

66 CoalFleet for Tomorrow - Future Coal Generation Options

Program Overview

Program Description

The CoalFleet for Tomorrow program targets the technical, economic, and institutional challenges to making highly efficient, near-zero-emission, carbon dioxide (CO₂)-capture-amenable coal plants a prudent and practical investment option. 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. Working with advanced coal power project owners/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 the U.S. Department of Energy (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.

Industry Needs and Issues Addressed

- Tools to efficiently accommodate future CO₂ emission reduction technologies in plants that may initially start service without such controls
- Technical means to counteract sharply higher construction costs and high natural gas prices
- Energy security concerns
- Large projected increases in demand for clean, affordable coal-powered generation worldwide

Impact

- Ensure that cost-effective, reliable, and highly efficient new coal plant designs with near-zero emissions and CO₂ capture are available to industry, thereby keeping coal in the generation mix to constrain increases in electricity and natural gas prices
- Provide timely and accurate engineering and economic information about advanced coal technologies to support generators' decisionmaking processes
- Cut costs by 30–50% for advanced coal technology feasibility study and preliminary engineering
- Shorten the IGCC project development cycle, increase reliability, and reduce plant capital costs through development of design guidelines and promotion of standard designs
- Shorten the USC PC and CFBC project development cycle and reduce capital costs through technology design studies, state-of-the-art environmental controls information, informed materials selection analyses, and CO₂ capture convertibility assessments

Key Accomplishments

- Design guidelines for new advanced PC, IGCC, and oxy-combustion units, and permitting guidelines/data used by generators, suppliers, and engineering, procurement, and construction (EPC) companies for plant design
- Engineering and economic information used by industry to support its coal technology evaluations
- Incentives analysis that supported inclusion of advanced coal tax credit and loan guarantee provisions in the Energy Policy Act of 2005
- Guidance via Congressional testimony on technical objectives and level of research, development, and demonstration funding needed for coal-power CO₂ capture and storage technology
- Vital laboratory and in-service test data to support qualification of high-temperature boiler and steam turbine materials for USC steam conditions

Current Year Objectives

- Informed engineering-economic evaluations and assessments of market trends and commercial technology offerings, including design issues for CO₂ capture readiness and convertibility
- Families of design guidelines and generic specifications for IGCC and advanced combustion-based technologies
- Reference libraries (knowledge bases), including permitting information, available on 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 through world-class expert teams composed of EPRI staff and uniquely qualified consultants
- Advanced coal projects with increased generating efficiency that demonstrate near-zero emissions and CO₂ capture and storage technologies
- Pilot research and test results for gasification of low-rank coals and auxiliary components
- Vital laboratory and in-service test data to support qualification of USC boiler and steam turbine materials

Industry Involvement

- Estimated 2009 funding: \$9.2M

Program Technical Lead

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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 involving CO₂ 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	Value
P66.001	Advanced Coal Technologies Knowledge Base; Assessment of Economics, Experience, and Markets	This project helps power generators better understand the technical and financial competitiveness of advanced coal investments. It includes two annual reports and an online database called Knowledge Base A. Of the annual reports, one focuses on cost and performance comparisons of state-of-the-art fossil power plants, and the other summarizes new developments in coal generation technology including CO ₂ capture. Knowledge Base A includes an online library of information and links, along with situational (i.e., fuel, location, and timeframe-specific) comparisons of technologies in terms of cost, performance, emissions, and CO ₂ capture convertibility.

Project Number	Project Title	Value
P66.002	Analysis of Advanced Coal Plant Deployment Options and Government Initiatives	This project tracks the implementation of U.S. federal energy legislation (the major bills of 2005 and 2007) and related state activities affecting advanced coal and carbon sequestration technology deployment. It also monitors potential climate change legislation. Information is provided in a quarterly newsletter, topical reports and papers, and public presentations and testimony.
P66.003	Analysis of Fuel Markets and Capacity Requirements	This project provides information on cost trends for natural gas and coal, their competitive relationships, and power generation capacity requirements for selected regions (U.S. and global) to generation planners. Building on advances in evaluation of fuel markets and capacity (Program 67), the project examines global supply and demand-side drivers that affect risks and profitability of coal plants.

