

# CoalFleet for Tomorrow - Future Coal Generation Options - Program 66

## Program Overview

### Program Description

Around the world, electricity is largely produced from fossil fuels, and coal is often the predominant fuel choice. In North America, Australia, and parts of Europe, Asia, and Africa, coal-fired power plants supply more than half of the electricity consumed. However, as public concern over the environmental impacts of coal-based generation increases, new technologies and practices to improve plant efficiency and reduce emissions of air pollutants and greenhouse gases are of interest. If cost-effective, reliable, and highly efficient new coal plant designs with near-zero emissions and CO<sub>2</sub> capture were available to the industry, coal could be kept in the generation mix to constrain expected increases in electricity and natural gas prices.

The Electric Power Research Institute's (EPRI's) CoalFleet for Tomorrow program (Program 66) targets the technical, economic, and institutional challenges to making highly efficient, near-zero-emission coal plants with CO<sub>2</sub> capture a prudent and practical investment option.

### Research Value

The program focuses on deploying a portfolio of advanced coal technologies, including integrated gasification combined-cycle (IGCC), ultra-supercritical pulverized coal (USC PC), circulating fluidized-bed combustion (CFBC), and oxygen (rather than air) combustion for PC and CFBC units. The program's R&D:

- Ensures that cost-effective, reliable, and highly efficient new coal plant designs with near-zero emissions and CO<sub>2</sub> capture are available to industry
- Provides timely and accurate engineering and economic information about advanced coal technologies to support generators' decisionmaking processes
- Cuts costs for advanced coal technology feasibility study and preliminary engineering by 30–50% by providing guidance from world-class experts and reference plant designs that can be used as a starting point
- Shortens the IGCC project development cycle, increases reliability, and reduces plant capital costs through design sensitivity studies, development of design guidelines, and promotion of standard designs incorporating various levels of capture
- Shortens the USC PC and CFBC project development cycle and reduces capital costs through technology design studies, state-of-the-art environmental controls information, informed materials selection analyses, and CO<sub>2</sub> capture convertibility assessments
- Shortens the development time for promising CO<sub>2</sub> capture technologies (post-, pre-, and oxy-combustion) through the co-sponsoring support of the DOE's "plug and play" pilot and sub-pilot-plant-scale testing facility.

### Approach

Working with advanced coal power project owners and developers, power industry equipment and service suppliers, and independent world-class experts, this program develops evaluation tools and technologies to help guide the design of innovative coal plant systems that manage cost and risk. EPRI works with DOE, the Coal Utilization Research Council, and numerous international organizations to include technology and information from public and private sources in coordinating advanced coal research, development, and demonstration.

- Engineering and economic evaluations and market assessments of advanced coal generation options help power generators screen technology options and conduct feasibility studies that assess the economics, operating performance, and technological risks of advanced coal generation technologies, both gasification- and combustion-based.

- Gasification-based power plant development and deployment support provides detailed engineering requirements and costs for IGCC plants with CO<sub>2</sub> capture. This project set emphasizes frequent technical status reports, feedback from IGCC projects that are in development, design specification guidelines, online information libraries, industry expert advisory groups, training tools, and a dedicated public-private, pilot-scale, pre-combustion capture test facility.
- Combustion-based power plant development and deployment support (USC PC and supercritical CFBC) concentrates on the full range of solutions, including fundamental work such as qualification of stronger, more corrosion-resistant materials to allow boilers and steam turbines to operate at higher temperatures and raise generating efficiency. Design guidelines and online information libraries reduce the risk of building USC PC and supercritical CFBC plants, as well as combustion in an oxygen/CO<sub>2</sub> mixture instead of air (oxy-combustion).

## Accomplishments

Research program deliverables are targeted to support organizations considering the deployment of advanced coal power generation technology either now or in the future. For example:

- Design guidelines for new advanced PC, IGCC, and oxy-combustion units, and permitting guidelines/data are used by generators, suppliers, and engineering, procurement, and construction (EPC) companies for plant design.
- Engineering and economic information are used by industry to support its coal technology evaluations.
- Congressional testimony provides guidance on technical objectives and levels of research, development, and demonstration funding needed for coal-power CO<sub>2</sub> capture and storage technology.
- Vital laboratory and in-service test data support qualification of high-temperature boiler and steam turbine materials for USC steam conditions of up to 760°C (1400°F).
- CoalFleet has invested more than \$3 million in the development of its IGCC User Design Basis Specification, the most comprehensive compilation on IGCC state-of-the-art and lessons learned available anywhere. The 1100-page document covers all aspects of IGCC design including feedstock choice, environmental and safety issues, and designing for reliable operation and maintenance.
- EPRI experts helped Duke assess the cost and performance impact of adding various levels of CO<sub>2</sub> capture to its Edwardsport IGCC design.
- CoalFleet staff helped five members define the scope of CO<sub>2</sub> capture and storage projects that could qualify for the U.S. Clean Coal Power Initiative or the U.K. government's post-combustion capture demonstration competition.
- CoalFleet's Outreach Communication initiative has produced a series of public documents for educating stakeholders, including a concise 72-page summary of the status of CO<sub>2</sub> capture and storage technology.
- CoalFleet has invested more than \$2 million in the development of its Guideline for Advanced Pulverized Coal Power Plants. Drawing on EPRI's wide knowledge base related to coal plants, the guideline compiles all the information a new plant buyer must know before deciding what to build.

## Current Year Activities

The program R&D for 2010 will focus on improving the economics of new coal power plants with CO<sub>2</sub> capture and storage. Specific efforts will include:

- Updated engineering-economic evaluations and assessments of market trends and commercial technology offerings
- Enhanced design guidelines and generic specifications for IGCC and advanced combustion-based technologies
- Reference libraries (knowledge bases), including permitting information, available on [www.epri.com](http://www.epri.com) for technology assessment and for IGCC and combustion-based plant design support
- Support to members evaluating or developing new IGCC and advanced PC units from world-class expert teams of EPRI staff and uniquely qualified consultants
- Pilot research and test results for pre-combustion and oxy-combustion capture of CO<sub>2</sub> and auxiliary components

- Vital laboratory and in-service test data to support qualification of USC boiler and steam turbine materials
- Optimized designs of advanced coal power plants integrated with CO<sub>2</sub> capture and compression processes

### Estimated 2010 Program Funding

\$7.5M

### Program Manager

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## Summary of Projects

### PS66A Engineering and Economic Evaluations and Market Assessments of Advanced Coal Generation Options (062001)

#### Project Set Description

This project set helps power generators screen technology options and conduct feasibility studies that assess the economics, operating performance, and technological risks of advanced coal generation technologies, both gasification- and combustion-based. Participants receive information about the economic risks and benefits of various advanced coal investment options in light of government incentives and future scenarios for CO<sub>2</sub> emissions constraints. Participants also receive information about risks and opportunities for coal technologies arising from shifts in capacity requirements and fuel markets in the United States and internationally.

