DOE/FE-0215P-2 Issue No. 3, Summer 1991

Clean Coal Today

An Update of the U.S. Clean Coal Technology Demonstration Program Office of Fossil Energy, U.S. Department of Energy

Clean Coal Briefs

America's commitment to the development of a new generation of clean coal technologies was reaffirmed with the submission of 33 new proposals—valued at more than $6.5 billion—for joint government/industry projects under the fourth round of the Clean Coal Technology Program. Proposers will be vying for a share of nearly $570 million in federal funds.

"In many ways, the 33 new proposals give us a snapshot of coal use in the coming century," said Secretary of Energy James D. Watkins in announcing the proposals received by the May 17, 1991, deadline. The Energy Department will announce the winning proposals by the middle of September.

In the meantime, considerable progress was achieved in many of the ongoing 34 projects from the first three rounds of the clean coal program, with 9 projects now operating or completed and another 11 under construction. Highlights of recent events follow.

*See "**Intro**" on page 6*

In This Issue

Gas Reburning Tests Begin at Illinois Power Plant

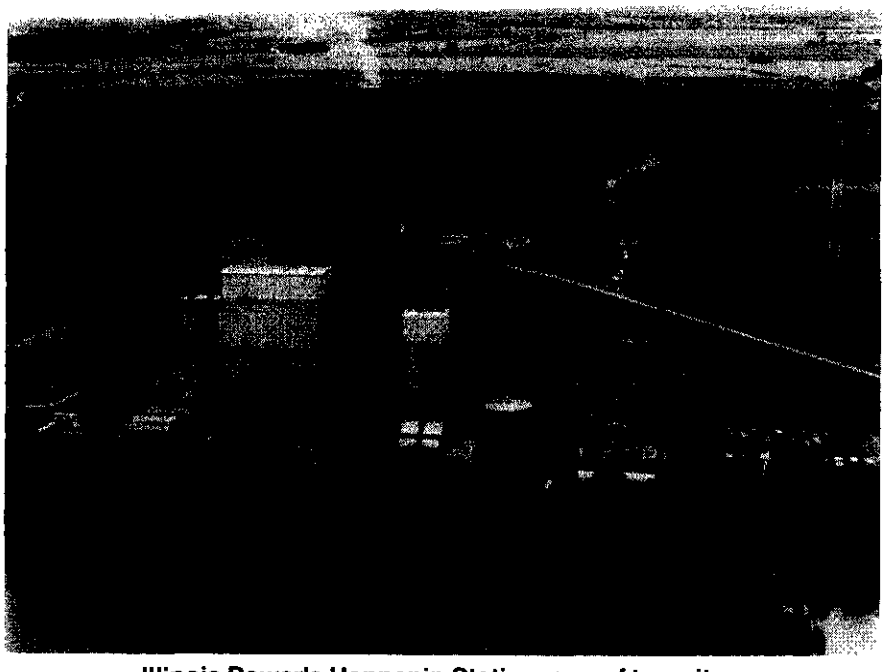
Early Tests Exceed Expectations

Tests of gas reburning technology on an operating tangentially fired coal-burning boiler have shown that this advanced clean coal technology can reduce nitrogen oxide emissions (NO_x) by nearly 70 percent.

In a series of 2-hour, steady-state tests conducted in December 1990 and January 1991, Energy and Environmental Research Corporation (EER) successfully reduced NO_x emissions from a 71-megawatt boiler by 68 percent, surpassing their initial goal of a 60 percent reduction. Natural gas amounted to 18 percent of the total heat input during the tests, which took place at Illinois Power's Hennepin Plant in Illinois.

Gas reburning is only the first half of a two-part process being tested by EER in this project from the initial round of the Clean Coal Technology Program. The project will combine gas reburning with sorbent injection, an emerging retrofit technique for the control of sulfur dioxides (SO_2) emissions. This joint government/industry project will be the first-ever simultaneous demonstration of

*See "**Reburn**" on page 3*



Illinois Power's Hennepin Station, one of two sites for gas reburning/sorbent injection demonstration.