Project Descriptions

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

Issue

Electricity suppliers face tremendous challenges to producing affordable electricity—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) already has caused huge increases in the price of advanced coal technologies. Generation planners need up-to-date information to make decisions.

Description

This project helps power generators understand the technical and financial risks of advanced coal investments. It provides two annual reports on in-service advanced coal plants and new commercial designs; a www.epri.com online library of information; and links including situational (i.e., fuel, location, and timeframe specific) comparisons of technologies in terms of cost, performance, emissions, and CO₂ capture convertibility.

Value

- 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 status of development 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
EPRI.com Advanced Coal Technologies Knowledge Base "A" : Regular updates of www.epri.com pages with online data and references, providing information on trends in advanced coal technology design criteria and cost, performance, and availability estimates for various fuel-technology-location combinations.	12/31/2009	Technical Resource
Operating Experience, Risk, and Market Assessment of Advanced Coal Technologies : This annual update will include analyses of the latest information from operating USC PC, advanced CFBC, and IGCC plants, and pilot oxy-combustion plants; evaluations of the latest designs, including comparison to a benchmark of conventional PC plants; and assessments of risks and market opportunities for each technology, including their environmental performance and CO ₂ capture conversion characteristics.	12/31/2009	Technical Update
Engineering/Economic Evaluations of Advanced Coal Technologies with CCS : This annual update will estimate the capital cost, performance, and levelized cost of electricity for PC, IGCC, CFBC, and natural gas combined cycle (NGCC) technologies, with and without CO ₂ capture. Also included are assessments of how variables such as coal type, fuel prices, environmental criteria, tax incentives, and various penalties affect technology and fuel selection.	12/31/2009	Technical Update
CCS Permitting Guideline for Advanced Coal Power Plants : This report, a joint deliverable with Program 165, will examine emerging regulations covering the purification, transport, and storage of CO ₂ captured from coal power plants. The report will provide guidance on important issues in the design of CO ₂ capture and storage projects, which may aid in the permitting of those projects.	12/31/2009	Technical Update
Engineering/Economic Evaluations of CCS Retrofits : This report will assess the cost of retrofitting post-combustion CO ₂ capture or oxy-combustion technologies to existing pulverized coal plants. Included will be a protocol for estimating the suitability of sites for retrofitting.	9/30/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
EPRI.com Advanced Coal Technologies Knowledge Base "A" : Regular updates of www.epri.com pages with online data and references, providing information on trends in advanced coal technology design criteria and cost, performance, and availability estimates for various fuel-technology-location combinations.	2010	Technical Resource

Product Title & Description	Planned Completion Date	Product Type
<p>Operating Experience, Risk, and Market Assessment of Advanced Coal Technologies: This annual update will include analyses of the latest information from operating USC PC, advanced CFBC, and IGCC plants, and pilot oxy-combustion plants; evaluations of the latest designs, including comparison to a benchmark of conventional PC plants; and assessments of risks and market opportunities for each technology, including their environmental performance and CO₂ capture conversion characteristics</p>	2010	Technical Update
<p>Engineering/Economic Evaluations of Advanced Coal Technologies with CCS: This annual update will estimate the capital cost, performance, and levelized cost of electricity for PC, IGCC, CFBC, and NGCC technologies, with and without CO₂ capture. Also included are assessments of how variables such as coal type, fuel prices, environmental criteria, tax incentives, and penalties affect technology and fuel selection.</p>	2010	Technical Update

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

Issue

Great uncertainty surrounds potential regulations of CO₂ emissions and how they might affect the electricity generation sector, particularly coal power generation. At the same time, government incentives have been created to encourage the use of advanced coal power generation and carbon sequestration technology.

Description

This project tracks the implementation of the U.S. federal government'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. Information is conveyed via a quarterly newsletter, topical reports/papers, and workshop presentations.

Value

- Concise summaries of pertinent legislative initiatives and policy implementation actions via newsletters and workshop presentations.
- Surveillance by experienced energy policy observers
- Expert on-call advice to guide power generation project planners through bureaucratic red tape.