Project Number	Project Title	Description
P66.001	Advanced Coal Technologies Knowledge Base; Assessment of Economics, Experience, and Markets	This project helps power generators understand the technical and financial risks of advanced coal investments.
P66.002	Analysis of Advanced Coal Plant Deployment Options and Government Initiatives	This project provides concise summaries of legislative initiatives and background documents to inform the public, stakeholders and decisionmakers about issues surrounding coal-fired power generation.
P66.003	Analysis of Fuel Markets and Capacity Requirements	This project examines issues related to long-term fuel supply that impact decisions to invest in a power plant that will be in service for 50 years or longer.

### P66.001 Advanced Coal Technologies Knowledge Base; Assessment of Economics, Experience, and Markets (062002)

#### Key Research Question

Electricity suppliers face tremendous challenges to producing affordable electricity, including fluctuating natural gas prices, energy supply concerns, and the need to address climate change. Heightened demand for new coal power generation worldwide (along with high demand for mining equipment, ore processing facilities, oil refineries and chemical/fertilizer plants, and other capital-intensive industrial facilities) has already caused huge increases in the price of advanced coal technologies. More recently, the economic downturn

appears to have reversed some of the escalating trends; however, in some cases financing may have become more problematic and costly. Generation planners need up-to-date information to make decisions.

### Approach

This project helps power generators understand the technical and financial risks of advanced coal investments. Two annual reports address in-service advanced coal plants and new commercial designs, while an online library of information and links at [www.epri.com](http://www.epri.com) provides situational (i.e., fuel, location, and timeframe specific) comparisons of technologies in terms of cost, performance, emissions, and CO<sub>2</sub> capture convertibility. CoalFleet arranges site tours featuring advanced coal generation technology developments as a part of three technical workshops during the year and co-sponsors the DOE Power Systems Development Facility (PSDF) in Wilsonville, Alabama.

### Impact

- Timely and accurate engineering and economic information on advanced coal technologies
- Impartial assessments of the capabilities of advanced coal technologies
- Up-to-date information on the development status of advanced coal technologies
- Site tours featuring advanced coal generation technology developments

### How to Apply Results

The online knowledge base and the annual assessment reports serve as reference documents to support planning for new generation capacity, and as guides for selecting technologies to include in preliminary feasibility studies for new coal generation capacity. Attendance at three CoalFleet workshops provides members with an opportunity to visit sites of important advanced coal technology developments and receive previews and summaries of project deliverables. Members can use these workshop materials to fully understand the program results and integrate them in their own planning documents.

In addition, members have year-round access to CoalFleet's technical experts to answer questions about the status, cost and performance of advanced coal power generation technologies. Through CoalFleet's sponsorship of the DOE Power Systems Development Facility (PSDF) in Wilsonville, Alabama, CO<sub>2</sub> capture test results will be made available and interpreted by EPRI's advanced coal technology experts (note that this information will be provided to funders of any of the three CoalFleet project sets).

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>EPRI.com Advanced Coal Technologies Knowledge Base "A"</b>: Regular updates of <a href="http://www.epri.com">www.epri.com</a> with online data and references provide information on trends in advanced coal technology design criteria and cost, performance, and availability estimates for various fuel-technology-location combinations. General background material on CO<sub>2</sub> capture and storage technical and regulatory issues is also provided. In addition, the website is the repository for all presentations given at CoalFleet technical meetings throughout the year, and provides links to external studies and regulatory documents deemed noteworthy by the CoalFleet staff. The goal of the CoalFleet Knowledge Base is to become the "go-to" online destination for answers related to coal power and CO<sub>2</sub> capture and storage.</p>	12/31/10	Technical Resource

Product Title & Description	Planned Completion Date	Product Type
<p><b>Operating Experience, Risk, and Market Assessment of Advanced Coal Technologies:</b> This annual update will include analyses of the latest information from operating USC PC, advanced CFBC and IGCC plants, and pilot oxy-combustion plants. It will also evaluate the latest designs and assess the risks and market opportunities for each technology, including their environmental performance and CO<sub>2</sub> capture conversion characteristics. Notable new coal power projects will be profiled.</p>	12/31/10	Technical Update
<p><b>Engineering/Economic Evaluations of Advanced Coal Technologies with CCS:</b> This annual update will estimate the capital cost, performance, and levelized cost of electricity for PC, IGCC, CFBC, and NGCC technologies, with and without CO<sub>2</sub> capture. Assessments of how variables such as coal type, fuel prices, environmental criteria, tax incentives, and penalties affect technology and fuel selection will also be included. In addition, a special focus chapter will be written on a topic based on member feedback. In previous years these topics have included the impact of retrofitting CO<sub>2</sub> capture on a plant that was not previously designed for capture; best practices for controlling construction costs; and power plant capital cost inflation indices.</p>	12/31/10	Technical Update
<p><b>Engineering/Economic Evaluations of Post-Combustion CO<sub>2</sub> Capture Retrofits:</b> This report will summarize the final results of a post-combustion CO<sub>2</sub> capture retrofit study CoalFleet is conducting on five North American coal power plants. The study will examine the technical feasibility, capital cost, and operating impact of adding an advanced amine-based post-combustion capture system onto each of the five plants. It will include a protocol for estimating the suitability of sites for retrofitting.</p>	07/31/10	Technical Report
<p><b>CCS Permitting Guidelines for Advanced Coal Power Plants:</b> This report, a joint deliverable with Program 165, will examine emerging regulations covering the purification, transport, and storage of CO<sub>2</sub> captured from coal power plants. The report will provide guidance on important issues in the design of CO<sub>2</sub> capture and storage projects, which may aid in the permitting of those projects.</p>	12/31/10	Technical Update
<p><b>CO<sub>2</sub> Footprint Life-Cycle Analyses:</b> This project will examine what is currently known about the life-cycle greenhouse gas emissions of three types of fossil fuel power plants: an NGCC fueled by domestic gas, an NGCC fueled by liquid natural gas (LNG) from an offshore liquefaction facility, and an SCPG fueled by coal delivered by rail. Existing literature on this subject will be reviewed and a summary will be compiled. Recommendations for additional research to fill gaps in the existing information base will be made.</p>	12/31/10	Technical Update
<p><b>Annual Power Systems Development Facility Test Report:</b> The annual report will include evaluation of results from testing of CO<sub>2</sub> capture technologies for use with coal-derived syngas and oxy-combustion-derived flue gas. This report also will be available to funders of Project Sets 66B and 66C.</p>	12/31/10	Technical Update

