



DOE/FE-0514

Clean Coal Technology Programs: Program Update 2007

Includes Clean Coal Technology Demonstration Program (CCTDP), Power Plant Improvement Initiative (PPII), and Clean Coal Power Initiative (CCPI) Projects

As of September 2007



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

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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 2007* is to provide an updated status of the U.S. Department of Energy (DOE) commercial-scale demonstrations of clean coal technologies (CCTs). These demonstrations are performed under the Clean Coal Technology Demonstration Program (CCTDP), the Power Plant Improvement Initiative (PPII), and the Clean Coal Power Initiative (CCPI). *Program Update 2007* 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the technologies being demonstrated, with fact sheets for demonstration projects that are active, recently completed, withdrawn, or ended, including status as of September 30, 2007.

Role of Clean Coal Technology Demonstrations

Coal accounts for over 94 percent of the proven fossil energy reserves in the United States, and supplies about 50 percent of the electricity vital to the nation's economy and global competitiveness. The expanded use of coal in electricity generation, industrial heat and power, and production of fuels and high value chemicals is dependent on the removal of environmental and economic barriers. The need to mitigate these barriers brought about a major federally sponsored clean coal research and development (R&D) program in the 1970s. However, it was recognized that the success of this coal R&D ultimately would be judged on the extent to which emerging technologies penetrated domestic and international marketplaces.

In order to achieve success in the marketplace, the technical and financial risk associated with the deployment of new coal technologies had to be reduced. Thus, in 1985 DOE initiated the CCTDP. This program was directed

toward taking the most promising technologies emerging from coal R&D and demonstrating them at a scale and in an operational environment sufficient to determine their potential for satisfying the technical, economic, and environmental needs of the marketplace.

These demonstrations were made possible by forging cost-sharing partnerships between the federal government, other public institutions, and the technology suppliers and users, which reduced the financial and technical risk of participants to acceptable levels. The CCTDP recently concluded, with 33 successfully completed demonstration projects. In 2001, DOE implemented the PPII in a single solicitation applying basic CCTDP principles resulting in four demonstrations specifically addressing electric power reliability concerns. In 2002, President Bush launched the comprehensive CCPI, which is designed to address an array of domestic and global 21st century energy issues through a series of demonstrations over 10 years.

Collectively, these demonstration programs, as part of an integrated 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."

The CCT RD&D Program advances a number of Presidential initiatives designed to achieve the DOE strategic goal, including the President's Coal Research Initiative, FutureGen Initiative, Global Climate Change Initiative, and Hydrogen Fuel Initiative. The program further addresses the requirements of the U.S. Environmental Protection Agency's (EPA) Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR).



Clean Coal Technology Demonstrations

Beginning in 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 principals.

The CCTDP focused on commercializing processes that helped reduce sulfur dioxide (SO₂) and nitrogen oxide (NO_x) emissions; demonstrating more efficient and environmentally friendly alternatives to traditional pulverized coal boilers; demonstrating coal preparation and coal conversion technologies leading to cleaner fuels; and demonstrating improved industrial technologies for clean coal use. With 33 successfully completed projects, the CCTDP has yielded technologies that meet existing environmental regulations, compete in the electric power marketplace, and provide a technical foundation for meeting future environmental demands.

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.

CCPI is a 10-year, \$2 billion technology demonstration program that fosters more efficient clean coal technologies for use in new and existing U.S. electric power generating facilities. Technologies emerging from the program will help to meet the environmental objectives for America embodied in the President's Global Climate Change Initiative, FutureGen Initiative, the Hy-

drogen Initiative, CAIR, and CAMR. Early CCPI demonstrations offer avenues to commercialization for the most promising technologies emerging from the R&D pipeline since the last major CCT solicitation in 1992. Later demonstrations are expected to include cutting-edge technology of the future, such as carbon sequestration, advanced turbines, gas separation membranes, fuel cells, new gasification processes, hydrogen production, and other advanced energy system technologies. The CCPI is the capstone of the President's Coal Research Initiative managed by the DOE Office of Fossil Energy.

Clean Coal Technology Demonstration Funding

Funding for CCT demonstrations (CCTDP, PPII, and CCPI) was previously provided to DOE through the annual appropriations bills for the Department of Interior and Related Agencies. Current funding is provided under the Energy and Water Development Appropriations Act.

Federal funding has exceeded \$1.3 billion for the 33 successfully completed projects under the CCTDP. Project sponsors have contributed an additional \$1.9 billion to these projects, representing 60 percent of overall project funding, far surpassing the 50 percent cost-sharing required by law.

The single PPII solicitation was conducted in 2001 with funding provided by appropriations for fiscal year 2001 (FY01) that established a transfer of \$95 million in previously appropriated funding for the CCTDP. As of September 30, 2007, one project was ongoing and three projects were complete. Three projects withdrew during the negotiation phase prior to contract award. One project withdrew after award, but prior to successful completion. The DOE funding commitments for the

PPII projects total over \$30 million, with participants contributing nearly \$41 million or 57 percent of the total project costs.

The solicitation for Round 1 of CCPI (CCPI-1) was completed in January 2003 with the selection of eight projects. As of September 30, 2007, four projects were under way with two projects in the operation phase. One project remained in the negotiation phase, two projects did not progress beyond the negotiation phase, and one project withdrew prior to completion. DOE's funding commitments represent less than 30 percent (\$255 million) of the total estimated costs (\$932 million) for the projects, while participant commitments are \$677 million.

The CCPI Round 2 (CCPI-2) solicitation and selections were made in October 2004, resulting in the selection of four projects. As of September 30, 2007, three projects were under way and one project ended during the negotiation phase. The three active projects are valued at \$3 billion with DOE commitments of nearly \$336 million.

On October 4, 2007, DOE released the draft Funding Opportunity Announcement for CCPI Round 3 (CCPI-3). CCPI-3 specifically focuses on technologies that capture and sequester CO₂ emissions or put them to beneficial reuse. Demonstration goals include technologies that capture and sequester at least 50 percent of CO₂ emissions with potential towards 90 percent carbon capture while increasing the cost of electricity by less than 10 percent. Project selections for CCPI-3 are expected in November 2008.

Clean Coal Technology Projects

Program Update 2007 provides project fact sheets for 12 ongoing or recently completed PPII and CCPI projects. These 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 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, and status for each project. The following section provides an overview of the major technologies included in the above market sectors.

Emissions Control

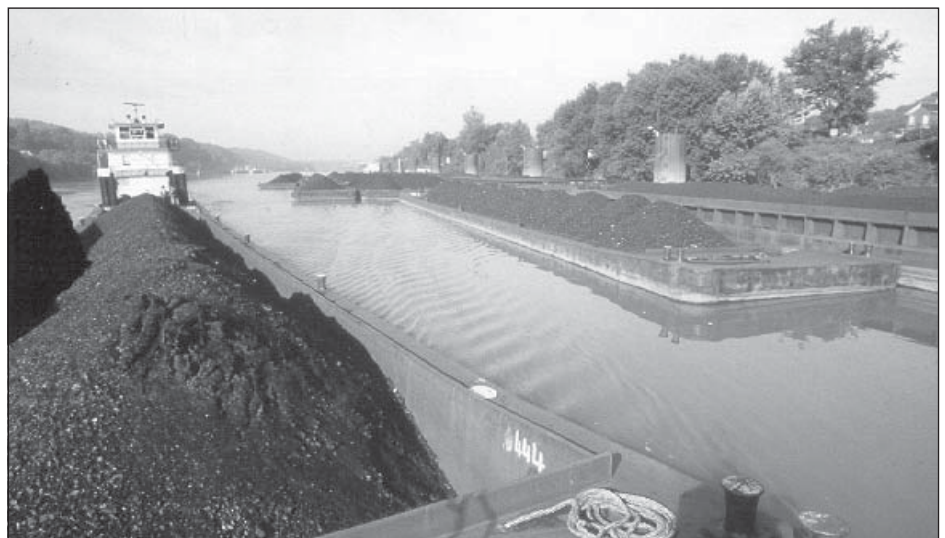
Advanced NO_x Controls. Advanced NO_x controls provide the means to meet the following: (1) EPA's Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone (commonly referred to as the NO_x 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 Mercury Rule (CAMR).

Advanced NO_x control technologies include:

- Low-NO_x burners and reburning systems that limit NO_x 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_x already formed (post-combustion processes); and
- Oxygen-enhanced combustion that displaces a portion of the air with oxygen in low-NO_x burners.

Mercury Controls. Mercury controls address EPA's CAIR/CAMR regulations regarding mercury emissions from coal-based power generation, which represent roughly one-third of U.S. mercury emissions. The mercury control program includes:

- 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 (FFDC);
- Oxidizing agents in conjunction with wet flue gas desulfurization (FGD) scrubbers to capture mercury in sulfate by-products; and



- Real-time measurement of mercury to aid mercury control.

Particulate Matter Controls. Particulate matter controls respond to EPA’s CAIR regulations and to revised NAAQS for particulate matter (fly ash) less than 2.5 microns in diameter (PM_{2.5}) and acid aerosols that can cause localized plume opacity and visibility impairment, and have been linked to human health impacts. Acid aerosols are required to be reported under the EPA Toxic Release Inventory. Secondary PM_{2.5} emissions are formed chemically in the atmosphere by precursors such as NO_x and SO₂. Particulate matter control technologies include:

- ESP/FFDC hybrids to leverage the best features of both NO_x and SO₂ control technologies;
- Flue gas preconditioning to enhance ESP performance;
- Concentration of particulate matter at ESP outlets for recycle;
- Alkaline injection for sulfur trioxide (SO₃) acid aerosol precursor control; and

- Continuous SO₃ analyzers for process control and validation.

Advanced Power Systems

Advanced Power Systems. Advanced power systems address Global Climate Change and Hydrogen Fuel Initiatives by enhancing power generation efficiency, producing near-zero pollutant emissions, and providing for hydrogen separation and carbon dioxide (CO₂) capture and sequestration. Advanced power system technologies include:

- Integrated gasification combined-cycle (IGCC) systems that: convert coal to a clean synthesis gas (syngas) amenable to use by gas turbines and advanced fuel cells, and separate out hydrogen and CO₂; 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;

- Hybrids that effectively integrate IGCC and CFB technologies; and
- Advanced combustion that uses oxygen in lieu of air or chemical means, such as chemical looping, to effect the equivalent of combustion.

Clean Coal Fuels

Upgrading. Upgrading coal enhances power plant efficiency and reduces emissions per kilowatt of electricity produced, which supports the Global Climate Change Initiative. Technologies include coal drying and ash removal methods to significantly increase coal energy density.

Conversion. Conversion of coal to clean liquid fuels, chemicals, or hydrogen enhances energy security and supports the Global Climate Change and Hydrogen Fuel Initiatives. Technologies include 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.

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 threat to groundwater contamination and a potential source of energy. Coal ash is a relatively untapped resource for construction materials that is largely disposed of in landfills, pos-



Exhibit ES-1
Projects by Market Sector

Project	Program	Participant	Status^a	Page
Emissions Control				
Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology	PPII	Otter Tail Power Company	Completed	3-12
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	CCPI-1	NeuCo, Inc.	Operation	3-16
Greenidge Multi-Pollutant Control Project	PPII	CONSOL Energy, Inc.	Operation	3-18
Mercury Specie and Multi-Pollutant Control	CCPI-2	Pegasus Technologies	Design	3-20
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	CCPI-1	Wisconsin Electric Power Company	Operation	3-22
Advanced Power Systems				
Demonstration of a 285-MWe Coal-Based Transport Gasifier	CCPI-2	Southern Company Services, Inc.	Construction	3-26
Mesaba Energy Project – Unit 1	CCPI-2	MEP-I LLC	Design	3-28
Clean Coal Fuels				
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	CCPI-1	WMPI PTY., LLC	Negotiation	3-32
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	CCPI-1	Great River Energy	Construction	3-34
Industrial Applications				
Advanced Multi-Product Coal Utilization By-Product Processing Plant	CCPI-1	University of Kentucky Research Foundation	Withdrawn	3-38
Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash	PPII	Universal Aggregates, LLC	Completed	3-40
Western Greenbrier Co-Production Demonstration Project	CCPI-1	Western Greenbrier Co-Generation, LLC	Design	3-44
^a Withdrawn: Project prematurely ended activities, voluntarily or involuntarily at the behest of DOE, prior to the completion of planned project activities. Withdrawals have occurred preceding and subsequent to the award of a cooperative agreement.				

ing a problem as landfill space becomes increasingly limited. By-product use technologies include:

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



1. Role of Clean Coal Technology Demonstrations

Introduction

Coal is recognized as an essential element in providing the United States with energy and economic stability and security to its citizens. Coal, which accounts for over 94 percent of the proven fossil energy reserves in the United States, supplies about 50 percent of the electricity vital to the nation's economy and global competitiveness. To support continued domestic economic growth, demand for electricity is projected to increase by approximately 40 percent by 2030. In the Energy Information Agency's *Annual Energy Outlook 2007* reference case, coal is projected to account for at least 50 percent of the new generating capacity additions through 2030. Moreover, coal is envisioned as an economically stable source of environmentally friendly fuels such as hydrogen, as well as strategically important chemicals. The expanded use of coal is dependent on developing technological capabilities that eliminate environmental concerns associated with coal use at a cost and efficiency that support economic growth. This new generation of technologies has been designated "clean coal technologies."

CCT research and development (R&D) 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 — demonstration. Demonstration proves the competitive cost and performance of a technology in a commercial setting in order to reduce risk to acceptable levels in the financial and technical arenas. To overcome 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-federal 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 marketplace technical, economic, and environmental needs.

The CCTDP recently concluded, with 33 successfully completed demonstration projects. The final active project withdrew in March 2006 prior to completion, and submitted a Final Report in March 2007 of activities performed. In 2001, DOE implemented the Power Plant Improvement Initiative (PPII) in a single solicitation applying CCTDP principles to secure demonstrations specifically addressing electric power reliability concerns. In 2002, President

Bush launched the comprehensive Clean Coal Power Initiative (CCPI), which is designed to address an array of domestic and global 21st century energy issues through a series of demonstrations over 10 years.

Collectively, these demonstration programs, as part of an integrated 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."

The CCT RD&D program advances a number of Presidential initiatives designed to achieve the DOE strategic goal, including:

- *President's Coal Research Initiative*: to produce public benefits by conducting research and development on coal-related technologies that will improve coal's competitiveness in future energy supply markets.



- *Global Climate Change Initiative:* to cut greenhouse gas intensity 18 percent by 2012 by supporting vital climate change research. This places the United States on a path to slow the growth of greenhouse gas emissions and, as the science allows, to stop and reverse the growth;
 - *Hydrogen Fuel Initiative:* to reverse the growing dependency of the United States on foreign oil by developing the technologies and infrastructure to produce, store, and distribute hydrogen for use in vehicles and electric power generation; and
 - *FutureGen Initiative:* to establish the capability and feasibility of co-producing electricity and hydrogen from coal with essentially zero emissions, including the low-cost capture and storage of carbon dioxide (CO₂).
- 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, reflecting commercialization goals;
 - 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.

Discussed below are the respective roles of the CCTDP, PPII, and CCPI in ensuring the coal-based systems meet 21st century energy and environmental demands.

The successful contributions of CCT demonstrations to the above goals and initiatives are the result of applying sound fundamental principles to ensure effective government-industry partnerships. These principles include:

- 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;
- A technical agenda established by industry, not the government, enhancing commercialization potential;

CCTDP

Begun in 1985, the CCTDP was the most ambitious government-industry initiative ever undertaken to develop environmental solutions for the use of the nation's abundant coal resources. The program's goal was to demonstrate the best, most innovative technology emerging from the world's engineering laboratories at a scale large enough so that industry could determine whether the new processes had commercial merit.

Originally, the CCTDP was a response to concerns over acid rain, which is formed by sulfur and nitrogen pollutants that can be emitted by coal-burning power plants. Based on recommendations from Special Envoys appointed by the U.S. and Canadian governments, President Reagan commissioned the CCTDP as a cost-shared effort among the U.S. government, state agencies, and the private sector. Projects proposed by industry were selected through a series

of five national competitions aimed at attracting promising technologies that had not yet been proven commercially. The commercial-scale projects have included SO₂ control systems, NO_x control technologies, fluidized-bed combustion, gasification, advanced coal processing technologies, and industrial process technologies. 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.

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 withdrew prior to successful completion. Of the four remaining projects, three have completed and one is in operation.

CCPI

In the 21st century, additional environmental concerns have emerged: the po-

tential health impacts of trace emissions of mercury, the effects of microscopic particles on people with respiratory problems, and the global climate-altering impact of greenhouse gases.