How to Apply Results

Presentations at three CoalFleet workshops in 2009 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 newsletter articles on the same topics. In addition, members can contact EPRI experts with answer questions about government incentive programs and climate change legislation.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
CoalFleet Deployment Newsletter: Quarterly updates will include analyses of power and fuel market trends, the cost and value of CO ₂ capture at IGCC and PC plants, potential climate change legislation (especially CO ₂ restrictions and technology deployment incentives) at various government levels, implementation of U.S. federal energy research programs and policy initiatives, and summaries of pre-press or newly released Project Set 66A publications.	12/31/2009	Technical Resource
Value of Operating Flexibility for Advanced Coal Power Plants with CCS: This report will summarize results from economic modeling of advanced coal power plants in wholesale electricity markets under future CO ₂ cap-and-trade scenarios. The modeling examines the economic value of capturing varying amounts of CO ₂ at different times, so that electric power can be maximized when power prices are high (i.e., during system demand peaks) and CO ₂ capture can be maintained during normal operating periods.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
CoalFleet Deployment Newsletter: Quarterly updates will include updates on analyses of power and fuel market trends, the cost and value of CO ₂ capture at IGCC and PC plants, potential climate change legislation (especially CO ₂ restrictions and technology deployment incentives) at various government levels, implementation of U.S. federal energy research programs and policy initiatives, and summaries of pre-press or newly released Project Set 66A publications.	2010	Technical Resource

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

Issue

New advanced coal power plants represent a billion-dollar-or-more investment with an expected service life of 50 years or longer. Deciding to invest in such a plant requires a degree of certainty in knowing that future fuel prices will not make the plant uncompetitive. The rapidly changing prices of fossil fuels and the potential impact of CO₂ regulations, energy security initiatives, and other policies on fuel markets make the decision more difficult.

Description

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 advances in evaluating fuel markets and capacity (Program 67), the project examines global supply and demand-side drivers, including the potential impact of CO₂ emission restrictions on fuel choices.

Value

- 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 CO₂ 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 that examine the market competitiveness of new coal power plants. Using fuel price information not available in the trade press, planners will gain an understanding of what is really driving prices now and what the impact of future trends may be on the fuel markets.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Analysis of Global Fuel Markets and Power Capacity Requirements: This report will provide impartial information 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, allowing generation planners to make realistic assumptions in their “what if” scenarios that examine the market competitiveness of new coal power plants. Using fuel price information not available in the trade press, planners will gain an understanding of what is really driving prices now and what the impact of future trends may be on the fuel markets.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Analysis of Global Fuel Markets and Power Capacity Requirements: The report offers an update of information developed in EPRI’s 2009 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 globally.	2010	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 CO₂ capture from pressurized synthesis gas prior to combustion compared to post-combustion alternatives—has attracted considerable market interest and public support. 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 CO₂ 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, pilot-scale IGCC test and demonstration facility.

Project Number	Project Title	Value
P66.004	Coal Gasification Technology Status - Annual Update	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 annual report also includes a useful primer on gasification technology basics.
P66.005	Advanced IGCC Project Development Guidance	This project provides direct support for early-deployment IGCC projects, including configuration analyses and CO ₂ capture design and convertibility assessments, startup emission analyses and other permitting-related activities; participation in design reviews and value engineering studies; and possible development of operator training materials and simulators.
P66.006	Plant Design Guidelines for IGCC	This project updates and expands an existing family of generic design basis and technology- and fuel-specific model specifications for IGCC power plants, both without and with CO ₂ capture. Also provided is a continually updated www.epri.com reference library (Knowledge Base B) of design studies, operational- and experience-based lessons-learned reports, and current project information.
P66.007	Permitting Support for IGCC Power Plants	This project provides regularly updated guidelines for permitting IGCC units and an online database of IGCC permits. It also provides for consultation with IGCC early deployment projects and with regulators to identify measures that enhance plant permissibility.
P66.008	Advanced IGCC Improvements and Next-Generation Designs with CO ₂ Capture and Hydrogen Coproduction	This project evaluates options for improved IGCC performance generally (for all coal types) and for integration with water-gas shift reactors for CO ₂ capture and hydrogen production. It will examine various levels of CO ₂ capture from 20% up to practical maximums to understand the incremental cost of capturing increasing amounts of CO ₂ . In addition, EPRI will evaluate higher- pressure gasifiers, alternative oxidant supplies, and lower-cost syngas cooler and quench systems.
P66.009	Power Systems Development Facility (PSDF) Annual Report	The PSDF, a DOE project co-sponsored by Southern Company Services, EPRI, and other industrial partners, serves as a test center for the Transport Gasifier. Testing is transitioning to place more emphasis on improved syngas cleanup and on CO ₂ capture from both syngas and flue gas streams. This project provides an annual report on activities at the PSDF, including test results.

