in a multiple-train integrated gasification combined-cycle configuration

### Capacity

Up to 606 MWe (net); 4,731 tons of coal/day input

### Coal

PRB subbituminous (preferred)

Illinois Basin #6 bituminous

### Project Funding

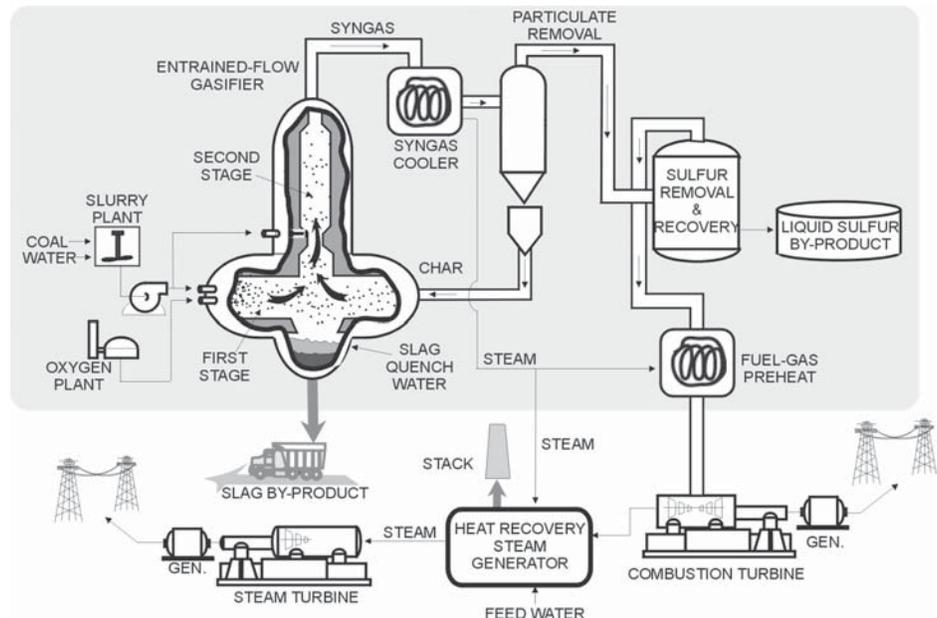
Total	\$2,155,680,783	100%
DOE	36,000,000	1.7
Participant	2,119,680,783	98.3

## CCPI-2

## Advanced Power Systems

IGCC  CFB

Hybrid  Adv Comb

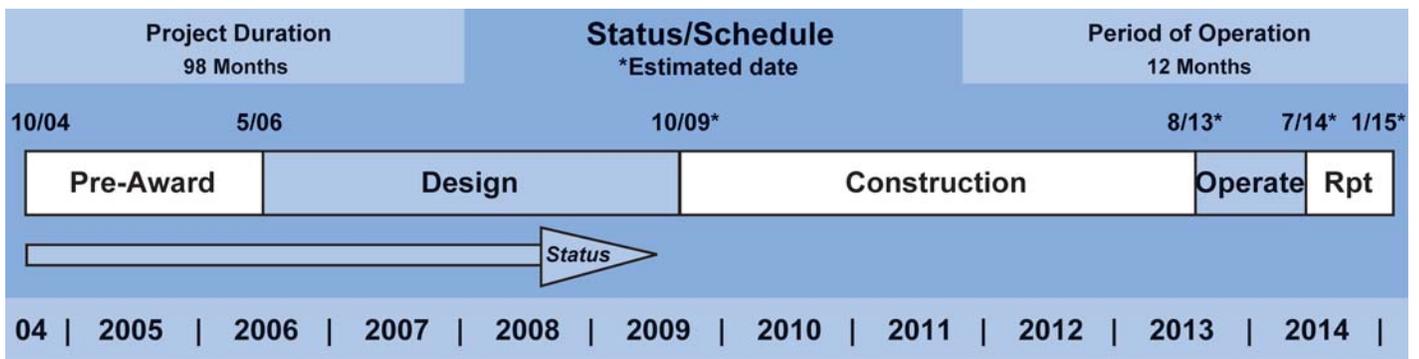


### Objectives

To demonstrate the ConocoPhillips E-Gas™ technology at twice the generating capacity of the *Wabash River Coal Gasification Repowering Project* performed under the Clean Coal Technology Demonstration Program (CCTDP). To achieve a 90 percent or better operational availability from an advanced full-slurry quench (FSQ) multiple-train gasifier system with a first-of-a-kind (U.S.) integrated air separations unit. To demonstrate carbon dioxide (CO<sub>2</sub>) emissions 15–20 percent lower than the 2006 average for U.S. coal-based power plants and emission levels for criteria pollutants and mercury equal to or below those of the lowest emission rates for utility-scale, coal-based generation.

### Technology/Project Description

The project will demonstrate the next-generation ConocoPhillips E-Gas™ technology in up to a 606-MWe (net) integrated gasification combined-cycle (IGCC) application. The ConocoPhillips E-Gas™ gasifier features an oxygen-blown, continuous-slugging, two-stage entrained-flow process. Coal is slurried, combined with 95 percent pure oxygen from an air separation unit, and injected into a first stage gasifier, which operates at 2,600 °F and 400 pounds per square inch gage (psig) pressure. In the first stage, the coal slurry undergoes a partial oxidation reaction at temperatures high enough to bring the coal's ash above its melting point. The fluid ash falls through a tap hole at the bottom of the first stage into a water quench, forming an inert vitreous slag. The synthesis gas (syngas) formed in the first stage flows to a second stage where additional coal slurry is injected. The coal undergoes pyrolysis in an endothermic reaction with the hot gas, enhancing the syngas heating value and improving efficiency. The syngas leaving the gasifier will be cooled by the heat used to generate steam. The syngas will be processed to remove particulates (probably using a two-stage dry process), mercury (using activated carbon beds), and sulfur (as a marketable by-product) prior to combustion in advanced gas turbines. Heat from the gas turbines and steam from the syngas loop will be used to raise steam for the steam turbine.



## Benefits

ConocoPhillips E-Gas™ technology established its potential for providing clean energy at competitive costs in the successful demonstration under the CCTDP at the Wabash River Generating Station. The Mesaba project will incorporate cost and performance improvements from more than a decade of experience with the predecessor design, including: (1) gasifier scale-up; (2) increased system pressure; (3) increased slurry percentage to the second-stage gasifier; and (4) enhanced by-product and contaminant removal systems.

## Status/Accomplishments

The environmental site permitting process is ongoing, with the Minnesota Public Utilities Commission (PUC) assessing Excelsior Energy's submittals for a Large Electric Generating Plant Site Permit, High Voltage Transmission Line Route Permit, Natural Gas Pipeline Routing Permit, and other environmental-related permits. The draft Environmental Impact Statement (EIS) was released in November 2007.

The Draft EIS is available at [http://www.netl.doe.gov/technologies/coalpower/cctc/EIS/eis\\_mesaba.html](http://www.netl.doe.gov/technologies/coalpower/cctc/EIS/eis_mesaba.html). The Final EIS is planned to be released in 2009. Excelsior announced that the project had been selected for the federal loan guarantee program in October 2007 and had been selected to receive federal investment tax credits in May 2008. See <http://www.excelsiorenergy.com/>.

Excelsior is exploring the potential for a statewide market for the power produced by the Mesaba Project.

The project will demonstrate the commercial viability of a large, multiple-gasifier system with CO<sub>2</sub> emissions 15 to 20 percent lower than the 2006 average for U.S. generation with similar feedstocks.

The ConocoPhillips E-Gas™ gasifier features an oxygen-blown, continuous-slugging, two-stage entrained-flow process that can produce a concentrated CO<sub>2</sub> stream that would be amenable to capture for geologic storage or beneficial reuse such as enhanced oil recovery.

Excelsior intends to adopt zero-liquid discharge and thereby eliminate any discharge to the environment of process water and cooling tower blow-down water from the proposed plant.

## Contacts

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# Clean Coal Fuels

# Gilberton Coal-to-Clean Fuels and Power Co-Production Project

**Project Discontinued**

## Participant

WMPI PTY., LLC

## Additional Team Members

Nexant, Inc.—engineering support

Shell Global Solutions B.V., U.S.—technology partner

SASOL Technology Ltd.—Fischer-Tropsch (FT) technology supplier

## Location

Gilberton, Schuylkill County, PA

## Technology

Shell oxygen-blown, entrained-bed gasifier and SASOL FT liquefaction technology

## Project Capacity/Production

4,700 tons/day of coal waste to produce 41 MW of power and 5,000 barrels/day of clean liquid transportation fuel

## Coal

Anthracite culm

## Project Funding (proposed)

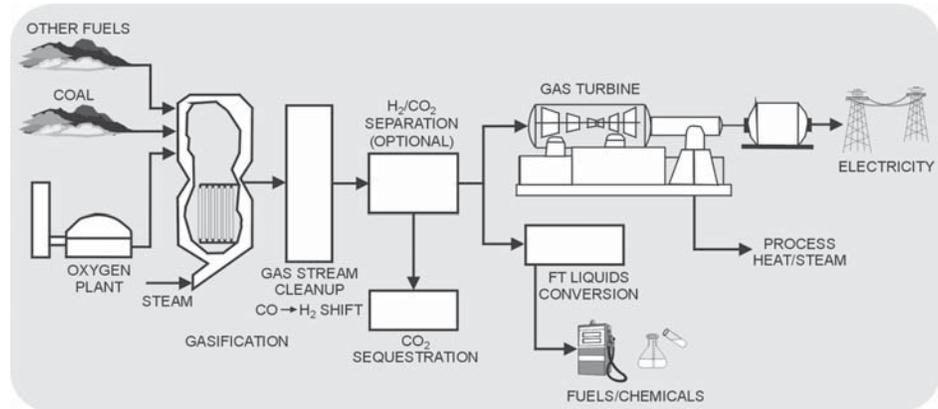
Total	\$1,062,882,038	100%
DOE	100,000,000	9.4
Participant	962,882,038	90.6

## CCPI-1

## Clean Coal Fuels

Upgrading

Conversion

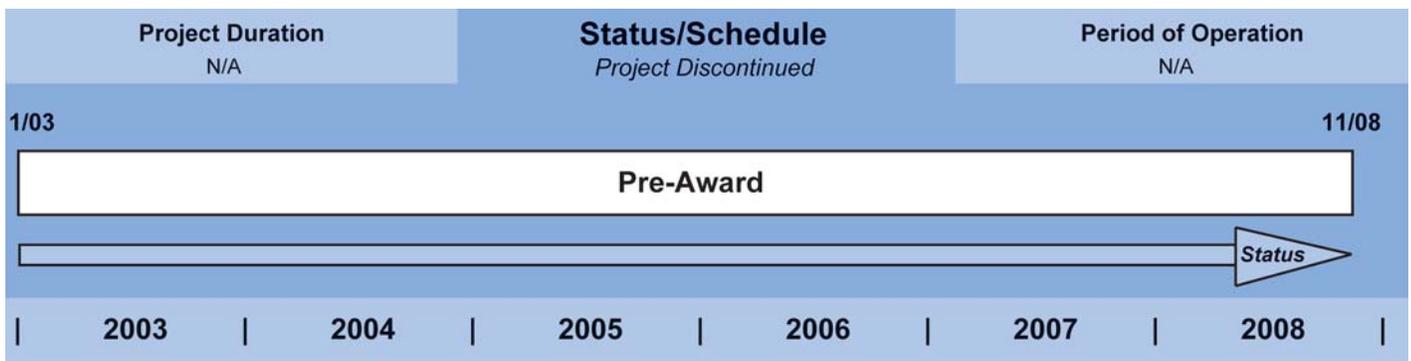


## Objectives

To demonstrate gasification of 4,700 tons/day of coal waste to produce 41 MW of power and 5,000 barrels/day of clean liquid transportation fuel, including high-cetane diesel fuel and naphtha that contain no sulfur or aromatics.

## Technology/Project Description

The project proposed to demonstrate conversion of 4,700 tons/day of coal waste from abandoned anthracite culm piles into 41 MW of electric power and over 5,000 barrels per day of ultra-clean transportation fuels. In doing so, over one million tons/year of coal waste would have been removed that contribute to contamination of watersheds through leaching of minerals and acid water formation. In the proposed process, coal waste is fed to a Shell oxygen-blown, entrained-bed gasifier that applies heat and pressure, transforms the ash constituent of the coal waste into an inert vitreous slag, and converts the hydrocarbon and sulfur constituents primarily into carbon monoxide (CO), hydrogen (H<sub>2</sub>), carbonyl sulfide (COS), and hydrogen sulfide (H<sub>2</sub>S). This raw synthesis gas (syngas) is cleaned in a patented Rectisol™ process, which removes nearly all of the COS and H<sub>2</sub>S. Clean syngas (CO and H<sub>2</sub>) is either shifted by the addition of steam to carbon dioxide (CO<sub>2</sub>) and H<sub>2</sub> for separation, or used directly for power generation and liquid fuel production. Power is generated in a gas turbine, which in turn provides process heat and steam for a SASOL slurry-phase Fischer-Tropsch (FT) reactor. The SASOL FT reactor produces high-cetane diesel fuel and naphtha that contain no sulfur or aromatics. Naphtha can either be upgraded to a high-octane, clean-burning reformulated gasoline or used as sulfur-free on-board reforming feed for fuel cell-powered vehicles.



## Benefits

The proposed project would have addressed an environmental issue associated with vast abandoned coal waste piles while providing a source of high-grade, ultra-clean transportation fuels. Well over a billion tons of coal waste resides in Pennsylvania, Illinois, West Virginia, and Ohio. This coal waste could become low-cost feedstock to help fuel the nation's transportation fleet and contribute to energy independence. This project proposed to process about one million tons per year of coal waste materials from the Gilberton site. Had the project been successful, the technology could have been applied in many regions of the country where coal wastes currently are stockpiled. The FT transportation fuels can be used for a variety of high-end fuel applications, and being virtually free of sulfur, nitrogen, and aromatics, are superior to their conventional petroleum counterparts in both end-use and environmental properties. Their characteristics translate into reduced sulfur, nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), hydrocarbon, and CO emissions. The process scheme is very flexible, allowing use of a broad range of feedstock (coal, coal waste, petroleum coke, biomass, and blends thereof), and facilitating carbon separation/capture for sequestration by keeping CO<sub>2</sub> streams concentrated.

## Status/Accomplishments

This project was selected for award on January 8, 2003. A Memorandum of Understanding was signed with SASOL to commence negotiations for the use of SASOL's FT technology in the proposed project. On September 29, 2005, Pennsylvania Governor Ed Rendell announced that the state had entered into an agreement to buy the fuel products from the project.

The Public Scoping Meeting for preparation of an Environmental Impact Statement (EIS) was held on May 5, 2003. Public hearings on the draft EIS were held on January 9, 2006, in Shenandoah, Pennsylvania and on January 10, 2006, in Pottsville, Pennsylvania.

Following a lengthy pre-award period, DOE ended negotiation efforts in November 2008. Unfortunately, the participant was not able to finalize all the technology vendor agreements necessary to pursue development of the project.

## Contacts

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# Increasing Power Plant Efficiency—Lignite Fuel Enhancement

## CCPI-1

## Clean Coal Fuels

Upgrading   
 Conversion

### Participant

Great River Energy (GRE)

### Additional Team Members

Electric Power Research Institute—collaborator

Lehigh University—collaborator

Barr Engineering—lignite handling

Falkirk Mining Company — lignite coal supplier

### Location

Underwood, McLean County, ND (GRE’s Coal Creek Station)

### Technology

GRE’s waste-heat dryer for low-rank coals

### Project Capacity/Production

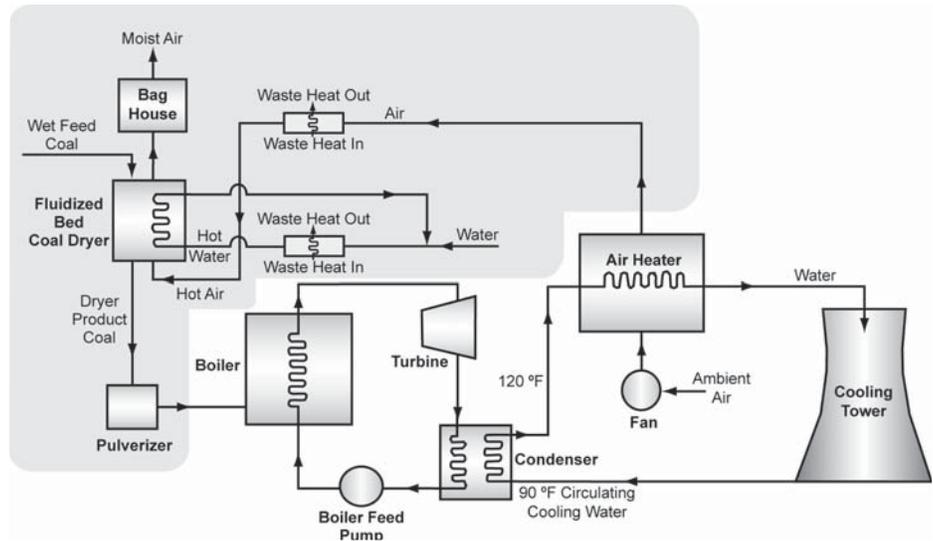
546 MW

### Coal

Lignite

### Project Funding

Total	\$31,512,215	100%
DOE	13,518,737	43
Participant	17,993,478	57



### Objectives

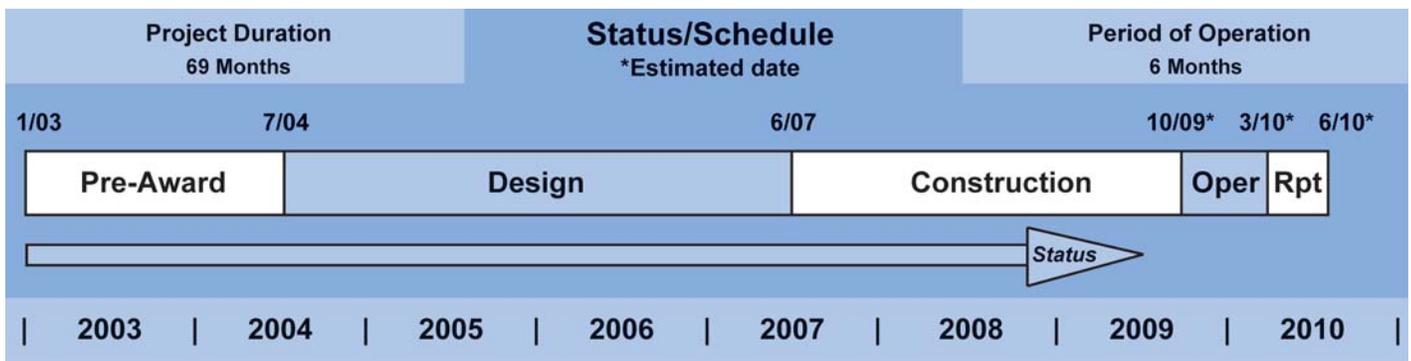
To demonstrate a 25 percent reduction in lignite moisture content (from 40 to 30 percent moisture in this application) using plant waste heat; and to optimize and assess plant operation on dried coal to quantify benefits.