Fiberglass Reinforced Plastic Highlights CT-121 "Second Generation" Wet Scrubber

Many advanced technologies being demonstrated in the Clean Coal Technology Program are aimed at reducing the high costs associated with conventional pollution control techniques. In addition to process improvements, significant savings can also be realized through the use of new construction materials and fabrication techniques.

In one of their four clean coal technology projects, Southern Company Services is installing an advanced wet scrubbing system that promises to remove both SO_2 and fly ash at potentially half the cost of conventional scrubbers. Called the Chiyoda Thoroughbred (CT-121), this advanced system combines conventional limestone FGD chemistry, forced oxidation, and gypsum crystallization in one reaction vessel.

Reactor Design Cuts Costs

The CT-121 system, featuring a "Jet Bubbling Reactor" (JBR), is designed with several cost-saving features. Its high reliability eliminates the need for a spare absorber vessel, and the JBR design provides much more effective gas-liquid contact and better absorption than conventional spray systems.

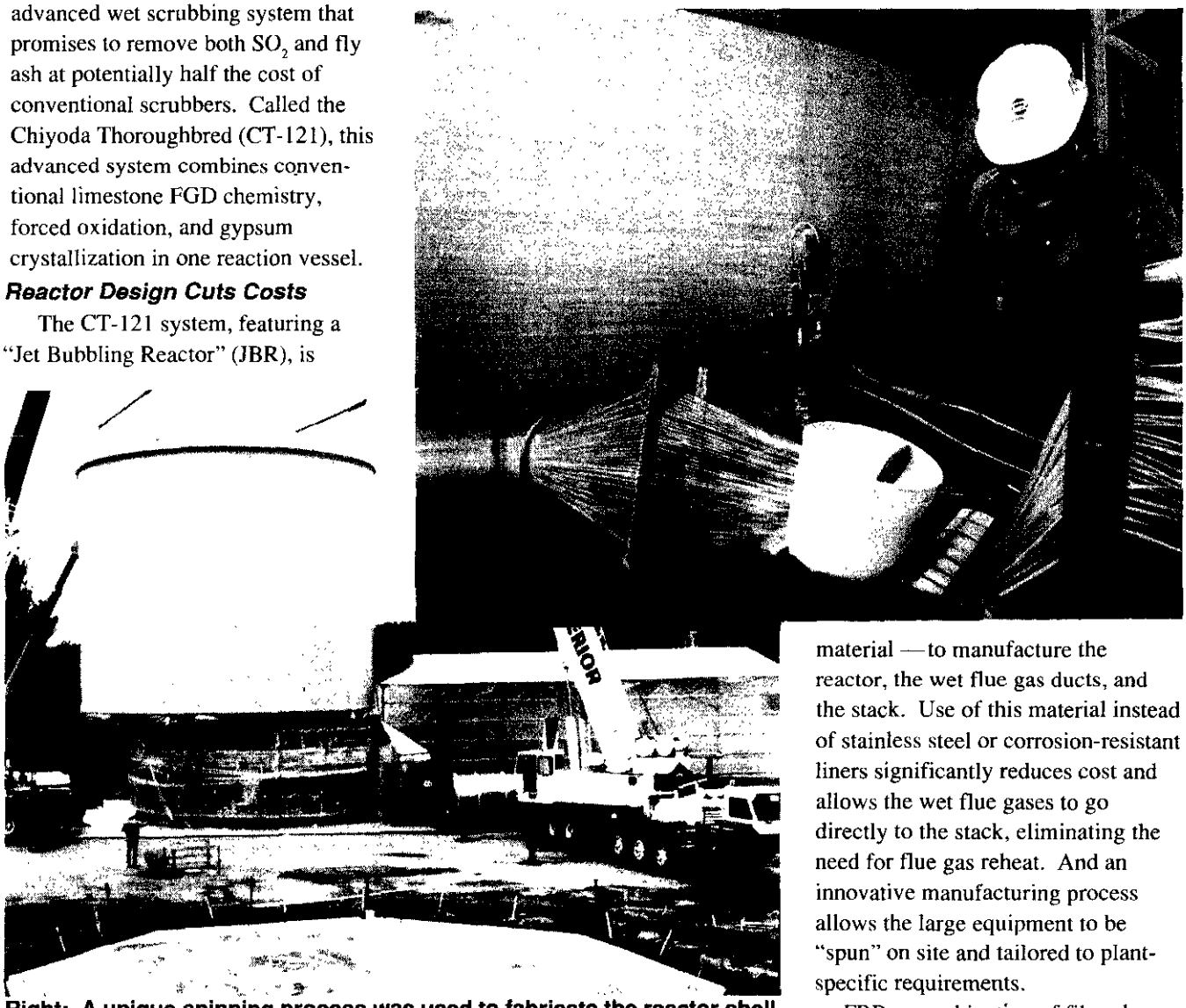
Combining SO_2 and particulate removal in one vessel can eliminate the need for an ESP, baghouse or prescrubber. The design allows a high concentration of gypsum crystals in the SO_2 absorption area, avoiding scaling problems and promoting the growth of large gypsum crystals that are easier to dewater. The marketable gypsum by-product avoids many of the environmental and handling problems associated with scrubber sludge.