## P66.002 Analysis of Advanced Coal Plant Deployment Options and Government Initiatives (062003)

### Key Research Question

Great uncertainty surrounds potential regulation of CO<sub>2</sub> emissions and how it might affect the electricity generation sector, particularly coal power generation. At the same time, government incentives encourage the use of advanced coal power generation and carbon sequestration technology, with the possibility of more to

come. There is a clear need for better understanding of advanced coal technologies by policy decisionmakers, and of CCS policies and incentives by power generators.

### Approach

This project tracks the implementation of U.S. energy policies and related state policies, regulations, and incentives for advanced coal technology deployment. It also monitors climate change legislation at various government levels, and works with industry stakeholders via the Coal Utilization Research Council (CURC) technical committees to identify research, development and demonstration priorities for advanced coal generation technologies, including CO<sub>2</sub> capture and storage. Information is conveyed via webcasts, topical reports and papers, and workshop presentations. In addition, through the CoalFleet Communications Outreach working group, background education materials on advanced coal power generation technologies including CCS are created and disseminated to electricity industry stakeholders, policymakers and the general public.

### Impact

- Concise summaries of pertinent legislative initiatives and policy implementation actions via technical updates, webcasts and workshop presentations
- Surveillance by experienced energy policy observers
- Analysis of potential CO<sub>2</sub> policies on coal plant economics and operating strategies
- Expert on-call advice to guide power generation project planners through bureaucratic red tape
- EPRI advanced coal experts participate in developing industry consensus on RD&D priorities
- Fact-based background materials, which can be freely distributed and/or incorporated into company-specific communications materials, on advanced coal power generation technology

### How to Apply Results

Presentations at three CoalFleet workshops in 2010 will provide up-to-the-minute information on advanced coal generation incentives and potential climate change legislation in the United States. Planners can use the concise summaries and intelligence from experienced energy policymakers to augment their own planning activities. This information will be supplemented in periodic technical updates on selected topics. In addition, members can contact EPRI experts with answer questions about government incentive programs and climate change legislation.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>CoalFleet Outreach Communications Initiative:</b> The CoalFleet Outreach Communications Initiative was created in 2007 in response to members requests for help in using EPRI materials to communicate the status and capabilities of advanced coal power generation technology to policymakers and the public at large. Its goal is to present balanced, fact-based information in a format that non-technical audiences can understand. The materials are developed by EPRI staff and contractors, based on feedback from a working group consisting of communications and technical experts from CoalFleet members. Such materials could include fact sheets, reports, presentations, and others depending on the target audiences. An example is the CoalFleet Vision report (1016877) prepared in 2008. Updates on the activities of the Outreach Communications working group will be given at CoalFleet technical meetings throughout the year.	12/31/10	Technical Resource
<b>Compliance Strategies in Response to Potential/New U.S. CCS Legislation:</b> This report will examine the impact of new or potential U.S. CO <sub>2</sub> emissions-related legislation on compliance strategies of power generation companies with coal-based generation assets.	12/31/10	Technical Update

## P66.003 Analysis of Fuel Markets and Capacity Requirements (065778)

### Key Research Question

New advanced coal power plants represent investments of a billion dollars or more, with an expected service life of 50 years or longer. Deciding to invest in such a plant requires a degree of certainty that future fuel prices will not make the plant uncompetitive. The rapidly changing prices of fossil fuels and the potential impact of CO<sub>2</sub> regulations, energy security initiatives, and other policies on fuel markets make the decision more difficult.

### Approach

This project provides information to generation planners on cost trends for natural gas and coal, their competitive relationships, and expected power generation capacity additions for selected regions in the United States and globally. Building on other EPRI evaluations of fuel markets and capacity, the project examines global supply and demand-side drivers, including the potential impact of CO<sub>2</sub> emission restrictions on fuel choices.

### Impact

- Support for minimizing risks through knowledge of fuel and power markets
- Understanding of the technical and regulatory drivers of fuel prices
- Insight into the potential impact of CO<sub>2</sub> emission restrictions on fuel demand and prices
- Impartial information on new generation capacity that is under construction and under development, as well as predictions of the impact on reserve margins

### How to Apply Results

Information about capacity additions, and coal and natural gas price floors and ceilings, will allow generation planners to make realistic assumptions in their “what if” scenarios of the market competitiveness of new coal power plants. This fuel price information, which not available in the trade press, gives planners an understanding of what is really driving prices now and what the impact of future trends may be on the fuel markets.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Analysis of Global Fuel Markets and Power Capacity Requirements:</b>            Due to rapidly fluctuating fuel prices and uncertainty about potential CO<sub>2</sub> emissions regulations, the title and focus of this report is tentative. Changes will be made based on feedback from members at the beginning of the program year. Current thinking is that the report will update information developed in EPRI's 2010 program year based on new cost information, fuel production and transportation trends, and newly announced or forecast power generation capacity additions, for selected regions in the United States and the world.</p>	12/31/10	Technical Update

## PS66B Gasification-Based Power Plant Development and Deployment Support (IGCC) (062004)

### Project Set Description

The low emissions and high potential efficiency of integrated gasification combined cycle (IGCC) technology—together with the prospect of relatively easier CO<sub>2</sub> capture from pressurized synthesis gas prior to combustion compared to post-combustion alternatives—has attracted considerable market interest. Gasification-based processes also offer options for co-production of power and clean transportation fuels or hydrogen, or even dedicated facilities for producing fuels or synthetic natural gas. This project will study detailed engineering requirements and costs for converting IGCC plants from standard operation to CO<sub>2</sub> capture mode.