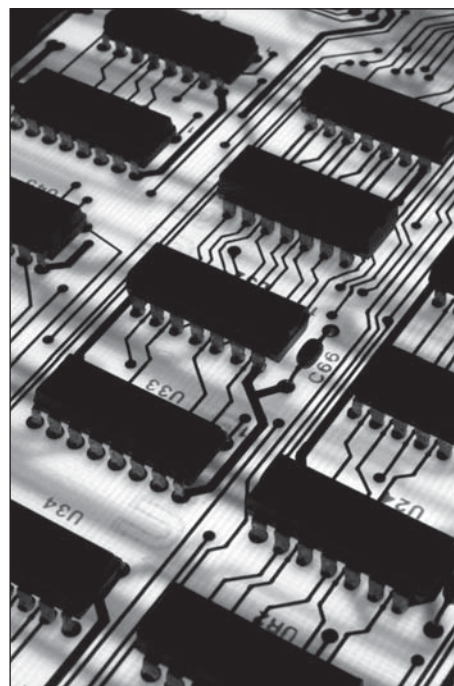
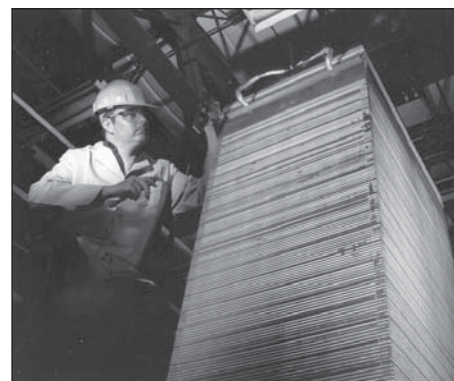
With coal likely to remain one of the nation’s lowest-cost electric power suppliers for the foreseeable future, President Bush has pledged a new commitment to even more advanced clean coal technologies.

As the President said in presenting his National Energy Policy to the American public on May 17, 2001, “More than half of the electricity generated in America today comes from coal. If we weren’t blessed with this natural resource, we would face even greater [energy] shortages and higher prices today. Yet, coal presents an environmental challenge. So our plan funds research into new, clean coal technologies.”

Building on the successes of the original CCTDP, the new CCPI encompasses a broad spectrum of research and large-scale projects that target today’s most pressing environmental challenges. The CCPI is designed to be implemented over 10 years, with a federal investment totaling \$2 billion and an industry cost-share of 50 percent at a minimum.

Initially, the CCPI is providing government co-financing for new coal technologies that can help utilities cut sulfur, nitrogen, and mercury pollutants from power plants nearly 70 percent by 2018. Also, some of the early projects are showing ways to reduce greenhouse gases from coal plants by boosting the efficiency at which coal is converted to electricity or other energy forms.

The CCPI is closely linked with R&D activities that are conducted throughout the core elements of the President’s Coal Research Initiative, which are driving toward ultra-clean, fossil-fuel-based energy complexes in the 21st century. The Clean Coal Technology Roadmap, developed cooperatively with the coal and power industry, addresses short-



Implementing a Comprehensive Energy Strategy: Energy Policy Act of 2005 (EPAcT)

Expanding the availability of power from clean coal technologies

EPAcT authorizes funding for the Clean Coal Power Initiative (CCPI), focused on accelerated coal research, development and demonstration. New technologies will help us use coal — our nation’s most abundant fossil fuel — in an environmentally sensitive way for generations to come. EPAcT authorizes \$200 million of annual funding to help develop cutting-edge research. The goal is to dramatically reduce emissions of pollutants such as sulfur dioxide, nitrogen oxides and mercury, and improve the coal-to-product efficiency for all types of coal by 2020.

While CCPI is focused on demonstrations of new and improved technologies, EPAcT also authorizes investment tax incentives that provide \$1.6 billion in investment tax credits for the deployment of early commercial coal gasification and other advanced coal technologies. Taken together, the CCPI and investment tax incentives provide a clear path for advanced coal technologies to progress from R&D through demonstration to affordable commercial deployment.

Samuel W. Bodman
Secretary
U.S. Department of Energy

and long-term coal technology needs. When integrated with these and other DOE initiatives, CCPI will help the nation successfully commercialize advanced power systems that will produce electricity at efficiencies nearly double that of today’s technologies, attain near-zero emissions, produce clean fuels, and have CO₂ management capabilities. The President’s Global Climate Change Initiative commits the United States to reduce greenhouse gas intensity (the ratio of greenhouse gas emissions to economic output) by 18 percent by the year 2012. Improving power plant efficiency is a potentially significant way to reduce carbon emissions in the near- and mid-term. In the longer term, CCPI technologies offering CO₂ capture and sequestration will remove fossil-fueled power as a threat to global climate change.

In Round 1 of CCPI (CCPI-1), the criteria for candidate projects was very broad. Specifically, the solicitation 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 five ongoing CCPI-1 projects, two are expected to contribute to the Global Climate Change Initiative to reduce greenhouse gases by boosting the fuel use efficiency of power plants. A third project will install a high-tech process to a power plant that will absorb mercury and other air toxic emissions from the plant’s flue gases, thus contributing to achieving the standards set by EPA CAMR. The two remaining projects will reduce air pollution through advanced gasification and combustion systems designed to extract the potential energy from waste coal piles (scattered throughout many areas

of Pennsylvania and West Virginia) as a new source of fuel.

In February 2004, the second CCPI solicitation (CCPI-2) was issued and encouraged 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 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 over \$3 billion, with DOE commitments of over \$335 million.

The choice of the CCPI-2 solicitation categories reflected DOE's judgment of the most pressing technological needs confronting the nation's power industry in the 2010 to 2020 time frame. Two projects involve integrated gasification combined-cycle (IGCC) and the third

addresses mercury control as well as other power plant emissions.

On October 4, 2007, DOE released the draft Funding Opportunity Announcement for the third solicitation (CCPI-3). CCPI-3 specifically focuses on technologies that capture and sequester CO₂ emissions or put them to beneficial reuse. DOE has established the following goals for demonstration at commercial-scale in a commercial setting:

- Technologies that capture and sequester at least 50 percent of CO₂ emissions from the proposed facility, or put them to beneficial reuse;
- Technologies that show significant progress toward 90 percent carbon capture; and
- Technologies that show significant progress toward CO₂ capture and sequestration with less than 10 percent increase in electricity costs.



CCPI-3 is also structured to allow demonstration projects under CCPI to integrate with ongoing sequestration field tests, which might already be fully operational when new projects become available.

The remaining competitions are also likely to emphasize advanced technologies for reducing greenhouse gas (GHG) emissions through dramatic improvements in fuel use and power generating efficiencies and by GHG capture and sequestration. Rather than reducing emissions of a single pollutant, future pollution control projects will be encouraged to combine technologies into multi-pollutant control “packages” that can achieve superior environmental effectiveness at the lowest possible cost.

2. Funding and Costs

Introduction

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

Congress has appropriated a net amount of \$2.1 billion for the CCTDP based on appropriations bills that began in 1986. 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 submitted the Final Report in March 2007.

A single PPII solicitation was conducted in 2001, with funding provided

by appropriations for fiscal year 2001 (FY01) that established a transfer of \$95 million in previously appropriated funding for the CCTDP. As of September 30, 2007, one project was ongoing and three projects were complete. 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, over \$600 million 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 Develop-

ment Act of 1982, and provides funding for small, innovative firms in selected research and development areas. The STTR program implements the Small Business Technology Transfer Act of 1992, which provides funding for small business concerns performing cooperative research and development (R&D) efforts. Other adjustments include across-the-board general and omnibus reductions imposed by Congress.

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 2005 with funding provided by appropriations for FY04 and FY05, along with uncommitted funds from prior CCPI and PPII appropriations. As of September 30, 2007, seven CCPI projects were under way with one project remaining in the negotiation phase. Three projects did not progress beyond the negotiation phase and one project withdrew after award.

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

	Fiscal Year								Total
	2001	2002	2003	2004	2005	2006	2007	2008 ^c	
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						47,633	58,154	TBD	105,787
Program Support	948	1,500	1,490	1,701	493	495	604		7,231
SBIR & STTR ^a		3,935	3,909	4,709	1,367	1,372	1,675		16,967
Other Adjustments ^b	209		975	2,119	694	500			4,497
Total	95,000	150,000	150,000	172,000	50,000	50,000	60,433	TBD	727,433

^a Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) Programs. All Fossil Energy programs are required to contribute to these programs on an equal percentage basis.

^b Across-the-board general and omnibus reductions required by the annual appropriations bills.

^c As of September 30, 2007, appropriations for FY2008 had not been signed into law.

CCTDP

Congress has appropriated a net amount of \$2.1 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. From 24 applications, eight projects were selected for negotiation in September 2001.

As of September 30, 2007, three projects had been completed. Three projects withdrew during the negotiation phase prior to contract award. One project withdrew after award, but prior to successful completion. One project is ongoing. No additional solicitations are planned, and unused funds are intended 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. For the PPII projects, participants have committed to funding 57 percent of the total project costs. Exhibit 2-2 summarizes the project costs and financial status of the PPII projects as of September 30, 2007. 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.

CCPI

The CCPI supports the National Energy Policy (NEP) recommendation to increase investment in clean coal technology. 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, two solicitations have been issued (CCPI-1 and CCPI-2). Activities are under way for a third solicitation (CCPI-3).

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, two projects were withdrawn. Of the remaining six

projects, four are ongoing, one remains in negotiation, and one withdrew after award. As of September 30, 2007, the total cost of the projects was estimated at about \$932 million, with the DOE share being approximately \$255 million.

DOE funding commitments for the six awarded CCPI-1 projects represent less than 30 percent of the total estimated cost, while participant commitments

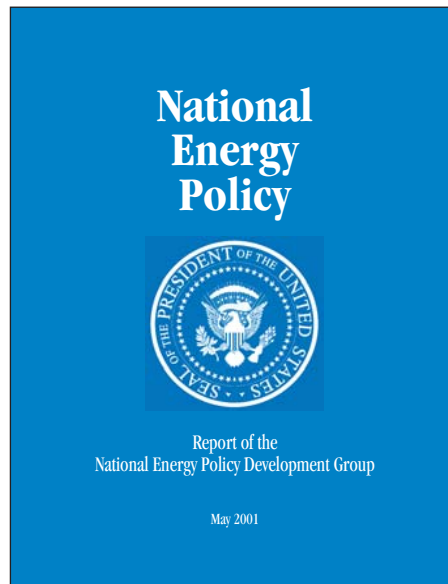


Exhibit 2-2 PPII Project Costs and Financial Status (Dollars)				
	Total Project Costs	DOE Share	DOE Obligated	DOE Cost
Achieving NSPS Emission Standards Through Integration of Low-NO _x Burners with an Optimization Plan for Boiler Combustion (project ended prior to completion)	3,005,169	1,387,530	1,387,530	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	7,222,409
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	32,742,976	14,341,423	14,341,423	13,405,177
Total PPII	71,064,781	30,348,551	30,348,551	29,410,714

exceed \$675 million. The largest project in terms of total cost has proposed over 80 percent participant funding, showing the strong commitment by participants to demonstrate clean coal technologies. Exhibit 2-3 summarizes the project cost and financial status of the CCPI-1 projects as of September 30, 2007.

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, with DOE committing nearly \$297 million. Subsequently, one project has withdrawn and three are under way. The IGCC projects under CCPI-2 represent several of the largest

projects to date, with one having the largest total project cost at \$2.1 billion (DOE commitment of \$36 million) and one representing the largest DOE contribution of nearly \$294 million of an \$844 million total project cost.

Exhibit 2-4 summarizes the project costs and financial status of the CCPI-2 projects as of September 30, 2007.

On October 4, 2007, DOE released the draft Funding Opportunity Announcement for CCPI-3. Funds appropriated for FY06 and FY07 were intended for use towards CCPI-3; however, some of these funds were committed to ongoing projects that have experienced cost growth. Funds appropriated for FY08 will be used toward CCPI-3.



General Provisions and Project Administration

Projects in the CCTDP, PPII, and CCPI are subject to similar requirements and oversight. 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

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

	Total Project Costs	DOE Share	DOE Obligated	DOE Cost
Advanced Multi-Product Coal Utilization By-Product Processing Plant (withdrawn)	1,245,305	621,407	621,407	621,407
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	19,904,733	8,592,630	8,592,630	8,423,659
Gilberton Coal-to-Clean Fuels and Power Co-Production Project (in negotiation)	612,480,000	100,000,000	0	0
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	31,512,215	13,518,737	13,518,737	6,945,960
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	52,978,115	24,859,578	24,859,578	24,859,578
Western Greenbrier Co-Production Demonstration Project	214,983,758	107,491,879	7,878,470	7,733,348
Total CCPI-1	932,294,126	255,084,231	55,470,822	48,583,952

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

	Total Project Costs	DOE Share	DOE Obligated	DOE Cost
Demonstration of a 285-MWe Coal-Based Transport Gasifier	844,267,321	293,750,000	243,386,111	12,675,945
Mercury Specie and Multi-Pollutant Control	15,560,811	6,079,479	3,577,451	2,090,559
Mesaba Energy Project – Unit 1	2,155,680,783	36,000,000	22,245,505	13,376,666
Total CCPI-2	3,015,508,915	335,829,480	269,209,067	28,143,170

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 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, which 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 has been present since the first CCTDP solicitation. The duration of the repayment period is usually 20 years following the end of the project demonstration period. In accordance with Congressional direction, funds obtained from repayment provisions 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 project 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.

3. Projects

Introduction

This chapter provides fact sheets on clean coal technology demonstration projects encompassing the Power Plant Improvement Initiative (PPII) and Clean Coal Power Initiative (CCPI). The project fact sheets reflect activities that have occurred since publication of the *Clean Coal Technology Programs: Program Update 2006*.

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 10 of the 12 projects covered in the report that are ongoing and have not completed final documentation. The two-page fact sheets provide information on project participants, location, and funding; present project objectives; describe the project and technology; delineate benefits derived from the project; characterize project status and accomplishments; and define planned schedules.

Four-page fact sheets are provided for two projects (Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector and Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash) 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, and identify sources for additional information. Both projects completed operations in 2006.

Technology Overview

Following is an overview of some of the major technology areas, underlying drivers, and associated challenges that are the current focus of clean coal technologies.

Emissions Control

Advanced NO_x Controls. Advanced nitrogen oxide (NO_x) 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 (commonly referred to as the NO_x 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 Mercury Rule (CAMR).

Advanced NO_x control technologies include:

- Low-NO_x burners and reburning systems that limit NO_x 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_x already formed (post-combustion processes); and
- Oxygen-enhanced combustion that displaces a portion of the air with oxygen in low-NO_x burners.

Low-NO_x 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 to complete combustion in a cooler zone; and (4) can be used with neural network



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

controls for optimum load-following performances. Reburning systems inject fuel into flue gas to strip oxygen away from the NO_x and introduce overfire air to complete combustion. SCR and SNCR use ammonia/urea to transform 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.

By the end of 2010, the challenge is to reduce NO_x emissions to 0.15 lb/10⁶ Btu or less with technologies costing 75 percent less than current SCR systems. SCR has inherently high capital costs, and SNCR is inefficient. Thus, the options are to improve combustion modification techniques, improve SNCR efficiency, and/or use SCR more effectively.

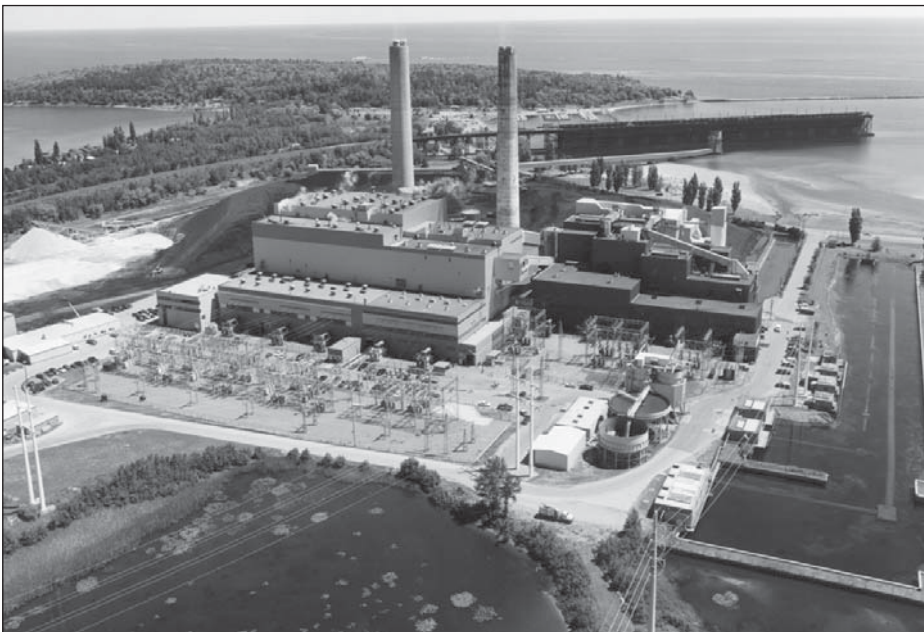
Mercury Controls. Mercury controls address EPA regulations regarding mercury emissions from coal-based power

generation, which represents roughly one-third of U.S. mercury emissions. In addition, a number of states have adopted, or are moving to adopt, more restrictive limits on mercury emissions. 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. The mercury captured in the FGD by-product (gypsum, often used in wallboard), is chemically bound and precluded from re-release. Mercury instrumentation and controls measure both the mercury species (elemental and oxidized) entering the control device, and the total mercury entering the stack.