FRP Allows On-Site Construction

Perhaps the most significant cost-saving measure in this $36 million project is the use of fiberglass reinforced plastic (FRP)—a lightweight, strong, and corrosion-resistant material —to manufacture the reactor, the wet flue gas ducts, and the stack. Use of this material instead of stainless steel or corrosion-resistant liners significantly reduces cost and allows the wet flue gases to go directly to the stack, eliminating the need for flue gas reheat. And an innovative manufacturing process allows the large equipment to be "spun" on site and tailored to plant-specific requirements.

FRP, a combination of fiberglass

See "Fiberglass" on page 5



Right: A unique spinning process was used to fabricate the reactor shell on site in less than 30 days. Above: The completed vessel being lifted from the mold for placement onto the foundation.

Reburn...continued from pg. 1

the two technologies.

In addition to the Hennepin Station, EER will test the same combination of technologies on a 33-megawatt cyclone boiler operated by City Water, Light & Power at its Lakeside Station in Springfield, Illinois. Funding for the $30 million project is being provided by the Department of Energy, the Gas Research Institute, and the State of Illinois Department of Energy and Natural Resources.

If tests continue to be successful, the project will have demonstrated two important options for reducing acid rain-causing emissions from older or tightly-spaced plants that cannot house large complex pollution control systems.

Gas reburning and sorbent injection (GR-SI) was designed to easily interface with existing coal combustion systems. When the system is installed, existing burners or combustors are retained, significantly reducing the capital costs of this pollution control system.

Gas reburning controls NO_x emissions through a staged combustion process. A slightly smaller than usual amount of coal is burned in the combustor at a carefully controlled air-to-fuel ratio. The reduced coal input is supplemented by natural gas which is injected downstream of the coal combustion zone. Most of the NO_x formed by combustion is converted to atmospheric nitrogen by the reducing conditions that result from the partial combustion of coal and natural gas. Air is then injected above the natural gas injection point to complete the combustion process.

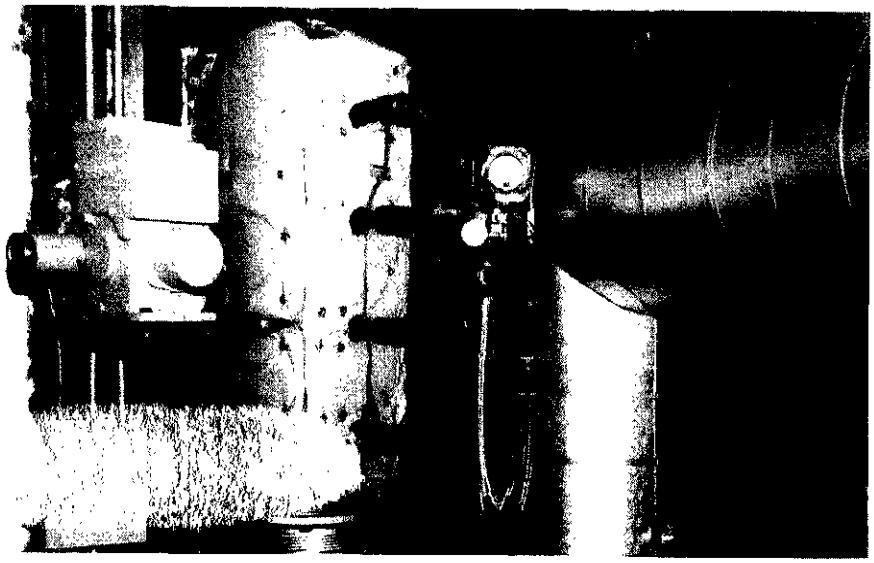
. . . the project will demonstrate two important options for reducing acid rain-causing emissions from tightly-spaced power plants .