In general, standard designs and market infrastructure are less well-established than for combustion-based advanced coal technologies, leading to an emphasis in this project set on frequent technical status reports, design specification guidelines, online information libraries, industry expert advisory groups, training tools, and a dedicated public-private facility for hosting sub-pilot and pilot scale tests of pre-combustion CO<sub>2</sub> capture technologies.

Project Number	Project Title	Description
P66.004	Coal Gasification Technology Status - Annual Update	The annual update provides a concise summary of coal gasification technology written by EPRI's world-class experts.
P66.005	Advanced IGCC Project Development Guidance	Access to CoalFleet's experts at any stage of development of an IGCC project
P66.006	Plant Design Guidelines for IGCC	Reduces the risk of deploying a new IGCC by supporting the use of standardized and optimized IGCC designs, which maximize plant reliability and shorten project development cycles.
P66.007	Permitting Support for IGCC Power Plants	A database of environmental permits for existing and proposed IGCCs is maintained and updated, and can be accessed via the CoalFleet Knowledge Base B at <a href="http://www.epri.com">www.epri.com</a> .
P66.008	Advanced IGCC Improvements and Next-Generation Designs with CO <sub>2</sub> Capture	This project identifies optimum IGCC design configurations for near-term plants and fosters longer-term development of IGCC with improved CO <sub>2</sub> capture technology.

### P66.004 Coal Gasification Technology Status - Annual Update (062005)

#### Key Research Question

IGCC technology is evolving rapidly in response to cost reduction, need to accommodate low-rank coal, and to provide a better transition from conventional operation to CO<sub>2</sub> separation. Several new gasifier technologies are being scaled up, and a number of new technologies for improving low-rank coal performance and syngas clean-up economics are under development. Generation planners need information about which coal generation technologies are ready for deployment and economically viable.

#### Approach

This project provides technical insight into the status, challenges, and opportunities associated with various gasification technologies and feedstock options, including coal, petroleum residuals, and biomass and wastes via an annual report covering technical developments and operating experience. The project also includes plant visits arranged through the Gasification User Association (GUA), a related supplemental project.



## Impact

- Impartial technology assessments written by world-class gasification experts
- Up-to-date information on the status of coal gasification technology development
- Increased confidence in decisions about future plant design, project schedules, and implementation timing

## How to Apply Results

Project planners and developers can use the information contained in the annual report, as well as insights gained during plant visits and CoalFleet technical meetings and webcasts, to understand opportunities and risks involved in deploying coal gasification technologies. Previous annual reports developed by this project are used as reference documents by EPRI members and are considered to be among the best available source of information on the existing fleet of coal-based IGCC units and other pertinent coal gasification facilities.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Coal Gasification Technology Status—Annual Update:</b> This project provides technical insight into the status, challenges, and opportunities associated with various gasification technologies and feedstock options such as coal, petroleum residuals, and biomass and wastes via an annual report covering technical developments and operating experience. The report also includes a useful primer on gasification technology basics as well as an overview of IGCC capital and operating costs with and without CO <sub>2</sub> capture.	12/31/10	Technical Update

## P66.005 Advanced IGCC Project Development Guidance (062006)

### Key Research Question

Designing an IGCC unit requires expertise that many power generation companies do not have in-house. The current surge of interest in coal gasification technology has placed a premium on technical staff with experience in process design and equipment specification for air separation units (ASUs), coal gasifiers, syngas clean-up, water-gas shift and CO<sub>2</sub> separation processes, and syngas- or hydrogen-firing combustion turbines.

### Approach

This project provides direct technical support through advanced coal project development consulting for all facets of the IGCC project development cycle, especially initial configuration analyses and CO<sub>2</sub> capture convertibility assessments, risk assessments, guidance in conducting reliability-availability-maintainability evaluations and permitting-related activities, and participation in design reviews and value engineering studies. It also provides project-specific assistance in applying other deliverables from the CoalFleet program, such as the IGCC User Design Basis Specification (UDBS).

## Impact

- Opportunity to quickly add 300 person-years of IGCC technical experience to project development teams
- Independent review of supplier recommendations
- Generic lessons learned from other IGCC projects, with potential to be incorporated into members' project designs

## How to Apply Results

For companies developing IGCC projects, the support provided will depend upon the stage of project development and will evolve as the project progresses through feasibility study, FEED, design, construction, and startup. For each project, a mutually agreed upon scope of work that fully defines the engagement and budget will be established with each owner. CoalFleet's world-class IGCC Experts Group will be available for consultation and design reviews. For companies not yet developing IGCC plants, this project will provide information about the issues faced and design decisions made during the implementation of actual IGCC projects. Status reports on these projects will be made at CoalFleet technical meetings during the year, and the Experts Group will ensure that lessons learned from these projects are incorporated in the IGCC design guidelines produced in Project P66.006.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Advanced IGCC Project Development Consulting:</b> This project provides consultation with the world-class CoalFleet IGCC Experts Group in support of members at any stage of developing an IGCC project. Expertise can be provided on all aspects of plant design, project development and implementation, including permitting-related activities, participation in design reviews and value engineering studies, and potentially the development of operator training materials. Generic summaries of the issues encountered by new IGCC projects and their solutions will be provided in presentations at CoalFleet meetings throughout the year.</p>	12/31/10	Technical Resource

## P66.006 Plant Design Guidelines for IGCC (062007)

### Key Research Question

High capital and construction costs, reliability uncertainty, long project schedules, lack of standardization, and complex environmental permitting procedures are obstacles to IGCC technology, which can offer superior environmental performance and be the lowest-cost generating option for coal plants with CO<sub>2</sub> capture. Improved design guidance will enable program participants to determine if IGCC is the best technology for their needs and choose the optimal plant configuration.

### Approach

This project supports the deployment of more reliable and economical IGCCs through the use of reference plant designs. It updates and expands a generic user design basis document as well as technology- and fuel-specific design specifications for IGCC power plants, both with and without CO<sub>2</sub> capture. Through [www.epri.com](http://www.epri.com), the project also provides a continually updated online reference library (Knowledge Base B) of design studies, operational and experience-based lessons-learned reports, and current project information. Lessons learned by both existing IGCC plants and CoalFleet members developing new IGCC projects are incorporated into design guidelines so that all members can benefit from the knowledge gained by early movers.