By the end of 2010, the challenge is to achieve 90 percent removal of mercury at 50–75 percent of today’s cost of removal with activated carbon. Simple activated carbon injection techniques do not offer the efficient contact needed for 90 percent removal, because mercury occurs in highly dilute concentrations in power plant flue gas — typically around 30 parts per billion. FGD applications offer good mercury contact mechanisms, but mercury is subject to species shift from solid to vapor state in FGD processes.



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.

Particulate Matter Controls. The control of particulate matter (PM), including PM equal to or less than 2.5 microns in size ($PM_{2.5}$), responds to EPA regulations. 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 (SO_2 and NO_x), and problematic acid gases that can cause localized plume opacity and visibility impairment, and have been linked to human health impacts. Control technologies include:

- ESP/FFDC hybrids to leverage the best features of both NO_x and SO_2 removal;
- Flue gas preconditioning to enhance ESP performance;
- Concentration of particulate matter at ESP outlets for recycle;
- Alkaline injection for sulfur trioxide (SO_3) acid aerosol precursor control; and
- Continuous SO_3 analyzers for process control and validation.

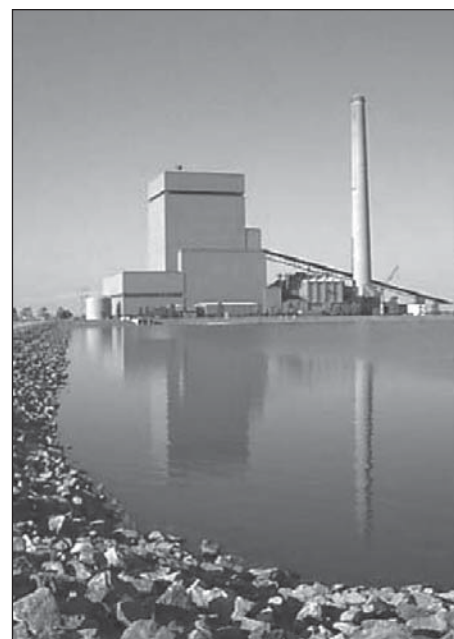
ESPs electrically charge particulate matter for capture on collection plates. FFDCs use fabric filter bags that receive and collect particulate matter on the outside surface, and then are pulsed internally with jets of air to disengage the collected particulate. Preconditioning agents either lower resistivity or induce agglomeration of incoming particulate matter. Alkaline injection converts SO_2 and SO_3 acid precursors into readily captured sulfate particulates, and neutralizes other acid gases such as hydrochloric and hydrofluoric acids. SO_3 analyzers measure input and output levels for control and validation.

By the end of 2010, the challenge is to reduce $PM_{2.5}$ by 99.99 percent for less than \$50 to \$70 per kilowatt (kW), and reduce acid aerosols by 95 percent. ESPs efficiently capture large volumes of primary PM in size ranges down to 10 microns. FFDCs efficiently capture fine particulates down to 0.1 micron,

but at an economic penalty for large volumes; and many FFDC fabrics cannot stand the rigors of high SO_2 concentrations in the flue gas. Neither system alone can cost-effectively comply with a 99.99 percent removal of $PM_{2.5}$. The use of existing preconditioning agents to enhance ESP performance through agglomeration requires large quantities of ammonia, which under recent legislation has been classified as extremely hazardous. Aerosols readily escape conventional pollutant control devices. SCR applications exacerbate SO_3 production through catalytic oxidation of a portion of the larger SO_2 fraction in the flue gas. No continuous SO_3 analyzer exists with the EPA Test Method sensitivity of 0.05 mg/m^3 , which is needed to validate control.

Advanced Power Systems

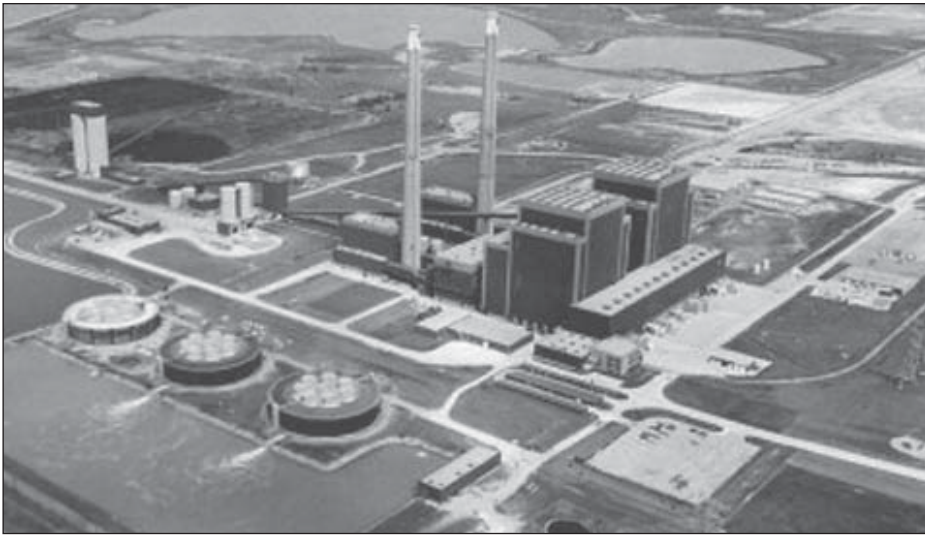
Advanced Power Systems. Advanced power systems address Global Climate Change and Hydrogen Fuel Initiatives by enhancing power generation efficiency, producing near-zero pollutant emissions, and providing for hydrogen separation and carbon dioxide (CO_2)



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



Advanced CFB is being demonstrated at JEA's Northside Station in Jacksonville, Florida.



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

capture and sequestration. Advanced power technologies include:

- Integrated gasification combined-cycle (IGCC) systems that convert 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 CO₂; 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 precipitate 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 SO₂ 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



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

combustion efficiency at temperatures below the thermal NO_x formation temperature, and achieves high-efficiency SO₂ capture through lengthy and direct sorbent/SO₂ contact.

By the end of 2010, 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 enhances energy security and supports the Global Climate Change and Hydrogen Fuel Initiatives. Technologies include 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.

By the end of 2010, the challenge resides in reducing 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.

By the end of 2010, the challenge is to demonstrate and document successful application of CUBs to provide the impetus for increased industry acceptance, leading to increased utilization from the current 30 percent to over 60 percent.

Project Fact Sheets

An index to project fact sheets by market sector is provided in Exhibit 3-1, which is labeled in the order that the fact sheets appear. An index by program (PPII, CCPI-1, and CCPI-2) is provided in Exhibit 3-2. Within these breakdowns, 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. 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. Schedules are provided by a series of vertically oriented bars designating the basic functional phases, starting with *Preaward* at the bottom and proceeding through *Design*, *Construction*, *Operation*, and final technical *Report Preparation* and completion. The length of the bar does not connote time (all phase bars are the same size); the time per phase is provided by dates at the beginning and end of each bar. Other milestone data of interest are provided to the right of the phase bars. General status is indicated by a continuous bar to the left of the phase bars that is shaded up to the approximate percent of completion of a phase.

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 withdrawn from the program include the term *Project Withdrawn* below the project title. Withdrawn projects are projects that have prematurely ended activities, either voluntarily or involuntarily at the behest of DOE. Withdrawals have occurred preceding and subsequent to the award of a cooperative agreement.

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 provides the primary Internet gateway to clean coal technology program and project information 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 — 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
Emissions Control				
Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology	PPII	Otter Tail Power Company	Completed	3-12
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	CCPI-1	NeuCo, Inc.	Operation	3-16
Greenidge Multi-Pollutant Control Project	PPII	CONSOL Energy, Inc.	Operation	3-18
Mercury Specie and Multi-Pollutant Control	CCPI-2	Pegasus Technologies	Design	3-20
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	CCPI-1	Wisconsin Electric Power Company	Operation	3-22
Advanced Power Systems				
Demonstration of a 285-MWe Coal-Based Transport Gasifier	CCPI-2	Southern Company Services, Inc.	Construction	3-26
Mesaba Energy Project – Unit 1	CCPI-2	MEP-I LLC	Design	3-28
Clean Coal Fuels				
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	CCPI-1	WMPI PTY., LLC	Negotiation	3-32
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	CCPI-1	Great River Energy	Construction	3-34
Industrial Applications				
Advanced Multi-Product Coal Utilization By-Product Processing Plant	CCPI-1	University of Kentucky Research Foundation	Withdrawn ^a	3-38
Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash	PPII	Universal Aggregates, LLC	Completed	3-40
Western Greenbrier Co-Production Demonstration Project	CCPI-1	Western Greenbrier Co-Generation, LLC	Design	3-44
^a Withdrawn: Project prematurely ended activities, voluntarily or involuntarily at the behest of DOE, prior to the completion of planned project activities. Withdrawals have occurred preceding and subsequent to the award of a cooperative agreement.				

Exhibit 3-2
Project Fact Sheets by Program

Project	Participant	Status	Page
PPII			
Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash	Universal Aggregates, LLC	Completed	3-40
Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology	Otter Tail Power Company	Completed	3-12
Greenidge Multi-Pollutant Control Project	CONSOL Energy, Inc.	Operation	3-18
CCPI-1			
Advanced Multi-Product Coal Utilization By-Product Processing Plant	University of Kentucky Research Foundation	Withdrawn ^a	3-38
Demonstration of Integrated Optimization Software at the Baldwin Energy Complex	NeuCo, Inc.	Operation	3-16
Gilberton Coal-to-Clean Fuels and Power Co-Production Project	WMPI PTY., LLC	Negotiation	3-32
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	Great River Energy	Construction	3-34
TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers	Wisconsin Electric Power Company	Operation	3-22
Western Greenbrier Co-Production Demonstration Project	Western Greenbrier Co-Generation, LLC	Design	3-44
CCPI-2			
Demonstration of a 285-MWe Coal-Based Transport Gasifier	Southern Company Services, Inc.	Construction	3-26
Mercury Specie and Multi-Pollutant Control	Pegasus Technologies	Design	3-20
Mesaba Energy Project – Unit 1	MEP-I LLC	Design	3-28

^a Withdrawn: Project prematurely ended activities, voluntarily or involuntarily at the behest of DOE, prior to the completion of planned project activities. Withdrawals have occurred preceding and subsequent to the award of a cooperative agreement.

Exhibit 3-3 Geographic Locations of Projects

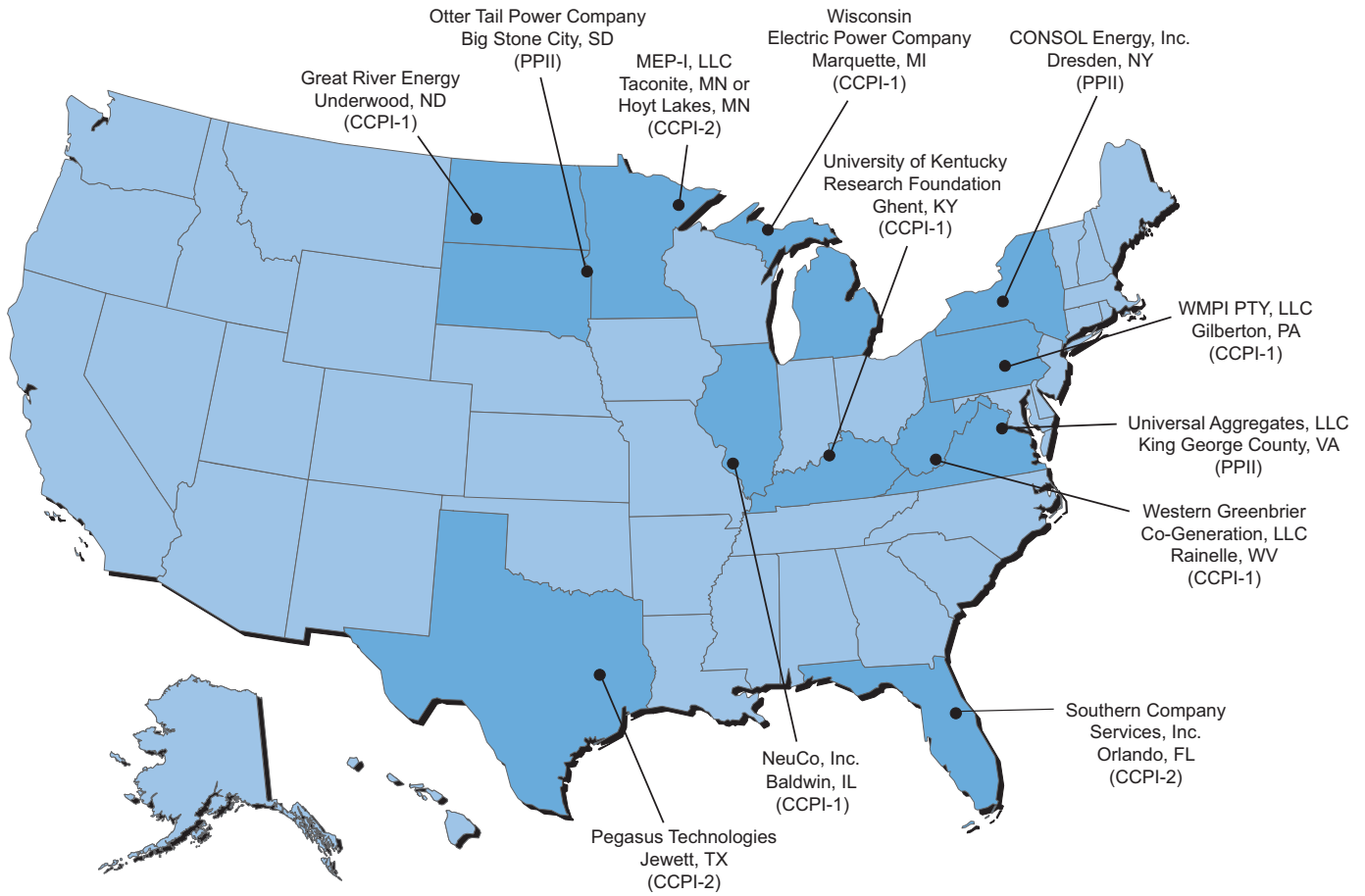
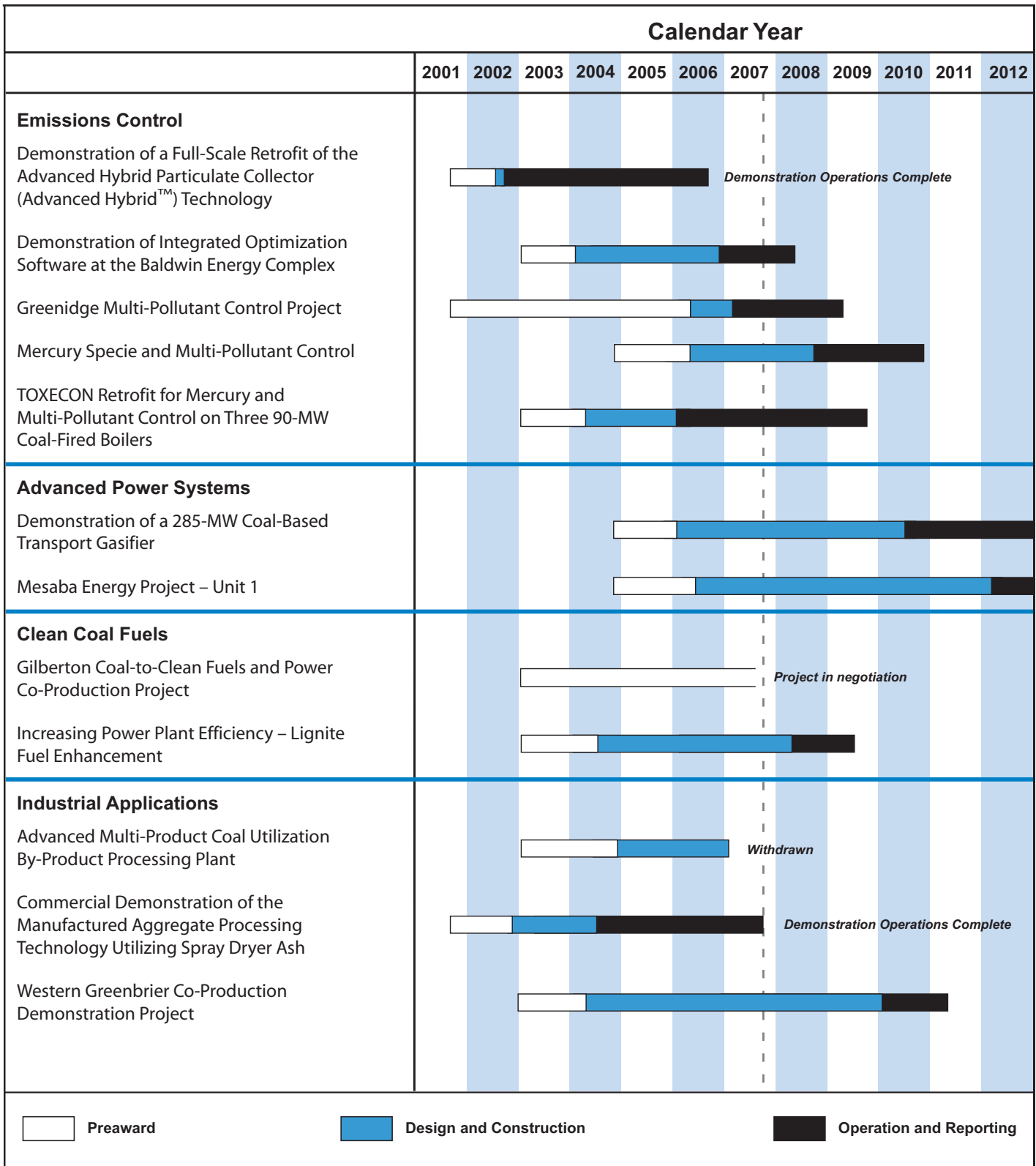