Project Descriptions

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

Issue

IGCC technology is evolving rapidly in response to cost-reduction and low-rank-coal-accommodation needs, and to provide a better transition from conventional operation to CO₂ 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.

Description

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, as well as plant visits arranged through the Gasification User Association (a related supplemental project).

Value

- Impartial technology assessments written by world-class gasification experts.
- Up-to-date information on coal gasification technology development status.
- 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 and 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 have been retained 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Coal Gasification Technology Status—Annual Update: 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 annual report also includes a useful primer on gasification technology basics.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p>Coal Gasification Technology Status—Annual Update: 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 annual report also includes a useful primer on gasification technology basics.</p>	2010	Technical Update

P66.005 Advanced IGCC Project Development Guidance (062006)

Issue

Designing an IGCC unit requires expertise 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, coal gasifiers, syngas clean-up, water-gas shift and CO₂ separation processes, and syngas- or hydrogen-firing combustion turbines.

Description

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 CO₂ 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.

Value

- 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 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 lessons learned from these projects are incorporated in the IGCC design guidelines produced in Project P66.006.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Advanced IGCC Project Development Consulting: This project provides consultation with the CoalFleet world-class IGCC Experts Group in support of members who are 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.	12/31/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Advanced IGCC Project Development Consulting: This project provides consultation with the CoalFleet world-class IGCC Experts Group in support of members who are 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.	2010	Technical Resource

P66.006 Plant Design Guidelines for IGCC (062007)

Issue

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 CO₂ 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. 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.

Description

This project updates and expands the family of generic design basis and technology- and fuel-specific design specifications for IGCC power plants, both with and without CO₂ capture. Also provided is a continually updated www.epri.com reference library (Knowledge Base B) of design studies, operational and experience-based lessons learned reports, and current project information.

Value

- Online IGCC reference information (Knowledge Base B).
- IGCC User Design Basis Specification, which provides power plant developers with the most detailed design guidance for IGCC plants available anywhere.
- 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 might be able to save millions of dollars in engineering 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 trade-offs and as a template for creating a specification document for an IGCC 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
EPRIweb Advanced Coal Technologies Knowledge Base B (IGCC Technology): This project offers regular updates of www.epri.com web pages 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.	12/31/2009	Technical Resource
IGCC User Design Basis Specification, Version 9: EPRI will update its 2008 UDDBS for IGCC based on technology developments and insights from the CoalFleet IGCC early deployment projects. The UDDBS will contain information on plant size, reliability-availability-maintainability goals, equipment train and sparing 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), and options for CO ₂ capture.	12/31/2009	Technical Report
IGCC Pre-Design Specification #7: A Pre-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 feasibility study and is ready to begin a front-end engineering design (FEED) study. One of the CoalFleet IGCC "early deployment projects" could serve as the basis for this Pre-Design Specification.	12/31/2009	Technical Update
IGCC Generic Design Specification #3: 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 front-end engineering design (FEED) study. One of the CoalFleet IGCC "early deployment projects" could serve as the basis for this Generic Design Specification.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p>EPRIweb Advanced Coal Technologies Knowledge Base B (IGCC Technology): This project offers regular updates of www.epri.com web pages 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.</p>	2010	Technical Resource
<p>IGCC User Design Basis Specification, Version 10: This project provides an update of EPRI's 2009 program year Version 10 of the UDBS, based on new technology developments and insights from the CoalFleet IGCC early deployment projects.</p>	2010	Technical Update

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

Issue

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 construction of a new plant.

Description

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. This project also provides for consultation with Project Set 66B members on IGCC feasibility studies and project development efforts, to assist members in working with regulators on measures to enhance plant permissibility.