### Impact

The objective of this project is to reduce the risk of deploying coal-fed IGCC plants by promoting the use of standard designs that meet the requirements of power generation companies. The project provides:

- Online IGCC reference information (Knowledge Base B)
- IGCC User Design Basis Specification (UDBS), which provides power plant developers with the most detailed design guidance for IGCC plants available

- Pre-Design and Generic Design Specification reports, which condense public filing documents and nonproprietary descriptions of new IGCC project designs into user-friendly reports
- Participation in the IGCC Design Guidelines Working Group, which can aid in developing in-house IGCC expertise

### How to Apply Results

Participants may be able to save millions of dollars in engineering costs and shave several months off a project schedule by adopting existing designs and technologies for their projects, allowing for minor adjustments to meet site-specific requirements. Knowledge Base B provides around-the-clock access to technical reference information on gasification and IGCC power plants. The User Design Basis Specification can be used both as a primer on IGCC technology and design tradeoffs, as well as a template for creating an IGCC specification document to which suppliers can submit bids. The Pre-Design and Generic Design Specifications provide concise descriptions of IGCC early-deployment project designs and give members important technical information on the design and performance of a specific supplier's technology.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>EPRIweb Advanced Coal Technologies Knowledge Base B (IGCC Technology):</b> This project offers regular updates of www.epri.com with online data and references that provide information on trends in IGCC technology design criteria and cost, performance, and availability estimates for various fuel-technology-location combinations. It also contains recordings of one-hour educational webcasts on different aspects of IGCC technology presented by the CoalFleet IGCC Experts Group.	12/31/10	Technical Resource
<b>IGCC User Design Basis Specification, Version 10:</b> This project updates EPRI's 2009 program year version of the UDBS, based on new technology developments and insights from the CoalFleet IGCC early deployment projects. The UDBS will contain information on plant size, reliability-availability-maintainability goals, equipment train and sparring recommendations, back-up fuel considerations, performance criteria, cost and time-to-build targets, operability requirements (e.g., turndown, ramp rate), emissions limits (steady state and startup/off-spec), plant safety, and options for CO <sub>2</sub> capture. New areas of focus in Version 10 will depend on feedback from members.	12/31/10	Technical Update
<b>IGCC Generic Design Specification #4:</b> A Generic Design Specification is a nonproprietary description of the design of an IGCC power plant that will be created after an IGCC developer has completed a FEED study. The actual project selected for this fourth report in the series will depend on project timing and feedback from members.	12/31/10	Technical Update

## P66.007 Permitting Support for IGCC Power Plants (062008)

### Key Research Question

The deployment of IGCC plants is complicated by uncertainty about regulations on greenhouse gas emissions. Obtaining environmental permits for a new IGCC coal plant is a critical-path item before construction can begin, and permitting a coal-based IGCC plant is highly complex, involving numerous tradeoffs. Given the limited regulatory experience base, permitting could cause significant delays in constructing a new plant.

## Approach

This project provides a regularly updated online database of permit information covering the unique aspects of permitting IGCC units. A custom interface is programmed to facilitate common queries. For members of Project Set 66B, this project also provides consultation with EPRI staff on IGCC feasibility studies and project development efforts that will assist members working with regulators to enhance plant permitability.

## Impact

- Significant reduction in the time required to permit an IGCC plant through ready access to a comprehensive set of IGCC permit data and consultation with EPRI staff.
- Information exchange among CoalFleet members, DOE, EPA, and other regulatory bodies, which could identify opportunities to streamline the IGCC permitting process.

## How to Apply Results

The database of existing IGCC permit information will serve as a reference for any company trying to permit a new coal-based power plant. Consultation with EPRI staff can help members developing an IGCC project pinpoint potential areas of concern in preparing permit applications, with particular focus on aspects of an IGCC that differ from pulverized coal plants. In addition, members will have access to CoalFleet's IGCC permitting experts and can place their own staff in the CoalFleet IGCC Permitting Working Group, which will foster the development of in-house IGCC permitting expertise.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>CoalFleet IGCC Permitting Database:</b> EPRI will monitor IGCC project developments worldwide, and continually update its IGCC permit database as new information becomes available from U.S. and international coal-based IGCC projects. The database is accessible via Advanced Coal Technologies Knowledge Base B on <a href="http://www.epri.com">www.epri.com</a> .	12/31/10	Technical Resource

## P66.008 Advanced IGCC Improvements and Next-Generation Designs with CO<sub>2</sub> Capture (062009)

### Key Research Question

Growing concern about the impact of CO<sub>2</sub> emissions on climate change is increasing the need to develop lower-cost methods for capturing CO<sub>2</sub> from coal-based power plants.

### Approach

This project evaluates options for improving IGCC performance generally for all coal types, and for integration with water-gas shift reactors for CO<sub>2</sub> capture and hydrogen production. The project will examine various levels of CO<sub>2</sub> capture, from 20% up to practical maximums, to understand the incremental cost of capturing increasing amounts of CO<sub>2</sub>. In addition, the project will evaluate optimum design options for plants with CO<sub>2</sub> capture as well as wise pre-investment strategies for IGCCs not initially designed to capture CO<sub>2</sub>.

A primary focus of this project is a series of engineering-economic studies that examine near-term options for commercial-scale IGCCs. As a starting point, plant configurations defined in the UDDBS (P66.006) have been evaluated. These case studies are now being expanded to look at the impacts of additional coal types and advanced turbine, gasification, and gas clean-up technologies.

A second focus of this project is to improve the economics of IGCCs with CO<sub>2</sub> capture by eliminating or mitigating sources of unavailability in plant operations. The CoalFleet IGCC RD&D Augmentation Plan

(1013219) issued in 2007 provides a roadmap for improving IGCC reliability and availability. This project will foster efforts to bring improvements identified in the augmentation plan to reality.