Exhibit 3-4 Project Schedules by Market Sector



Emissions Control

Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology

Demonstration Operations Complete

Participant

Otter Tail Power Company

Additional Team Members

Montana-Dakota Utilities — co-host

NorthWestern Public Service — co-host

W.L. Gore & Associates, Inc. — licensee and filter bag provider

Energy and Environmental Research Center (University of North Dakota) — concept developer

Location

Big Stone City, Grant County, SD (Montana-Dakota Utilities and NorthWestern Public Service's Big Stone Power Plant)

Technology

Advanced Hybrid™ (formerly known as Advanced Hybrid Particulate Collector)

Plant Capacity/Production

450 MW

Coal

Powder River Basin subbituminous

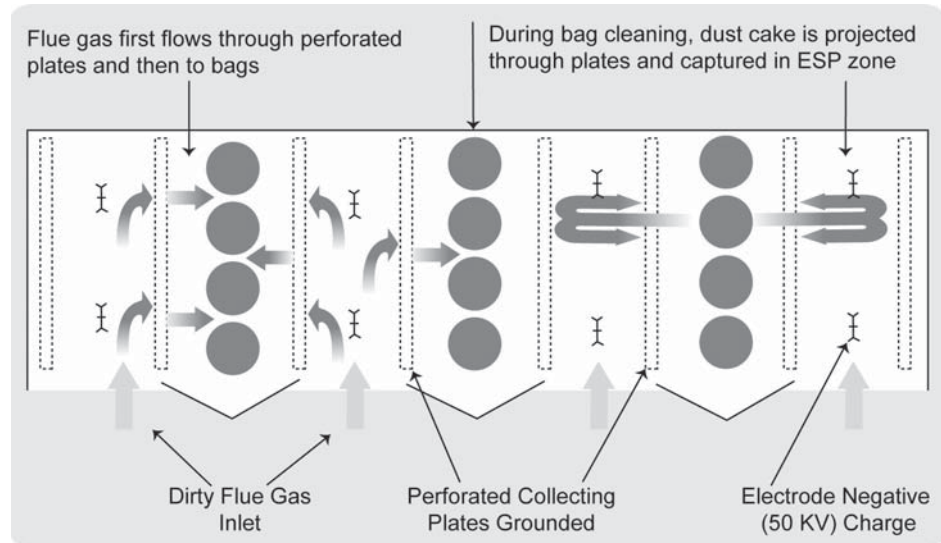
Project Funding

Total	\$13,353,288	100%
DOE	6,490,585	49
Participant	6,862,703	51

PPII

Emissions Control

Mercury	<input type="checkbox"/>	NO _x	<input type="checkbox"/>
SO ₂	<input type="checkbox"/>	PM _{2.5}	<input checked="" type="checkbox"/>



Objectives

To demonstrate up to 99.99 percent overall particulate matter (PM) capture for all particle sizes greater than 0.01 microns; to demonstrate the ability of the Advanced Hybrid™, formerly the Advanced Hybrid Particulate Collector (AHPC), to achieve low pressure drop (below 10 inches of water column) at an air-to-cloth ratio of 12 feet per minute; and to attain economic viability relative to competing technologies.

Technology/Project Description

The project demonstrates Advanced Hybrid™ technology in controlling PM from a 450-MW cyclone boiler burning Powder River Basin (PRB) coal. The Advanced Hybrid™ system combines electrostatic precipitator (ESP) and fabric filter dust collector (FFDC) technologies in a synergistic manner that leverages the best features of both. ESPs efficiently capture large volumes of PM in size ranges down to 10 microns. FFDCs efficiently capture fine particulates down to 0.1 micron, but at an economic penalty for large volumes. Leveraging these characteristics, the Advanced Hybrid™ uses an ESP to capture approximately 90 percent of the PM from incoming dirty flue gas, and uses an FFDC to capture only the balance of the PM. Perforated ESP plates surround the fabric filter bags and capture PM that is charged by electrodes placed between the plates. Remaining PM, which is predominately fines, passes to fabric filter bags made of highly efficient membrane material for removal. When the fabric filter bags are cleaned by pulsing jets of air from within, the re-entrained PM, not falling to a collection bin, is captured by the ESP.

Benefits

Revised National Ambient Air Quality Standards (NAAQS) for fine PM are expected to require power plants to remove a high percentage of particulates 2.5 microns or less (PM_{2.5}). FFDCs are the current state-of-the-art technology for PM_{2.5} control. The Advanced Hybrid™ integrates an FFDC with an ESP in a synergistic manner that allows the systems to operate at far higher throughputs (2.5 to 4 times) than a stand-alone conventional FFDC. Advanced Hybrid™ fabric

Project Duration 43 Months	Period of Operation 39 Months	Status/Schedule
		*Estimated date

filter bag materials offer higher capture efficiency than conventional bags that must sustain full PM loading from incoming dirty flue gas. Stand-alone FFDCs also suffer from re-entrainment of PM when the bags are cleaned, a problem nearly eliminated in the Advanced Hybrid™. Testing the Advanced Hybrid™ with PRB coal provided an excellent test of the system since these coals offer high resistivity, which reduces the efficiency of ESPs.

Status/Accomplishments

The cooperative agreement was awarded July 2, 2002. 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 June 11, 2002. Construction commenced in July 2002 and was completed in October 2002. The period of performance for the project ended on January 31, 2006.

The first six months of operation showed very good particulate removal efficiency, but at a higher than anticipated pressure drop. Performance testing has shown that the outlet dust loading is almost two orders of magnitude lower than the guarantee limit of 0.002 grains per actual cubic foot.

While the technology provided high removal efficiency, problem areas included high pressure drop, shorter than expected bag life, and frequent cleaning cycles. In December 2003, operators replaced 3 out of 20 rows of bags in one compartment with baffles in an effort to improve flow and pressure drop. Also, one-third of the filter bags were replaced with bags made of a different material to evaluate performance.

In a June 2004 outage, baffles were installed in three compartments and approximately 40 percent of the bags were replaced. Unfortunately, bag life issues persisted and opacity limits were exceeded on several occasions due to bag failures. Additional bags were replaced in an October 2004 outage.

During 2005, pressure drop issues persisted and the ESP components developed problems. Repairs made in July 2005 to the ESP components were not effective and the plant was forced to lower production output on multiple occasions. Following modifications made in December 2005, problems with the particulate collector continued. Due to the continuing problems, Otter Tail Power Company decided to replace the Advanced Hybrid™ with a proven particulate control technology.

S T A T U S	R e p o r t	<i>Final Report Issued</i>	8/06
		<i>Draft Report Issued</i>	5/06
		<i>Operation Completed</i>	1/06
	O p e r a t i o n		
		<i>Operation</i>	10/02
	C o n s t r u c t i o n		
		<i>Construction</i>	7/02
	D e s i g n		
		<i>Award</i>	7/02
	P r e a w a r d	<i>NEPA Completed (EA and FONSI)</i>	6/02
	<i>Selection</i>	9/01	

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Results Summary

Operational

- The commercial demonstration represented a significant scale up from the pilot scale unit (approx. 2.5 MW or 9,000 actual cubic feet per minute (ACFM)). The AHPC was retrofitted successfully into the existing ESP.
- During the first six months of operation, the AHPC achieved the anticipated particulate removal efficiency. However, the pressure drop was higher than targeted.
- The high pressure drop led to increased bag cleaning, which contributed to premature bag failures, high power requirements for the pulse air compressor and induced draft (ID) fan, and ultimately to derates of the unit as high as 55 MW.
- The ESP portion of the Advanced Hybrid™ was not achieving the particulate removal levels anticipated due to a portion of the incoming flue gas bypassing the ESP components. Various membrane bag types and baffles were installed to address these issues and were not entirely successful.

- In an effort to improve the ESP performance, Advanced Hybrid™ components were installed in the previously unused first field of the ESP casing. Unfortunately, there were problems with plate alignment in the new field that actually resulted in less particulate pre-collection, and high pressure drops continued to be observed.

Environmental

- After initial installation and startup in October 2002, stack tests were conducted in November 2002. These tests confirmed that the Advanced Hybrid™ is highly effective in capturing total particulate matter with an average collection efficiency being greater than 99.995 percent. The results are provided in Exhibit 3-5.
- The testing performed also showed the Advanced Hybrid™ is highly efficient at removal of a number of trace elements in the flue gas (Antimony, Arsenic, Beryllium, Cadmium, Chromium, Lead, and Nickel). The Advanced Hybrid™ is relatively ineffective in removing mercury, since much of the mercury is in the vapor state.

- Although the Advanced Hybrid™ showed impressive results in capturing particulate matter and removal of many trace elements, the pressure drop problems led to premature bag failures and unacceptable opacity excursions on several occasions.

Economic

- The Advanced Hybrid™ demonstrated extremely high particulate removal for all size ranges of particulate, as long as the filter bags remained intact. The high pressure drop operating issues necessitated replacement of the original filter bag materials with lower flow resistance but less durable materials. If the pressure drop and related bag failure issues can be overcome, then this technology may have a huge market potential.
- The capital cost for this unit reflected a first-of-a-kind installation that is typically more expensive than subsequent installations. Further, the installation was done in two phases and during limited length shutdowns, both factors that increased costs. The installation cost for both phases were approximately \$42/kW; however, the cost for the

**Exhibit 3-5
Advanced Hybrid™ Stack Test Results**

Date	Sample Method	Advanced Hybrid™ Inlet Dust Loading, grains/scf	Advanced Hybrid™ Inlet Dust Loading, lb/10 ⁶ Btu	Stack Dust Loading, grains/scf	Stack Dust Loading, lb/10 ⁶ Btu	Particulate Collection Efficiency, %
11/18/2002	EPA Method 17			0.00002	0.00003	99.998
11/19/2002	EPA Method 29 Multicyclones	1.02092 0.64099	1.38378 0.86882			
11/20/2002	EPA Method 17 EPA Method 29 EPA Method 29	0.85856 0.92151	1.16372 1.24904	0.00006	0.00008	99.994
11/21/2002	EPA Method 17 Multicyclones Multicyclones	0.66113 0.70044	0.89611 0.94940	0.00003	0.00004	99.997

'nth' installation is estimated at \$30/kW.

- Operating and maintenance costs for the Advanced Hybrid™ were significantly higher than the original ESP. Most of these increased costs were related to the pressure drop issues. If further development resolved the pressure drop issues, it is expected that the operating and maintenance costs would be reduced substantially.

Project Summary

This project demonstrated the Advanced Hybrid™ technology originally developed and tested by Energy and Environmental Research Center (University of North Dakota) on a 2.5 MWe slipstream at Otter Tail's Big Stone Plant near Milbank, South Dakota. The research was initially supported by the Innovations for Existing Plants

component of the DOE Fossil Energy Coal R&D Program.

The full-scale demonstration of the Advanced Hybrid™ was performed at the 450 MW Big Stone Plant from October 2002 through December 2005. The technology consists of fabric filter bags interspersed with perforated electrostatic precipitator (ESP) plates and electrodes in the same housing. The filter bags can achieve greater collection of very fine particles than can the ESP plates, while the ESP plates can capture dust that is re-entrained due to back-pulsing of the fabric filter bags.

The Advanced Hybrid™ demonstrated extremely high particulate removal for all size ranges of particulate as long as the filter bags remained intact. To address pressure drop issues, the original filter bags were replaced with bags having lower flow resistance but less

durable materials. Further problems were encountered with the effectiveness of the ESP portion of the device. These issues led to frequent bag cleaning cycles and limited bag life. Several bag failures resulted in unacceptable opacity excursions.

The technology has significant market potential; however, the flow dynamics and the synergy of the membrane filter bags with the ESP need to be perfected and optimized. Unfortunately, the project was not able to overcome these issues in the first, full-scale demonstration. If the problems encountered during this demonstration can be resolved, as seems probable, the Advanced Hybrid™ technology can be a viable option if more stringent emission standards are placed on respirable particulate matter.



Full-scale Advanced Hybrid™ retrofit at Big Stone

Demonstration of Integrated Optimization Software at the Baldwin Energy Complex

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
subbituminous

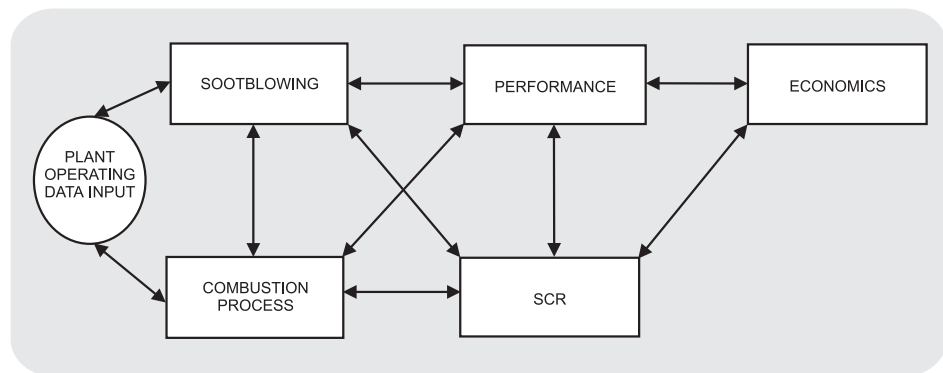
Project Funding

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

CCPI-1

Emissions Control

Mercury	■	NO _x	■
SO ₂	■	PM _{2.5}	■



Objectives

The project objectives are to design and apply individual on-line optimization modules 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 optimization modules through NeuCo's ProcessLink® platform; and to reduce the Baldwin Energy Complex nitrogen oxide (NO_x) 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

This project demonstrates an integrated on-line optimization control system at the Baldwin Energy Complex, incorporating inputs from two 585-MW cyclone-fired boilers with SCR and a 595-MW tangentially fired boiler with low-NO_x burners (LNBs). Optimization modules shall be developed and operated in a non-manual, neural control (closed loop) mode for control of combustion, sootblowing, and SCR operations. Optimization modules shall be developed for overall unit thermal performance, and plant-wide maintenance optimization (modules include software and additional sensors and actuators, as required). These five optimization modules will be 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 module will be designed, installed, and individually tested to verify effectiveness before being integrated with the other modules. The system allows collection of data and computations from other networked computers or resources rather than requiring that all data and logic be resident on a single computer, thus giving the user a single interface for insight and decision making support. After the optimization modules and associated sensors/controls/actuators are integrated and optimized, the following benefits should result: substantial improvement in enhanced SCR performance for lower NO_x emissions; increased thermal efficiency and reliability for reduced overall emissions per unit of energy reduction; increased power output; and lower costs for consumers.