Value

- 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 to 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 the aspects of an IGCC that are different 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
CoalFleet IGCC Permitting Database: EPRI will monitor IGCC project developments worldwide, and update its IGCC permit database (on an ongoing basis) 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 www.epri.com.	12/31/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
CoalFleet IGCC Permitting Database: EPRI will monitor IGCC project developments worldwide, and update its IGCC permit database (on an ongoing basis) 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 www.epri.com.	2010	Technical Resource

P66.008 Advanced IGCC Improvements and Next-Generation Designs with CO₂ Capture and Hydrogen Coproduction (062009)

Issue

Growing concern about the impact of CO₂ emissions on climate change is increasing the need to develop lower-cost methods for capturing CO₂ from coal-based power plants.

Description

This project evaluates options for improved IGCC performance generally (for all coal types) and for integration with water-gas shift reactors for CO₂ capture and hydrogen production. It will examine various levels of CO₂ capture from 20% up to practical maximums, in order to understand the incremental cost of capturing increasing amounts of CO₂. It will evaluate higher pressure gasifiers, alternative oxidant supplies, and lower-cost syngas cooler and quench systems.

Value

- Impartial, independent assessments of the potential advantages and risks of new technologies proposed for IGCCs with CO₂ capture.
- Lower-cost methods of capturing CO₂ from coal-based power plants.

How to Apply Results

The CoalFleet IGCC RD&D Augmentation Plan (EPRI Technical Update 1013219) identified a technology development pathway that could lead (by 2025) to an IGCC with 90% CO₂ capture and could produce electricity at a levelized cost no greater than a current IGCC that does not capture CO₂ (constant-dollar basis). This project will monitor progress toward that goal and provide independent assessments of proposed advances, such as lower-cost oxygen production technologies 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
<p>Engineering/Economic Evaluations of Case Studies for IGCC Power Plants with CCS: 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 including various levels of CO₂ capture will be included.</p>	6/30/2009	Technical Update

P66.009 Power Systems Development Facility (PSDF) Annual Report (062017)

Issue

Concerns about global climate change are expected to result in regulations limiting carbon dioxide (CO₂) emissions. Coal powers about 40% of the world's current electricity generation. For coal to remain a viable fuel, the electric industry needs cost-effective carbon capture and storage (CCS) technologies.

Description

The Power Systems Development Facility (PSDF) in Wilsonville, Alabama, operated by Southern Company on behalf of industrial partners under funding from the Department of Energy (DOE), is a unique test facility. It developed the Transport Gasifier and accelerated its advancement to demonstration, and supported testing and development of various ancillary gasification technologies. Now the PSDF is proposing a broad array of activities that will support development of cost-effective, advanced coal-based generation plants with CO₂ capture. The backbone of the program is a high-pressure, flexible facility designed to test an array of solvents and gas-liquid contactors under realistic conditions for a range of sizes providing representative data to guide the scale-up and design of commercial units. Multiple slipstreams of either coal-derived syngas or flue gas will be available, providing a range of gas flow rates and allowing several technologies to be tested simultaneously for a range of equipment sizes. Improved syngas cleanup, post-combustion capture, pre-combustion capture, and oxy-combustion projects are all included.

Value

- Reduced risk of scaling up to commercial application.
- Expanded knowledge and performance of processes that will provide cost-effective advanced coal power generation with CO₂ capture. This includes testing solvents, sorbents, and membrane technologies for CO₂ capture, and the development of supporting equipment and processes.
- Technology transfer to promote the commercialization of processes, materials, equipment, and systems successfully tested at the PSDF.

How to Apply Results

Test results from the PSDF programs, in conjunction with supporting economic analyses, can guide project developers in their choice of CO₂ capture technologies. For example, knowing how a CO₂ capture solvent performs in commercially representative syngas and flue gas advances solvent development and lowers the technical and financial risk of using that solvent in a commercial unit.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Annual PSDF Test Report: This annual report will include evaluation of results from testing of CO ₂ capture technologies for use with coal-derived syngas and flue gas.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Annual PSDF Test Report: This annual report will include evaluation of results from testing of CO ₂ capture technologies for use with coal-derived syngas and flue gas.	2010	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 and, more recently, CO₂ emissions. 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/CO₂ 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 CO₂ capture mode (post-combustion or oxy-combustion).