### Impact

- Impartial, independent engineering-economic evaluations of IGCC design options
- Identification of the potential advantages and risks of new technologies proposed for IGCCs with CO<sub>2</sub> capture
- Lower-cost methods of capturing CO<sub>2</sub> from coal-based power plants
- Higher IGCC operating availability, which will improve IGCC economics

### How to Apply Results

Results from the engineering-economic case studies will give members realistic, up-to-date information on the cost and performance of near-term commercial IGCC technology. They also will provide guidance on the most economical design configurations for various operating scenarios. This project will monitor progress in implementing the CoalFleet RD&D Augmentation Plan and provide independent assessments of proposed advances, such as improved instrumentation, controls and processes that could improve IGCC performance on low-rank coals. EPRI members can use this information to guide R&D investment decisions and anticipate when these enhancements will be commercially available. In addition to the deliverables listed here, Project Set 66B funders will also receive the Power Systems Development Facility (PSDF) annual report described in Project 66.001.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Engineering-Economic Evaluations of IGCC Plant Designs with CO<sub>2</sub> Capture: Phase 2:</b> This report will summarize results from EPRI's second phase of IGCC case studies, which will examine the cost and performance of different IGCC designs based on specific feedstocks at specific locations. Cases involving various levels of CO<sub>2</sub> capture will be included, as will both 50-Hz and 60-Hz cases.</p>	09/30/10	Technical Update
<p><b>Advanced Concepts in Pre-Combustion CO<sub>2</sub> Capture:</b> A survey of new concepts for pre-combustion capture—such as improved solvents, membrane separation and novel approaches—will be conducted similar to that in the recent EPRI Technology Innovation project, which surveyed emerging post-combustion capture technologies. The technical readiness level (TRL) of each concept will be defined and the potential advantages of the concepts will be determined to the extent possible. Recommendations for additional work then will be developed.</p>	12/31/10	Technical Update

## PS66C Combustion-Based Power Plant Development and Deployment Support (USC PC and Supercritical CFBC) (062010)

### Project Set Description

Coal combustion-based power technologies face continuing environmental challenges to reduce pollutant emissions, including CO<sub>2</sub>. In an era when high natural gas prices and energy security concerns have created tremendous potential for advanced coal technologies, solving environmental challenges promptly and affordably is critical. This Project Set concentrates on the full range of solutions, including fundamental work such as qualification of stronger, more corrosion-resistant materials to allow boilers and steam turbines to operate at higher temperatures and raise generating efficiency. System-level activities include design guidelines and online information libraries to reduce the risk of building USC PC and supercritical CFBC plants, and combustion in an oxygen/CO<sub>2</sub> mixture instead of air (oxy-combustion). Central elements of the

Project Set include industry support for large-scale demonstrations of advanced technologies and investigation of the optimal design approaches and costs for converting combustion-based plants from standard operation to CO<sub>2</sub> capture mode (post-combustion or oxy-combustion).

Project Number	Project Title	Description
P66.009	Design and Materials Development for Post-Ferritic (1200°F–1400°F) Ultra-Supercritical PC Plants	This project is validating the materials needed for boilers and steam turbines that will operate with main steam conditions up to 1400°F (760°C) and 5000 psi (345 bar).
P66.010	Evaluation of Oxy-Combustion for Advanced PC and CFBC Plants	This project will assess the development status and economics of oxy-combustion and the role that it is expected to play in reducing CO <sub>2</sub> capture costs.
P66.011	Advanced PC and CFBC Project Development Guidance	This project provides access to CoalFleet's experts at any stage of developing an advanced coal power project.
P66.012	Plant Design Guidelines and Near-Zero Emission Designs for USC PC Plants	This project provides information on the design and performance of advanced pulverized coal boilers, steam turbines, environmental controls, and CO <sub>2</sub> capture technologies integrated with the power plant.
P66.013	Integration of Post-Combustion CO <sub>2</sub> Capture Technologies with Advanced PC and CFBC Plants	Engineering-economic studies to identify cost saving improvements in commercial-scale applications of post-combustion capture technologies.

## **P66.009 Design and Materials Development for Post-Ferritic (1200°F–1400°F) Ultra-Supercritical PC Plants (062011)**

### **Key Research Question**

Increasing steam temperatures to improve pulverized coal power plant efficiency—which provides both economic benefits and lower CO<sub>2</sub> and pollutant emissions—tests the practical limits of strength and corrosion resistance offered by ferritic steel alloys. Austenitic steel alloys, which have high chromium content, offer improved high-temperature strength, but their significantly higher coefficient of expansion poses a challenge when they are combined in components with ferritic alloys. Advanced alloys containing significant amounts of nickel and chromium (“nickel-base alloys”) maintain strength better at higher temperatures than do austenitic steels, and they have coefficients of expansion similar to ferritic alloys; however, these alloys are expensive, more difficult to weld, and have not previously been used in fossil power plants. Development and testing of components made of advanced post-ferritic alloys in a power plant environment will give designers, prospective buyers, financiers, and insurers confidence in their application in advanced, highly efficient USC pulverized coal plants.

### **Approach**

In this project sponsored by DOE, a collaborative of public agencies, research laboratories, and industry is fabricating, testing, and evaluating boiler and steam turbine components made of advanced post-ferritic alloys. Laboratory testing and in-service power plant exposure at elevated steam temperatures simulate USC conditions up to 1400°F (760°C) and 5000 psi (345 bar or 35 MPa). In particular, the consortium is examining the candidate materials' creep strength, resistance to fireside and steam-side corrosion, and ease of welding, fabrication, and coating. An initial five-year program of testing USC boiler materials is already complete, and a

second phase is well under way. Results apply to boilers using either air or oxygen for coal combustion. USC steam turbine testing is nearing completion of its initial five-year program.

Annual progress reports—one on boiler materials and components, and one on steam turbine materials and components—summarize work plan accomplishments and results for tests of fabricated components placed in USC-simulated demonstration cells at existing pulverized coal units. These yearly progress reports, which include EPRI's perspective on the outcomes, will become available to members once DOE has reviewed the results. Ultimately, the advanced materials and fabrication methods qualified will be incorporated in finished components offered by boiler and steam turbine OEMs.

## Impact

- Accelerated acceptance of new USC materials by codes and standards organizations, and support for their introduction into the commercial marketplace.
- Plants operating at the steam conditions enabled by these new materials will achieve efficiencies greater than 45% (higher heating value) for a single reheat design. This would reduce fuel consumption and overall emissions—including CO<sub>2</sub>—by 15% to 22%, relative to the current U.S. fleet average for pulverized coal plants. An efficiency of 45% in the United States corresponds to an efficiency of 50% (lower heating value) for European and Japanese plants, which use slightly different efficiency calculations.
- Demonstration of advanced materials in a power plant environment significantly reduces the risk of unavailability for initial applications of advanced USC steam plants.