Sulfur dioxide emissions are also controlled during the combustion process. A sulfur-capturing sorbent is injected into either the upper part of the boiler or into the flue gas duct downstream of the boiler. The sorbent reacts with SO_2, forming solid compounds that are then captured by the existing electrostatic precipitator (ESP) or baghouse.

With the increased particulate loadings, it may be necessary to upgrade the particulate collection equipment to operate the GR-SI system. In the Hennepin demonstration, sorbent injection will occur in the upper furnace and will be followed by humidification, or water injection. This humidification step is expected to both enhance ESP performance and increase sulfur capture.

Sorbent injection start-up and short-term tests began in April of this year at the Hennepin site. These will be followed by long-term GR-SI tests, scheduled to begin late this summer. In addition to measuring NO_x and SO_x reductions, project personnel will carefully watch for any fouling or corrosion of boiler tubes and equipment that may be caused by the modified combustion process.

Tests at the Lakeside Station in Springfield, scheduled to begin this fall, will expand the technology's data base to include cyclone boilers. In these boilers, built mainly in the 1960s, coal and air are injected tangentially into cylindrical combustors where an intense cyclonic mixing yields high combustion rates—and high levels of NO_x emisisons. Coal-fired cyclone boilers are located mostly in the Midwest. With no technology currently available that can economically reduce NO_x from these boilers, the GR-SI technology will offer an important option to owners of these plants. ■



One of four gas reburn injectors installed in the corners of the Unit 1 boiler at the Hennepin Station.

Clean Coal Today

Published quarterly by
The Office of Clean Coal Technology
U.S. Department of Energy
Washington, D.C. 20585

Editor: Arvid Strom
Assoc. Editor: Phoebe Hamill

Comments are welcome.
Please submit these to the
Editor (FE-22)
(202) 586-7160

Bethlehem Steel's Innovative Cleanup System Nears Completion at Sparrow's Point

Power plants aren't the only facilities benefitting from new technologies emerging from the Clean Coal Technology Program.

In one of the program's three projects aimed specifically at industrial sources, Bethlehem Steel Corporation is in the final stages of building an innovative pollution control facility at its Sparrows Point Plant near Baltimore, Maryland. Demonstration of this advanced technology is expected to play a large part in helping the nation's steel industry meet a number of environmental challenges while holding down costs and maintaining competitiveness.

The project will focus on cleaning the gases that are produced in the making of coke—one of the first steps in the steel making process. These gases,which contain hydrogen, hydrogen sulfide, ammonia, carbon monoxide, and light organic gases, can be used as a fuel in the steel plant. If not treated, SO_2 is emitted when the gases are burned as fuel, and volatile organic compounds escape from conventional gas processing systems.

In this $45 million project, Bethlehem Steel is replacing much of the existing gas treatment facility at its Sparrows Point plant—parts of which are over 30 years old—with an innovative coke oven gas cleanup system. The existing treatment system, which employs two separate processing plants, cleaned only a portion of the gases. It was complex, inefficient, and produced byproducts that were difficult to dispose.

When the new system is complete, the entire output of coke oven gases will be cleaned with a process that is cleaner, simpler, more reliable, and less costly than any currently available.