Project Number	Project Title	Value
P66.010	Design and Materials Development for Post-Ferritic (1200°F–1400°F) Ultra-Supercritical PC Plants	This project targets steam cycle operation at temperatures up to 1400°F (760°C) and at pressures up to 5000 psig (35 MPa or 345 bar) by qualifying nickel-based boiler and steam turbine materials through laboratory testing and in-service exposure at elevated temperatures. PC plants operating at advanced USC steam conditions will achieve efficiencies greater than 45% (HHV basis) and reduce CO ₂ emissions by 15% to 22% compared to the current fleet.
P66.011	Evaluation of Oxy-Combustion for Advanced PC and CFBC Plants	This project assesses design concepts, pilot plant performance, and estimates of full-scale cost and performance of oxy-combustion boilers as a means of CO ₂ emissions reduction for advanced combustion-based power plants. Technologies will be evaluated for a range of coals, from bituminous to subbituminous to lignite.

Project Number	Project Title	Value
P66.012	Advanced PC and CFBC Project Development Guidance	This project provides direct support for early-deployment USC PC and SC CFBC projects, including participation in design reviews (e.g., high-temperature materials selection, emission control strategies and equipment selection, cycling/turndown capability), CO ₂ capture convertibility assessments, and possible development of operator training and control system tuning simulators.
P66.013	Plant Design Guidelines and Near-Zero Emission Designs for USC PC Plants	This project updates and expands the Advanced PC Guideline and companion www.epri.com reference library (Knowledge Base C) of design information, including materials selection, environmental control equipment, O&M histories, and information on planned projects or those under construction. These products support feasibility studies of USC PC plants by early deployers and reduce lead times, costs, and risks.
P66.014	Evaluation of Post-Combustion CO ₂ Capture Technologies for Advanced PC and CFBC Plants	This project assesses the performance and cost of post-combustion CO ₂ removal systems for advanced combustion-based power plants. Technologies will be evaluated for a range of coals, from bituminous to subbituminous to lignite.

Project Descriptions

P66.010 Design and Materials Development for Post-Ferritic (1200°F–1400°F) Ultra-Supercritical PC Plants (062011)

Issue

Increasing steam temperatures to improve pulverized coal power plant efficiency, which provides both economic benefits and lower CO₂ and pollutant emissions, test the practical limits of strength and corrosion resistance offered by ferritic steel alloys. Austenitic steel alloys (which have high chromium content) currently 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.

Description

In this project, sponsored by the 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 steamside corrosion, and ease of welding, fabrication, and coating. An initial five-year program of USC boiler materials testing already is 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/components, and one on steam turbine materials/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 (including EPRI's perspective on the advances made) will become available to members once the 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.

Value

- 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 CO₂—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 calculation procedures.
- Demonstration of advanced materials in a power plant environment significantly reduces the unavailability risk for initial applications in new plants with advanced USC steam conditions.

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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
<p>Technical Progress Report on Turbine Materials Development for USC Plants: The project provides an annual progress report summarizing test plan accomplishments and results for the steam turbine material tests. Ultimately, the qualified advanced materials and fabrication methods will be incorporated in finished steam turbine components offered by OEMs.</p>	12/31/2009	Technical Update
<p>Technical Progress Report on Boiler Materials Development for USC Plants: The project provides an annual progress report summarizing test plan accomplishments and results for tests of new USC boiler materials taking place in USC-simulated demonstration cells in existing supercritical units. Ultimately, the qualified advanced materials and fabrication methods will be incorporated in finished boiler components offered by OEMs.</p>	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Technical Progress Report on Turbine Materials Development for USC Plants: The project provides an annual steam turbine material testing progress report similar to that produced in EPRI's 2009 program year, pending the U.S. Department of Energy's continued funding of the collaborative	2010	Technical Update
Technical Progress Report on Boiler Materials Development for USC Plants: The project provides an annual boiler material testing progress report similar to that produced in EPRI's 2009 program year, pending the U.S. Department of Energy's continued funding of the collaborative.	2010	Technical Update