Benefits

NeuCo's ProcessLink® architecture offers plant operators a highly flexible control platform. Optimization modules can be designed and applied to individual

Project Duration 45 Months	Period of Operation 12 Months	Status/Schedule
		*Estimated date

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. In this application, upon linkage of five separate optimization modules, improved SCR performance is expected to reduce NO_x emissions by 5 percent while extending SCR catalyst life one year and reducing ammonia consumption by 15 percent. In parallel, Baldwin Energy Complex's thermal efficiency is expected to increase by 1.5 percent; and the plant's reliability and availability is expected to improve, increasing net annual electrical power production by 1.5 percent, thus lowering the cost of electricity. Emissions of carbon dioxide (CO₂), mercury (Hg), sulfur dioxide (SO₂), and particulate matter (PM) are reduced in proportion to the efficiency gain per unit of energy produced.

Status/Accomplishments

The project was selected for award on January 8, 2003. On February 18, 2004, a cooperative agreement was awarded. The National Environmental Policy Act (NEPA) requirements were met with a Categorical Exclusion (CX) at the time of award.

During the project, NeuCo designed, developed, and installed the ProcessLink[®] platform on all three units. In addition, NeuCo designed and installed combustion optimization (CombustionOpt) modules on the two cyclone-fired boilers (Units 1 and 2), and installed and tested an online ammonia analyzer to monitor ammonia slip in support of the SCR control optimization (as opposed to indirect optimization through combustion controls). Several software packages supporting the sootblowing optimization module (SootOpt) have been installed on the tangentially fired boiler (Unit 3). NeuCo further designed, developed, and installed the performance optimization module (PerformanceOpt) on all three units at Baldwin. NeuCo also installed and revised the maintenance optimization module (MaintenanceOpt) on Units 1, 2 and 3. Work is ongoing to fine tune all the Optimizers to further improve achieved benefits. NeuCo submitted repayments after the commercial sales of CombustionOpt for cyclone boilers, SootOpt, and PerformanceOpt systems.

S T A T U S	R e p o r t	<i>Final Report Issued</i>	5/08*
		<i>Draft Report Issued</i>	2/08*
		<i>Operation Completed</i>	11/07*
	O p e r a t i o n	<i>Operation</i>	11/06
	C o n s t r u c t i o n	<i>Construction</i>	5/04
	D e s i g n	<i>Award</i>	2/04
		<i>NEPA Completed (CX)</i>	2/04
	P r e a w a r d	<i>Selection</i>	1/03

Contacts	
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	Joseph Giove (301) 903-4130 joseph.giove@hq.doe.gov

Greenidge Multi-Pollutant Control Project

Participant

CONSOL Energy Inc.

Additional Team Members

AES Greenidge, LLC — host

Babcock Power Environmental, Inc. — (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_x burners to control NO_x and a circulating fluidized-bed dry scrubber (CFBDS) to control SO₂, mercury, and acid gases

Plant Capacity/Production

104 MW (Unit 4)

Coal

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

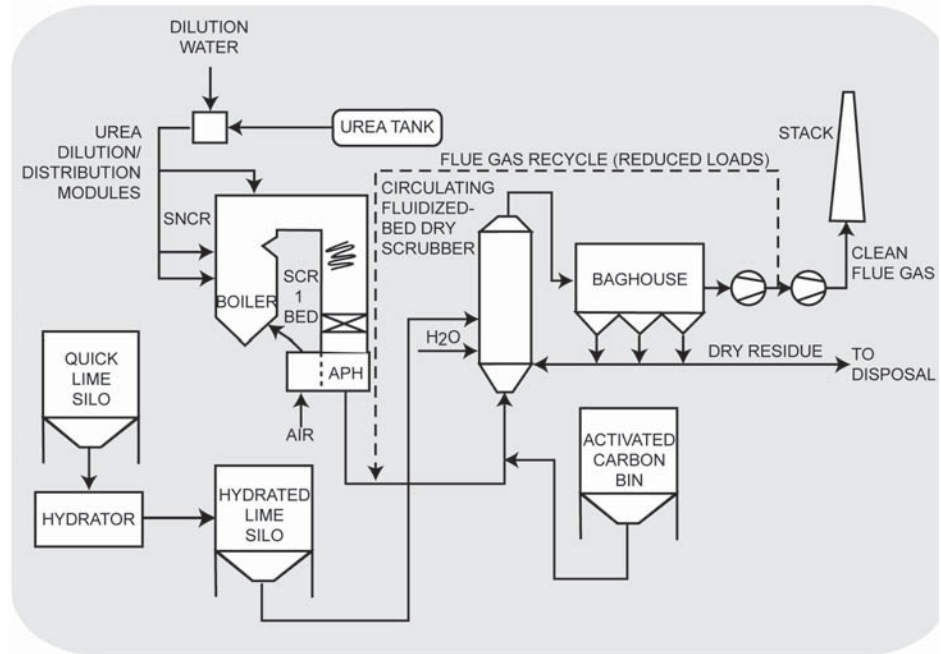
Project Funding

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

PPII

Emissions Control

Mercury	■	NO _x	■
SO ₂	■	PM _{2.5}	■



Objectives

To demonstrate cost-effective multi-pollutant control for relatively small power plants using a selective non-catalytic reduction (SNCR)/in-duct selective catalytic reduction (SCR) in combination with low-NO_x burners and a circulating fluidized-bed dry scrubber (CFBDS) system with recycled baghouse ash and activated carbon injection. To control nitrogen oxide (NO_x) emissions to 0.10 lb/10⁶ Btu at full load, and reduce sulfur dioxide (SO₂) by 95 percent, mercury by 90 percent, and acid gases by 95 percent; and to evaluate the impact of biomass co-firing up to 10 percent heat input on the performance of the SNCR/SCR hybrid and CFBDS system.

Technology/Project Description

This project will demonstrate an in-duct SNCR/SCR hybrid in combination with low-NO_x burners and a CFBDS system using recycled baghouse ash and activated carbon injection to cost-effectively reduce emissions of NO_x, SO₂, mercury, and acidic gases to levels equal to or lower than those required by regulation at an existing 104-MW plant. The project also will evaluate the effect of biomass co-firing on the multi-pollutant control system. To complement existing low-NO_x burners, an SNCR is strategically located upstream of a single-bed in-duct SCR. Urea injection required for the SNCR also generates the ammonia required for the SCR. Having the SCR downstream of the SNCR allows the SNCR to operate at lower temperatures than normal (normally avoided to protect against ammonia slip), which enhances performance. The CFBDS system uses a reactor vessel to facilitate contact of flue gas with separately injected dry hydrated lime, activated carbon, and water. The activated carbon absorbs mercury, and the lime reacts with the sulfur dioxide (SO₂) and sulfur trioxide (SO₃), hydrochloric acid (HCl), and hydrofluoric acid (HF) gases to form benign solids, all of which are captured in the baghouse. Lime and activated carbon sorbents captured in the baghouse are recycled to the CFBDS to enhance utilization. Performance testing will include biomass co-firing at heat inputs up to 10 percent.

Project Duration 29 Months	Period of Operation 20 Months	Status/Schedule
		*Estimated date

Benefits

The U.S. power industry is seeking lower cost and more compatible multi-pollutant control alternatives to SCR and wet scrubbers for the 473 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 typically are space constrained, making it difficult, if not impossible, to install conventional SCR and wet scrubbers. Greenidge Unit 4 is representative of the small coal-fired electricity generating units that together represent almost one-quarter of the U.S. coal-fired generating capacity. The NO_x control technology to be demonstrated at Greenidge is estimated to require about 65 percent of the capital costs and 75 percent of the operating costs of a conventional SCR unit. The CFBDS is projected to use at least 2.5 times less activated carbon for a given level of mercury control because the carbon has a greater average contact time in the CFBDS reactor than in a flue gas duct. Reducing the carbon feed rate results in substantial mercury control cost savings. Also, the CFBDS is estimated to be about one-half the capital cost of a conventional wet scrubber. The acid gas control afforded by the CFBDS is important because this removes the precursors to acid aerosols, which can form PM_{2.5} once emitted. Acid gases must be reported to the U.S. Environmental Protection Agency as part of the Toxics Release Inventory. 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

An Environmental Assessment (EA) was completed and a Finding of No Significant Impact (FONSI) was issued on December 3, 2004. Following protracted negotiations, the project was awarded on May 19, 2006, with design and construction activities already underway.

Construction was substantially completed in December 2006 and startup and commissioning began. 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_x, SO₂, SO₃, HCl, mercury, and ammonia slip. Testing and tuning to establish operational parameters and optimization for various levels of generation output are ongoing.

Contacts	
Participant	NETL
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S T A T U S	R e p o r t	<i>Final Report Issued</i>	4/09*
		<i>Draft Report Issued</i>	1/09*
		<i>Operation Completed</i>	10/08*
	O p e r a t i o n		
		<i>Operation</i>	3/07
	C o n s t r u c t i o n		
		<i>Construction</i>	<i>Ongoing at award</i>
	D e s i g n		
		<i>Award</i>	5/06
	P r e a w a r d		
	<i>NEPA Completed (EA and FONSI)</i>	12/04	
	<i>Selection</i>	9/01	

Mercury Specie and Multi-Pollutant Control

Participant

Pegasus Technologies (a division of NeuCo, Inc.)

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 subbituminous

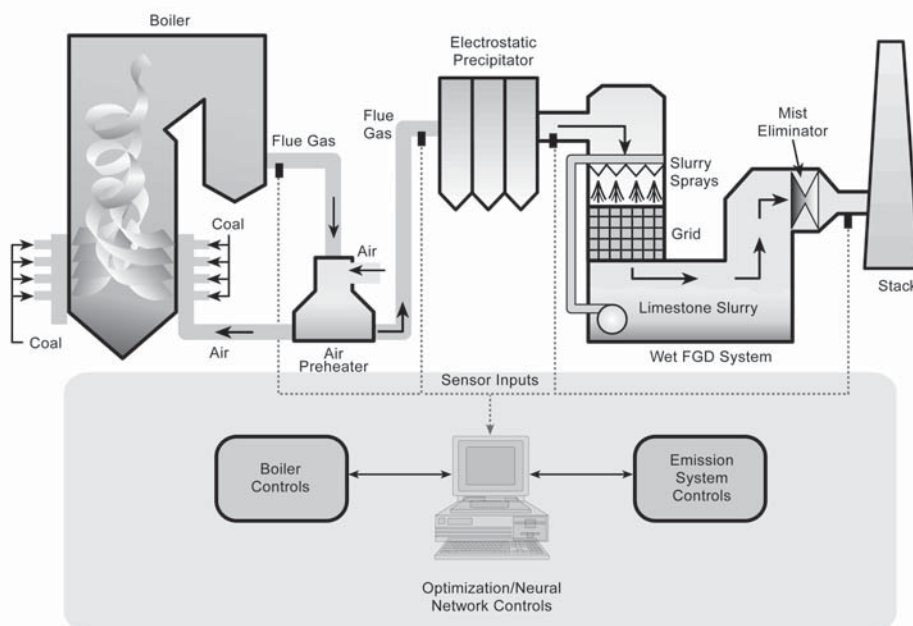
Project Funding

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

CCPI-2

Emissions Control

Mercury	■	NO _x	□
SO ₂	□	PM _{2.5}	□



Objectives

To demonstrate that state-of-the-art sensors and neural network-based optimization and controls can measure and effect mercury species; 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 (SO₂) 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 Powder River Basin subbituminous coal, which are known to emit relatively high levels of elemental mercury under routine combustion conditions. Pegasus Technologies will apply sensors to evaluate the mercury species (elemental and oxidized mercury) 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.

Project Duration 49 Months	Period of Operation 19 Months	Status/Schedule *Estimated date
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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.

Following several instrumentation problems and limited outage opportunities at the host site, the installation of all critical sensor components was completed in July 2007. Baseline testing is planned for November 2007 followed by parametric testing that will enable development of neural network optimization algorithms to minimize emissions of mercury and other regulated pollutants and to maximize plant efficiency. The final phase of the project will involve a long-term operational demonstration of plant-wide optimization.

STATUS	R	<i>Final Report Issued</i>	<i>11/10*</i>
	e	<i>Draft Report Issued</i>	<i>8/10*</i>
	p	<i>Operation Completed</i>	<i>5/10*</i>
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	p	<i>Operation</i>	<i>10/08*</i>
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	o	<i>Construction</i>	<i>12/07*</i>
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	P	<i>Award</i>	<i>4/06</i>
	r		
	e	<i>NEPA Completed (CX)</i>	<i>3/05</i>
	a		
	w		
	a		
	r	<i>Selection</i>	<i>10/04</i>

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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 — 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

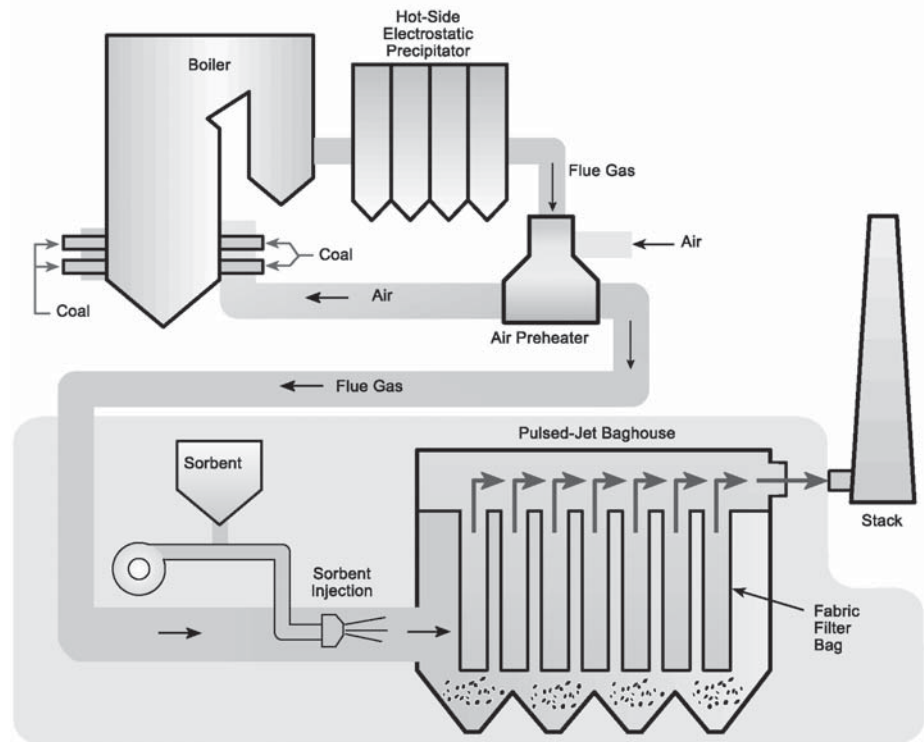
Project Funding

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

CCPI-1

Emissions Control

Mercury	■	NO _x	■
SO ₂	■	PM _{2.5}	■



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 (SO₂) and nitrogen oxide (NO_x) 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.

Project Duration 60 Months	Period of Operation 39 Months	Status/Schedule
		*Estimated date

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 SO₂ and NO_x 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 annually 97 pounds of mercury, 4,020 tons of SO₂, and 32 tons of fine PM.

Status/Accomplishments

Construction activities were completed in December 2005, and activated carbon was first injected the following month.

The project is demonstrating long-term reliability by continuously operating the powdered activated carbon (PAC) injection system, achieving an average of 90 percent mercury removal. Ash handling and dust control process issues still need to be resolved before continuous long term system reliability can be achieved. Preliminary 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 SO₂ removal, no effect on NO_x, 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_x and SO₂ emissions. Also, PM loading in the baghouse is being optimized for mercury removal efficiency.

Contacts	
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S T A T U S	R e p o r t	<i>Final Report Issued</i>	10/09*
		<i>Draft Report Issued</i>	7/09*
		<i>Operation Completed</i>	4/09*
	O p e r a t i o n		
		<i>Operation</i>	1/06
	C o n s t r u c t i o n		
		<i>Construction</i>	11/04
	D e s i g n		
		<i>Award</i>	4/04
	P r e A w a r d		
		<i>NEPA Completed (EA and FONSI)</i>	9/03
		<i>Selection</i>	1/03

Advanced Power Systems

Demonstration of a 285-MWe Coal-Based Transport Gasifier

Participant

Southern Company Services, Inc.