### Technology/Project Description

The project demonstrates Great River Energy’s (GRE) waste-heat dryer for low-rank coals on a 546-MW tangentially-fired boiler at the Coal Creek Station using North Dakota lignite that has approximately 40 percent moisture content. In phase 1 of a two-phased effort, GRE is to build and operate a prototype dryer module capable of producing one-fourth of the dry lignite requirement for the plant. In phase 2, which follows successful operation of the first dryer, GRE will build full-scale dryers to provide sufficient dryer capacity to fully fuel the 546-MW unit, optimize plant operation on dried lignite, and evaluate performance. The full boiler dryer system uses plant cooling water and flue gas as the major heating medium. Water drawn from the cooling tower captures heat from the steam condenser in the boiler circuit, raising the temperature to about 120 °F. The heated water is routed to an air heater before returning to the plant cooling water circuit. Ambient air is heated in the air heater to about 105 °F and subsequently used as the fluidizing media in the fluidized-bed dryer to provide heat along with hot water. In practice, a two-stage dryer is used to enhance heat transfer.

### Benefits

This technology uses heat (that would otherwise be lost out the stack) to upgrade the low-rank coal feedstock, thereby enhancing plant efficiency and performance. The high moisture content in low-rank coals significantly increases plant heat rates and reduces efficiency by requiring application of heat generated during combustion to vaporize large amounts of water in coal. This heat of vaporization represents a heat loss because it does not contribute to power generation. Moreover, high moisture content coals can contribute to corrosion of ductwork, and place an energy penalty on fans that move the vaporized water and pulverizers



that process the moisture in the coal. GRE's upgrading process improves plant economics and reduces plant heat loss (decreases heat rate), increases efficiency, and thereby reduces emissions of carbon dioxide (CO<sub>2</sub>), mercury, nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), and particulate matter (PM) per unit of energy produced. This technology has potential application to more than 100 gigawatts of domestic coal-fired capacity that currently uses low-rank coals.

### Status/Accomplishments

The National Environmental Policy Act (NEPA) requirement was met with an Environmental Assessment (EA) and issuance of a Finding of No Significant Impact (FONSI) on January 16, 2004. A cooperative agreement was awarded July 9, 2004.

Following installation and startup, around-the-clock operations of the prototype dryer and data collection began in March 2006. The moisture of the processed lignite coal was reduced from about 38.5 percent to 29.5 percent. The prototype dryer test results indicated that in addition to reducing the emissions of SO<sub>x</sub>, NO<sub>x</sub>, and CO<sub>2</sub>, there is also potential for mercury reduction. When the heavy components of lignite fall out in the first stage of the dryer, some material that is concentrated in mercury is also removed. Also, reducing moisture in coal increases mercury oxidation and facilitates additional capture in the flue gas desulfurization unit.

In September 2006, GRE initiated design activities for full-scale dryers (135 tons/hr), which will have improved reliability and flexibility with regard to management of the higher density fraction from the first stage, heat input, pressure drop, moisture reduction, and coal throughput. GRE is installing four dryers on Unit 2 as part of the project, and because of the success of the prototype, GRE is installing four more dryers on Unit 1 with its own funds. Thus, the entire Coal Creek Station is being retrofitted with lignite coal dryers.

GRE completed design of the integrated full-scale dryer system in December 2007. Fabrication and on-site assembly was finished in May 2008. By March 2009, major dryer internals, such as water coils, air sparger, fire protection system, and explosion protection system were completed for all dryers. Ongoing construction activities include installation of electrical cables, controls, and instrumentation; and modifications to the coal handling system. GRE plans to complete construction of the dryer system and begin testing in fall 2009.

Based on the success of the prototype dryer, the entire Coal Creek Station is being retrofitted with lignite coal dryers.

The coal dryer technology has generated significant domestic and international interest. GRE has performed pilot-scale tests to determine specific coal drying characteristics for utilities interested in the technology.

Project team members are performing engineering efforts to evaluate the feasibility and benefits of using the coal dryer technology for Luminant (Texas utility), SaskPower (Canadian utility), and Vattenfall (European company).

### Contacts

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# **Industrial Applications**

# Western Greenbrier Co-Production Demonstration Project

## Project Discontinued

### Participant

Western Greenbrier Co-Generation (WGC), LLC

### Additional Team Members

Alstom Power, Inc.—technology supplier

ENERFAB—Architect/Engineer (A/E) services/construction

Marshall Miller—owners/construction management

### Location

Rainelle, Greenbrier County, WV

### Technology

Alstom Power fluidized-bed combustion

### Project Capacity/Production

100 MW (net) electric power and steam for district heating, alkaline ash for remediation, and co-production of structural bricks or other marketable materials

### Coal

4,000 tons/day of bituminous waste coal

### Project Funding

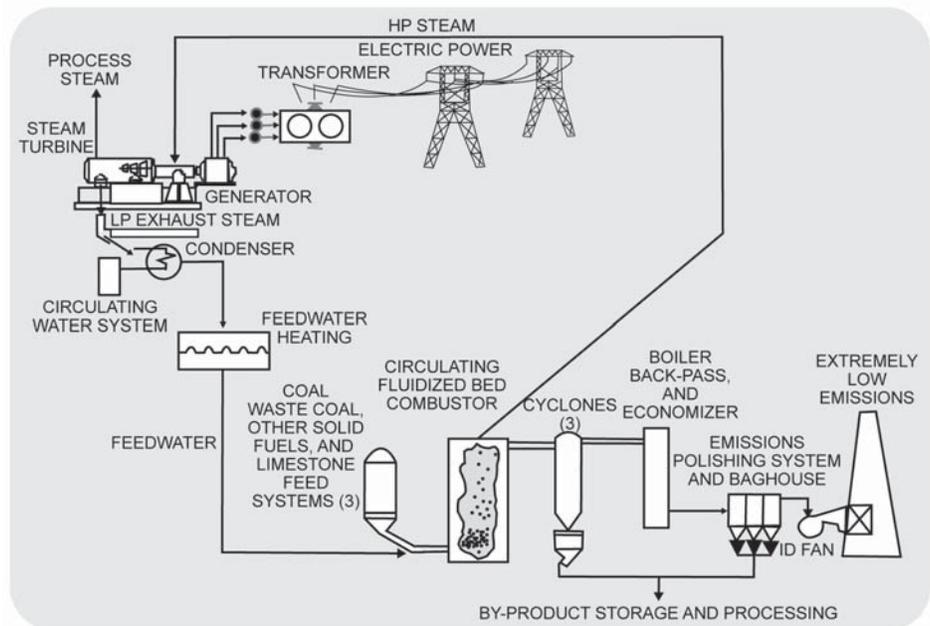
Total	\$16,256,940	100%
DOE	8,128,470	50
Participant	8,128,470	50

## CCPI-1

## Industrial Applications

Direct Coal Use

By-Product Use

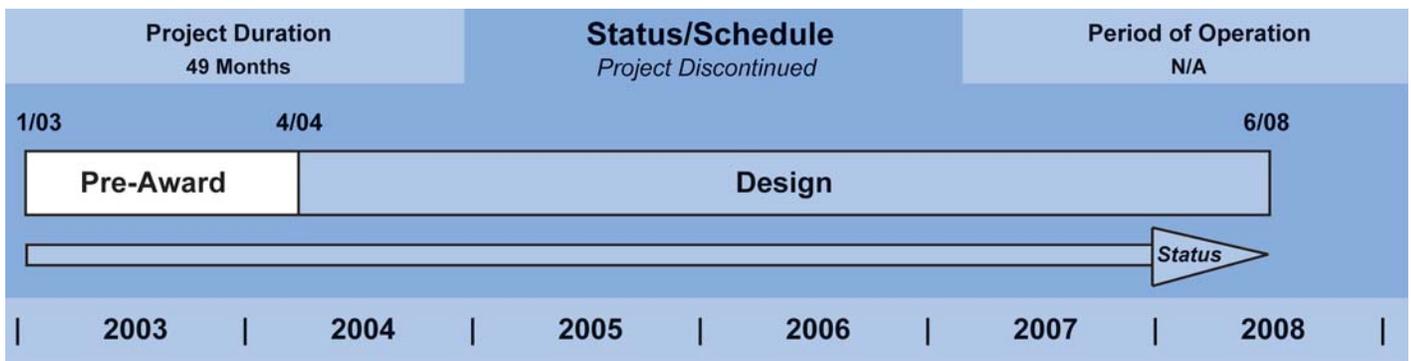


### Objectives

To demonstrate advanced circulating fluidized-bed (CFB) combustion technology in the co-production of 100 MW (net) electric power and steam, and marketable ash by-products using bituminous waste coal as the primary feedstock; to use residual steam from the steam turbine for industrial use and district heating; and to apply alkaline ash from the CFB to remediate acid water formation in waste coal impoundments.

### Technology/Project Description

The project proposed to apply advanced CFB technology to convert approximately 4,000 tons/day of coal mining waste materials (“gob”) into 100 MW (net) of electricity. Also, up to 20,000 pounds/hour of steam/hot water for industrial use and district heating would have been generated. Initially, about 10 percent of the ash generated would have been used to produce a salable by-product, and about 800 tons/day would have been used for remediation of acid water formation. The CFB power plant was intended to be an anchor tenant in a planned, environmentally balanced industrial park (Eco-Park). The advanced CFB would have incorporated an inverted cyclone separator and mid-support structure designs to reduce assembly time (6–8 weeks), lower material costs (60 percent less structural steel tonnage), and provide a smaller footprint (30–40 percent) than conventional designs. In the proposed technology, waste coal and limestone are simultaneously fed to the CFB, which raises steam by passing water through water walls lining the CFB. The limestone removes the bulk of the sulfur in the coal feedstock, and the solids are entrained and re-circulated via the cyclone separators to enhance limestone and carbon utilization. An economizer located downstream of the cyclones recovers additional heat from the flue gas. Selective non-catalytic reduction (SNCR), flash dryer absorber, and a baghouse provide additional control of nitrogen oxides, sulfur dioxide, particulate matter, and mercury. Steam from the CFB boiler drives a nominal 100-MW (net) steam turbine.



Also, a portion of the steam can be used for ash by-product processing while hot water supplies district heating to tenants in the Eco-Park. Bottom ash and a small portion of the fly ash are collected and returned to the source of the feedstock. The mildly alkaline nature of the ash assists in neutralizing the acid runoff from the waste pile, alleviating a significant environmental problem. Some of the fly ash is processed and used for production of salable materials, including cements and aggregates.

### Benefits

The project was intended to be a model of industrial ecology by applying advanced technology to: (1) generate energy from wastes, alleviating an environmental problem; (2) maximize energy generated and associated efficiency; (3) produce salable by-products, enhancing plant economics; and (4) produce remediation by-products, enabling significant land reclamation. West Virginia alone has over 400 million tons of waste coal in abandoned mine dump sites, or gob piles. Water coming in contact with these gob piles becomes highly acidic, absorbs minerals, and may contaminate streams and rivers. Successful integration of project technologies and approaches would have served as a model for remediation of similar refuse sites.

### Status/Accomplishments

In June 2003, the National Environmental Policy Act (NEPA) process was launched with a public scoping meeting to define the requirements for an Environmental Impact Statement (EIS). On January 4, 2007, a public hearing was held in Crawley, West Virginia, to gather input on the draft EIS. The final EIS was released in December 2007. NEPA requirements were successfully completed with a Record of Decision (ROD) published in the Federal Register on May 2, 2008.

Alstom Power combusted about 150 tons of Anjean waste coal and 50 tons of the Greenbrier Valley limestone at its test facility to obtain furnace design parameters and to provide representative ash to Hazen Research for by-product development and qualification testing.

Unfortunately, construction and equipment costs had increased substantially and the participant was unable to secure the necessary private financing to move the project forward. Following multiple time extensions, DOE ended participation in the project in June 2008.

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# Appendix A. Historical Perspective, Legislative History, and Public Laws

## CCTDP Historical Perspective

A number of key events prompted the creation of the Clean Coal Technology Demonstration Program (CCTDP) and impacted its focus over the course of the five solicitations. The roots of the CCTDP can be traced to the acid rain debates of the early 1980s, culminating in U.S. and Canadian envoys recommending a five-year, \$5 billion U.S. effort to curb precursors to acid rain formation—sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>). This recommendation was adopted and became a presidential initiative in March 1987.

As part of the response to the recommendations of the *Special Envoys on Acid Rain* in April 1987, the President directed the Secretary of Energy to establish a panel to advise the President on innovative clean coal technology activities. This panel was the Innovative Control Technology Advisory Panel. As a part of the panel's activities, the state and federal incentive subcommittee prepared a report, *Report to the Secretary of Energy Concerning Commercialization Incentives*, that addressed actions that States could take to provide incentives for demonstrating and deploying clean coal technologies. The panel determined that demonstration and deployment should be managed through both State and federal initiatives.

In the same time frame, the Vice President's Task Force on Regulatory Relief (later referred to as the Presidential Task Force on Regulatory Relief) was established. Among other things, the task force examined incentives and disincentives for the commercial realization of new clean coal technologies. The task force also examined cost-effective

emissions reduction measures that might be inhibited by various federal, State, and local regulations. The task force recommended that preference be given to projects located in states that offer certain regulatory incentives to encourage such technologies. This recommendation was accepted and became part of the project selection considerations beginning with CCTDP Round II.

Initial CCTDP emphasis was on controlling SO<sub>2</sub> and NO<sub>x</sub> emissions from existing coal-based power generators. Approaches demonstrated through the program were coal processing to produce clean fuels, combustion modification to control emissions, postcombustion cleanup of flue gas, and repowering with advanced power generation systems. These early efforts (projects resulting from the first three solicitations) produced a suite of cost-effective compliance options available today to address acid rain concerns.

As the CCTDP evolved, work began on drafting what was to become the Clean Air Act Amendments of 1990 (CAAA). Through a dialog with the U.S. Environmental Protection Agency (EPA) and Congress, the program was able to remain responsive to shifts in environmental emphasis. Also, projects in place enabled CAAA architects to have access to real-time data on emission control capabilities while structuring proposed acid rain regulations under Title IV of the CAAA.

Aside from acid rain, there was an emerging issue in the area of hazardous air pollutants (HAPs), also referred to as air toxics. Title III of the CAAA listed 189 airborne compounds subject to control, including trace elements and volatile and semi-volatile compounds.

To assess the impacts on coal-based power generation, CCTDP projects were leveraged to obtain data through an integrated effort among the U.S. Department of Energy (DOE), EPA, the Electric Power Research Institute (EPRI), and the Utility Air Regulatory Group. Through this effort, concerns about HAPs relative to coal-based power generation have been significantly mitigated, enabling focus on but a few flue gas constituents. Also, because NO<sub>x</sub> is a precursor to ozone formation, the presence of NO<sub>x</sub> in ozone nonattainment areas, even at low levels, became an issue. This precipitated action in the CCTDP to include technologies capable of deep NO<sub>x</sub> reduction in the portfolio of technologies being sought.

In the course of the last two solicitations of the CCTDP, a number of energy and environmental considerations combined to change the emphasis toward seeking high-efficiency, very low-emission power generation technology. Energy demand projections in the United States showed the need for continued reliance on coal-based power generation, with significant growth required into the 21<sup>st</sup> century. The CAAA, however, capped SO<sub>2</sub> emissions at year 2000 levels, and NO<sub>x</sub> continued to receive increased attention relative to ozone nonattainment. Furthermore, particulate emissions were coming under increased scrutiny because of correlations with lung disorders and the tendency for toxic compounds to adhere to particulate matter. Added to these concerns was the growing concern over global warming and, more specifically, the carbon dioxide (CO<sub>2</sub>) produced from burning fossil fuels. Coal became a primary target because of its high carbon-to-hydrogen ratio relative to natural gas, resulting in somewhat higher CO<sub>2</sub> emissions per unit of energy produced. However, coal

is the fuel of choice (if not necessity) for many developing countries where projected growth in electric power generation is the greatest. The path chosen to respond to these considerations was to pursue advanced power generation systems that could provide major enhancements in efficiency and control SO<sub>2</sub>, NO<sub>x</sub>, and particulates without introducing external parasitic control devices. (Increased efficiency translates to less coal consumption per unit of energy produced.) As a result, a number of advanced power generation projects were undertaken, representing pioneer efforts recognized throughout the world.

## CCTDP Legislative History

The legislation authorizing the CCTDP is found in Public Law 98-473, Joint Resolution Making Continuing Appropriations for Fiscal Year (FY) 1985 and for Other Purposes. Title I set aside \$750 million of the congressionally rescinded \$5.375 billion of the Synthetic Fuels Corporation into a special U.S. Treasury account entitled the “Clean Coal Technology Reserve.” This account was dedicated to “conducting cost-shared clean coal technology projects for the construction and operation of facilities to demonstrate the feasibility of future commercial applications of such technology.” Title III of this act directed the Secretary of Energy to solicit statements of interest in and proposals for clean coal projects. In keeping with this mandate, DOE issued a program announcement, which resulted in the receipt of 176 proposals representing both domestic and international projects with a total estimated cost in excess of \$8 billion.

After this significant initial expression of interest in clean coal demonstration projects, Public Law 99-190, enacted December 1985, appropriated \$400 million to conduct cost-shared dem-

onstration projects. Of the total appropriated funds, approximately \$387 million was made available for cost-shared projects to be selected through a competitive solicitation, or Program Opportunity Notice (PON), referred to as CCTDP-I. (The remaining funds were required for program direction and the legislatively mandated Small Business Innovation Research Program [SBIR] and Small Business Technology Transfer Program [STTR].)