P66.011 Evaluation of Oxy-Combustion for Advanced PC and CFBC Plants (065779)

Issue

Boilers designed to burn coal in a blend of oxygen and CO₂, rather than air, offer an alternative means of separating and concentrating CO₂, instead of using post-combustion solvent-based CO₂ capture processes. Known as "oxy-combustion," this approach offers potentially lower costs and lower energy penalties for CO₂ capture at PC and CFBC plants, particularly if emerging low-cost oxygen production technologies reach commercial fruition. A 30-MW_{th} oxy-combustion pilot plant, to which EPRI is providing technical support, commenced testing in the United States in 2007. Similar-sized test and demonstration units will enter service in Europe (2008) and Australia (2010), and the number of research projects worldwide is steadily increasing.

Description

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 the 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 CO₂ capture costs.

Value

- 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 CO₂ 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for PC Plants: This report will assess the performance of oxy-combustion pilot plants and estimate the cost and performance of full-scale oxy-combustion PC plants based on the latest available information.	6/30/2009	Technical Update
Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for CFBC Plants: This report will assess the performance of oxy-combustion pilot plants and estimate the cost and performance of full-scale oxy-combustion CFBC plants based on the latest available information.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for PC Plants: This report, similar to that provided in EPRI's 2009 program year, will update results from oxy-combustion pilot plants and the estimates of cost and performance for full-scale oxy-combustion PC plants.	2010	Technical Update
Oxy-Combustion Developments, Pilot Plant Operating Experience, and Designs for CFBC Plants: This report, similar to that provided in EPRI's 2009 program year, will update results from oxy-combustion pilot plants and the estimates of cost and performance for full-scale oxy-combustion CFBC plants.	2010	Technical Update

P66.012 Advanced PC and CFBC Project Development Guidance (062013)

Issue

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 recently have addressed these same issues—can help project developers make informed decisions.

Description

This project shares lessons learned from CoalFleet PC and CFBC project development consulting 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.

Value

- 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 “CO₂ 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 in developing siting studies, permit applications, design basis decisions, preliminary engineering designs, CO₂ capture conversion studies, and public outreach activities.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
<p>Presentations on CoalFleet Advanced PC and CFBC Project Development Consulting: At CoalFleet technical meetings, which are 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.</p>	12/31/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p>Presentations on CoalFleet Advanced PC and CFBC Project Development Consulting: At CoalFleet technical meetings, which are 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.</p>	2010	Technical Resource

P66.013 Plant Design Guidelines and Near-Zero Emission Designs for USC PC Plants (062014)

Issue

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 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 CO₂ 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.

Description

This project provides two updates of EPRI's design guideline for advanced PC plants, and a review of the current status of advanced CFBC plants. The guideline is supported by an online reference library (Knowledge Base C) containing technical papers, design data for existing units and those under construction, operating parameters including availability and emissions data, materials selections, and selected web links pre-screened for relevance by EPRI staff and the CoalFleet advanced combustion experts. Also included in this project is 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-base 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.

Value

- Faster and better-informed internal evaluations of advanced coal technologies by CoalFleet members, including initial technology screening 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 CO₂ capture 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 and incorporate the data and lessons learned into siting studies, permit applications, preliminary designs, and CO₂ 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
USC 1260° F (680° C) Reference Plant Design Study (Phase III): This project includes an engineering-economic design study for a USC PC unit with superior environmental controls fired by Pittsburgh #8 bituminous coal. A variant of the basic study will examine the thermal and economic impacts of firing the unit with Illinois #6 coal (which has higher sulfur and chloride contents). Another variant will examine the cost-effectiveness of employing a post-FGD polishing device for deep SO ₂ reductions as a means of reducing solvent losses due to sulfur poisoning in a downstream CO ₂ removal stage.	6/30/2009	Technical Update