Additional Team Members

Southern Power Company
— host utility co-owner

Orlando Utilities Commission
— host utility co-owner

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

Location

Orlando, Orange County, FL
(Stanton Energy Center)

Technology

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

Capacity

285 MW (net); 3,300 tons of coal/day input

Coal

Powder River Basin subbituminous

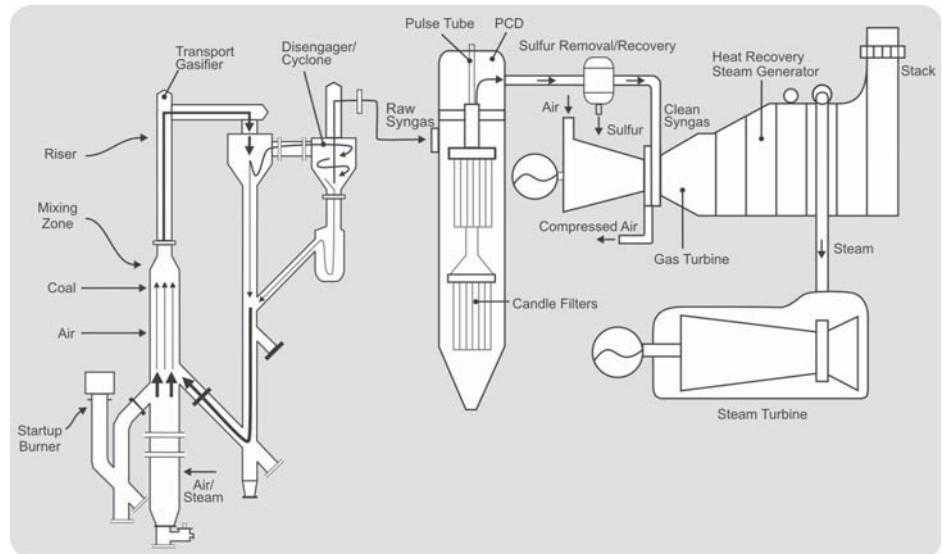
Project Funding

Total	\$844,267,321	100%
DOE Share	293,750,000	34.8
Participant	550,517,321	65.2

CCPI-2

Advanced Power Systems

IGCC	■	CFB	□
Hybrid	□	Adv Comb	□



Objectives

To assess the operational, environmental, and economic performance of the air-blown transport gasifier-based 285-MW (net) integrated gasification combined-cycle (IGCC) system; and achieve a heat rate of 8,400 Btu per kilowatt-hour, which equates to 40.6 percent efficiency on a higher heating value (HHV) basis.

Technology/Project Description

The project will demonstrate a 285-MW (net) IGCC unit applying the Kellogg Brown and Root (KBR) transport gasifier in an air blown mode. KBR's transport gasifier consists of two sections: a short, larger-diameter mixing zone and a longer, smaller-diameter riser. Air and steam are 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). In addition, some of the sulfur released from the coal is captured as calcium sulfide by the calcium in the coal and added calcium-based sorbent. The majority of the unreacted char and sorbent-derived material 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, state-of-the-art emission controls will be used.

Project Duration 106 Months	Period of Operation 54 Months	Status/Schedule
		*Estimated date

Benefits

The KBR transport gasifier offers a simple, robust, and efficient means of processing, which 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, conditions more conducive to long refractory life, and higher mass and heat transfer rates. The recycling of solids increases the effective residence time, increases carbon conversion, and improves sorbent utilization. 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 and adapt to carbon management requirements.

Status/Accomplishments

The project was selected in October 2004 and the cooperative agreement was awarded on January 30, 2006. The National Environmental Policy Act (NEPA) requirements were met with an Environmental Impact Statement (EIS) and issuance of a Record of Decision (ROD) in April 2007. Detailed design and equipment procurement are progressing as scheduled.

Due to the world market conditions for material availability, services, and lead times required for equipment fabrication and construction, the cost of the project has increased significantly from \$569 million to \$844 million.

The groundbreaking ceremony was held on September 10, 2007, at the Stanton Energy Center in Orlando, Florida.

	R e p o r t	<i>Final Report Issued</i>	5/15*
		<i>Draft Report Issued</i>	2/15*
	O p e r a t i o n	<i>Operation Completed</i>	11/14*
		<i>Operation</i>	6/10*
S T A T U S	C o n s t r u c t i o n	<i>Construction</i>	9/07
		<i>NEPA Completed (EIS)</i>	4/07
	D e s i g n	<i>Award</i>	1/06
		<i>Selection</i>	10/04
	P r e A w a r d		

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Mesaba Energy Project – Unit 1

Participant

MEP-I LLC
(Excelsior Energy, Inc.)

Additional Team Members

ConocoPhillips — technology holder

EPC — to be determined

Location

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

Technology

Next generation ConocoPhillips E-Gas™ gasifier applied in an integrated gasification combined-cycle (IGCC) mode

Capacity

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

Coal

PRB subbituminous (preferred)
Illinois Basin #6 bituminous

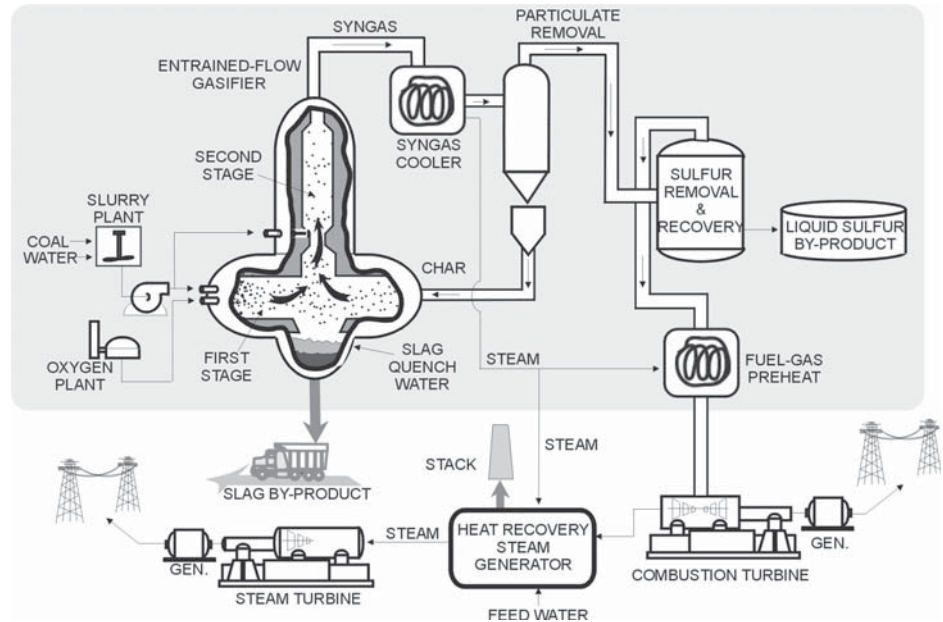
Project Funding

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: a generating capacity that is double that of the Wabash River Coal Gasification Repowering Project; advanced full-slurry quench (FSQ) multiple-train gasifier system having 90 percent or better operational availability; first-of-a-kind (U.S.) integrated air separations unit; greater feedstock flexibility; emission levels for criteria pollutants and mercury equal to or below those of the lowest emission rates for utility-scale, coal-based generation fueled by similar feedstocks; carbon dioxide emissions 15–20 percent lower than the current average for U.S. coal-based power plants fueled by similar feedstocks; design heat rate of about 8,600 Btu/kilowatt-hour when using bituminous coal; and a standard replicable design configuration with a sound basis for providing firm installed cost information for future commercialization.

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 IGCC design will incorporate findings from a comprehensive Value Improving Practices (VIP) process applied by an industry forum to improve cost and performance based on the predecessor Wabash River Coal Gasification Repowering Project. 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 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 synthesis gas heating value and improving efficiency. The synthesis gas leaving the gasifier will be cooled and the heat will be used to generate steam. Particulate

Project Duration 81 Months	Period of Operation 12 Months	Status/Schedule
		*Estimated date

matter will be removed from the cooled gas (probably in a two-stage dry process) and processed through state-of-the-art sulfur removal and recovery systems 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 at Global Energy’s Wabash River Generating Station. The Mesaba project is designed to validate that potential and move the technology into commercialization by demonstrating a commercial E-Gas™ IGCC design configuration emerging from a comprehensive analysis of the Wabash plant. Following the Wabash Demonstration, a VIP process (a formal industry process applying nine separate practices) was applied to examine lessons learned from the Wabash demonstration, identify options to improve cost and performance, and optimize design for a commercial plant configuration. The Mesaba project will implement the commercial design configuration coming out of the VIP process and subsequent research and development.

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 PUC continues to review Excelsior Energy’s request for a Power Purchase Agreement (PPA). In August 2007, the PUC qualified the proposed Mesaba IGCC plant for regulatory advantages as an Innovative Energy Project under Minnesota statute, but also found the PPA lacked sufficient protections for ratepayers. While neither approving nor denying the request, the PUC urged the parties to negotiate with other Minnesota utilities having a baseload need and re-draft the PPA. A synopsis of the PUC findings can be found on its Web site at: http://www.puc.state.mn.us/news_events/mesabapetition.pdf.

S T A T U S	R e p o r t	<i>Final Report Issued</i>	8/13*
		<i>Draft Report Issued</i>	5/13*
		<i>Operation Completed</i>	2/13*
	O p e r a t i o n		
		<i>Operation</i>	3/12*
	C o n s t r u c t i o n		
		<i>Construction</i>	5/08*
	D e s i g n		
		<i>Award</i>	5/06
	P r e A w a r d		
	<i>Selection</i>	10/04	

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Clean Coal Fuels

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

Participant

WMPI PTY., LLC

Additional Team Members

Nexant, Inc. — engineering support

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

Unde GmbH. — gasification technology supplier

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

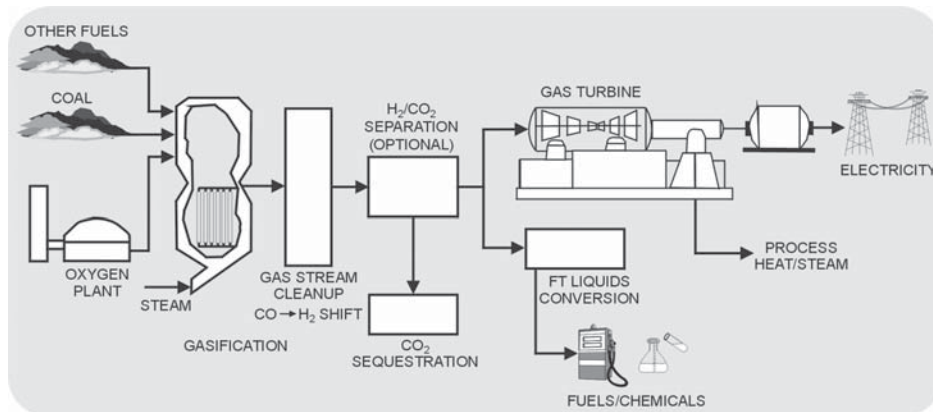
Total	\$612,480,000	100%
DOE	100,000,000	16
Participant	512,480,000	84

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 will 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 will be removed that would otherwise contribute to contamination of watersheds through leaching of minerals and acid water formation. In the conversion 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 (H₂), carbonyl sulfide (COS), and hydrogen sulfide (H₂S). This raw synthesis gas is cleaned in a patented Rectisol™ process, which removes nearly all of the COS and H₂S. Clean synthesis gas (CO and H₂) is either shifted by the addition of steam to carbon dioxide (CO₂) and H₂ 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.

Project Duration <i>TBD</i>	Period of Operation <i>TBD</i>	Status/Schedule *Estimated date
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Benefits

This project addresses a long-standing environmental issue associated with vast abandoned coal waste piles while providing a sorely needed alternative source of high-grade, ultra-clean transportation fuels. Well over a billion tons of coal waste resides in Pennsylvania, Illinois, West Virginia, and Ohio. With successful demonstration of project technologies, coal waste that has threatened major watersheds may become low-cost feedstock to help fuel our nation’s transportation fleet and contribute to energy independence. This project will process about one million tons per year of coal waste materials from the Gilberton site. If successful, this technology could be applied in many regions of the country where coal wastes currently are stockpiled, and significantly reduce waste disposal activities from operating coal mines. The FT transportation fuels produced 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, particulate matter, 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 CO₂ streams concentrated. If successful, this project is of sufficient scale to reduce technical, business, and financial risks, clearing the way for subsequent applications.

Status/Accomplishments

This project was selected for award on January 8, 2003. Negotiations are proceeding toward award of a cooperative agreement. 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 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, PA and on January 10, 2006, in Pottsville, PA.

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S T A T U S	R e p o r t	<i>Final Report Issued</i>	<i>TBD</i>
		<i>Draft Report Issued</i>	<i>TBD</i>
		<i>Operation Completed</i>	<i>TBD</i>
	O p e r a t i o n		
		<i>Operation</i>	<i>TBD</i>
	C o n s t r u c t i o n		
		<i>Construction</i>	<i>TBD</i>
	D e s i g n		
		<i>Award</i>	<i>TBD</i>
	P r e A w a r d		
	<i>Selection</i>	<i>1/03</i>	

Increasing Power Plant Efficiency – Lignite Fuel Enhancement

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

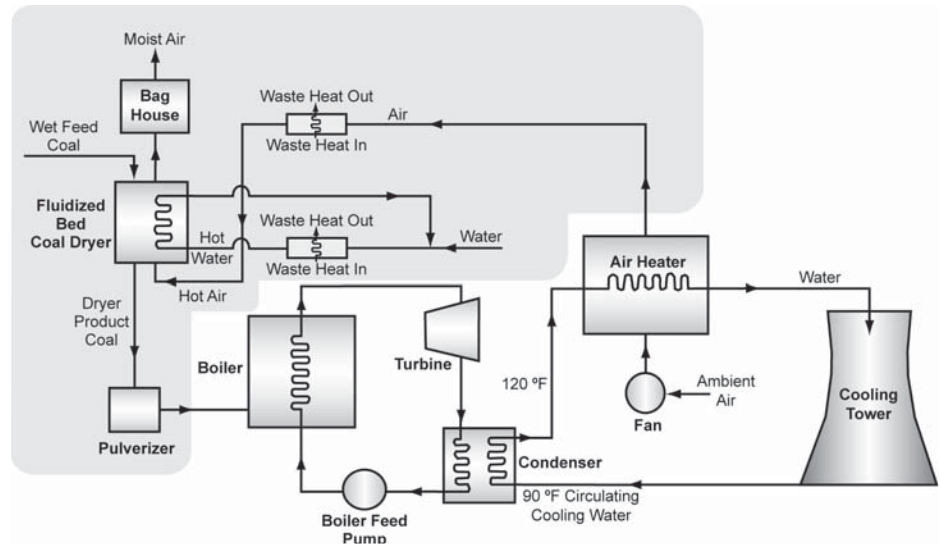
Total	\$31,512,215	100%
DOE	13,518,737	43
Participant	17,993,478	57

CCPI-1

Clean Coal Fuels

Upgrading

Conversion



Objectives

To demonstrate a 25 percent reduction in lignite moisture content (e.g., from 40 percent moisture 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, and 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,

Project Duration 54 Months	Period of Operation 8 Months	Status/Schedule
		*Estimated date

and thereby reduces emissions of carbon dioxide (CO₂), mercury, nitrogen oxides (NO_x), sulfur dioxide (SO₂), 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_x, NO_x, and CO₂, there is also potential for mercury reduction. When the heavy components of lignite fallout 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. The fabrication of the first two full-scale dryers is scheduled for completion in fall 2007. A total of four full-scale dryers are planned for the demonstration.

Outside the scope of the DOE CCPI project, GRE is planning to install coal dryers on another 546-MW unit at the Coal Creek Station with its own funds.