In a manner similar to the initiation of CCTDP-I, Congress again directed DOE to solicit information from the private sector in the Department of the Interior and Related Agencies Appropriations Act for FY1987 (Public Law 99-591, enacted October 30, 1986). The information received was to be used to establish the level of potential industrial interest in another solicitation, this time involving clean coal technologies capable of retrofitting, repowering, or modernizing existing facilities. Projects were to be cost-shared, with industry sharing at least 50 percent of the cost. As a result of the solicitation, a total of 39 expressions of interest were received by DOE in January 1987.

On March 18, 1987, the President announced the endorsement of the recommendations of the *Special Envoys on Acid Rain*, including a \$2.5 billion government share of funding for industry/government demonstrations of innovative control technology over a five-year period. On April 4, 1987, the President asked Congress for an additional \$350 million in FY1988 and an advanced appropriation of \$500 million in FY1989. Additional appropriations of \$500 million would be requested in fiscal years 1990, 1991, and 1992.

Public Law 100-202, enacted December 22, 1987, as amended by Public Law 100-446, appropriated a total of \$575 million to conduct CCTDP-II. About \$536 million was for projects, with the remainder for program direction and the SBIR and STTR programs.

The Department of the Interior and Related Agencies Appropriations Act for FY1989 (Public Law 100-446, enacted September 27, 1988) provided \$575 million for necessary expenses associated with clean coal technology demonstrations in the CCTDP-III solicitation. Of the total funding, about \$546 million was made available for cost-sharing projects, with the remainder for program direction and the SBIR and STTR programs. The act continued the requirement that proposals must demonstrate technologies capable of retrofitting or repowering existing facilities. The statute also authorized the use of Tennessee Valley Authority power program funds as a source of nonfederal cost-sharing, except if provided by annual appropriations acts. In addition, funds borrowed by Rural Electrification Administration (now Rural Utilities Service) electric cooperatives from the Federal Financing Bank became eligible as cost-sharing in the CCTDP-III solicitation, except if provided by annual appropriations.

In the Department of the Interior and Related Agencies Appropriations Act of 1990 (Public Law 101-121, enacted October 23, 1989), Congress provided \$600 million for the CCTDP-IV solicitation. CCTDP-IV, according to the act, “shall demonstrate technologies capable of replacing, retrofitting, or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190, 100-202 and 100-446 as amended by this Act.” About \$563 million was made available for federal cofunding of projects selected in CCTDP-IV, with the remainder for program direction and the SBIR and STTR programs.

In Public Law 101-121, enacted October 23, 1989, Congress also provided \$600 million for the CCTDP-V solicitation. CCTDP-V, according to the act, “shall be subject to all provisos contained under this head in Public Laws 99-190, 100-202 and 100-446 as amended by this Act.” Approximately

\$568 million was made available for federal cofunding of projects to be selected in this solicitation, with the remainder again for program direction and the SBIR and STTR programs.

Subsequent acts (Public Laws 101-164, 101-302, 101-512, and 102-154) modified the schedule for issuing CCTDP-IV and/or CCTDP-V PONs and selecting projects. In Public Law 101-512, Congress directed DOE to issue the PON for CCTDP-IV not later than February 1, 1991, with selections to be made within 8 months. In Public Law 102-154, Congress directed DOE to issue the CCTDP-V PON not later than July 6, 1992, with selections to be made within 10 months. This later act also directed that CCTDP-V proposals should advance significantly the efficiency and environmental performance of coal-using technologies and be applicable to either new or existing facilities.

Public Laws 101-164, 101-302, 101-512, 103-138, and 103-332 adjusted the rate at which funds were to be made available to the program.

The CCTDP funds have been further adjusted through sequestering requirements of the Gramm-Rudman-Hollings Deficit Reduction Act, rescissions, and transfers to other Fossil Energy activities. Sequestering reduced CCTDP appropriations as follows:

- \$2,028 was sequestered from the \$575 million appropriated by Public Law 100-446, as amended by Public Law 101-164.
- \$455 was sequestered from the \$1.2 billion appropriated by Public Law 101-121, as amended by Public Laws 101-512, 102-154, 102-381, 103-138, 103-332, 104-6, 104-208, and 105-18.

Rescissions and transfers have reduced CCTDP appropriations as follows:

- \$200 million was rescinded by Public Law 104-6.
- \$123 million was rescinded by Public Law 104-208.
- \$17 million was rescinded by Public Law 105-18.
- \$101 million was rescinded by Public Law 105-83.
- \$38,000 was rescinded by Public Law 106-113 (general reduction).
- \$95 million was transferred to the Power Plant Improvement Initiative by Public Law 106-291.
- \$33.7 million was transferred to Fossil Energy Research and Development by Public Law 107-63.
- \$10,000 was rescinded by Public Law 107-206 (Admin and Travel Rescission).
- \$88 million was rescinded by Public Law 108-108.
- \$20 million was rescinded by Public Law 109-103.
- \$166 million was transferred to Fossil Energy Research and Development by Public Law 110-161.
- \$149 million was transferred to the Clean Coal Power Initiative (CCPI) by Public Law 111-8.

In addition to rescissions and transfers, the annual appropriations bills have deferred the availability of various amounts of previously appropriated funds until the start of subsequent fiscal years. These deferrals only involved funding not needed in the current fiscal year and therefore, did not impact ongoing projects. Recently, Public Law 111-8 transferred the full amount of previously deferred CCTDP funding (\$149 million) to the CCPI. With no active projects remaining in the

CCTDP Program, these funds were no longer needed. This transfer left less than \$17 million in unobligated funding in CCTDP accounts. Public Law 110-161 granted authorization to utilize remaining unobligated CCTDP funds for the CCPI.

Exhibit A-1 lists all the key legislation relating to the CCTDP and provides a summary of provisions relating to program funding as well as program implementation. At the end of this appendix are funding provisions excerpted from appropriations and other relevant funding-related acts.

## Exhibit A-1 CCTDP Legislative History (Funding Only)

Public Law	Date Enacted	CCTDP Round	Program Funding	Implementation Provisions
98-473	10/12/84	Initiation of CCTDP informational solicitation	Rescinded \$750 million of \$5.375 billion from the Energy Security Reserve (Synthetic Fuels Corporation) to be deposited in a U.S. Treasury Department account entitled "Clean Coal Technology Reserve" for conducting cost-shared clean coal technologies (CCT) projects for the construction and operation of facilities to demonstrate the feasibility for future commercial application of such technology, without fiscal year limitation, subject to subsequent annual appropriation.	Title III required publication of a notice soliciting statements of interest in and proposals for projects employing emerging CCTs. A report to Congress was required no later than 4/15/85.
99-88	8/15/85	CCTDP-I	Deferred \$1.6 million for obligation until 10/1/85.	Conference Report (H. Rep. 99-236) concurred with CCT project guidelines contained in Senate Report 99-82, with certain modifications.
99-190	12/19/85	CCTDP-I	Conference Report (H. Rep. 99-450) agreed to a \$400-million CCTDP as described under the U.S. Treasury Department Energy Security Reserve, with the request for proposals to be for the full \$400 million.	Required a PON (CCTDP-I) to be issued and projects to be selected no later than 8/1/86. Project cost-sharing provisions were detailed.
99-591	10/30/86	Second informational solicitation	(Contained no funding provisions for CCTDP.)	Title II required publication of a notice soliciting statements of interest in, and informational proposals for projects employing emerging CCTs capable of retrofitting, repowering, or modernizing existing facilities. A report to Congress was required no later than 3/6/87.
100-202	12/22/87	CCTDP-II	Appropriated \$50 million for FY beginning 10/1/87 until expended and \$525 million for FY beginning 10/1/88 until expended.	Required a request for proposals (CCTDP-II) to be issued no later than 60 days following enactment, for emerging CCTs capable of retrofitting or repowering existing facilities. Extended project selection from 120 days to 160 days after receipt of proposals. Provided for cost-sharing of preaward costs for preparation and submission of environmental data upon signing of the cooperative agreement. Conference Report (H. Rep. 100-498) provided that project cost-sharing funds be made available to nonutility as well as utility applications. No funds were made available for new, stand-alone applications. H. Rep. Report 100-171 and Senate Report 100-165 outlined provisions for participant to repay government contributions.
100-446	9/27/88	CCTDP-III	Made available \$575 million on 10/1/89 until expended. Pub. L. 100-202 was amended by striking \$525 million and inserting \$190 million for FY beginning 10/1/88 until expended, \$135 million for fiscal year beginning 10/1/89 until expended, and \$200 million for FY beginning 10/1/90 until expended, provided that outlays for FY89 resulting from use of funds appropriated under Pub. L. 100-202, as amended, did not exceed \$15.5 million.	Request for proposals (CCTDP-III) to be issued by 5/1/89 for emerging CCTs capable of retrofitting or repowering existing facilities. Proposals were to be due 120 days after issuance of the PON; projects were to be selected no later than 120 days after receipt of proposals. Funds borrowed by REA electric cooperatives from the Federal Financing Bank were made eligible as cost-sharing. Funds derived by the Tennessee Valley Authority from its power program were deemed allowable as cost-sharing except if provided by annual appropriations acts.
101-45	6/30/89	CCTDP-III	Funds appropriated for FY1989 were made available for a third solicitation.	Project selections for the third solicitation were to be made not later than 1/1/90.
101-121	10/23/89	CCTDP-IV & CCTDP-V	Made available \$600 million on 10/1/90 until expended and for \$600 million on 10/1/91 until expended. Pub. L. 100-446 was amended by striking \$575 million and inserting \$450 million to be made available on 10/1/89 until expended and \$125 million to be made available on 10/1/90. Unobligated balances excess to the needs of the procurement for which they originally were made available may be applied to other procurements for which requests for proposals had not yet been issued, except that no supplemental, backup, or contingent selection of projects could be made over and above the projects originally selected.	Two solicitations (CCTDP-IV and CCTDP-V) to be issued, one each appropriation, to demonstrate technologies capable of replacing, retrofitting, or repowering existing facilities, subject to all provisos contained in Pub. L. 99-190, 100-202, and 100-446 as amended. The PON (CCTDP-IV) using funds becoming available on 10/1/90 was to be issued by 6/1/90, with selections made by 2/1/91. The PON (CCTDP-V) using funds becoming available on 10/1/91 was to be issued no later than 9/1/91, with selections made by 5/1/92.

**Exhibit A-1 (continued)**  
**CCTDP Legislative History (Funding Only)**

<b>Public Law</b>	<b>Date Enacted</b>	<b>CCTDP Round</b>	<b>Program Funding</b>	<b>Implementation Provisions</b>
101-164	11/21/89	CCTDP-IV & CCTDP-V	Appropriation for FY1990 was amended by striking \$450 million and inserting \$419 million and by striking \$125 million and inserting \$156 million.	Solicitations could not be conducted prior to ability to obligate funds. Repayment provisions for CCTDP-IV and CCTDP-V were to be the same as for CCTDP-III.
101-302	5/25/90	CCTDP-IV & CCTDP-V	Obligation of funds previously appropriated for CCTDP-IV and was deferred until 9/1/91.	
101-512	11/5/90	CCTDP-IV & CCTDP-V	Pub. L. 101-121 was amended by striking \$600 million made available on 10/1/90 until expended and \$600 million made available on 10/1/91 until expended and inserting \$600 million made available as follows: \$35 million on 9/1/91, \$315 million on 10/1/91, and \$250 million on 10/1/92, all sums remaining until expended, for use in conjunction with a separate general request for proposals, and \$600 million made available as follows: \$150 million on 10/1/91, \$225 million on 10/1/92, and \$225 million on 10/1/93, all sums remaining until expended, for use with a separate general request for proposals.	The CCTDP-IV solicitation was to be issued not later than 2/1/91. The CCTDP-V PON was to be issued not later than 3/1/92. Project selections were to be made within eight months of PON's issuance. Repayment provisions were to be the same as for CCTDP-III. Provisions were included to provide protections for trade secrets and proprietary information. Conference Report (H. Rep. 101-971) recommends changes to program policy factors.
102-154	11/13/91	CCTDP-V	Pub. L. 102-512 was amended by striking \$150 million on 10/1/91 and \$225 million on 10/1/92 and inserting \$100 million on 10/1/91 and \$275 million on 10/1/92.	The CCTDP-V PON was delayed to not later than 7/6/92, with selection to be made within 10 months (extended by two months). The PON was to be for projects that advance significantly the efficiency and environmental performance of coal-using technologies and be applicable to either new or existing facilities. Conference Report (H. Rep. 102-256) stated expectations that the CCTDP-V solicitation would be conducted under the same general types of criteria as CCTDP-IV, principally modified only to (1) include the wider range of eligible technologies or applications; (2) adjust technical criteria to consider allowable development activities, strengthen criteria for nonutility demonstrations, and adjust commercial performance criteria for additional facilities and technologies with regard to aspects of general energy efficiency and environmental performance; and (3) clarify and strengthen cost and finance criteria, particularly with regard to development activities. Funding was allowed for project-specific development activities for process performance definition, component design verification, materials selection, and evaluation of alternative designs on a cost-shared basis up to a limit of 10 percent of the government share of project cost. Development activities eligible for cost-sharing included limited modifications to existing facilities for project-related testing but not construction of new facilities.
102-381	10/5/92		Pub. L. 101-512 was amended by striking \$250 million on 10/1/92 and inserting \$150 million on 10/1/93 and \$100 million on 10/1/94; and by striking \$275 million on 10/1/92 and \$225 million on 10/1/93 and inserting \$250 million on 10/1/93 and \$250 million on 10/1/94.	
102-486	10/24/92		(Contained no funding provisions for CCTDP.)	Section 1301—Coal RD&D and Commercial Applications Programs (Title XIII; Subtitle A) authorized DOE to conduct programs for RD&D and commercial applications of coal-based technologies. Secretary of Energy was directed to submit to Congress (1) a report that included, among other things, recommendations regarding the manner in which the cost-sharing demonstrations conducted pursuant to the Clean Coal Program (Pub. L. 98-473) might be modified and extended in order to ensure the timely demonstration of advanced coal-based technologies and (2) periodic status reports on the development of advanced coal-based technologies and RD&D and commercial application attributes.

**Exhibit A-1 (continued)**  
**CCTDP Legislative History (Funding Only)**

<b>Public Law</b>	<b>Date Enacted</b>	<b>CCTDP Round</b>	<b>Program Funding</b>	<b>Implementation Provisions</b>
103-138	11/11/93		Pub. L. 101-512 was amended by striking \$150 million on 10/1/93 and \$100 million on 10/1/94 and inserting \$100 million on 10/1/93, \$100 million on 10/1/94, and \$50 million on 10/1/95; and by striking \$250 million on 10/1/93 and \$250 million on 10/1/94 and inserting \$125 million on 10/1/93, \$275 million on 10/1/94, and \$100 million on 10/1/95.	
103-332	9/30/94		Pub. L. 101-512 was amended by striking \$100 million on 10/1/94 and \$50 million on 10/1/95 and inserting \$18 million on 10/1/94, \$100 million on 10/1/95, and \$32 million on 10/1/96; and by striking \$275 million on 10/1/94 and \$100 million on 10/1/95 and inserting \$19.121 million on 10/1/94, \$100 million on 10/1/95, and \$255.879 million on 10/1/96.	An amount not to exceed \$18 million available in FY1995 may be used for administrative oversight of the CCTDP.
104-6	4/10/95		Of funds available for obligation in FY1996, \$50 million was rescinded. Of the funds to be made available for obligation in FY97, \$150 million was rescinded.	
104-134 <sup>a</sup>	4/26/96			Conference Report (H. Rep. 104-402 to accompany H.R. 1977) allowed for the use of up to \$18 million in CCTDP funds for program administration.
104-208 <sup>b</sup>	9/30/96		Conference Report (H. Rep. 104-863 to accompany H.R. 3610) noted rescission of \$123 million for FY1997 or prior years.	House and Senate committees did not object to use of up to \$16 million in available funds for administration of the CCTDP in FY1997 (H. Rep. 104-625 and Senate 104-319 to accompany H.R. 3662).
105-18	6/12/97		Of funds made available for obligation in FY1997 or prior years, \$17 million was rescinded.	
105-83	11/14/97		Of funds made available for obligation in FY1997 or prior years, \$101 million was rescinded.	
105-277	10/21/98		Of funds made available for obligation in prior years, \$40 million was deferred.	Conference Report allowed \$14.9 million in CCTDP funds for program administration.
106-113	11/29/99		Of funds made available for obligation in prior years, \$156 million was deferred. \$38,000 was rescinded as a result of the general reduction.	Conference Report did not object to the use of up to \$14.4 million in CCTDP funds for program administration.
106-291	10/11/00		Of funds made available for obligation in prior years, \$67 million was deferred. Another \$95 million was transferred to the Power Plant Improvement Initiative.	Conference Report (H. Rep. 106-406) did not object to the use of up to \$14.4 million in CCTDP funds for program administration.
107-63	11/5/01		Of funds made available for obligation in prior years, \$40,000,000 was deferred and \$33,700,000 was transferred to Fossil Energy Research and Development.	
108-7	2/20/03		Of funds made available for obligation in prior years, \$87,000,000 was deferred.	
108-108	11/10/03		Of funds made available for obligation in prior years, \$97,000,000 was deferred and \$88,000,000 rescinded.	
108-447	12/8/04		Of funds made available for obligation in prior years, \$257,000,000 was deferred.	
109-103	11/19/05		Of funds made available for obligation in prior years, \$257,000,000 was deferred and \$20,000,000 rescinded.	
110-5	2/15/07		Of funds made available for obligation in prior years, \$257,000,000 was deferred.	
110-161	12/26/07		Of funds made available for obligation in prior years, \$149,000,000 was deferred and \$166,000,000 was transferred to Fossil Energy Research and Development.	
111-8	3/11/09		Of funds made available for obligation in prior years, \$149,000,000 was transferred to the Clean Coal Power Initiative.	

<sup>a</sup> H.R. 3019, which became Pub. L. 104-134, replaced H.R. 1977.

<sup>b</sup> H.R. 3610, which became Pub. L. 104-208, replaced H.R. 3662.

## PPII Historical Perspective

The roots of this program lie in the blackouts and brownouts of 1999 and 2000. The Power Plant Improvement Initiative (PPII) is an outgrowth of congressional direction provided in FY2001 appropriations to DOE’s fossil energy research program. Funding was added for the program following increasing concerns over the adequacy of the nation’s power supplies. Several parts of the United States, including the West Coast and parts of the Northeast, had experienced rolling blackouts and brownouts in the previous two years caused in large part by sharp rises in demand for electricity and lagging construction of new power plants.