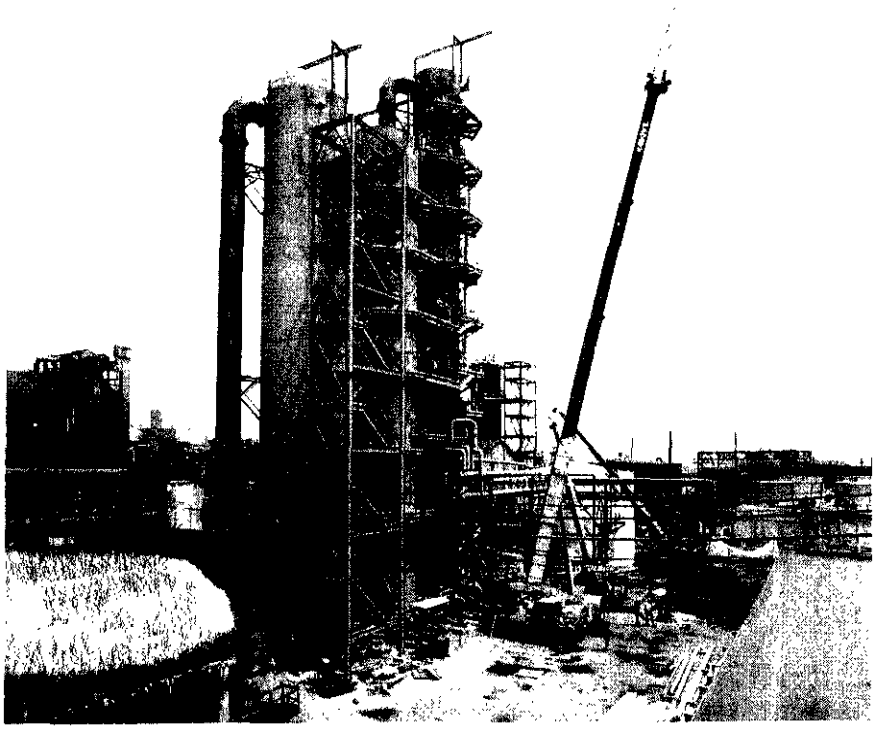
The new system is actually a first-time incorporation of four processes that have been tested previously as commercial units. In the integrated coke oven gas cleaning system, the hot gases are cooled as they leave the coke ovens, hydrogen sulfide and ammonia are removed and recovered, ammonia is destroyed, and sulfur is produced as a salable by-product.

When complete, the entire output of coke oven gases will be cleaned with a process that is cleaner, simpler, more reliable, and less costly than any currently available.

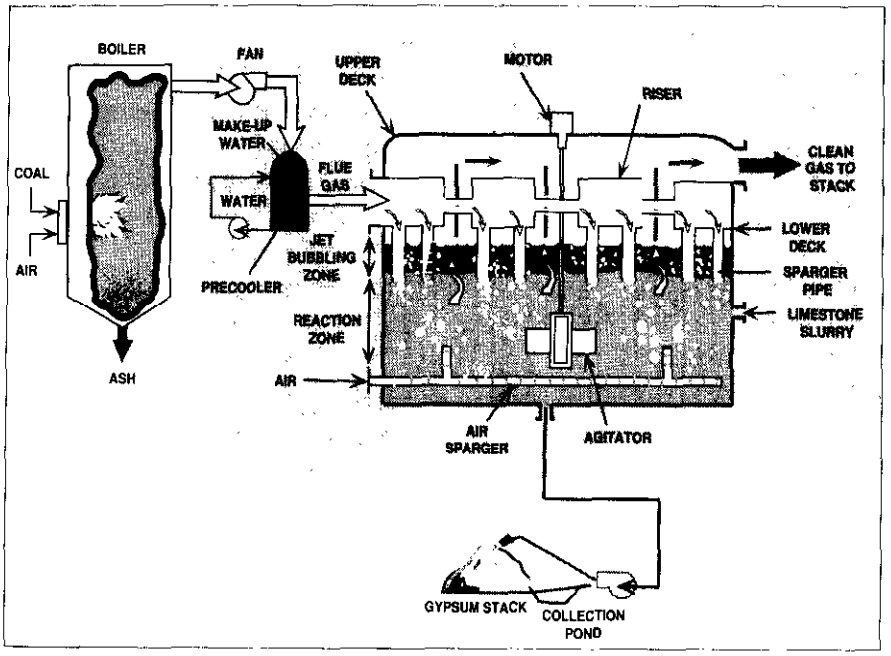
The major environmental benefit of this new technology is realized when cleaned coke oven gases are burned within the steel plant. Emissions of SO_2 will be reduced by more than 75 percent. Target concentrations for hydrogen sulfide and ammonia in the clean coke oven gas are 70 and 4 grains per 100 standard cubic feet, respectively. The secondary gas cooling system reduces coke oven gas temperatures, allowing for improved removal of hydrogen sulfide and ammonia. And because this cooling system avoids direct contact of the gases with the atmosphere, emissions of volatile organic compounds are also minimized.