R e p o r t	<i>Final Report Issued</i>	6/09*	
	<i>Draft Report Issued</i>	3/09*	
O p e r a t i o n	<i>Operation Completed</i>	12/08*	
	<i>Operation</i>	4/08*	
S T A T U S	C o n s t r u c t i o n	<i>Construction</i>	6/07
		<i>Award</i>	7/04
P r e A w a r d	D e s i g n	<i>NEPA Completed (EA and FONSI)</i>	1/04
		<i>Selection</i>	1/03

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Industrial Applications

Advanced Multi-Product Coal Utilization By-Product Processing Plant

Project Withdrawn

Participant

University of Kentucky Research Foundation Center for Applied Energy Research (CAER)

Additional Team Members

Kentucky Utilities (a subsidiary of LG&E Corporation) — host

Location

Ghent, Carroll County, KY (Kentucky Utilities' Ghent Power Station)

Technology

CAER's hydraulic classification and froth flotation beneficiation process (Fast Float™)

Project Capacity/Production

197,500 tons/yr of high quality marketable products from coal ash

Coal

Pittsburgh bituminous

Project Funding

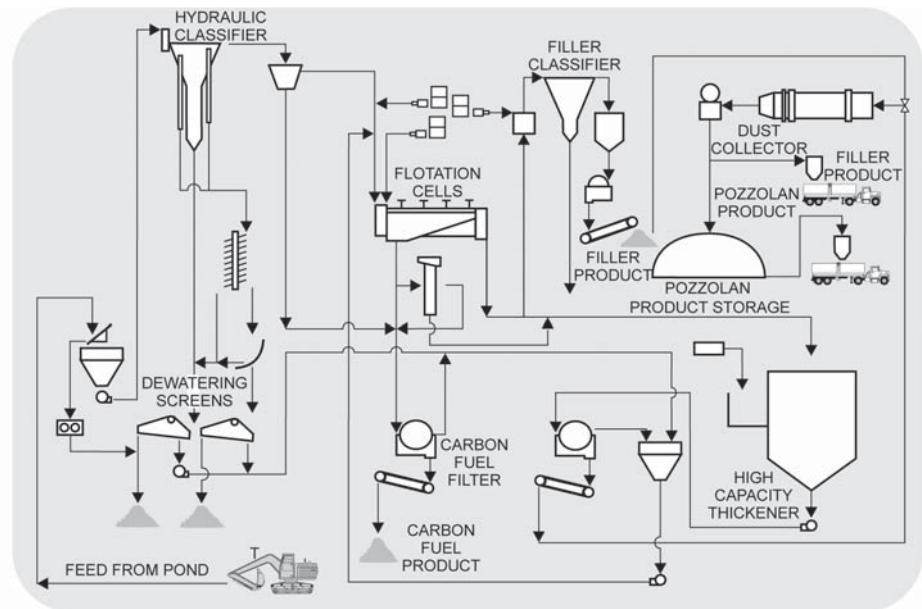
Total	\$1,245,305	100%
DOE	621,407	50
Participant	623,898	50

CCPI-1

Industrial Applications

Direct Coal Use

By-Product Use



Objective

To demonstrate that the coal utilization by-product (CUB) beneficiation process developed by the University of Kentucky Research Foundation's Center for Applied Energy Research (CAER) can convert nearly the entire CUB produced by the Ghent Power Station into a variety of useful products, including:

- 156,000 tons/yr of high-quality, cementious pozzolan;
- 16,000 tons/yr of high-grade, lightweight aggregate;
- 16,000 tons/yr of graded fill sand;
- 1,500 tons/yr of high-quality, polymeric fill; and
- 8,000 tons/yr of recycled carbon fuel.

Technology/Project Description

The project will utilize the CAER beneficiation process technology that is based on hydraulic classification and froth flotation (Fast Float™). Raw coal ash feed will be reclaimed from the Ghent Power Station's ash storage ponds. The feed enters a hydraulic classifier where material is separated into two basic sizes — a -200 mesh fine size and a +200 mesh coarse size. Coarse materials enter spiral concentrators that classify (separate by size and weight) and concentrate the incoming material into a lightweight aggregate suitable for masonry block, graded fill sand, and a coarse carbon fuel. The -200 mesh fine material is treated with a patented reagent before entering froth flotation cells where fine carbon is separated, leaving a stream of pozzolan material. The bulk of the pozzolan stream is subsequently concentrated and dried to produce a high-quality substitute for Portland cement. A fraction of the pozzolan stream is further processed hydraulically to produce a 9- to 4-micron size material for use as a polymer additive or other filler applications.

Project Duration 29 Months	Period of Operation <i>Project Withdrawn</i>	Status/Schedule *Estimated date
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Benefits

Each year the U.S. electric utility industry generates about 100 million tons of CUB, including flyash, scrubber sludge, and bottom ash. Currently, less than one-third of these waste products are used. The remainder is disposed of in impoundments or in landfills. Greater reuse of CUB can offset future land use and minimize the production of greenhouse gases. Portland cement manufacturing releases approximately one ton of carbon dioxide per ton of cement produced, equating to an annual emission rate of approximately 47 million tons. The CAER beneficiation process produces a high-quality pozzolan that can be used at higher cement substitution levels in concrete (i.e., 30 percent versus 20 percent). The demonstration project alone is targeted to produce 156,000 tons/yr of high-quality pozzolan. This increased utilization rate represents a significant greenhouse gas avoidance potential.

Status/Accomplishments

The National Environmental Policy Act (NEPA) requirement was met with an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) in November 2004. The project was awarded a cooperative agreement in November 2004.

Ash pond core sampling, analysis, and mapping have been completed. Results indicate the pond volume exceeds 200 million cubic feet and contains more than seven million tons of ash. In May 2005, it was decided that the demonstration project will be fed entirely from the ash pond as opposed to directly from the power station.

A mobile field system was operated at Ghent to evaluate unit processing configurations and to process about 140 tons of material for product evaluation. CAER conducted parametric tests on the primary and secondary classifiers, and evaluated a series of retention times and dispersant dosages on the secondary classifier to produce an ultra-fine ash product.

In November 2006, a financial and commercialization partner decided not to continue participation in the project. CAER sought other potential partners; however, none was willing to commit to the funding necessary for the project to proceed. CAER withdrew from the project in March 2007.

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S T A T U S	R e p o r t	<i>Final Report Issued</i>	<i>4/07</i>
		<i>Draft Report Issued</i>	<i>N/A</i>
		<i>Operation Completed</i>	<i>N/A</i>
	O p e r a t i o n		
		<i>Operation</i>	<i>N/A</i>
	C o n s t r u c t i o n		
		<i>Construction</i>	<i>N/A</i>
	D e s i g n		
		<i>Withdrawn</i>	<i>3/07</i>
		<i>Award NEPA Completed (EA and FONSI)</i>	<i>11/04</i> <i>11/04</i>
P r e A w a r d			
	<i>Selection</i>	<i>1/03</i>	

Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash
Demonstration Operations Complete

Participant

Universal Aggregates, LLC (UA)

Additional Team Members

P.J. Dick, Inc. — project management and construction

SynAggs, LLC — marketing

Location

King George County, VA
 (Birchwood Power Facility)

Technology

Universal Aggregate’s manufacturing process for conversion of spray dryer ash (SDA) into construction-grade aggregate

Plant Capacity/Production

167,000 tons/year of lightweight aggregate

Coal

Bituminous, 0.9% sulfur

Project Funding

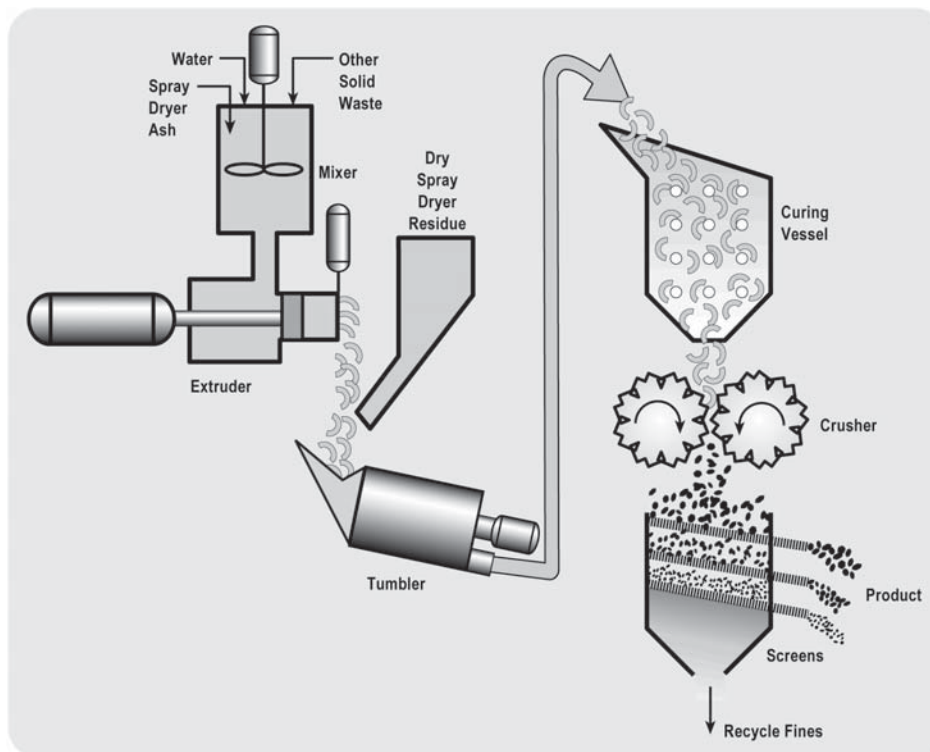
Total	\$19,581,734	100%
DOE	7,224,000	37
Participant	12,357,734	63

PPII

Industrial Applications

Direct Coal Use

By-Product Use



Objectives

To demonstrate conversion of 115,000 tons/year of spray dryer ash (SDA) into 167,000 tons/year of lightweight aggregate, meeting or exceeding American Society for Testing and Materials (ASTM) specifications for commercial construction-grade products, such as masonry blocks or lightweight concrete.

Technology/Project Description

The project demonstrates conversion of SDA and other solid wastes from the 250-MW Birchwood Power Facility into construction-grade lightweight aggregate applicable to masonry block, lightweight concrete, or asphalt paving material. In the process, residue from the spray dryer and other solid wastes from the power plant are blended with water in a mixer (pug mill) to produce a uniform granular material. The loose, moist material then is fed to an extruder that intensifies mixing by shearing the material as it is forced through holes in a metal die, forming wet “green” pellets. The green pellets are tumbled with additional dry SDA residue, embedding the residue into the pellets. The pellets are dried and hardened in a curing vessel specially designed to allow the solids to flow continuously, avoiding choke points and impediments that could hang up the material. After curing, the hardened pellets are crushed and screened to specification, then stockpiled for sale as manufactured aggregates. Once the goal of consistent operation is achieved, the Universal Aggregates manufacturing process at the Birchwood Power Facility will produce 167,000 tons of aggregate a year.

Project Duration 50 Months	Period of Operation 31 Months	Status/Schedule
		*Estimated date

Benefits

As new environmental standards take effect, power companies are expected to install more scrubbers, including spray dryer technology like that applied at the Birchwood Power Facility. While air quality will improve, scrubber waste tonnage inevitably will increase, placing greater burdens on landfills and increasing waste disposal costs. Of the 28 million tons of scrubber residue produced annually by coal-fired plants, only about 30 percent is reused and most of that is from wet scrubbers. Providing the means to convert dry scrubber residue to saleable by-products is deemed crucial by many in the power industry who believe that, as additional scrubbing is required, dry scrubbers will be the technology of choice. There currently are 21 spray dryer facilities operating in the United States that produce an adequate amount of spray dryer residue to economically justify the installation of a lightweight aggregate manufacturing facility. The construction aggregate market in the United States is estimated to be about two billion tons annually.

Status/Accomplishments

The National Environmental Policy Act (NEPA) requirement was met with an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) on October 1, 2002. On November 14, 2002, a cooperative agreement was awarded. Construction began in March 2003, and the plant was completed in March 2004. Operation was completed in December 2006. The final report was submitted in September 2007 and was accepted with minor changes.

S T A T U S	R e p o r t	<i>Final Report Issued</i>	9/07*
		<i>Draft Report Issued</i>	3/07
		<i>Operation Completed</i>	12/06
	O p e r a t i o n		
		<i>Operation</i>	4/04
	C o n s t r u c t i o n		
		<i>Construction</i>	3/03
	D e s i g n		
		<i>Award</i>	11/02
	P r e A w a r d	<i>NEPA Completed (EA and FONSI)</i>	10/02
	<i>Selection</i>	9/01	

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Results Summary

Since startup operation began, Universal Aggregates demonstrated that the process successfully operates by producing over 1,000 tons of manufactured lightweight aggregates from December 2004 to March 2005. The aggregates were produced with the design size gradation and bulk density. The aggregates were sold to Versalite Sales Inc. of Midlothian, Virginia, and used successfully by a Maryland masonry producer in production of concrete masonry units. The milestone of 24 hours continuous operation requested by the Department of Energy (DOE) was achieved on December 12 and 13, 2005. However, most of the production was at low capacity factors and for relatively short time periods in 2005.

The objective to achieve complete material balance for continuous aggregate production was not achieved during the project demonstration period, which ended in December 2006. A single-shaft pug mill was used in mixing during the project demonstration. A double-shaft pug mill was designed and installed for operation to enhance mixing in February 2007. Aggregate production increased to about 5,200 tons in March 2007. Currently, the demonstration plant operates at 50–60 percent design capacity on a daily basis after instal-

lation of the double shaft pug mill and additional process and equipment enhancements. Additional equipment modifications and upgrades are continuing to improve operating capacity.

Operational

- Startup of the facility was undertaken in April 2004, and continuous extrusion operation was obtained in July and then again in September 2004. The curing vessel was initially charged with green extrudants in October 2004, and again in December 2004.
- The process demonstrated the large-scale integrated operation of mixing, extrusion, curing, crushing, and screening, and incorporates automatic programmable logic controls, process trending, and data recording to produce lightweight aggregate.
- The demonstration worked through many challenges during the startup period including, but not limited to:
 - inexperienced staff;
 - construction bugs;
 - process control problems;
 - material handling difficulties; and
 - ash quality issues.
- Production rates were lower than design capacity, mainly due to free flow problem of the aerated SDA at relatively high throughput, resulting in extruder operation problems.

Environmental

- Environmental benefits from use of this technology include:
 - reduction of landfilling of FGD waste products;
 - reduction in environmental impacts of mining clay/shale for lightweight aggregate; and
 - reduction in environmental impacts of creating voids in the expanded clay/shale by the fossil fuel-intensive process typically used in conventional lightweight aggregate production.
- The facility applied for, received, and complied with all stormwater and wastewater permits.
- The facility used best management practice, a “Fugitive Dust Action Plan,” and many design features to protect against potential fugitive dust emissions.

Economic

- The manufactured aggregate process successfully demonstrated that aggregates can be commercially produced from SDA.
- The original, total project cost was estimated at \$19,581,734.00, and was scheduled for a 30-month period, including startup. Three time extensions were provided to the project with no adjustment to the financial contribution of DOE. Universal Aggregates used the three time extensions for plant startup, equipment modifications, and plant operations. All additional costs were borne by Universal Aggregates to achieve commercial production.
- The projected economic performance estimates indicate that the demonstration project must operate at, or very near, full production ca-



capacity to experience a positive, net cash flow. Future operating experience will be required to normalize operating and maintenance costs that were not normalized during the demonstration due to inconsistent, less-than-full-load operation.

- Application of this technology may be extended to other coal combustion by-products including wet FGD and fluidized-bed combustion (FBC) materials at utility power plants, if shown to be economically feasible.
- Costs for any subsequent plants must be derived on a site-by-site basis. Although installed capital costs and operating costs could be factored from current experience for modeling purposes, firm prices for capital equipment, construction, materials, engineering, and permits would be required for any subsequent plant installation. Cost analyses also would require a good understanding of the regional product market and complete income structure.

Project Summary

Universal Aggregates' proposal was selected by DOE through the Power Plant Improvement Initiative Program to design, construct, and operate a lightweight aggregate manufacturing plant at the Birchwood Power Facility in King George, Virginia in September 2001. A cooperative agreement was signed in November 2002. The installation and startup expenses for the Birchwood Aggregate Facility were \$19.6 million. The DOE share was \$7.2 million (37 percent) and the Universal Aggregates share was \$12.4 million (63 percent). The original project team consisted of Universal Aggregates, SynAggs, LLC, CONSOL Energy Inc., and P. J. Dick, Inc. The purpose of the project was to demonstrate conversion of 115,000 tons

per year of SDA, a dry FGD by-product from the power station, to produce 167,000 tons of manufactured lightweight aggregate to be used in production of concrete masonry units (CMU). Manufacturing aggregate from FGD by-products can provide an economical high-volume use and substantially expand market for FGD by-products. Most of the FGD by-products currently are disposed of in landfills.

Construction of the Birchwood Aggregate Facility was completed in March 2004. Operation startup began in April 2004. Plant Integration was initiated in December 2004. Integration included mixing, extrusion, curing, crushing, and screening. Lightweight aggregates with proper size gradation and bulk density were produced from the manufacturing aggregate plant and loaded on a stockpile for shipment. The shipped aggregates were used in a commercial block plant for CMU production. However, most of the production was made at low capacity factors and for a relatively short time in 2005. Several areas were identified as important factors to improve plant capacity and availability. Equipment and process control modifications and curing vessel cleanup were made to improve plant operation in the first half of 2006. About 3,000 tons of crushed aggregate were produced in August 2006. Currently, the plant is operating at 50–60 percent design capacity on a daily basis. Universal Aggregates is continuing to work to improve plant availability and throughput capacity, and to produce quality lightweight aggregate for use in commercial applications.