Eligible projects included technologies that boost the efficiencies of currently operating power plants—generating more megawatts from the same amount of fuel—or that lower emissions and allow plants to stay in operation in compliance with environmental standards. The program was also open to technologies that improve the economics and overall performance of coal-fired power plants.

Private sector proposers must at least match the government funding. Proposed technologies must be mature enough to be commercialized within the next few years, and the cost-shared demonstrations must be large enough

to show that the technology is viable for commercial use.

## PPII Legislative History

The legislation authorizing PPII is found in Public Law 106-291, Department of the Interior and Related Agencies Appropriations Act, 2001. Under the act, \$95,000,000 was transferred from funds appropriated in prior years under the CCTDP and made available for a general request for proposals for the commercial-scale demonstration of technologies to assure the reliability of the nation’s energy supply from existing and new electric generating facilities. The funds provided were to be spent only in accordance with the provisions governing the use of funds contained in the CCTDP under which they were originally appropriated. Provisions for recoupment are identical to CCTDP-III except that repayments from the sale or licensing of technologies shall be from both domestic and foreign transactions, and the repayments are retained for future projects. Congress provided that any project approved under PPII shall be considered a Clean Coal Technology Demonstration Project, for the purposes of Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations.

In Public Law 107-63, Congress provided that funds in excess of the needs of the PPII procurement be made available for the Clean Coal Power Initiative (CCPI).

Exhibit A-2 lists all the key legislation relating to PPII and provides a summary of provisions relating to program funding as well as program implementation.

## CCPI Historical Perspective

The CCPI was designed to respond to tighter air emission standards, the growth in electricity consumption, and emerging new technologies. With emerging air emission regulations dealing with ozone, particulate matter, and mercury, new technologies are needed to provide consistent, reliable, low-cost energy while meeting these standards. Electricity demand is expected to grow at a significant pace for the foreseeable future. Driven by the rise in the digital economy, higher quality electricity is in greater demand than ever before. Digital-based technologies are playing an ever-increasing role in the development of new power plant technologies. Neural networks and artificial intelligence can be used to fine-tune operations and increase efficiency at coal-fired power plants. New environmental control technologies could reduce fine particulates and mercury to previously unattainable levels. To meet the challenges of tighter air emission standards, the growth in electricity consumption, and emerging new technologies, Congress appropriated funds for CCPI.

**Exhibit A-2  
PPII Legislative History**

Public Law	Date Enacted	Program Funding	Implementation Provisions
106-291	10/11/00	Made available \$95,000,000 derived by transfer from funds appropriated in prior years from the CCTDP for a general request for proposals for the commercial-scale demonstration of technologies to assure the reliability of the Nation’s energy supply from existing and new electric generating facilities for which the Department of Energy upon review may provide financial assistance awards.	
107-63	11/5/01	Provided that funds excess to the needs of the Power Plant Improvement Initiative procurement provided for in Public Law 106-291 shall be made available for the Clean Coal Power Initiative provided for in Public Law 107-63.	

By spreading out multiple solicitations over a 10-year period, CCPI will be able to emphasize the most pressing environmental issues of the day, such as climate change, and the latest technologies that are ready for commercial-scale demonstration.

## CCPI Legislative History

The legislation authorizing CCPI is found in Public Law 107-63, Department of Interior and Related Agencies Appropriations Act for FY02. Under the act, \$150,000,000 was made available for a request for proposals for a Clean Coal Power Initiative providing for competitively awarded research, development, and demonstration (RD&D) projects to reduce the barriers to continued and expanded coal use. Congress specified that no CCPI project could be selected for which sufficient funding was not available to provide for the total project. Also, funds are to be expended in accordance with the provisions governing the use of funds contained under the heading “Clean Coal Technology” in prior appropriations.

Congress specified certain changes to the repayment provisions. Specifically, DOE could include provisions for repayment of government contributions to individual projects in an amount up to the government contribution to the project on terms and conditions that are acceptable to DOE, including repayments from sale and licensing of technologies from both domestic and foreign transactions. (In the CCTDP, repayment had been limited to domestic transactions.) Also, repayments are being retained by DOE for future coal-related RD&D projects.

As with PPII, Congress specified that any technology selected under CCPI shall be considered a “Clean Coal Technology,” and any project selected under CCPI shall be considered a “Clean Coal Technology Project,” for the purposes of 42 U.S.C. 765In, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations.

In 2003, Congress appropriated another \$150,000,000 for CCPI in Public Law 108-7. There were no changes in the implementing provisions. Again in 2003 under Public Law 108-108, Con-

gress made an additional \$172,000,000 available for CCPI. In 2004, Congress appropriated another \$50,000,000 for CCPI in Public Law 108-447.

In 2005, Congress appropriated \$50,000,000 for CCPI in Public Law 109-103 for use in a third solicitation. In 2007, Public Laws 110-5 and 110-161 made available a total of \$130.4 million for the third solicitation. In 2009, Public Law 111-8 added \$288.2 million and the American Recovery and Reinvestment Act (ARRA) added an additional \$800 million. The ARRA funding could be used for new or modified applications under the third solicitation.

Exhibit A-3 lists all key legislation relating to CCPI and provides a summary of provisions relating to program implementation. Following this section are funding provisions excerpted from appropriations.

### Exhibit A-3 CCPI Legislative History

Public Law	Date Enacted	Program Funding	Implementation Provisions
107-63	11/5/01	Made available \$150,000,000, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use 107-63.  Provided that funds excess to the needs of the Power Plant Improvement Initiative procurement provided for in Public Law 106-291 shall be made available for the Clean Coal Power Initiative provided for in Public Law 107-63.	No project may be selected for which sufficient funding is not available to provide for the total project. Funds shall be expended in accordance with the provisions governing the use of funds contained under the heading “Clean Coal Technology” in prior appropriations. Provisions for repayment of government contributions to individual projects in an amount up to the government contribution including repayments from sale and licensing of technologies from both domestic and foreign transactions. Repayments shall be retained by DOE for future coal-related research, development and demonstration projects. Any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 765In, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations.
108-7	2/20/03	Made available \$150,000,000, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use.	Comparable to prior years.

**Exhibit A-3 (continued)**  
**CCPI Legislative History**

<b>Public Law</b>	<b>Date Enacted</b>	<b>Program Funding</b>	<b>Implementation Provisions</b>
108-108	11/10/03	Made an additional \$172,000,000 available for CCPI.	Comparable to prior years.
108-447	12/8/04	Made an additional \$50,000,000 available for CCPI.	Comparable to prior years.
109-58	8/8/05	(Contained no funding provisions).	<p>Section 401—Report to Congress – The Secretary shall submit to Congress the report required by this subsection not later than March 31, 2007. The report shall include, with respect to subsection (a), a plan containing (1) a detailed assessment of whether the aggregate funding levels provided under subsection (a) are the appropriate funding levels for that program; (2) a detailed description of how proposals will be solicited and evaluated, including a list of all activities expected to be undertaken; (3) a detailed list of technical milestones for each coal and related technology that will be pursued; and (4) a detailed description of how the program will avoid problems enumerated in Government Accountability Office reports on the Clean Coal Technology Program, including problems that have resulted in unspent funds and projects that failed either financially or scientifically.</p> <p>Section 402—Project Criteria – Section provided detailed requirements to be eligible to receive assistance under CCPI, including specifics regarding efficiency, environmental performance, cost competitiveness, and that at least 70 percent of the funds are used only to fund projects on coal-based gasification technologies.</p> <p>Section 403—Report to Congress – Not later than 1 year after the date of enactment of this Act, and once every 2 years thereafter through 2014, the Secretary, in consultation with other appropriate Federal agencies, shall submit to Congress a report describing—(1) the technical milestones set forth in section 402 and how those milestones ensure progress toward meeting the requirements of subsections (b)(1)(B) and (b)(2) of section 402; and (2) the status of projects funded under this subtitle.</p>
109-103	11/19/05	Made an additional \$50,000,000 available for CCPI.	Comparable to prior years.
110-5	2/15/07	Made an additional \$60,433,000 available for CCPI.	Comparable to prior years.
110-161	12/26/07	Made an additional \$70,000,000 available for CCPI.	Comparable to prior years.
111-5	2/17/09	Made \$3,400,000,000 available to Fossil Energy under the American Recovery and Reinvestment Act of 2009. \$800,000,000 was made available for CCPI.	Senate conference language recommended a second closing date under CCPI-3 for new or modified applications and consideration of applications that utilize petroleum coke for some or all of the project's fuel input.
111-8	3/11/09	Made an additional \$288,174,000 available for CCPI.	Specified a two-year time limit from time of project selection to award that may be extended at the Secretary's discretion for matters outside the control of the applicant, or if the Secretary determines that extension of the time limit is in the public interest.

## Public Laws—CCTDP, PPII, and CCPI

### Public Law 99-190

**Public Law 99-190, 99 Stat. 1251 (1985)**

#### Clean Coal Technology

Within 60 days following enactment of this Act [Dec. 19, 1985] the Secretary of Energy shall, pursuant to the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901, *et seq.*), issue a general request for proposals for clean coal technology projects for which the Secretary of Energy upon review may provide financial assistance awards. Proposals for clean coal technology projects under this section shall be submitted to the Department of Energy within 60 days after issuance of the general request for proposals. The Secretary of Energy shall make any project selections no later than August 1, 1986: *Provided*, That the Secretary may vest fee title or other property interests acquired under cost-shared clean coal technology agreements in any entity, including the United States: *Provided further*, That the Secretary shall not finance more than 50 per centum of the total costs of a project as estimated by the Secretary as of the date of award of financial assistance: *Provided further*, That cost-sharing by project sponsors is required in each of the design, construction, and operating phases proposed to be included in a project: *Provided further*, That financial assistance for costs in excess of those estimated as of the date of award of original financial assistance may not be provided in excess of the proportion of costs borne by the Government in the original agreement and only up to 25 per centum of the original financial assistance: *Provided further*, That revenues or royalties from prospective operation of projects beyond the time considered in the award

of financial assistance, or proceeds from prospective sale of the assets of the project, or revenues or royalties from replication of technology in future projects or plants are not cost-sharing for the purposes of this appropriation: *Provided further*, That other appropriated Federal funds are not cost-sharing for the purposes of this appropriation: *Provided further*, That existing facilities, equipment, and supplies, or previously expended research or development funds are not cost-sharing for the purposes of this appropriation, except as amortized, depreciated, or expensed in normal business practice.

**Conference Report (H.R. Conf. Rep. No. 450, 99th Cong., 1st Sess. [1985])**

#### Clean Coal Technology

The managers have agreed to a \$400,000,000 Clean Coal Technology program as described under the Department of the Treasury, Energy Security Reserve. Bill language is included which provides for the selection of projects no later than August 1, 1986. Within that period, a general request for proposals must be issued within 60 days and proposals must be submitted to the Department within 60 days after issuance of the general request for proposals. Language is also included allowing the Secretary of Energy to vest title in interests acquired under agreements in any entity, including the United States, and delineating cost-sharing requirements. Funds for these activities and projects are made available to the Clean Coal Technology program in the Energy Security program.

It is the intent of the managers that contributions in the form of facilities and equipment be considered only to the extent that they would be amortized, depreciated or expensed in normal business practice. Normal business practice shall be determined by the Secretary and is not necessarily the practice of any single proposer. Property which has been fully depreciated would not

receive any cost-sharing value except to the extent that it has been in continuous use by the proposer during the calendar year immediately preceding the enactment of this Act. For this property, a fair use value for the life of the project may be assigned. Property offered as a cost-share by the proposer that is currently being depreciated would be limited in its cost-share value to the depreciation claimed during the life of the demonstration project. Furthermore, in determining normal business practice, the Secretary should not accept valuation for property sold, transferred, exchanged, or otherwise manipulated to acquire a new basis for depreciation purposes or to establish a rental value in circumstances which would amount to a transaction for the mere purpose of participating in this program.

The managers agree that, with respect to cost-sharing, tax implications of proposals and tax advantages available to individual proposers should not be considered in determining the percentage of Federal cost-sharing. This is consistent with current and historical practices in Department of Energy procurements.

It is the intent of the managers that there be full and open competition and that the solicitation be open to all markets utilizing the entire coal resource base. However, projects should be limited to the use of United States mined coal as the feedstock and demonstration sites should be located within the United States.

The managers agree that no more than \$1,500,000 shall be available in FY86 and \$2,000,000 each year thereafter for contracting, travel and ancillary costs of the program, and that manpower costs are to be funded under the fossil energy research and development program.

The managers direct the Department, after projects are selected, to provide a comprehensive report to the Congress on proposals received.

The managers also expect the request for proposals to be the full \$400,000,000 program, and not only for the first \$100,000,000 available in fiscal year 1986.

## **Public Law 100-202**

**Public Law 100-202, 101 Stat. 1329-1 (1987)**

### **Clean Coal Technology**

For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 *et seq.*, \$50,000,000 are appropriated for the fiscal year beginning October 1, 1987, and shall remain available until expended, and \$525,000,000 are appropriated for the fiscal year beginning October 1, 1988, and shall remain available until expended.

No later than sixty days following enactment of this Act, the Secretary of Energy shall, pursuant to the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901 *et seq.*), Issue a general request for proposals for emerging clean coal technologies which are capable of retrofitting or repowering existing facilities, for which the Secretary of Energy upon review may provide financial assistance awards. Proposals under this section shall be submitted to the Department of Energy no later than ninety days after issuance of the general request for proposals required herein, and the Secretary of Energy shall make any project selections no later than one hundred and sixty days after receipt of proposal: *Provided*, That projects selected are subject to all provisos contained under this head in Public Law 99-190: *Provided further*, That pre-award costs incurred by project sponsors after selection and before signing an agreement are allowable to the extent that they are related to (1) the preparation of material requested by the Department of Energy and identified as required for the negotiation; or (2) the preparation and submission of

environmental data requested by the Department of Energy to complete National Environmental Policy Act requirements for the projects: *Provided further*, That pre-award costs are to be reimbursed only upon signing of the project agreement and only in the same ratio as the cost-sharing for the total project: *Provided further*, That reports on projects selected by the Secretary of Energy pursuant to authority granted under the heading "Clean coal technology" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, which are received by the Speaker of the House of Representatives and the President of the Senate prior to the end of the first session of the 100th Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading "Administrative provision, Department of Energy" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate.

**Conference Report (H.R. Conf. Rep. No. 498, 100th Cong., 1st Sess. [1987])**

### **Clean Coal Technology**

Appropriates \$575,000,000 for clean coal technology instead of \$350,000,000 as proposed by the House and \$850,000,000 as proposed by the Senate. The comparison by year is as follows:

Bill language, proposed by the House, which would have prohibited using grants has been deleted. The managers agree that project funding is expected to be based on cooperative agreements, but that grants might be applicable to support work also funded from this account.

The managers agree to deleted Senate language providing personnel floors for

Clean Coal Technology. The managers further agree that the budget estimates for personnel and contract support are to be followed. The agreement included 58 new positions above current employment floors for the fossil energy organization and 30 positions within the floors. Out of clean coal technology funds, up to \$3,980,000 is for fiscal year 1988 personnel-related costs and up to \$16,520,000 is for all contract costs needed to make project selections and complete negotiations for both clean coal procurements. Contract costs necessary to monitor approved projects should be requested in the fiscal year 1989 budget. Increases above to those amount are subject to reprogramming procedures. No funds other than personnel related costs for the 30 positions included in the program direction are to be provided from the fossil energy research and development account.

The length of time for selection of projects by the Secretary of Energy has been extended from 120 days to 160 days based on experience from the original clean coal procurement. Once projects have been selected the Secretary should establish project milestones and guidelines for project negotiations in order to expedite the negotiation process to the extent feasible.

The managers agree that the funds provided are available for non-utility applications as well as for utility applications.

The managers agree that no funds are provided for the demonstration of clean coal technologies which are intended solely for new, stand alone, applications. The Senate had proposed up to 25 percent of the funds be available for this purpose.

Bill language has been included which provides that reports on projects selected in the first round of clean coal procurements that are received before the end of the first session of the 100th Congress will satisfy reporting require-

ments 30 calendar days after receipt by Congress. This provision applies to a maximum of two project reports.

## **Public Law 100-446**

**Public Law 100-446, 102 Stat. 1774 (1988)**

### **Clean Coal Technology**

For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 *et seq.*, \$575,000,000 shall be made available on October 1, 1989, and shall remain available until expended: *Provided*, That projects selected pursuant to a general request for proposals issued pursuant to this appropriation shall demonstrate technologies capable of retrofitting or repowering existing facilities and shall be subject to all provisions contained under this head in Public Laws 99-190 and 100-202 as amended by this Act.

The first paragraph under this head in Public Law 100-202 is amended by striking “and \$525,000,000 are appropriated for the fiscal year beginning October 1, 1988” and inserting “\$190,000,000 are appropriated for the fiscal year beginning October 1, 1988, and shall remain available until expended, \$135,000,000 are appropriated for the fiscal year beginning October 1, 1989, and shall remain available until expended, and \$200,000,000 are appropriated for the fiscal year beginning October 1, 1990”: *Provided*, That outlays in fiscal year 1989 resulting from the use of funds appropriated under this head in Public Law 100-202, as amended by this Act, may not exceed \$15,500,000: *Provided further*, That these actions are taken pursuant to section 202(b)(1) of Public Law 100-119 (2 U.S.C. 909).

For the purposes of the sixth proviso under this head in Public Laws 99-190, funds derived by the Tennessee Valley Authority from its power program are hereafter not to be precluded from

qualifying as all or part of any cost-sharing requirement, except to the extent that such funds are provided by annual appropriations Acts: *Provided*, That unexpended balances of funds made available in the “Energy Security Reserve” account in the Treasury for the Clean Coal Technology Program by the Department of the Interior and Related Agencies Appropriations Acts, 1986, as contained in section 101(d) of Public Law 99-190, shall be merged with this account: *Provided further*, That for the purposes of the sixth proviso in Public Law 99-190 under this heading, funds provided under section 306 of Public Law 93-32 shall be considered non-Federal: *Provided further*, That reports on projects selected by the Secretary of Energy pursuant to authority granted under the heading “Clean coal technology” in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, which are received by the Speaker of the House of Representatives and the President of the Senate prior to the end of the second session of the 100th Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading “Administrative Provisions, Department Energy” in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate.