## How to Apply Results

Members will gain early access to information resulting from this project's research and will get priority in hosting demonstrations of new designs and materials. Once demonstrated, advanced materials will significantly reduce the capital cost and unavailability risk for new, highly efficient USC PC plants.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Technical Progress Report on Turbine Materials Development for USC Plants:</b> The project provides an annual steam turbine material testing progress report similar to that produced in EPRI's 2009 program year, pending DOE's continued funding of the collaborative.	12/31/10	Technical Update
<b>Technical Progress Report on Boiler Materials Development for USC Plants:</b> The project provides an annual boiler material testing progress report similar to that produced in EPRI's 2009 program year, pending DOE's continued funding of the collaborative.	12/31/10	Technical Update

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Technical Progress Report on Turbine Materials Development for USC Plants:</b> The project provides an annual steam turbine material testing progress report pending DOE's continued funding of the collaborative.	12/31/11	Technical Update
<b>Technical Progress Report on Boiler Materials Development for USC Plants:</b> The project provides an annual boiler material testing progress report pending DOE's continued funding of the collaborative.	12/31/11	Technical Update

## P66.010 Evaluation of Oxy-Combustion for Advanced PC and CFBC Plants (065779)

### Key Research Question

Boilers designed to burn coal in a blend of oxygen and CO<sub>2</sub> instead of air offer an alternative means of separating and concentrating CO<sub>2</sub> to post-combustion solvent- or sorbent-based capture processes. Known as “oxy-combustion,” this approach offers potentially lower costs and lower energy penalties for CO<sub>2</sub> capture at PC and CFBC plants, particularly if emerging low-cost oxygen production technologies reach commercial fruition. A 30-MW<sub>th</sub> oxy-combustion pilot plant, to which EPRI is providing technical support, commenced testing in the United States in 2007. Similarly sized test-and-demonstration units are entering service in Europe (2008) and Australia (2010), and the number of research projects worldwide is steadily increasing.

### Approach

This project will advance the understanding of oxy-combustion technologies for PC and CFBC plants by evaluating design studies and pilot plant results, as well as their implications for scale-up to larger demonstrations and commercial units. In particular, EPRI will examine oxy-combustion burner performance, boiler heat transfer characteristics, and materials compatibility with different chemical environment within the boiler. In addition, the project will assess the economics of oxy-combustion and the role that it is expected to play in reducing CO<sub>2</sub> capture costs.

### Impact

- Accurate information on the status of oxy-combustion technologies, pilot plant results, technical challenges faced, and prospects for their resolution
- Information about the relative costs and likely commercialization timeframe for oxy-combustion as a CO<sub>2</sub> capture measure for coal-combustion-based power plants

### How to Apply Results

Members will have early access to objective information about oxy-combustion technology, pilot test results, and early unit design decisions, allowing them to better evaluate the oxy-fuel combustion option for their specific requirements. In addition to the products listed here, Project Set 66C funders will also receive the Power Systems Development Facility annual report described in Project 66.001.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for PC and CFBC Plants:</b> This report, similar to that provided in program year 2009, will update oxy-combustion pilot plant results and the estimates of thermodynamic and economic performance for commercial-scale power plants.	12/31/10	Technical Update

### Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for PC and CFBC Plants:</b> This report will update oxy-combustion pilot plant results and the estimates of thermodynamic and economic performance for commercial-scale power plants.	12/31/11	Technical Update



## P66.011 Advanced PC and CFBC Project Development Guidance (062013)

### Key Research Question

Deployers of advanced PC and CFBC technologies need accurate engineering and economic data to identify robust, cost-effective design options for process equipment, boiler materials, fuel selection, emissions control systems, and cycling/turndown capability. Expert advice and up-to-date information—including input from peers who have recently addressed these same issues—can help project developers make informed decisions.

### Approach

This project shares lessons learned from CoalFleet PC and CFBC project development in consultation with the broader CoalFleet membership through informative presentations at CoalFleet technical meetings, which are held three times per year. Briefings by CoalFleet project representatives and EPRI staff typically address permitting and design issues relevant to all power producers planning or pursuing new PC or CFBC power plants. Direct support by EPRI CoalFleet experts for advanced PC or CFBC project developers is available via a supplemental project.

### Impact

- Benefit from lessons learned by others experienced in new plant siting and the permit application process
- Information about selecting design fuels, unit sizes, steam conditions, equipment configurations, and materials for new units
- Information about approaches to CO<sub>2</sub> capture conversion for new units.

### How to Apply Results

CoalFleet members can use the experiences and lessons learned from their peers in the advanced PC or CFBC project development process to develop siting studies, permit applications, design basis decisions, preliminary engineering designs, CO<sub>2</sub> capture conversion studies, and public outreach activities.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Presentations on CoalFleet Advanced PC and CFBC Project Development Consulting:</b> At CoalFleet technical meetings, held three times per year, project representatives discuss key issues in the permitting and design processes for their projects and how those issues were resolved. Members hear the experiences of their peers first-hand and collect information useful for their own new coal plant projects.	12/31/10	Technical Resource

### Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Presentations on CoalFleet Advanced PC and CFBC Project Development Consulting:</b> At CoalFleet technical meetings, held three times per year, project representatives discuss key issues in the permitting and design processes for their projects and how those issues were resolved. Members hear the experiences of their peers first-hand and collect information useful for their own new coal plant projects.	12/31/11	Technical Resource

## P66.012 Plant Design Guidelines and Near-Zero Emission Designs for USC PC Plants (062014)

### Key Research Question

In North America and Europe, high natural gas prices and energy security concerns have sparked renewed interest in coal-based power systems, but few have received all the necessary construction permits. In many instances, project developers are asked to show new units based on technology with the lowest emissions and highest potential for cost-effective CO<sub>2</sub> capture. Even in Asia, where demand for coal-based generating units has been strong and steady, new units must demonstrate marked advances. Reliable information and data from new technology demonstrations worldwide and from lessons learned in initial applications of advanced boiler and steam turbine designs, materials, and environmental controls is crucial.

### Approach

This project provides an update of EPRI's design guideline for advanced PC plants. The guideline is supported by an online reference library (Knowledge Base C) at [www.epri.com](http://www.epri.com) containing technical papers, design data for existing units and those under construction, operating parameters such as availability and emissions data, materials selections, and selected links screened for relevance by EPRI staff and the CoalFleet advanced combustion experts.