Western Greenbrier Co-Production Demonstration Project

Participant

Western Greenbrier Co-Generation (WGC), LLC

Additional Team Members

Alstom Power, Inc. — technology supplier

ENERFAB — 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

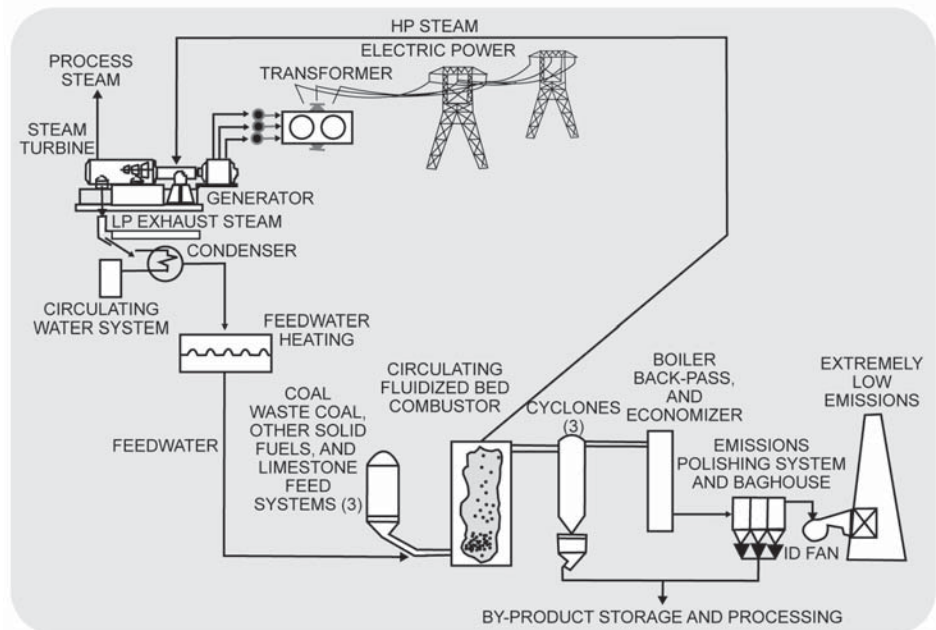
Total	\$214,983,758	100%
DOE	107,491,879	50
Participant	107,491,879	50

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 applies 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 can be generated. Initially, about 10 percent of the ash generated will be used to produce a salable by-product, and about 800 tons/day will be used for remediation of acid water formation. The CFB power plant will be an anchor tenant in a planned, environmentally balanced industrial park (Eco-Park). The advanced CFB incorporates 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. 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 as-

Project Duration 80 Months	Period of Operation 11 Months	Status/Schedule *Estimated date
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sists 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 is a model of industrial ecology at its best, 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 contaminates streams and rivers. Successful integration of project technologies and approaches can serve as a model for regions around the world interested in remediation of similar refuse sites.

Status/Accomplishments

On April 29, 2004, the project was awarded a cooperative agreement. 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. On January 4, 2007, a public hearing was held in Crawley, West Virginia, to gather input on the Draft Environmental Impact Statement (EIS). The Final EIS is expected to be released in October 2007. A Record of Decision is expected in late 2007.

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.

Western Greenbrier (WGC) is currently working to finalize the project agreements for product sales, financing, construction, and plant operations. Construction and equipment costs have increased substantially since the project was awarded.

S T A T U S	R e p o r t	<i>Final Report Issued</i>	5/11*
		<i>Draft Report Issued</i>	3/11*
		<i>Operation Completed</i>	12/10*
	O p e r a t i o n		
		<i>Operation</i>	2/10*
	C o n s t r u c t i o n		
		<i>Construction</i>	11/07*
	D e s i g n		
		<i>Award</i>	4/04
	P r e A w a r d		
		<i>NEPA Launched</i>	6/03
		<i>Selection</i>	1/03

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

CCTDP Historical Perspective

There were a number of key events that prompted 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 (SO₂) and nitrogen oxides (NO_x). 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 was asked to examine 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 SO₂ and NO_x 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_x is a precursor to ozone formation, the presence of NO_x in ozone nonattainment areas, even at low levels, became an issue. This precipitated action in the CCTDP to include technologies capable of deep NO_x 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 21st century. The CAAA, however, capped SO₂ emissions at year 2000 levels, and NO_x 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 (CO₂) 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 CO₂ 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 SO₂, NO_x, 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 demonstration projects. Of the total ap-

propriated 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. The Secretary of Energy stated that the Department would ask 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. This request was made by the President on April 4, 1987.

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

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)

Public Law	Date Enacted	CCTDP Round	Program Funding	Implementation Provisions
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)

Public Law	Date Enacted	CCTDP Round	Program Funding	Implementation Provisions
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 ^a	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 ^b	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 priors, \$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 the 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 the funds made available for obligation in prior years, \$87,000,000 was deferred.	
108-108	11/10/03		Of the funds made available for obligation in prior years, \$97,000,000 was deferred and \$88,000,000 rescinded.	
108-447	12/8/04		Of the 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.	

^a H.R. 3019, which became Pub. L. 104-134, replaced H.R. 1977.

^b H.R. 3610, which became Pub. L. 104-208, replaced H.R. 3662.

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.

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 110-5, deferred the availability of \$257 million of previously appropriated funds until October 1, 2007.

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 imple-

mentation. At the end of this appendix are funding provisions excerpted from appropriations and other relevant funding-related acts.

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 include 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.

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.	

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 mat-

ter, 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.

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.

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. 7651n, 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

Public Law	Date Enacted	Program Funding	Implementation Provisions
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.

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 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 research, development, and demonstration 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. 7651n, 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 108-108 Congress 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 Public Law 110-5, an additional \$60.4 million was made available for 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.

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 requirements 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 pursuant 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 head 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 \$1,885,172,000. 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 pursu-

ant 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 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. 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 technol-

ogy 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 \$14,400,00 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 Appropriations 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, without 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.



Appendix B. CCTDP Financial History

This appendix provides predominately historical funding and cost information on the CCTDP. As of September 30, 2007, there were 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.

Exhibit B-1						
CCTDP Project Costs and Cost-Sharing for Successfully Completed Projects						
(Dollars in Thousands)						
	Total Project Costs	%	Cost-Share Dollars		Cost-Share Percent	
			DOE^b	Participants	DOE	Participants
Subprogram						
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 ^a	3,252,110	100	1,300,376	1,951,734	40	60
Application Category						
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 ^a	3,252,110	100	1,300,376	1,951,734	40	60

^a Totals may not add up to the total figure shown due to rounding.
^b DOE share does not include \$155,229,000 obligated for withdrawn projects and audit expenses.

Exhibit B-2					
Relationship Between Appropriations and Subprogram Budgets					
(Dollars in Thousands)					
Appropriation Enacted	Subprogram	Adjusted Appropriations	SBIR & STTR Budgets^a	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	453,298	6,906	22,548	423,844
P.L. 101-121 ^b	CCTDP-IV	331,990	7,065	24,990	299,935
P.L. 101-121 ^b	CCTDP-V	429,934	5,427	25,000	399,507
Total		2,069,598	31,081	249,817	1,788,700

^a Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.
^b 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, and 110-5.

Exhibit B-3
Annual CCTDP Funding by Appropriations and Subprogram Budgets

(Dollars in Thousands)

Fiscal Year	1986-98	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total ^d
Adjusted Appropriations^a												
P.L. 99-190	380,600				15,000							380,600
P.L. 100-202	473,997	(40,163)	9,962	14,980	(33,700)		(185,000)	97,000				473,776
P.L. 100-446	574,998		(156,000)	156,000	(33,700)							453,298
P.L. 101-121 ^b	427,000			(162,000)	26,990	(47,000)	87,000					331,990
P.L. 101-121 ^b	449,934							(257,000)	(20,000)		257,000	429,934
Total	2,306,529	(40,163)	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	257,000	2,069,598
Subprogram Budgets												
CCTDP-I Projects	303,231	(14,900)	(14,400)	(14,000)	(14,000)	(15,000)						230,931
CCTDP-II Projects	434,704	(40,163)	9,962	14,980	15,000							434,483
CCTDP-III Projects	545,544		(156,000)	156,000	(33,700)		(185,000)	97,000				423,844
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)		257,000	399,507
Projects Subtotal	2,097,921	(55,063)	(160,438)	(5,020)	(5,700)	(62,000)	(98,000)	(160,000)	(20,000)	0	257,000	1,788,700
Program Direction	177,527	14,900	14,400	14,000	13,990	15,000						249,817
Fossil Energy Subtotal	2,275,448	(40,163)	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	257,000	2,038,517
SBIR & STTR ^c	31,081											31,081
Total ^d	2,306,529	(40,163)	(146,038)	8,980	8,290	(47,000)	(98,000)	(160,000)	(20,000)	0	257,000	2,069,598

^a Shown are appropriations less amounts sequestered under the Gramm-Rudman-Hollings Deficit Reduction Act.

^b 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, and 110-5.

^c Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.

^d Totals may not appear to add due to rounding.

Exhibit B-4 presents the financial activity of the CCTDP by fiscal year through September 30, 2007. SBIR and STTR funds are not included in Exhibit B-4 as these funds are tracked separately from the CCTDP. The negative Budget Authority values shown in Exhibit B-4 result from the rescission or deferral of funds as required by the annual appropriations bills. The negative obligations in FY03 resulted from the ending of two large projects. Unused funds that were committed to these projects were deobligated and made available for other purposes.

Exhibit B-5 shows the financial status of the CCTDP through September 30, 2007, by subprogram. SBIR and STTR funds are included in this exhibit to account for all funding.

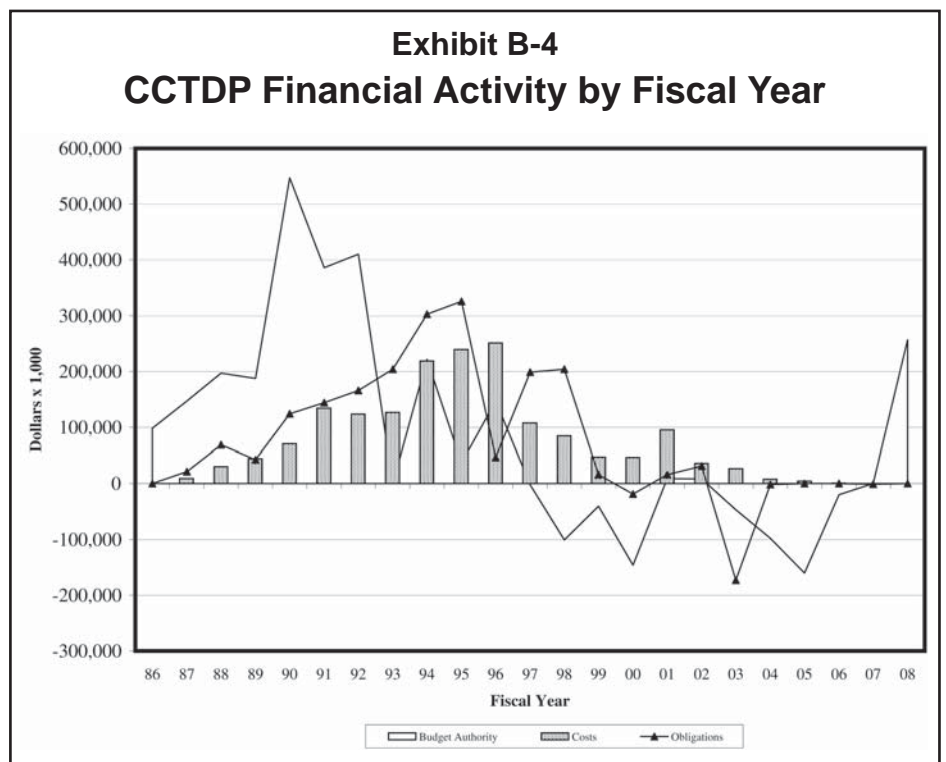


Exhibit B-5
Financial Status of the CCTDP as of September 30, 2007
(Dollars in Thousands)

Subprogram	Appropriations Allocated to Subprogram ^b	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	423,844	423,844	506,012	506,012	506,012
CCTDP-IV	299,935	299,935	476,770	476,770	476,770
CCTDP-V	399,507	142,507	50,440	50,440	50,440
Projects Subtotal	1,788,700	1,531,700	1,455,605	1,455,605	1,455,605
SBIR & STTR ^a	31,081	31,081	31,081	31,081	31,081
Program Direction	249,817	249,817	249,817	249,817	249,374
Total	2,069,598	1,812,598	1,736,503	1,736,503	1,736,060

^aSmall Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs.
^bTotals may not appear to add up to the total figure shown due to rounding.

Exhibit B-6 indicates the apportionment sequence as modified by Public Law 110-5. These values represent the amount of budget authority available for the CCTDP.

Exhibit B-6 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	257,000	2,069,598

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) and associated regulations promulgated by the Council for 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 possible documents that serve as 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

Project	NEPA Action	Status
PPII		
Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash	EA	FONSI issued 10/2/02
Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector (Advanced Hybrid™) Technology	EA	FONSI issued 6/11/02
Greenidge Multi-Pollutant Control Project	EA	FONSI issued 12/3/04
CCPI-1		
Advanced Multi-Product Coal Utilization By-Product Processing Plant	EA	FONSI issued 10/12/04
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	In process
Increasing Power Plant Efficiency – Lignite Fuel Enhancement	EA	FONSI issued 1/6/04
TOXCON 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	In process
CCPI-2		
Demonstration of a 285-MWe Coal-Based Transport Gasifier	EIS	ROD issued 4/7/06
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	CCTDP	Clean Coal Technology Demonstration Program	EIA	U.S. Energy Information Administration
°C	degrees Celsius	CCTDP-I	First CCTDP solicitation	EIS	Environmental Impact Statement
°F	degrees Fahrenheit	CCTDP-II	Second CCTDP solicitation	EIV	Environmental Information Volume
\$	dollars (U.S.)	CCTDP-III	Third CCTDP solicitation	EPA	U.S. Environmental Protection Agency
\$/kW	dollars per kilowatt	CCTDP-IV	Fourth CCTDP solicitation	EPAct	Energy Policy Act
\$/ton	dollars per ton	CCTDP-V	Fifth CCTDP solicitation	EPRI	Electric Power Research Institute
%	percent	CCPI	Clean Coal Power Initiative	ESP	electrostatic precipitator
®	registered trademark	CCPI-1	First CCPI solicitation	FBC	fluidized-bed combustion
™	trademark	CCPI-2	Second CCPI solicitation	FD	forced draft
ACFB	atmospheric circulating fluidized-bed	CCPI-3	Third CCPI solicitation	FE	Office of Fossil Energy
ACFM	actual cubic feet per minute	CD-ROM	Compact disk-read only memory	FFDC	Fabric filter dust collector
A/E	architect/engineering	CDS	circulating dry scrubber	FGD	flue gas desulfurization
AFBC	atmospheric fluidized-bed combustion	CEM	continuous emissions monitor	FONSI	finding of no significant impact
AHPC	Advanced Hybrid Particulate Collector	CEQ	Council on Environmental Quality	FSQ	full-slurry quench
AI	artificial intelligence	CFB	circulating fluidized-bed	ft, ft ² , ft ³	foot (feet), square feet, cubic feet
APH	air preheater	CFBDS	circulating fluidized-bed dry scrubber	FT	Fischer-Tropsch
API	application programming interface	CFR	Code of Federal Regulations	FY	fiscal year
ASTM	American Society of Testing Materials	CO	carbon monoxide	gal	gallon(s)
atm	atmosphere(s)	CO ₂	carbon dioxide	gal/ft ³	gallons per cubic foot
avg.	average	COS	carbonyl sulfide	GHG	greenhouse gases
B&W	The Babcock & Wilcox Company	CSC	convective syngas cooler	gob	coal waste used as a fuel
BOP	balance of plant	CUB	coal utilization by-product(s)	gpm	gallons per minute
BSA	by-product storage area	CX	Categorical Exclusion	gr	grains
Btu(s)	British thermal unit(s)	DEP	Department of Environmental Protection	GRE	Great River Energy
Btu/kWh	British thermal units per kilowatt-hour	DOE	U.S. Department of Energy	GW	gigawatt(s)
CAAA	Clean Air Act Amendments of 1990	DOE/HQ	U.S. Department of Energy Headquarters	GWe	gigawatt(s)-electric
CAER	Center for Applied Energy Research	DSE	dust stabilization enhancement	H ₂	molecular hydrogen
CAIR	Clean Air Interstate Rule	EA	Environmental Assessment	H ₂ S	hydrogen sulfide
CAMR	Clean Air Mercury Rule			H ₂ SO ₄	sulfuric acid
CCT	clean coal technology			HAPs	hazardous air pollutants
				HCl	hydrogen chloride
				HF	hydrofluoric acid

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

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

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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C

Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash *ES-5, 2-3, 3-1, 3-7, 3-8, 3-10, 3-40-3-43, C-2*

CONSOL Energy, Inc. *ES-5, 3-7, 3-8, 3-9, 3-18-3-19, 3-43*

D

Demonstration of a 285-MWe Coal-Based Transport Gasifier *ES-5, 2-5, 3-7, 3-8, 3-10, 3-26-3-27, C-2*

Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector Technology *ES-5, 2-3, 3-1, 3-7, 3-8, 3-10, 3-12-3-15, C-2*

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Excelsior Energy, Inc. *3-28-3-29*

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