**Conference Report (H.R. Conf. Rep. No. 862, 100th Cong., 2nd Sess. [1988])**

### **Clean Coal Technology**

Amendment No. 131: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

In lieu of the matter proposed by said amendment insert the following: For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 *et seq.*, \$575,000,000 shall be made available on October 1, 1989, and shall remain available until expended: *Provided*, That projects selected pursuant to a general request for proposals issued pursuant to this appropriation shall demonstrate technologies capable of retrofitting or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190 and 100-202 as amended by this Act.

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate. The amendment provides \$575,000,000 in fiscal year 1990 for a third Clean Coal Technology procurement as proposed by the Senate, and clarifies that the procurement is for retrofit and repowering technologies and is subject to the cost-sharing provisions of the previous two procurements.

The managers agree that a request for proposals should be issued by May 1, 1989, with proposals due no later than 120 days after issuance of the request for proposals, and that the Secretary of Energy should make project selections no later than 120 days after receipt of proposals.

Amendment No. 132: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

Restore the matter stricken by said amendment, amended to read as follows: The first paragraph under this head in Public Law 100-202 is amended by striking “and \$525,000,000 are appropriated for the fiscal year beginning October 1, 1988” and inserting “\$190,000,000 are appropriated for the

fiscal year beginning October 1, 1988, and shall remain available until expended, \$135,000,000 are appropriated for the fiscal year beginning October 1, 1989, and shall remain available until expended, and \$200,000,000 are appropriated for the fiscal year beginning October 1, 1990”: *Provided*, That outlays in FY89 resulting from the use of funds appropriated under this head in Public Law 100-202, as amended by this Act, may not exceed \$15,500,000: *Provided further*, That these actions are taken pursuant to section 202(b)(1) of Public Law 100-119 (2 U.S.C. 909).

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate. The amendment changes the availability of \$525,000,000 originally made available for fiscal year 1989 in Public Law 100-202 by making \$190,000,000 available in 1989, \$135,000,000 available in 1990, and \$200,000,000 available in 1991 and also provides an outlay ceiling in fiscal year 1989. The House had proposed \$100,000,000 in fiscal year 1989, \$225,000,000 in fiscal year 1990, and \$200,000,000 in fiscal year 1989, \$225,000,000 in fiscal year 1990, and \$200,000,000 in fiscal year 1991, and the Senate struck the House language.

Both of these changes are necessary because of budget allocation constraints, but neither action has an effect on the execution of the Clean Coal program, or on the Congress’ overall support for the program, as is evidenced by additional appropriations provided for a third procurement of technologies.

The managers agree that administrative contract expenses may be incurred up to the budget level of \$9,820,000, but caution that close control of such expenditures is necessary to assure that the outlay ceiling provided will be sufficient to cover project costs.

Amendment No. 133: Modifies public law citation as proposed by the Senate.

Amendment No. 134: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which clarifies that funds borrowed by REA Electric Cooperatives from the Federal Financing Bank are eligible as cost-sharing in the clean coal technology program.

Amendment No. 135: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which specifies clean coal projects may proceed 30 calendar days after receipt by Congress of required reports, provided the reports are received prior to the end of the 100th Congress.

### **Public Law 101-45**

**Public Law 101-45, 103 Stat. 97 (1989)**

#### **Clean Coal Technology**

Notwithstanding any other provision of law, funds originally appropriated under this head in the Department of the Interior and Related Agencies Appropriations Act, 1989, shall be available for a third solicitation of clean coal technology demonstration projects, which projects are to be selected by the Department not later than January 1, 1990.

### **Public Law 101-121**

**Public Law 101-121, 103 Stat. 701 (1989)**

#### **Clean Coal Technology**

For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 *et seq.*, \$600,000,000 shall be made available on October 1, 1990, and shall remain available until expended, and \$600,000,000 shall be made available on October 1, 1991, and shall remain available until expended: *Provided*, That projects selected pur-

suant to a separate general request for proposals issued pursuant to each of these appropriations shall demonstrate technologies capable of replacing, retrofitting or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190, 100-202, and 100-446 as amended by this Act: *Provided further*, That the general request for proposals using funds becoming available on October 1, 1990, under this paragraph shall be issued no later than June 1, 1990, and projects resulting from such a solicitation must be selected no later than February 1, 1991: *Provided further*, That the general request for proposals using funds becoming available on October 1, 1991, under this paragraph shall be issued no later than September 1, 1991, and projects resulting from such a solicitation must be selected no later than May 1, 1992.

The first paragraph under this head in Public Law 100-446 is amended by striking “\$575,000,000 shall be made available on October 1, 1989” and inserting “\$450,000,000 shall be made available on October 1, 1989, and shall remain available until expended, and \$125,000,000 shall be made available on October 1, 1990”: *Provided*, That these actions are taken pursuant to section 202(b)(1) of Public Law 100-119 (2 U.S.C. 909).

With regard to funds made available under this head in this and previous appropriations Acts, unobligated balances excess to the needs of the procurement for which they originally were made available may be applied to other procurements for which requests for proposals have not yet been issued: *Provided*, That for all procurements for which project selections have not been made as of the date of enactment of this Act no supplemental, backup, or contingent selection of projects shall be made over and above projects originally selected for negotiation and utilization of available funds: *Provided further*, That reports on projects selected by the

Secretary of Energy pursuant to authority granted under this heading which are received by the Speaker of the House of Representatives and the President of the Senate less than 30 legislative days prior to the end of the first session of the 101st Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading "Administrative provisions, Department of Energy" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate or at the end of the session, whichever occurs later.

**Conference Report (H.R. Conf. Rep. No. 264, 101st Cong., 1st Sess. [1989])**

**Clean Coal Technology**

Amendment No. 112: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which adds the word "replacing" to the definition of clean coal technology. The managers agree that the inclusion of "replacing" for clean coal IV and V is intended to cover the complete replacement of an existing facility if because of design or site specific limitations, repowering or retrofitting of the plant is not a desirable option.

Amendment No. 113: Appropriates \$450,000,000 for fiscal year 1990 for clean coal technology instead of \$500,000,000 as proposed by the House and \$325,000,000 as proposed by the Senate. This appropriation along with \$125,000,000 provided for fiscal year 1991 in Amendment 114 fully funds the third round of clean coal technology projects. The managers agree that additional manpower is required, particularly at the Department's Energy Technology Centers, in order to manage adequately the increased workload

from the accumulation of active clean coal technology projects and the inclusion of additional procurements in this bill. Although a legislative floor is not included, the managers agree that at least eighty personnel will be required in addition to the approximately thirty FTE's now included in the fossil energy research and development appropriation. The managers agree further that funds from the fossil energy research and development appropriation should not be used to pay the cost of more than the equivalent FTE's paid under that account in fiscal year 1989.

Amendment No. 114: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

In lieu of the matter stricken and inserted by said amendment, insert: and shall remain available until expended, and \$125,000,000.

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate. The amendment provides \$125,000,000 in fiscal year 1991 for the third clean coal technology procurement instead of \$75,000,000 as proposed by the House and \$100,000,000 as proposed by the Senate.

Amendment No 115: Deletes Senate proposed appropriation of \$150,000,000 for fiscal year 1992 for clean coal technology. The House proposed no such appropriation.

Amendment No. 116: Restores House language stricken by the Senate which prohibits the use of supplemental, backup, or contingent project selections in clean coal technology procurements.

Amendment No. 117: Restores the word "further" stricken by the Senate.

**Public Law 101-164**

**Public Law 101-164, 103 Stat. 1109 (1989)**

**Clean Coal Technology**

The second paragraph under this heading contained in the Act making appropriations for the Department of the Interior and Related Agencies for the fiscal year ending September 30, 1990, is amended by striking "\$450,000,000" and inserting "\$419,000,000" and by striking "\$125,000,000" and inserting "\$156,000,000."

**Conference Report (H.R. Conf. Rep. No. 315, 101st Cong.) 1st Sess. [1989])**

The managers have agreed to reduce the funds appropriated by the Energy and Water Development Appropriations Act for Fiscal Year 1990 (Public Law 101-101) for the "Nuclear Waste Disposal Fund" by \$46,000,000. This reduction will make funds available for the drug prevention effort.

The managers have agreed to reductions to the Interior and Related Agencies Appropriations Act for Fiscal Year 1990 (Public Law 101-121) in order to accommodate additional drug related appropriations.

The reductions are in three areas. The new budget authority for Clean Coal Technology of \$450,000,000 for fiscal year 1990 is reduced by \$31,000,000 with this same amount added to the advance appropriation for fiscal year 1991. With this change the new amount for fiscal year 1990 is \$419,000,000 while fiscal year 1991 increases to \$156,000,000. The second area of change is the imposition of an outlay ceiling on Strategic Petroleum Reserve oil acquisition. Outlays will be reduced from an estimated \$169,945,000 to \$147,125,000 and will decrease the fill rate from approximately 50,000 barrels per day to approximately 46,000 or 47,000 barrels per day. The third reduction relates to the Pennsylvania

Avenue Development Corporation. The borrowing authority is reduced from \$5,000,000 to \$100,000.

The conference agreement includes bill language reducing the amount of funds transferred from trust funds to the Health Care Financing Administration Program Management account by \$32,000,000 from \$1,917,172,000 to \$18,851,712,000. This reduction, along with the outlays reserved from the regular 1990 Labor, Health and Human Services, and Education appropriations bill, will be sufficient to support the subcommittee's share of the cost of anti-drug abuse funding. The conferees intend that the reduction in trust fund transfers be associated with activities to implement catastrophic health insurance, where funding needs may be diminished.

### **Public Law 101-302**

**Public Law 101-302, 104 Stat. 213 (1990)**

#### **Clean Coal Technology**

Funds previously appropriated under this head for clean coal technology solicitations to be issued no later than June 1, 1990, and no later than September 1, 1991, respectively, shall not be obligated until September 1, 1991: *Provided*, That the aforementioned solicitations shall not be conducted prior to the ability to obligate these funds: *Provided further*, That pursuant to section 202(b) of the Balanced Budget and Emergency Deficit Control Reaffirmation Act of 1987, this action is a necessary (but secondary) result of a significant policy change: *Provided further*, That for the clean coal solicitations identified herein, provisions included for the repayment of government contributions to individual projects shall be identical to those included in the Program Opportunity Notice for Clean Coal Technology III (CCTDP-III) Demonstration Projects (solicitation number DE-PSO1-89 FE

61825), issued by the Department of Energy on May 1, 1989.

**Conference Report (H.R. Conf. Rep. No. 493, 101st Cong., 2nd Sess. [1990])**

#### **Clean Coal Technology**

Amendment No. 89: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the senate with an amendment as follows:

In lieu of the matter proposed by said amendment insert:

#### **Department of Energy Clean Coal Technology**

Funds previously appropriated under this head for clean coal technology solicitations to be issued no later than June 1, 1990, and no later than September 1, 1991, respectively, shall not be obligated until September 1, 1991: *Provided*, That the aforementioned solicitations shall not be conducted prior to the ability to obligate these funds: *Provided further*, That pursuant to section 202 (b) of the Balanced Budget and Emergency Deficit Control reaffirmation/Act of 1987 this action is a necessary (but secondary) result of a significant policy change: *Provided further*, That for the clean coal solicitations identified herein, provisions included for the repayment of government contributions to individual projects shall be identical to those included in the PON for Clean Coal Technology III (CCTDP-III) Demonstration Projects (solicitation number DE-PSO1-89 FE 61825), issued by the Department of Energy on May 1, 1989.

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate.

The amendment delays the fourth and fifth clean coal technology solicitations as proposed by the Senate and specifies

that, when issued, these solicitations must use repayment provisions used successfully in the third solicitation. This provision was included in the House introduced bill (H.R. 4828) and modifies a Senate amendment to the original Dire Emergency Supplemental.

The managers agree that changes to the clean air bill, proposed by a House authorizing committee, that would modify the Clean Coal Technology program must be resolved before a reasonable solicitation can be issued. The proposed delay will allow such resolution.

The managers have added language to ensure that provisions dealing with the repayment of government provided funds will remain the same as the third round of procurements. These provisions were developed over a four year period based on experience of previous procurements and negotiations, and input from industrial participants, Congress, and the managers of the program. They appear to be working well.

Based on the long-term experience, and the clear fact that implementation of this type of technology will become even more important with passage of clean air legislation, the managers reject proposals put forth by the Department of Energy to increase rates substantially. Such proposals, while they might increase the recovery of government-provided funds over periods of up to 20 years, might also act as a deterrent to industrial participation in the program, which is already over 50 percent cost-shared by industry. The purpose of the program is to accelerate the introduction of clean uses of coal in a more efficient manner in compliance with stringent new air quality standards, not the provision of investment returns to the Government at the expense of nascent markets.

## Public Law 101-512

Public Law 101-512, 104 Stat. 1915 (1990)

### Clean Coal Technology

The first paragraph under this head in Public Law 101-121 is amended by striking “\$600,000,000 shall be made available on October 1, 1990, and shall remain available until expended, and \$600,000,000 shall be made available on October 1, 1991, and shall remain available until expended” and inserting “\$600,000,000 shall be made available as follows: \$35,000,000 on September 1, 1991, \$315,000,000 on October 1, 1991, and \$250,000,000 on October 1, 1992, all such sums to remain available until expended for use in conjunction with a separate general request for proposals, and \$600,000,000 shall be made available as follows: \$150,000,000 on October 1, 1991, \$225,000,000 on October 1, 1992, and \$225,000,000 on October 1, 1993, all such sums to remain available until expended for use in conjunction with a separate general request for proposals”: *Provided*, That these actions are taken pursuant to section 202(b)(1) of Public Law 100-119 (2 U.S.C. 909): *Provided further*, That a fourth general request for proposals shall be issued not later than February 1, 1991, and a fifth general request for proposals shall be issued not later than March 1, 1992: *Provided further*, That project proposals resulting from such solicitations shall be selected not later than eight months after the date of the general request for proposals: *Provided further*, That for clean coal solicitations required herein, provisions included for the repayment of government contributions to individual projects shall be identical to those included in the PON for Clean Coal Technology III (CCTDP-III) Demonstration Projects (solicitation number DE-PS01-89 FE 61825), issued by the Department of Energy on May 1, 1989: *Provided further*, That funds provided under this head in this or any other appropriations Act shall be

expended only in accordance with the provisions governing the use of such funds contained under this head in this or any other appropriations Act.

With regard to funds made available under this head in this and previous appropriations Acts, unobligated balances excess to the needs of the procurement for which they originally were made available may be applied to other procurements for use on projects for which cooperative agreements are in place, within the limitations and proportions of Government financing increases currently allowed by law: *Provided*, That the Department of Energy, for a period of up to five (5) years after completion of the operations phase of a cooperative agreement may provide appropriate protections, including exemptions from subchapter II of chapter 5 of title 5, United States Code, against the dissemination of information that results from demonstration activities conducted under the Clean Coal Technology Program and that would be a trade secret or commercial or financial information that is privileged or confidential if the information had been obtained from and first produced by a non-Federal party participating in a Clean Coal Technology project: provided further, That, in addition to the full-time permanent Federal employees specified in section 303 of Public Law 97-257, as amended, no less than 90 full-time Federal employees shall be assigned to the Assistant Secretary for Fossil Energy for carrying out the programs under this head using funds available under this head in this and any other appropriations Act and of which 35 shall be for PETC and 30 shall be for METC: *Provided further*, That reports on projects selected by the Secretary of Energy pursuant to authority granted under this heading which are received by the Speaker of the House of Representatives and the President of the Senate less than 30 legislative days prior to the end of the second session of the 101st Congress shall be deemed to have met the criteria in the third pro-

viso of the fourth paragraph under the heading “administrative provisions, Department of Energy” in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate or at the end of the session, whichever occurs later.

**Conference Report (H.R. Conf. Rep. No. 971, 101st Cong., 2nd Sess. [1990])**

### Clean Coal Technology

Amendment No. 142: Provides \$35,000,000 for clean coal technology on September 1, 1991 as proposed by the House instead of \$100,000,000 as proposed by the Senate. This amendment and Amendment No. 143 shift the availability of \$65,000,000 from fiscal year 1991 to fiscal year 1992.

Amendment No. 143: Provides \$315,000,000 for clean coal technology on October 1, 1991 as proposed by the House instead of \$250,000,000 as proposed by the Senate. This amendment and Amendment No. 142 shift the availability of \$65,000,000 from fiscal year 1991 to fiscal year 1992.

Amendment No. 144: Provides dates for two solicitations for clean coal technology as proposed by the Senate. The date for CCTDP-IV is amended to February 1, 1991 from January 1, 1991. The date for CCTDP-V is not changed from the Senate date of March 1, 1992.

The managers have agreed to a February 1, 1991 date for the next solicitation to enable the Department to publish a draft solicitation for comment by interested parties. It is expected that there will be changes to evaluation criteria and other factors that make it imperative that potential proposers have an opportunity to comment on the content of the solicitation.

The managers urge the Department to include potential benefits to remote, import-dependent sites as a program policy factor in evaluating proposals. The Department should also consider projects which can provide multiple fuel resource options for regions which are more than seventy-five percent dependent on one fuel form for total energy requirements.

Amendment No. 145: Requires selection of projects within eight months of the requests for proposals required by Amendment No. 144 as proposed by the Senate. The House had no such provision.

Amendment No. 146: Requires repayment of government contributions to projects under conditions identical to the most recent clean coal solicitation as proposed by the Senate. The House had no such provision.

Amendment No. 147: Provides that funds for clean coal technology may be expended only under conditions contained in appropriations Acts. The Senate language had prohibited geographic restrictions on the expenditure of funds. The House had no such provision. The managers direct that no preferential consideration be given to any project referenced explicitly or implicitly in other legislation.

The managers agree to delete bill language dealing with geographic restrictions based on such restrictions being deleted from clean air legislation.

Amendment No. 148: Earmarks employees to two fossil energy technology centers as proposed by the Senate. The House had no such provision. The managers agree that the earmarks for PETC and METC are minimum levels and may be increased as necessary.

The managers agree that no more than the current 30 full-time equivalent positions from fossil energy research and development may be used in the clean coal program in fiscal year 1991.

## **Public Law 102-154**

**Public Law 102-154, 105 Stat. 990 (1991)**

### **Clean Coal Technology**

The first paragraph under this head in Public Law 101-512 is amended by striking the phrase “\$150,000,000 on October 1, 1991, \$225,000,000 on October 1, 1992” and inserting “\$100,000,000 on October 1, 1991, \$275,000,000 on October 1, 1992.”