An important aspect of this work is identifying ways to reduce the penalties associated with incorporating CCS with the power plant. Included are design and integration approaches that improve heat economy and lower the reduction in power output associated with CCS, reduce cooling requirements and water consumption, and minimize potential reductions in availability and capacity factor. This project also includes a reference plant design study for a PC plant with final steam temperatures of 1260°F (680°C), which would entail the use of nickel-based alloys in high-temperature components (see P66.010). Finally, the project could include a generic pre-design specification for an advanced PC plant, based on the permit application package developed by a CoalFleet early deployment project (see P66.012). Compiling reference documents and databases and keeping them current provides vital industry data and allows information to be shared.

### Impact

- Faster and better-informed internal evaluations of advanced coal technologies by CoalFleet members, including initial technology screenings in advance of feasibility studies
- Information to reduce outage rates, constraints on ramping and turndown, and O&M costs for initial applications of advanced PC and CFBC units
- Information about the likely future performance and economic impacts of retrofitting post-combustion CO<sub>2</sub> capture and oxy-coal processes onto PC and CFBC plants
- Exchange of nonproprietary information that can speed the process of deployment, bringing advanced coal technologies to maturity more quickly and reducing costs for the entire industry

### How to Apply Results

CoalFleet members can access the guideline and online reference library via [www.epri.com](http://www.epri.com) and incorporate the data and lessons learned into siting studies, permit applications, preliminary designs, and CO<sub>2</sub> capture-readiness studies. Through participation in a project-related industry working group, members can discuss information needs with their peers and ask questions of EPRI experts.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Guideline for Advanced PC Plants, Version 7:</b> This guideline is an update of EPRI's 2009 Version 6 of the advanced PC guideline, based on new technology developments and insights from the CoalFleet USC PC early deployment project(s).	06/30/10	Technical Update

Product Title & Description	Planned Completion Date	Product Type
<b>Advanced Coal Technologies Knowledge Base C:</b> Regular online updates of EPRI's 2009 online library of data and references for advanced PC, CFBC, and oxy-combustion technologies are provided through www.epri.com.	12/31/10	Technical Resource
<b>Commercial Readiness of UltraGen II:</b> This report will provide a generic description of design decisions and performance data for a USC PC unit that meets the definition of CoalFleet's UltraGen II demonstration plant. UltraGen II is an 800-MWe pulverized coal boiler with main steam temperature of 770°C (1290°F) and 42.5% efficiency, with very low SO <sub>2</sub> , NO <sub>x</sub> and Hg emissions, and 60% CO <sub>2</sub> capture with 2.4 million tonnes/yr of CO <sub>2</sub> to storage or enhanced oil recovery. Net CO <sub>2</sub> emissions to atmosphere will be similar to those from a natural-gas-fired combined-cycle plant.	12/31/10	Technical Update
<b>Current Status of CFBC Technology:</b> This report will review current CFBC developments to increase generating efficiency, improve economy of scale, and progress to near-zero emissions. Means of integrating CCS technology with the power plant will also be presented.	12/31/10	Technical Update
<b>Assessment of Heat Rate Improvement Measures:</b> This report will summarize the results of CoalFleet's analysis of heat rate improvement options for new coal-fired power plants. Improvements to be covered will be selected based on feedback from members, but are expected to include coal drying processes that use low-temperature heat sources.	12/31/10	Technical Update
<b>Review of Water Conservation Measures:</b> This report will identify and assess the capital and operating costs of emerging techniques designed specifically to lower the water consumption of coal-fired power plants with and without CCS incorporated.	12/31/10	Technical Update

## P66.013 Integration of Post-Combustion CO<sub>2</sub> Capture Technologies with Advanced PC and CFBC Plants (062015)

### Key Research Question

Regulations limiting CO<sub>2</sub> emissions from coal-fired power plants are expected in the near future in the United States and many other countries. Although technologies for post-combustion capture of CO<sub>2</sub> from boiler flue gases have been applied commercially in the chemical and industrial gas industries at a small scale, none has been applied at the scale needed for a large coal-fired power plant. Design studies of applying the most developed amine solvents suggest the energy requirements for solvent regeneration (expected to be provided by steam extracted from the turbine circuit) will be large, reducing plant output by 20% or more. However, considerable research into solvents with lower heats of regeneration, including improved amines and alternatives to amines, is taking place around the world. Energy penalties will be further reduced by effective thermal integration, the nature of which will depend upon the properties of the solvent selected. Comprehensive and objective analyses of this rapidly changing field are needed to guide power producers planning new PC or CFBC units designed for, or to be retrofitted with, post-combustion CO<sub>2</sub> capture technologies.

### Approach

This project evaluates various post-combustion CO<sub>2</sub> capture technologies for application with new advanced PC and CFBC units. The project will address both designs for retrofit after initial operation without CO<sub>2</sub> capture as well as optimal integration of post-combustion capture processes in new units that will capture CO<sub>2</sub> upon initial commissioning. Initial analyses are based on advanced amines but alternative capture technologies will be evaluated as data become available.

## Impact

- Information about the likely future costs, performance, and operational impacts of incorporating post-combustion CO<sub>2</sub> capture processes into PC and CFBC plants, helping improve plans for coal-fired capacity additions and carbon management
- Information to reduce outage rates, constraints on ramping and turndown, and O&M costs for initial applications of CO<sub>2</sub> capture technologies in new PC and CFBC units

## How to Apply Results

CoalFleet members can incorporate insights from this project into generation planning studies, plant feasibility and CO<sub>2</sub> capture readiness studies, and corporate carbon management strategies.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Integrating CO<sub>2</sub> Capture Technologies into New PC and CFBC Plants - Alternate Process:</b> This report will assess the cost and performance impacts of integrating emerging post-combustion CO <sub>2</sub> capture technologies. It will be completed in conjunction with Program 165 as a companion to the report developed in the 2009 program year.	12/31/10	Technical Update
<b>Retrofitting Post-Combustion Capture into the Existing Fleet:</b> This report will examine the technical issues involved in retrofitting advanced amine-based post-combustion CO <sub>2</sub> capture systems into existing coal power plants.	09/30/10	Technical Update