In addition to environmental benefits, the new system promises to be cost effective. Preliminary data indicates that using the modified system at the Sparrows Point Plant will save the steel firm $4-7 million each year in operating costs. It also results in less need to purchase and handle feed chemicals, and reduced

*See "**Bethlehem**" on page 5*



Three large process reactors manufactured in the Bethlehem Steel Ship Yards are the heart of the COG cleanup system.



The CT-121 Jet Bubbling Reactor

***Fiberglass**...continued from pg. 3*

and resin, is a lightweight, high-strength material that won't corrode when confronted with the abrasive acidic conditions in a scrubber environment. Already in widespread use as a stack liner material at utilities where scrubbers are installed, FRP can be virtually maintenance-free and last indefinitely.

Unique Manufacturing "Spinning" Process

A unique manufacturing "spinning" process was used by Ershigs Inc. to make the 42-foot diameter fiberglass reactor shell at the Yates plant site in less than 30 days. Made with alternating layers of resin and fiberglass strands, the vessel contains no vertical seams and no external metal reinforcement.

To construct a vessel, mylar film is first wrapped around a revolving cylindrical mandrel approximately 42 feet in diameter and 12 feet high. As this mold revolves, it is sprayed with vinyl ester and reinforced with a glass veil. The primary structural portion of the vessel is made from 45-glass strand roving that is presaturated in a resin bath and helically wound around the rotating interior layer. Additional layers of strand roving are then applied in alternating directions to build lateral and vertical strength. The outer surface is coated to withstand ultraviolet degradation.

After an initial 10-foot high cylindrical section is spun, it is lifted to the top of the mandrel with a crane and another section is wound, overlapping the first. The mandrel can be reused to make multiple modules.

When the shell spinning was completed last December, the 36-foot high JBR was simply moved onto its concrete pad, ready for installation of the bottom panels, internal gas piping, nozzles, and roof.

Except for the central agitator and sparger tubes, all of the components of the JBR will be manufactured of the fiberglass material. Ershigs has also completed fabrication of the 28-foot diameter fiberglass limestone slurry tank. Sections of the 13-foot diameter fiberglass flue gas stack and associated ductwork are currently being assembled for installation.

Throughout design and construction, the project has been kept on schedule and within its $36 million budget. Construction is scheduled to be completed in September of 1992. Two years of testing will be complete in August 1994. The Electric Power Research Institute is funding $7.0 million of the project's total cost.

Because of its strength, flexibility, and low-cost, FRP construction and on-site manufacturing is expected to be widely used in the U.S. pollution control industry. ■

***Bethlehem**...continued from pg. 4*

costs for the disposal of nuisance by-products.

Most of the key process equipment has been fabricated and installed at the site since the agreement was signed in November 1989. The hydrogen sulfide scrubber is approximately 13 feet in diameter and 136 feet high, and the two ammonia absorber towers are 16.5 feet in diameter and approximately 105 feet high. These structures were fabricated at Bethlehem Steel's shipyard facility, also located at Sparrows Point.

Construction is expected to be finished this fall. Cold commissioning of the new system will begin this summer with the circulation of fluids throughout the system. The system will be operated for 14 months under the Clean Coal Technology Program.

The integrated system was designed by the project's prime subcontractor, Davy/Still-Otto, a joint venture between Davy McKee Corporation, a major engineering contractor, and Still-Otto, the world's largest designer and builder of coke-making facilities.

When this clean coal technology project is complete, the Sparrows Point steel-making facility will be a showcase of advanced technology for integrated steel plants throughout the nation and will have moved another step closer to its goal of becoming a modern, competitive steel producer. ■

Intro...continued from pg. 1

Western Energy Company hosted a ground breaking at its Rosebud Mine near Colstrip, Montana, on March 28, 1991, for its $69 million advanced coal conversion process project. Attending the ceremony were Montana Governor Stan Stephens and other key industry and government officials from throughout the state. In addition to initiating construction of this 1000-ton-per-day project, Western Energy officials announced the formation of a new partnership with the NRG Group, a subsidiary of Northern States Power Co. of Minneapolis, Minnesota. Rosebud Syncoal will oversee the demonstration project as well as future commercialization efforts of this promising technology that could open new markets for low rank coals.