Notwithstanding the issuance date for the fifth general request for proposals under this head in Public Law 101-512, such request for proposals shall be issued not later than July 6, 1992, and notwithstanding the proviso under this head in Public Law 101-512 regarding the time interval for selection of proposals resulting from such solicitation, project proposals resulting from the fifth general request for proposals shall be selected not later than ten months after the issuance date of the fifth general request for proposals: *Provided*, That hereafter the fifth general request for proposals shall be subject to all provisos contained under this head in previous appropriations Acts unless amended by this Act.

Notwithstanding the provisos under this head in previous appropriations Acts, projects selected pursuant to the fifth general request for proposals shall advance significantly the efficiency and environmental performance of coal-using technologies and be applicable to either new or existing facilities: *Provided*, That budget periods may be used in lieu of design, construction, and operating phases for cost-sharing calculations: *Provided further*, That the Secretary shall not finance more than 50 per centum of the total costs of any budget period: *Provided further*, That project specific development activities for process performance definition, component design verification, materials selection, and evaluation of alternative designs may be funded on a cost-shared

basis up to a limit of 10 per centum of the Government’s share of project cost: *Provided further*, That development activities eligible for cost-sharing may include limited modifications to existing facilities for project related testing but do not include construction of new facilities.

With regard to funds made available under this head in this and previous appropriations Acts, unobligated balances excess to the needs of the procurement for which they originally were made available may be applied to other procurements for use on projects for which cooperative agreements are in place, within the limitations and proportions of Government financing increases currently allowed by law: *Provided*, That hereafter, the Department of Energy, for a period of up to five years after completion of the operations phase of a cooperative agreement may provide appropriate protections, including exemptions from subchapter II of chapter 5 of title 5, United States Code, against the dissemination of information that results from demonstration activities conducted under the Clean Coal Technology Program and that would be a trade secret or commercial or financial information that is privileged or confidential if the information had been obtained from and first produced by a non-Federal party participating in a Clean Coal Technology project: *Provided further*, That hereafter, in addition to the full-time permanent Federal employees specified in section 303 of Public Law 97-257, as amended, no less than 90 full-time Federal employees shall be assigned to the Assistant Secretary for Fossil Energy for carrying out the programs under this head using funds available under this head in this and any other appropriations Act and of which not less than 35 shall be for PETC and not less than 30 shall be for METC: *Provided further*, That hereafter reports on projects selected by the Secretary of Energy pursuant to authority granted under this heading

which are received by the Speaker of the House of Representatives and the President of the Senate less than 30 legislative days prior to the end of each session of Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading "Administrative provisions, Department of Energy" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate or at the end of the session, whichever occurs later.

**Conference Report (H.R. Conf. Rep. No. 256, 102nd Cong., 1st Sess. [1991])**

**Clean Coal Technology**

Amendment No. 165: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

In lieu of the matter stricken and inserted by said amendment insert:

Notwithstanding the issuance date for the fifth general request for proposals under this head in Public Law 101-512, such request for proposals shall be issued not later than July 6, 1992, and notwithstanding the proviso under this head in Public Law 101-512 regarding the time interval for selection of proposals resulting from such solicitation, project proposals resulting from the fifth general request for proposals shall be selected not later than ten months after the issuance date of the fifth general request for proposals: *Provided*, That hereafter the fifth general request for proposals.

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate.

The amendment changes the issuance date for the fifth general request for proposals to July 6, 1992 instead of March 1, 1992 as proposed by the House and August 10, 1992 as proposed by the Senate and the allowable length of time from issuance of the request for proposals to selection of projects to ten months. The amendment also deletes Senate proposed bill language pertaining to a sixth general request for proposals as discussed below.

The managers agree that the additional two months in the procurement process for the fifth round of proposals should include an additional month to allow for the preparation of proposals by the private sector, and up to an additional month for Department of Energy review and evaluation of proposals when compared to the process for the fourth round.

The managers have agreed to delete bill language regarding a sixth round of proposals, but agree that funding will be provided for a sixth round based on unobligated and unneeded amounts that may become available from the first five rounds. The report from the Secretary on available funds, which was originally in the Senate amendment, is still a requirement and such report should be submitted to the House and Senate Committees on Appropriations not later than May 1, 1994. Based on that report, the funding, dates and conditions for the sixth round will be included in the fiscal year 1995 appropriation.

The managers expect that the fifth solicitation will be conducted under the same general types of criteria as the fourth solicitation principally modified only (1) to include the wider range of eligible technologies or applications; (2) to adjust technical criteria to consider allowable development activities, to strengthen criteria for non-utility demonstrations, and to adjust commercial performance criteria for additional facilities and technologies with regard to aspects of general energy efficiency

and environmental performance; and (3) to clarify and strengthen cost and finance criteria particularly with regard to development activities.

Amendment No. 166: Restores House language deleted by the Senate which refers to a fifth general request for proposals. The Senate proposed language dealing with both a fifth and a sixth round.

Amendment No. 167: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which directs the Secretary of Energy to reobligate up to \$44,000,000 from the fourth round of Clean Coal Technology proposals to a proposal ranked highest in its specific technology category by the Source Evaluation Board if other than the highest ranking project in that category was selected originally by the Secretary, and if such funds become unobligated and are sufficient to fund such projects. This amendment would earmark such funds, if they become available, to a specific project not chosen in the Department of Energy selection process for the fourth round of Clean Coal Technology.

Amendment No. 168: Technical amendment which deletes House proposed punctuation and numbering as proposed by the Senate.

Amendment No. 169: Deletes House proposed language which made unobligated funds available for procurements for which requests for proposals have not been issued.

Amendment No. 170: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which adds "not less than" to employment floor language for PETC as proposed by the Senate. The House had no such language.

Amendment No. 171: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which adds “not less than” to employment floor language for METC as proposed by the Senate. The House had no such language.

### **Public Law 102-381**

**Public Law 102-381, 106 Stat. 1374 (1992)**

#### **Clean Coal Technology**

The first paragraph under this head in Public Law 101-512, as amended, is further amended by striking the phrase “and \$250,000,000 on October 1, 1992” and inserting “\$150,000,000 on October 1, 1993, and \$100,000,000 on October 1, 1994” and by striking the phrase “\$275,000,000 on October 1, 1992, and \$225,000,000 on October 1, 1993” and inserting “\$250,000,000 on October 1, 1993, and \$250,000,000 on October 1, 1994”

### **Public Law 103-138**

**Public Law 103-138, 107 Stat. 1379 (1993)**

#### **Clean Coal Technology**

The first paragraph under this head in Public Law 101-512, as amended, is further amended by striking the phrase “\$150,000,000 on October 1, 1993, and \$100,000,000 on October 1, 1994” and inserting “\$100,000,000 on October 1, 1993, \$100,000,000 on October 1, 1994, and \$50,000,000 on October 1, 1995” and by striking the phrase “\$250,000,000 on October 1, 1993, and \$250,000,000 on October 1, 1994” and inserting “\$125,000,000 on October 1, 1993, \$275,000,000 on October 1, 1994, and \$100,000,000 on October 1, 1995”

### **Public Law 103-332**

**Public Law 103-332, 108 Stat. 2499 (1994)**

#### **Clean Coal Technology**

The first paragraph under this head in Public Law 101-512, as amended, is further amended by striking the phrase “\$100,000,000 on October 1, 1994, and \$50,000,000 on October 1, 1995” and inserting “\$18,000,000 on October 1, 1994, \$100,000,000 on October 1, 1995, and \$32,000,000 on October 1, 1996”; and by striking the phrase “\$275,000,000 on October 1, 1994, and \$100,000,000 on October 1, 1995” and inserting “\$19,121,000 on October 1, 1994, \$100,000,000 on October 1, 1995, and \$255,879,000 on October 1, 1996”: *Provided*, That not to exceed \$18,000,000 available in fiscal year 1995 may be used for administrative oversight of the Clean Coal Technology program.

### **Public Law 104-6**

**Public Law 104-6, 109 Stat. 73 (1995)**

#### **Clean Coal Technology (Rescission)**

Of the funds made available under this heading for obligation in fiscal year 1996, \$50,000,000 are rescinded and of the funds made available under this heading for obligation in fiscal year 1997, \$150,000,000 are rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Public Law 104-134**

**Conference Report (H.R. Conf. Rep. No. 402, 104th Cong., 1st Sess. [1995])**

The managers do not object to the use of up to \$18,000,000 in clean coal technology program funds for administration of the clean coal program.

### **Public Law 104-208**

**Public Law 104-208, 110 Stat. 3009 (1996)**

#### **Clean Coal Technology (Rescission)**

Of the funds made available under this heading for obligation in fiscal year 1997 or prior years, \$123,000,000 are rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

**Conference Report (H.R. Conf. Rep. No. 863, 104th Cong., 2nd Sess., [1996])**

#### **Clean Coal Technology (Rescission)**

Of the funds made available under this heading for obligation in fiscal year 1997 or prior years, \$123,000,000 are rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

**Senate Report (S. Rep. No. 319, 104th Cong., 2nd Sess. [1996])**

The Committee does not object to the use of up to \$16,000,000 in available funds for administration of the clean coal program in fiscal year 1997.

**House Report (H.R. Rep. No. 625, 104th Cong., 2nd Sess. [1996])**

The Committee does not object to the use of up to \$16,000,000 in available funds for administration of the clean coal program in fiscal year 1997.

### **Public Law 105-18**

**Public Law 105-18, 111 Stat. 158 (1997)**

#### **Clean Coal Technology (Rescission)**

Of the funds made available under this heading for obligation in fiscal year 1997 or prior years, \$17,000,000 are

rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Public Law 105-83**

**Public Law 105-83, 111 Stat. 37 (1997)**

Of the funds made available under this heading for obligation in fiscal year 1997 or prior years, \$101,000,000 are rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Public Law 105-277**

**Public Law 105-277, 112 Stat. 2681 (1998)**

#### **Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$10,000,000 of such funds shall not be available until October 1, 1999; \$15,000,000 shall not be available until October 1, 2000; and \$15,000,000 shall not be available until October 1, 2001: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

**Conference Report (H.R. Conf. Rep. No. 825, 105th Cong. 2nd Sess. [1998])**

#### **Clean Coal Technology**

The conference agreement provides for the deferral of \$40,000,000 in previously appropriated funds for the clean coal technology program as proposed by the Senate. The House did not propose to defer funding. The Committees

agree that \$14,900,000 may be used for administration of the clean coal technology program.

### **Public Law 106-113**

**Public Law 106-113, 113 Stat. 1501 (1999)**

#### **Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$156,000,000 shall not be available until October 1, 2000: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

**Conference Report (H.R. Rep. No. 406, 106th Cong., 1st Sess. [1999])**

#### **Clean Coal Technology (Deferral)**

The conference agreement provides for the deferral of \$156,000,000 in previously appropriated funds for the clean coal technology program as proposed by the Senate instead of a deferral of \$256,000,000 as proposed by the House. The managers agree that up to \$14,400,000 may be used for program direction.

### **Public Law 106-291**

**Public Law 106-291, 114 Stat. 922 (2000)**

#### **Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$67,000,000 shall not be available until October 1, 2001: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Fossil Energy Research and Development (including transfers of funds)**

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), performed under the minerals and materials science programs at the Albany Research Center in Oregon \$540,653,000, to remain available until expended, of which \$12,000,000 for oil technology research shall be derived by transfer from funds appropriated in prior years under the heading "Strategic Petroleum Reserve, SPR Petroleum Account" and of which \$95,000,000 shall be derived by transfer from funds appropriated in prior years under the heading "Clean Coal Technology", such funds to be available for a general request for proposals for the commercial-scale demonstration of technologies to assure the reliability of the Nation's energy supply from existing and new electric generating facilities for which the Department of Energy upon review may provide financial assistance awards: *Provided*, That the request for proposals shall be issued no later than one hundred and twenty days following enactment of this Act, proposals shall be submitted no later than ninety days after the issuance of the request for proposals, and the Department of Energy shall make project selections no later than one hundred and sixty days after the receipt of proposals: *Provided further*, That no funds are to be obligated for selected proposals prior to September 30, 2001: *Provided further*, That funds provided

shall be expended only in accordance with the provisions governing the use of funds contained under the heading under which they were originally appropriated: *Provided further*, That provisions for repayment of Government contributions to individual projects shall be identical to those included in the Program Opportunity Notice (Solicitation Number DE-PS01-89FE61825), issued by the Department of Energy on May 1, 1989, except that repayments from sale or licensing of technologies shall be from both domestic and foreign transactions: *Provided further*, That such repayments shall be deposited in this account to be retained for future projects: *Provided further*, That any project approved under this program shall be considered a Clean Coal Technology Demonstration Project, for the purposes of Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account.

### **Public Law 107-63**

**Public Law 107-63, 115 Stat. 414 (2001)**

#### **Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$40,000,000 shall not be available until October 1, 2002: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Fossil Energy Research and Development (Including Transfer of Funds)**

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), \$616,490,000, to remain available until expended, of which \$11,000,000 is to begin a 7-year project for construction, renovation, furnishing, and demolition or removal of buildings at National Energy Technology Laboratory facilities in Morgantown, West Virginia and Pittsburgh, Pennsylvania; and for acquisition of lands, and interests therein, in proximity to the National Energy Technology Laboratory, and of which \$33,700,000 shall be derived by transfer from funds appropriated in prior years under the heading 'Clean Coal Technology', and of which \$150,000,000 and such sums as may be appropriated in FY03 are to be made available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded demonstrations of commercial-scale technologies to reduce the barriers to continued and expanded coal use: *Provided*, That the request for proposals shall be issued no later than 120 days following enactment of this Act, proposals shall be submitted no later than 150 days after the issuance of the request for proposals, and the Department of Energy shall make project selections no later than 160 days after the receipt of proposals: *Provided further*, That no project may be selected for which sufficient

funding is not available to provide for the total project: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading 'Clean Coal Technology' in prior appropriations: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Government contribution to the project on terms and conditions that are acceptable to the Department including repayments from sale and licensing of technologies from both domestic and foreign transactions: *Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. Sec. 7651n, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That funds excess to the needs of the Power Plant Improvement Initiative procurement provided for under this heading in Public Law 106-291 shall be made available for the Clean Coal Power Initiative provided for under this heading in this Act: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account.

## **Public Law 108-7**

**Public Law 108-7, 117 Stat. 11  
(2003)**

### **Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$87,000,000 shall not be available until October 1, 2003: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

### **Fossil Energy Research and Development**

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), \$624,900,000, to remain available until expended, of which \$4,000,000 is to continue a multi-year project for construction, renovation, furnishing, and demolition or removal of buildings at National Energy Technology Laboratory facilities in Morgantown, West Virginia and Pittsburgh, Pennsylvania; and of which \$150,000,000 are to be made available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use: *Provided*, That no project may be selected for which sufficient funding is not available to provide for the total project: *Provided further*, That

funds shall be expended in accordance with the provisions governing the use of funds contained under the heading “Clean Coal Technology” in prior appropriations: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Government contribution to the project on terms and conditions that are acceptable to the Department including repayments from sale and licensing of technologies from both domestic and foreign transactions: *Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 7651n, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account.

## **Public Law 108-108**

**Public Law 108-108, 117 Stat. 1241  
(2003)**

### **Clean Coal Technology (Deferral and Recision)**

Of the funds made available under this heading for obligation in prior years, \$97,000,000 shall not be available until October 1, 2004, and \$88,000,000 are rescinded: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

## **Fossil Energy Research and Development**

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95-91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), \$681,163,000, to remain available until expended, of which \$4,000,000 is to continue a multi-year project for construction, renovation, furnishing, and demolition or removal of buildings at National Energy Technology Laboratory facilities in Morgantown, West Virginia and Pittsburgh, Pennsylvania; of which not to exceed \$536,000 may be utilized for travel and travel-related expenses incurred by the headquarters staff of the Office of Fossil Energy; and of which \$172,000,000 are to be made available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use: *Provided*, That no project may be selected for which sufficient funding is not available to provide for the total project: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading “Clean Coal Technology” in 42 U.S.C. 5903d: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Government contribution to the project on terms and conditions that are acceptable to the Department including

repayments from sale and licensing of technologies from both domestic and foreign transactions: *Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 7651n, and Chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account.

**Conference Report (H.R. Conf. Rep. No. 108-330, 108th Cong., 1st Sess. [2003])**

**Clean Coal Technology (Deferral and Recision)**

The conference agreement defers \$97,000,000 in clean coal technology funds as proposed by the Senate instead of a deferral of \$86,000,000 as proposed by the House. The conference agreement also rescinds \$88,000,000 in clean coal technology funds. These funds have been added to the base budget for the fossil energy research and development account where all continuing research programs and associated administrative expenses should be funded. Clean coal technology funds are limited to completing active projects under that program. Once those projects are completed, a separate clean coal technology account will no longer be required.

The managers have not included bill language authorizing the use of

clean coal technology funds for the FutureGen program as proposed by the Senate. Funding is included in the fossil energy research and development account for FutureGen. The managers agree that clean coal technology funds should not be transferred to fund ongoing programs in fossil energy research and development. Rather, a rescission of excess clean coal funds should be proposed and, to the extent new and expanded research program funds are required, including funds for FutureGen, they should be budgeted directly in the fossil energy research and development account.

**Fossil Energy Research and Development**

The conference agreement includes \$681,163,000 for fossil energy research and development, instead of \$609,290,000 as proposed by the House and \$593,514,000 as proposed by the Senate. The conference agreement includes funds for several ongoing programs that were previously funded under the clean coal technology account, funding to begin the FutureGen program, and funding increases for programs that provide critical underpinning for, and are critical for the success of, FutureGen. The increase in funding above the Senate proposed level is offset fully by the rescission of \$88 million in clean coal technology funding. The numerical changes described below are to the House recommended level.

The conference agreement includes increases of \$42,000,000 for the clean coal power initiative and \$9,000,000 to initiate the FutureGen program. The funds provided for the FutureGen program are contingent on the receipt of a complete program plan that clearly and fully delineates by project and by year the funding for each element of, and milestone associated with, the FutureGen program. This plan should be closely coordinated with industry cooperators and submitted to the House and Senate Committees on Appropria-

tions no later than December 31, 2003. The managers understand the need for a lower cost share for the initial research and planning stages of the FutureGen program, but any demonstration component must include at least a 50 percent industry cost share.