Product Title & Description	Planned Completion Date	Product Type
<p>Guideline for Advanced PC Plants: Version 6: This guideline is an update of 2008 program year Version 5 of the advanced PC guideline, including new materials, updates to previous materials, and new developments and insights from the CoalFleet USC PC early deployment project(s). As with previous editions, the guideline will concentrate on designs for near-zero emissions, accommodating higher steam conditions without adversely affecting reliability, availability, maintainability, and operability goals, with options to facilitate later conversion to CO₂ capture while minimizing impact on electrical output, efficiency, and cost of electricity.</p>	9/30/2009	Technical Update
<p>Advanced Coal Technologies Knowledge Base C: Regular updates are provided of EPRI's 2008 online library of data and references covering trends in advanced PC technology design criteria and cost, materials selection, performance, and availability estimates for various fuel-technology combinations. During 2009, information on advanced CFBC plants and oxy-combustion technologies will be assembled and added.</p>	12/31/2009	Technical Resource
<p>Current Status of CFBC Technology: This report will provide a review of current CFBC developments to increase generating efficiency, improve economy of scale, and progress to near-zero emissions. The retrofit of CO₂ capture processes in ways that minimize impact on electrical output, efficiency, and cost of electricity will be assessed.</p>	12/31/2009	Technical Update
<p>Assessment of Heat Rate Improvement Measures: In conjunction with Project 71.005, this project will identify and evaluate steam-side and boiler-side heat rate improvement measures for inclusion in advanced PC power plants. The driver for such improvements is a reduction in CO₂ emissions with an associated reduction in the cost of capture and storage. The cost benefit and the effect on availability will be included in the evaluation.</p>	12/31/2009	Technical Update
Future Year Products		
Product Title & Description	Planned Completion Date	Product Type
<p>Guideline for Advanced PC Plants, Version 7: This guideline is an update of EPRI's 2009 program year Version 6 of the advanced PC guideline, based on new technology developments and insights from the CoalFleet USC PC early deployment project(s).</p>	2010	Technical Update
<p>Advanced Coal Technologies Knowledge Base C: Regular updates are provided of EPRI's 2009 online library of data and references for advanced PC, CFBC, and oxy-combustion technologies.</p>	2010	Technical Resource

Product Title & Description	Planned Completion Date	Product Type
<p>Pre-Design Specification #1 for USC PC Plants: This report will provide a generic description of design decisions and performance data for a USC PC unit derived from publicly available information in permit application package(s). It will also potentially include nonproprietary information from a CoalFleet early deployer's detailed feasibility study or preliminary engineering design.</p>	2010	Technical Update

P66.014 Evaluation of Post-Combustion CO₂ Capture Technologies for Advanced PC and CFBC Plants (062015)

Issue

Regulations limiting CO₂ 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 CO₂ 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 the application of 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. 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 CO₂ capture technologies.

Description

This project evaluates various post-combustion CO₂ capture technologies for application to new advanced PC and CFBC units. The project will address both designs for retrofit after initial operation without CO₂ capture, and optimal integration of post-combustion capture processes in new units that will capture CO₂ upon initial commissioning. Cost and performance comparisons of candidate CO₂ capture technologies will consider the impacts of fuel properties for bituminous, subbituminous, and lignite coals.

Value

- Information about the likely future costs and performance and operational impacts of incorporating post-combustion CO₂ capture processes into PC and CFBC plants, thereby 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 CO₂ 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 CO₂ capture readiness studies, and corporate carbon management strategies.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
<p>Integrating CO₂ Capture Technologies into New PC and CFBC Power Plants – Chilled Ammonia Process: In conjunction with Program 165, this project will determine cost and performance impacts of integrating chilled ammonia post-combustion CO₂ capture technology with commercial-scale PC and CFBC plants firing U.S. coals.</p>	12/31/2009	Technical Update
<p>Post-Combustion CO₂ Capture “Base Case” and Optimal Heat Integration Study - Phase 3: This report will describe results of an engineering-economic case study incorporating an improved amine-based post-combustion CO₂ capture process into a new, state-of-the-art, ultra-supercritical PC plant. This phase investigates the economic effect of different percentage CO₂ capture and higher steam conditions.</p>	6/30/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p>Integrating CO₂ Capture Technologies into New PC and CFBC Plants: This report will assess cost and performance impacts of integrating emerging post-combustion CO₂ capture technologies. It will be completed in conjunction with Program 165 as a companion to the report developed in the 2009 program year.</p>	2010	Technical Update