**Public Law 108-447**

**Public Law 108-447, 118 Stat. 2809 (2004)**

**Clean Coal Technology (Deferral)**

Of the funds made available under this heading for obligation in prior years, \$257,000,000 shall not be available until October 1, 2005: *Provided*, That funds made available in previous appropriations Acts shall be available for any ongoing project regardless of the separate request for proposal under which the project was selected.

**Fossil Energy Research and Development**

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), \$579,911,000, to remain available until expended, of which \$4,000,000 is to continue a multi-year project for construction, renovation, furnishing, and demolition or removal of buildings at National Energy Technology Laboratory facilities in Morgantown, West Virginia and Pittsburgh, Pennsylvania: *Provided*, That of the amounts provided, \$18,000,000 is to continue a multi-year project coordinated with the private sector for FutureGen, with-

out regard to the terms and conditions applicable to clean coal technology projects: *Provided further*, That the initial planning and research stages of the FutureGen project shall include a matching requirement from non-Federal sources of at least 20 percent of the costs: *Provided further*, That any demonstration component of such project shall require a matching requirement from non-Federal sources of at least 50 percent of the costs of the component: *Provided further*, That of the amounts provided, \$50,000,000 is available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use: *Provided further*, That no project may be selected for which sufficient funding is not available to provide for the total project: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading ‘Clean Coal Technology’ in 42 U.S.C. 5903d: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Government contribution to the project on terms and conditions that are acceptable to the Department including repayments from sale and licensing of technologies from both domestic and foreign transactions: *Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 7651n, and chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That funds shall be expended in accordance with the provisions governing the use

of funds contained under the heading ‘Clean Coal Technology’ in prior appropriations: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account.

**Conference Report (H.R. Conf. Rep. No. 108-792, 108th Cong. 2nd Sess. [2004])**

**Clean Coal Technology (Deferral)**

The conference agreement defers the availability of \$257,000,000 in clean coal technology funds until October 1, 2005, as proposed by the Senate instead of a deferral of \$237,000,000 as proposed by the House. The FutureGen program is not funded in this account, as proposed by the House, but is funded in the fossil energy research and development account.

The managers expect the Department to include a table on the FutureGen program, as outlined in the House Report 108-542, in future budget requests for fossil energy research and development account. The managers make no assumptions on the future use of deferred clean coal technology funds.

**Fossil Energy Research and Development**

The conference agreement provides \$579,911,000 for fossil energy research and development instead of \$601,875,000 as proposed by the House and \$542,529,000 as proposed by the Senate. The changes described below are to the House recommended funding level.

FutureGen—There is an increase of \$18,000,000 for the FutureGen power plant initiative.

Clean Coal Power Initiative—There is a decrease of \$55,000,000 for the clean coal power initiative.

The managers note that funding will need to be increased substantially in FY06 if the program is to remain on a schedule consistent with the President’s clean coal initiative.

**Public Law 109-103**

**Public Law 109-103, 119 Stat. 2247 (2005)**

**Clean Coal Technology (Deferral and Rescission)**

Of the funds made available under this heading for obligation in prior years, \$257,000,000 shall not be available until October 1, 2006: *Provided*, That funds made available in previous appropriations Acts shall be made available for any ongoing project regardless of the separate request for proposal under which the project was selected: *Provided further*, That \$20,000,000 of uncommitted balances is rescinded.

**Fossil Energy Research and Development**

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, the hire of passenger motor vehicles, the hire, maintenance, and operation of aircraft, the purchase, repair, and cleaning of uniforms, the reimbursement to the General Services Administration for security guard services, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), \$597,994,000, to remain available

until expended, of which \$18,000,000 is to continue a multi-year project coordinated with the private sector for FutureGen, without regard to the terms and conditions applicable to clean coal technological projects: *Provided*, That the initial planning and research stages of the FutureGen project shall include a matching requirement from non-Federal sources of at least 20 percent of the costs: *Provided further*, That any demonstration component of such project shall require a matching requirement from non-Federal sources of at least 50 percent of the costs of the component: *Provided further*, That of the amounts provided, \$50,000,000 is available, after coordination with the private sector, for a request for proposals for a Clean Coal Power Initiative providing for competitively-awarded research, development, and demonstration projects to reduce the barriers to continued and expanded coal use: *Provided further*, That no project may be selected for which sufficient funding is not available to provide for the total project: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading 'Clean Coal Technology' in 42 U.S.C. 5903d as well as those contained under the heading 'Clean Coal Technology' in prior appropriations: *Provided further*, That the Department may include provisions for repayment of Government contributions to individual projects in an amount up to the Government contribution to the project on terms and conditions that are acceptable to the Department including repayments from sale and licensing of technologies from both domestic and foreign transactions: *Provided further*, That such repayments shall be retained by the Department for future coal-related research, development and demonstration projects: *Provided further*, That any technology selected under this program shall be considered a Clean Coal Technology, and any project selected under this program shall be

considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 7651n, and chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this account: *Provided further*, That for fiscal year 2006 salaries for Federal employees performing research and development activities at the National Energy Technology Laboratory can continue to be funded from program accounts: *Provided further*, That the Secretary of Energy is authorized to accept fees and contributions from public and private sources, to be deposited in a contributed funds account, and prosecute projects using such fees and contributions in cooperation with other Federal, State, or private agencies or concerns: *Provided further*, That revenues and other moneys received by or for the account of the Department of Energy or otherwise generated by sale of products in connection with projects of the Department appropriated under the Fossil Energy Research and Development account may be retained by the Secretary of Energy, to be available until expended, and used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements.

### **Public Law 110-5**

#### **Public Law 110-5, 121 Stat. 8 (2007)**

*The final continuing resolution for fiscal year 2007 did not contain language specific to the Clean Coal Technology Demonstration Program or the Clean Coal Power Initiative. For the Clean Coal Technology Demonstration Program, the availability of \$257,000,000 was deferred until October 1, 2007.*

*For the Clean Coal Power Initiative, \$60,433,000 was made available.*

### **House Report 109-474 (2006)**

#### **Clean Coal Technology (Rescission)**

The Committee recommends the rescission of \$257,000,000 in clean coal technology funding. These balances are no longer needed to complete active projects in this program. For several years the Administration has proposed, and Congress has to some extent obliged, the deferral of these balances to the out-years, for the appearance of retaining them for FutureGen activities. The practice of 'deferring balances' or 'transferring balances' is purely a budgetary optical illusion. Congress appropriates FutureGen activities on an annual basis. There are no budgetary savings by utilizing prior year clean coal technology balances. The Committee will continue to evaluate budget requests for FutureGen activities on an annual basis, and appropriate directly, without the budget scoring gimmickry of clean coal technology prior year balances.

#### **Fossil Energy Research and Development**

Clean coal power initiative—This program researches, develops, and demonstrates commercial readiness to implement advanced clean coal-based technologies that enhance electricity reliability, increase generation capacity, and reduce emissions. The Committee recommends \$36,400,000 for the clean coal power initiative (CCPI), an increase of \$31,443,000 over the budget request. This funding will support the third round of demonstration projects, incorporating the latest advances in clean coal technologies. The Committee believes it is important to keep momentum in this program towards the accumulation of balances for future rounds of CCPI awards. The Committee does not accept the Department's argument that this next solicitation is not needed because the technologies

demonstrated will be too late for incorporation in FutureGen. The Committee views FutureGen as a major step in the development of coal fired power plants, but not the end of new technology in this area.

#### **Senate Report 109-274 (2006)**

#### **Clean Coal Technology (Including Deferral and Rescission)**

The Committee recommends the deferral of \$203,000,000 in clean coal technology funding until fiscal year 2008. The Committee recommends that the Department rescind \$50,000,000 of prior year balances from excess contingency estimates in demonstration projects.

#### **Fossil Energy Research and Development**

Clean Coal Power Initiative—The Committee recommends \$70,000,000. The Committee is frustrated by the remarkably low level of funding provided to this initiative which demonstrates advanced coal technologies including carbon capture, mercury control and other co-production opportunities. The budget only provided \$4,957,000. The Committee is aware that not all of the previously awarded projects have been successfully developed for a variety of reasons, and available balances will not be used. The Department has identified one project that will not be able to spend the remaining balances of \$50,000,000. The Committee directs the Department to rescind the available balances and apply that funding to the Clean Coal Power Initiatives for a future competitive award. In addition, the Committee provides an additional \$20,000,000.

Combined with existing balances of \$70,000,000 provided in the current year, the Department will have \$140,000,000 to commit to the next CCPI solicitation.

#### **Public Law 110-161**

#### **Public Law 110-161, 121 Stat. 1844 (2007)**

#### **Clean Coal Technology (Deferral and Transfer)**

Of the funds made available under this heading for obligation in prior years, \$149,000,000 shall not be available until October 1, 2008: *Provided*, That funds made available in previous appropriations Acts shall be made available for any ongoing project regardless of the separate request for proposal under which the project was selected: *Provided further*, That \$166,000,000 of uncommitted balances are transferred to Fossil Energy Research and Development to be used until expended.

#### **Fossil Energy Research and Development**

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95-91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, and for the hire of passenger motor vehicles, the hire, maintenance, and operation of aircraft, the purchase, repair, and cleaning of uniforms, the reimbursement to the General Services Administration for security guard services, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), \$750,000,000, to remain available until expended, of which \$166,000,000 shall be derived by transfer from ‘Clean Coal Technology’: *Provided further*, That funds appropriated for prior solicitations under the Clean Coal Technology Program, Power Plant Improvement Initiative, and Clean Coal

Power Initiative, but not required by the Department to meet its obligations on projects selected under such solicitations, may be utilized for the Clean Coal Power Initiative Round III solicitation under this Act in accordance with the requirements of this Act rather than the Acts under which the funds were appropriated: *Provided further*, That no project may be selected for which full funding is not available to provide for the total project: *Provided further*, That financial assistance for costs in excess of those estimated as of the date of award of original Clean Coal Power Initiative financial assistance may not be provided in excess of the proportion of costs borne by the Government in the original agreement and shall be limited to 25 percent of the original financial assistance: *Provided further*, That at least 50 percent cost-sharing shall be required in each budget period of a project: *Provided further*, That in accordance with section 988(e) of Public Law 109-58, repayment of the DOE contribution to a project shall not be a condition of making an award under this solicitation: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That in this Act and future Acts, up to 4 percent of program direction funds available to the National Energy Technology Laboratory may be used to support Department of Energy activities not included in this Fossil Energy account: *Provided further*, That in this Act and future Acts, the salaries for Federal employees performing research and development activities at the National Energy Technology Laboratory can continue to be funded from any appropriate DOE program accounts: *Provided further*, That revenues and other moneys received by or for the account of the Department of Energy or otherwise generated by sale of products in connection with projects of the Department appropriated under the Fossil Energy Research and

Development account may be retained by the Secretary of Energy, to be available until expended, and used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements.

### **Public Law 111-5**

**Public Law 111-5, 123 Stat. 115 (2009)**

#### **American Recovery and Reinvestment Act of 2009**

##### **Fossil Energy Research and Development**

For an additional amount for ‘Fossil Energy Research and Development’, \$3,400,000,000.

#### **House Report 111-016 (2009)**

##### **Fossil Energy Research and Development**

For an additional amount for ‘Fossil Energy Research and Development’, \$3,400,000,000.

#### **Senate Report 111-003 (2009)**

##### **Fossil Energy Research and Development**

The Committee provides an additional \$4,600,000,000, to remain available for projects awarded by September 30, 2010. Of the amounts appropriated, \$2,000,000,000 is available for one or more near-zero emissions powerplant(s) designed to capture and sequester a high percentage of carbon dioxide.

Of the amounts appropriated, \$1,000,000,000 is available, in addition to amounts appropriated in the fiscal year 2009 spending bill and such other amounts available from prior appropriations, for selections under the Department’s Clean Coal Power Initiative Round III Funding Opportunity Announcement. The Department is encouraged to establish a second clos-

ing date on or after April 1, 2009 for the receipt of new or modified applications. Notwithstanding the mandatory eligibility requirements of the Funding Opportunity Announcement, the Committee finds that projects using petroleum coke as a fuel may directly lead to improvements in technology applicable to coal-based systems and is consistent with program objectives. Therefore, language is included in the bill directing the Department to consider applications that utilize petroleum coke for some or all of the project’s fuel input.

Of the amounts appropriated, \$1,520,000,000 is available for a competitive solicitation pursuant to section 703 of Public Law 110-140 for projects that demonstrate carbon capture from industrial sources. Such projects may include plant efficiency improvements for integration with carbon capture technology. Preferences will be given to projects that capture and sequester at least 75 percent of the carbon dioxide that would otherwise be emitted to the atmosphere or put such carbon dioxide to beneficial reuse that provides an equivalent net reduction of carbon emissions to the atmosphere.

Of the amounts appropriated, \$50,000,000 is available for a competitive solicitation pursuant to section 702(c)(3)(B) of Public Law 110-140 to conduct site characterization for a minimum of 10 candidate geologic sequestration formations. The Secretary may provide awards to project recipients previously provided funding for large-scale testing by the Department of Energy. Preference should be given to qualifying projects which include a private-public partnership with State Geological Surveys, and have storage sites near high point sources of carbon dioxide emissions.

\$20,000,000 is available to carry out the geologic sequestration training and research grant program authorized in section 705(b) of Public Law 110-140, and \$10,000,000 is available for pro-

gram direction funding. The Committee recognizes the broad sequestration experience resident in the Office of Fossil Energy.

### **Public Law 111-8**

**Public Law 111-8, 123 Stat. 524 (2009)**

#### **Clean Coal Technology (Transfer)**

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

##### **Fossil Energy Research and Development**

For necessary expenses in carrying out fossil energy research and development activities, under the authority of the Department of Energy Organization Act (Public Law 95-91), including the acquisition of interest, including defeasible and equitable interests in any real property or any facility or for plant or facility acquisition or expansion, and for conducting inquiries, technological investigations and research concerning the extraction, processing, use, and disposal of mineral substances without objectionable social and environmental costs (30 U.S.C. 3, 1602, and 1603), \$876,320,000, to remain available until expended, of which \$149,000,000 shall be derived by transfer from ‘Clean Coal Technology’: *Provided*, That of the amounts provided, \$288,174,000 is available for the Clean Coal Power Initiative Round III solicitation, pursuant to title IV of the Public Law 109-58: *Provided further*, That funds appropriated for prior solicitations under the Clean Coal Technology Program, Power Plant Improvement Initiative, Clean Coal Power Initiative, and FutureGen,

but not required by the Department to meet its obligations on projects selected under such solicitations, may be utilized for the Clean Coal Power Initiative Round III solicitation under this Act in accordance with the requirements of this Act rather than the Acts under which the funds were appropriated: *Provided further*, That no Clean Coal Power Initiative project may be selected for which full funding is not available to provide for the total project: *Provided further*, That if a Clean Coal Power Initiative project selected after enactment of this legislation for negotiation under this or any other Act in any fiscal year, is not awarded within 2 years from the date the application was selected, negotiations shall cease and the Federal funds committed to the application shall be retained by the Department for future coal-related research, development and demonstration projects, except that the time limit may be extended at the Secretary's discretion for matters outside the control of the applicant, or if the Secretary determines that extension of the time limit is in the public interest: *Provided further*, That the Secretary may not delegate this responsibility for applications greater than \$10,000,000: *Provided further*, That financial assistance for costs in excess of those estimated as of the date of award of original Clean Coal Power Initiative financial assistance may not be provided in excess of the proportion of costs borne by the Government in the original agreement and shall be limited to 25 percent of the original financial assistance: *Provided further*, That funds shall be expended in accordance with the provisions governing the use of funds contained under the heading 'Clean Coal Technology' in 42 U.S.C. 5903d as well as those contained under the heading 'Clean Coal Technology' in prior appropriations: *Provided further*, That any technology selected under these programs shall be considered a Clean Coal Technology, and any project selected under these programs shall be

considered a Clean Coal Technology Project, for the purposes of 42 U.S.C. 7651n, and chapters 51, 52, and 60 of title 40 of the Code of Federal Regulations: *Provided further*, That funds available for the Clean Coal Power Initiative Round III Funding Opportunity Announcement may be used to support any technology that meets the requirements of the Round III Announcement relating to carbon capture and storage or other beneficial uses of CO<sub>2</sub>, without regard to the 70 and 30 percent funding allocations specified in section 402(b)(1)(A) and 402(b)(2)(A) of Public Law 109-58: *Provided further*, That no part of the sum herein made available shall be used for the field testing of nuclear explosives in the recovery of oil and gas: *Provided further*, That, of the amount appropriated in this paragraph, \$43,864,150 shall be used for projects specified in the table that appears under the heading 'Congressionally Directed Fossil Energy Projects' in the text and table under this heading in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act).

# Appendix B. CCTDP Financial History

This appendix provides historical funding and cost information on the CCTDP. Over a series of five solicitations, the CCTDP produced 33 successfully completed projects. The final active project withdrew prior to completion in March 2006. Exhibit B-1 summarizes the costs associated with the 33 successfully completed projects.

Exhibit B-2 presents the allocation of appropriated CCTDP funds (after adjustment) and the amount available for each solicitation. Additional activities funded by CCTDP appropriations are the Small Business Innovation Research (SBIR) Program, the Small Business Technology Transfer (STTR)

Program, and program direction for CCTDP management.

Exhibit B-3, on the following page, depicts the apportionment of appropriated funds to DOE. Funds can be transferred among subprogram budgets to meet project and program needs.

<b>Exhibit B-1</b>						
<b>CCTDP Project Costs and Cost-Sharing for Successfully Completed Projects</b>						
<b>(Dollars in Thousands)</b>						
	Total Project Costs	%	Cost-Share Dollars		Cost-Share Percent	
			DOE <sup>b</sup>	Participants	DOE	Participants
<b>Subprogram</b>						
CCTDP-I	844,363	23	239,640	604,723	28	72
CCTDP-II	318,577	9	139,195	179,382	44	56
CCTDP-III	1,138,741	30	483,665	655,076	42	58
CCTDP-IV	950,429	25	437,876	512,553	46	54
CCTDP-V	0	0	0	0	0	0
Total <sup>a</sup>	3,252,110	100	1,300,376	1,951,734	40	60
<b>Application Category</b>						
Advanced Electric Power Generation	1,978,492	61	812,912	1,165,580	41	59
Environmental Control Devices	620,110	19	252,832	367,278	41	59
Coal Processing for Clean Fuels	431,810	13	192,029	239,781	44	56
Industrial Applications	221,698	7	42,603	179,095	19	81
Total <sup>a</sup>	3,252,110	100	1,300,376	1,951,734	40	60

<sup>a</sup>Totals may not add up to the total figure shown due to rounding.  
<sup>b</sup>DOE share does not include \$156,499,000 obligated for withdrawn projects and audit expenses.

<b>Exhibit B-2</b>					
<b>Relationship Between Appropriations and Subprogram Budgets</b>					
<b>(Dollars in Thousands)</b>					
Appropriation Enacted	Subprogram	Adjusted Appropriations	SBIR & STTR Budgets <sup>a</sup>	Program Direction Budget	Projects Budget
P.L. 99-190	CCTDP-I	380,600	4,902	144,767	230,931
P.L. 100-202	CCTDP-II	473,776	6,781	32,512	434,483
P.L. 100-446	CCTDP-III	304,298	6,906	22,548	274,844
P.L. 101-121 <sup>b</sup>	CCTDP-IV	331,990	7,065	24,990	299,935
P.L. 101-121 <sup>b</sup>	CCTDP-V	263,934	5,427	25,000	233,507
Total		1,754,598	31,081	249,817	1,473,700

<sup>a</sup>Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.  
<sup>b</sup>P.L. 101-121 was revised by P.L. 101-512, 102-154, 102-381, 103-138, 103-332, 104-6, 104-208, 105-18, 105-83, 105-277, 106-113, 106-291, 107-63, 108-7, 108-108, 108-447, 109-103, 110-5, 110-161, and 111-8.

**Exhibit B-3**  
**Annual CCTDP Funding by Appropriations and Subprogram Budgets**  
**(Dollars in Thousands)**

Fiscal Year	1986-98	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total <sup>d</sup>
<b>Adjusted Appropriations<sup>a</sup></b>												
P.L. 99-190	380,600											380,600
P.L. 100-202	433,834	9,962	14,980	15,000								473,776
P.L. 100-446	574,998	(156,000)	156,000	(33,700)		(185,000)	97,000					304,298
P.L. 101-121 <sup>b</sup>	427,000		(162,000)	26,990	(47,000)	87,000						331,990
P.L. 101-121 <sup>b</sup>	449,934						(257,000)	(20,000)		(58,000)		263,934
Total	2,266,366	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	(58,000)	0	1,754,598
<b>Subprogram Budgets</b>												
CCTDP-I Projects	288,331	(14,400)	(14,000)	(14,000)	(15,000)							230,931
CCTDP-II Projects	394,541	9,962	14,980	15,000								434,483
CCTDP-III Projects	545,544	(156,000)	156,000	(33,700)		(185,000)	97,000					274,844
CCTDP-IV Projects	394,935		(162,000)	27,000	40,000							299,935
CCTDP-V Projects	419,507				(87,000)	87,000	(257,000)	(20,000)		(58,000)		233,507
Projects Subtotal	2,042,858	(160,438)	(5,020)	(5,700)	(62,000)	(98,000)	(160,000)	(20,000)	0	(58,000)	0	1,473,700
Program Direction	192,427	14,400	14,000	13,990	15,000							249,817
Fossil Energy Subtotal	2,235,285	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	(58,000)	0	1,723,517
SBIR & STTR <sup>c</sup>	31,081											31,081
Total <sup>d</sup>	2,266,366	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	(58,000)	0	1,754,598

<sup>a</sup> Shown are appropriations less amounts sequestered under the Gramm-Rudman-Hollings Deficit Reduction Act.

<sup>b</sup> Shown is the fiscal year apportionment schedule of P.L. 101-121 as revised by P.L. 101-512, 102-154, 102-381, 103-138, 103-332, 104-6, 104-208, 105-18, 105-83, 105-277, 106-113, 106-291, 107-63, 108-7, 108-108, 108-447, 109-103, 110-5, 110-161, and 111-8.

<sup>c</sup> Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.

<sup>d</sup> Totals may not appear to add due to rounding.

**Exhibit B-4**  
**Financial Status of the CCTDP**  
(Dollars in Thousands)

Subprogram	Appropriations Allocated to Subprogram <sup>b</sup>	Apportioned to Date	Committed to Date	Obligated to Date	Cost to Date
CCTDP-I	230,931	230,931	257,048	257,048	257,048
CCTDP-II	434,483	434,483	165,335	165,335	165,335
CCTDP-III	274,844	274,844	506,012	506,012	506,012
CCTDP-IV	299,935	299,935	476,770	476,770	476,770
CCTDP-V	233,507	233,507	51,710	51,710	51,710
Projects Subtotal	1,473,700	1,473,700	1,456,875	1,456,875	1,456,875
SBIR & STTR <sup>a</sup>	31,081	31,081	31,081	31,081	31,081
Program Direction	249,817	249,817	249,817	249,817	249,383
Total	1,754,598	1,754,598	1,737,773	1,737,773	1,737,339

<sup>a</sup> Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.  
<sup>b</sup> Totals may not appear to add up to the total figure shown due to rounding.

Exhibit B-4 shows the financial status of the CCTDP by subprogram. SBIR and STTR funds are included in this exhibit to account for all funding.

Exhibit B-5 indicates the apportionment sequence as modified by Public Law 111-8. These values represent the amount of budget authority available for the CCTDP.

**Exhibit B-5**  
**Apportionment Sequence**  
(Dollars in Thousands)

FY	Annual	Cumulative
1986	99,400	99,400
1987	149,100	248,500
1988	199,100	447,600
1989	190,000	637,600
1990	554,000	1,191,600
1991	390,995	1,582,595
1992	415,000	1,997,595
1993	0	1,997,595
1994	225,000	2,222,595
1995	37,055	2,259,650
1996	150,000	2,409,650
1997	(2,121)	2,407,529
1998	(101,000)	2,306,529
1999	(40,163)	2,266,366
2000	(146,038)	2,120,328
2001	8,980	2,129,308
2002	8,290	2,137,598
2003	(47,000)	2,090,598
2004	(98,000)	1,992,598
2005	(160,000)	1,832,598
2006	(20,000)	1,812,598
2007	0	1,812,598
2008	(58,000)	1,754,598
2009	0	1,754,598



# Appendix C. NEPA Actions and Status for Active Projects

## Introduction

Projects under the clean coal technology demonstration programs comply with the procedural requirements of the National Environmental Policy Act (NEPA) of 1969 and associated regulations promulgated by the Council on Environmental Quality (CEQ) at 40 Code of Federal Regulations (CFR) Parts 1500-1508, and by the U.S. Department of Energy (DOE) at 10 CFR Part 1021.

In carrying out NEPA, DOE examines the environmental aspects of each proposed demonstration project in the evaluation phase of the selection process. Each proposed project is rated against environmental evaluation criteria, which are heavily weighted in the scoring process.

Upon selection, project participants are required to prepare and submit additional environmental information. The detailed site- and project-specific information is used, along with independent information gathered by DOE, as the basis for site-specific NEPA documents that are prepared by DOE for each selected project. These NEPA documents are prepared, considered, and published in full conformance with CEQ and DOE regulations for NEPA compliance. The three documents that serve as possible outcomes of the NEPA process are outlined below.

### **Categorical Exclusions**

“Subpart D—Typical Classes of Actions” of the DOE NEPA regulations provides for categorical exclusions (CX) as a class of actions that DOE has determined do not individually or cumulatively have a significant effect on the human environment.

### **Environmental Assessments**

Environmental Assessments (EA) have the following three functions:

1. To provide sufficient evidence and analysis for determining whether a proposed action requires preparation of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI);
2. To aid an agency’s compliance with NEPA when no EIS is necessary; i.e., to provide an interdisciplinary review of proposed actions, assess potential impacts, and identify better alternatives and mitigation measures; and
3. To facilitate preparation of an EIS when one is necessary.

The content of an EA is determined on a case-by-case basis and depends on the nature of the action. If appropriate, a DOE EA also includes any floodplain or wetlands assessment that has been prepared, and may include analyses needed for other environmental determinations.

If an agency determines on the basis of an EA that it is not necessary to prepare an EIS, a FONSI is issued. CEQ regulations describe the FONSI as a document that briefly presents the reasons why an action will not have significant effect on the human environment and for which an EIS therefore will not be prepared. The FONSI includes the EA, or a summary of it, and notes any other related environmental documents. The CEQ and DOE regulations also provide for notification of the public that a FONSI has been issued. Also, DOE provides copies of the EA and FONSI to the public on request.

### **Environmental Impact Statements**

The primary purpose of an EIS is to serve as an action-forcing device to ensure that the policies and goals defined in NEPA are infused into the programs and actions of the federal government. An EIS contains a full and fair discussion of all significant environmental impacts. The EIS should inform decision-makers and the public of reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment.

The CEQ regulations state that an EIS is to be more than a disclosure document; it is to be used by federal officials in conjunction with other relevant material to plan actions and make decisions. Analysis of alternatives is to encompass those alternatives to be considered by the ultimate decision-maker, including a complete description of the proposed action. In short, the EIS is a means of assessing the environmental impacts of a proposed DOE action (rather than justifying decisions already made), prior to making a decision whether to proceed with the proposed action. Consequently, before a Record of Decision (ROD) is issued, DOE may not take any action that would have an adverse environmental effect or limit the choice of reasonable alternatives.

## NEPA Actions and Status

Exhibit C-1 provides the NEPA action taken and the status of that action for each of the active clean coal technology demonstration projects. The projects are presented by program and are listed alphabetically within each program.

**Exhibit C-1**  
**NEPA Action and Status**

<b>Project</b>	<b>NEPA Action</b>	<b>Status</b>
<b>PPII</b>		
Greenidge Multi-Pollutant Control Project	EA	FONSI issued 12/3/04
<b>CCPI-1</b>		
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	CX	Completed 2/18/04
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	EIS	Halted
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	EA	FONSI issued 1/6/04
TOXECON™ Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	EA	FONSI issued 9/19/03
Western Greenbrier Co-Production Demonstration Project	EIS	ROD issued 5/2/08
<b>CCPI-2</b>		
Demonstration of a Coal-Based Transport Gasifier	EIS	In process
Mercury Specie and Multi-Pollutant Control	CX	Completed 3/28/05
Mesaba Energy Project – Unit 1	EIS	In process

# Appendix D. Acronyms, Abbreviations, and Symbols

¢	cent	CAMR	Clean Air Mercury Rule	DCS	digital control system
°C	degrees Celsius	CAVR	Clean Air Visibility Rule	DEP	Department of Environmental Protection
°F	degrees Fahrenheit	CCPI	Clean Coal Power Initiative	DOE	U.S. Department of Energy
\$	dollars (U.S.)	CCPI-1	First CCPI solicitation	DOE/HQ	U.S. Department of Energy Headquarters
\$/kW	dollars per kilowatt	CCPI-2	Second CCPI solicitation	DSE	dust stabilization enhancement
\$/ton	dollars per ton	CCPI-3	Third CCPI solicitation	EA	Environmental Assessment
%	percent	CCS	carbon capture and storage	EIA	U.S. Energy Information Administration
®	registered trademark	CCT	clean coal technology	EIS	Environmental Impact Statement
™	trademark	CCTDP	Clean Coal Technology Demonstration Program	EIV	Environmental Information Volume
ACFB	atmospheric circulating fluidized-bed	CCTDP-I	First CCTDP solicitation	EPA	U.S. Environmental Protection Agency
ACFM	actual cubic feet per minute	CCTDP-II	Second CCTDP solicitation	EPAct	Energy Policy Act
A/E	architect/engineering	CCTDP-III	Third CCTDP solicitation	EPC	Engineering, Procurement & Construction
AFBC	atmospheric fluidized-bed combustion	CCTDP-IV	Fourth CCTDP solicitation	EPRI	Electric Power Research Institute
AHPC	Advanced Hybrid Particulate Collector	CCTDP-V	Fifth CCTDP solicitation	ESP	electrostatic precipitator
AI	artificial intelligence	CD-ROM	Compact disk-read only memory	FBC	fluidized-bed combustion
APH	air preheater	CDS	circulating dry scrubber	FD	forced draft
API	application programming interface	CEM	continuous emissions monitor	FE	Office of Fossil Energy
ARRA	American Recovery and Reinvestment Act of 2009	CEMS	continuous emission monitoring system	FFDC	Fabric filter dust collector
ASTM	American Society of Testing Materials	CEQ	Council on Environmental Quality	FGD	flue gas desulfurization
atm	atmosphere(s)	CFB	circulating fluidized-bed	FOA	Funding Opportunity Announcement
avg.	average	CFBDS	circulating fluidized-bed dry scrubber	FONSI	finding of no significant impact
B&W	The Babcock & Wilcox Company	CFR	Code of Federal Regulations	FSQ	full-slurry quench
BOP	balance of plant	CO	carbon monoxide	ft, ft <sup>2</sup> , ft <sup>3</sup>	foot (feet), square feet, cubic feet
BSA	by-product storage area	CO <sub>2</sub>	carbon dioxide	FT	Fischer-Tropsch
Btu(s)	British thermal unit(s)	COS	carbonyl sulfide	FY	fiscal year
Btu/kWh	British thermal units per kilowatt-hour	CSC	convective syngas cooler	gal	gallon(s)
CAAA	Clean Air Act Amendments of 1990	CUB	coal utilization by-product(s)	gal/ft <sup>3</sup>	gallons per cubic foot
CAER	Center for Applied Energy Research	CX	Categorical Exclusion	GHG	greenhouse gases
CAIR	Clean Air Interstate Rule	DCAA	Defense Contract Audit Agency		

gob	coal waste used as a fuel	N <sub>2</sub>	molecular nitrogen	psi	pound(s) per square inch
gpm	gallons per minute	N/A	not applicable	psia	pound(s) per square inch absolute
gr	grains	NAAQS	National Ambient Air Quality Standards	psig	pound(s) per square inch gauge
GRE	Great River Energy	NaHCO <sub>3</sub>	sodium bicarbonate	Pty	Proprietary
GUI	graphical user interface	NaNO <sub>3</sub>	sodium nitrate	Pub.L.	Public Law
GW	gigawatt(s)	NaOH	sodium hydroxide	R&D	research and development
GWe	gigawatt(s)-electric	Na <sub>2</sub> CO <sub>3</sub>	sodium carbonate	RD&D	research, development, and demonstration
H <sub>2</sub>	molecular hydrogen	Na <sub>2</sub> SO <sub>4</sub>	sodium sulfate	RFP	request for proposals
H <sub>2</sub> S	hydrogen sulfide	NEPA	National Environmental Policy Act	ROD	Record of Decision
H <sub>2</sub> SO <sub>4</sub>	sulfuric acid	NETL	National Energy Technology Laboratory	RRI	Rich Reagent Injection
HAPs	hazardous air pollutants	NH <sub>3</sub>	ammonia	S	sulfur
HCl	hydrogen chloride	NH <sub>4</sub> HCO <sub>3</sub>	ammonium bicarbonate	SBIR	Small Business Innovation Research
HF	hydrofluoric acid	NH <sub>4</sub> NO <sub>3</sub>	ammonium nitrate	scf	standard cubic feet
Hg	mercury	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	ammonium sulfate	scfm	standard cubic feet per minute
HHV	higher heating value	NO <sub>2</sub>	nitrogen dioxide	SCR	selective catalytic reduction
hr.	hour(s)	NO <sub>x</sub>	nitrogen oxides	SCS	Southern Company Services, Inc.
HRSG	heat recovery steam generator	NSPS	New Source Performance Standards	SDA	spray dryer ash
ID	induced draft	O <sub>2</sub>	molecular oxygen	SIP	State Implementation Plan
IGCC	integrated gasification combined-cycle	O <sub>3</sub>	ozone	SNCR	selective noncatalytic reduction
in, in <sup>2</sup> , in <sup>3</sup>	inch(es), square inch(es), cubic inch(es)	O&M	operation and maintenance	SO <sub>2</sub>	sulfur dioxide
kV	kilovolt	OMB	Office of Management and Budget	SO <sub>3</sub>	sulfur trioxide
kW	kilowatt(s)	PAC	powdered activated carbon	STTR	Small Business Technology Transfer Programs
kWh	kilowatt-hour(s)	PC	pulverized coal	syngas	synthetic gas
lb	pound	PCD	particulate collection device	TBD	to be determined
LHV	lower heating value	PM	particulate matter	TRI	Toxics Release Inventory
LLC	limited liability company	PM <sub>2.5</sub>	particulate matter less than 2.5 microns in diameter	UKRF	University of Kentucky Research Foundation
LNB	low-NO <sub>x</sub> burner	PON	Program Opportunity Notice	U.S.	United States
LP	low pressure	PPII	Power Plant Improvement Initiative	VIP	value improving practices
LPA	Large Particle Ash	PRB	Powder River Basin	VOA	virtual online analyzer
MHz	megahertz	ppm	parts per million (mass)	WGC	Western Greenbrier Co-Generating LLC
mills/kWh	mills per kilowatt-hour	ppmv	parts per million by volume	WMPI	Waste Management Processors, Inc.
min	minute(s)	PSC	Public Service Commission	yr.	year(s)
mo	month(s)	PSDF	Power Systems Development Facility		
MOU	Memorandum of Understanding				
MPC	model predictive control				
MW	megawatt(s)				
MWe	megawatt(s)-electric				
MWt	megawatt(s)-thermal				

## State Abbreviations

AK	Alaska
AL	Alabama
AR	Arkansas
AZ	Arizona
CA	California
CO	Colorado
CT	Connecticut
DC	District of Columbia
DE	Delaware
FL	Florida
GA	Georgia
HI	Hawaii
IA	Iowa
ID	Idaho
IL	Illinois
IN	Indiana
KS	Kansas
KY	Kentucky
LA	Louisiana
MA	Massachusetts
MD	Maryland
ME	Maine
MI	Michigan
MN	Minnesota
MO	Missouri
MS	Mississippi
MT	Montana
NC	North Carolina
ND	North Dakota
NE	Nebraska
NH	New Hampshire
NJ	New Jersey
NM	New Mexico

NV	Nevada
NY	New York
OH	Ohio
OK	Oklahoma
OR	Oregon
PA	Pennsylvania
PR	Puerto Rico
RI	Rhode Island
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VA	Virginia
VI	Virgin Islands
VT	Vermont
WA	Washington
WI	Wisconsin
WV	West Virginia
WY	Wyoming

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## Other

Some companies have adopted an acronym as their corporate names. The following corporate names reflect the former name of the company.

JEA	Jacksonville Electric Authority
KBR	Kellogg Brown & Root, Inc.



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