On May 9, 1991, Ohio Edison Company hosted a ceremony to celebrate the start of construction of the $11.6 million **Babcock & Wilcox SOx-NOx-Rox Box** project at its R. E. Burger Station in Dilles Bottom, Ohio. Over 100 guests watched as officials from federal, state and local governments joined environmental and labor representatives to help place one of the high-temperature bags in the unique baghouse.

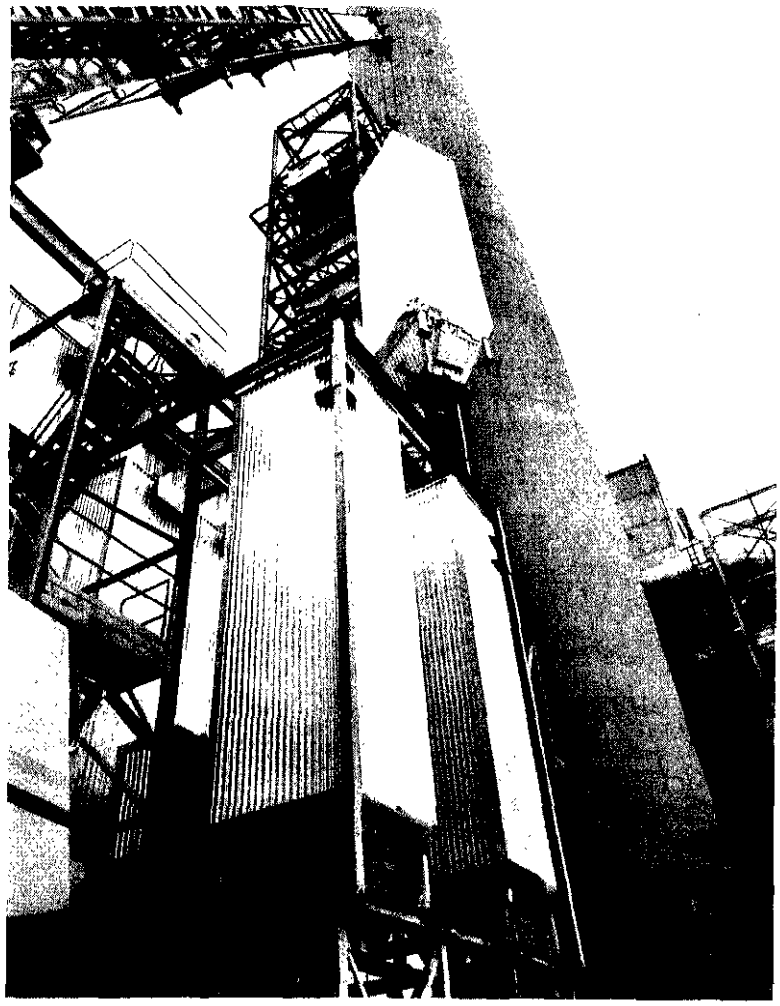
Senator Richard Lugar (R/IN) and Congressman Philip Sharp (D/IN) were among the invited guests at the ceremonial kickoff of construction for the $17 million **LIFAC Project**. The ceremony was held on May 29, 1991, at Richmond Power & Light Whitewater Valley Station in Richmond, Indiana.

In other projects, **Southern Company Services** continued to make progress on its evaluation of low NO_x combustion systems for wall-fired and tangentially fired boilers. In the wall-fired project at Georgia Power Company's Plant Hammond, advanced overfire air tests were completed, low-NO_x burners were installed in April and testing of the 24 Foster Wheeler burners began in May on their Unit #4 500-megawatt boiler. At Gulf Power's Plant Smith, one of three basic air/coal feed configurations to be tested on their Unit #1 180-megawatt tangentially fired boiler was installed. Tests began in April 1991.

Over 300 hours of coal-fired operation were logged at **Ohio Power Company's Tidd PFBC project**, including a continuous run of more than 60 hours reaching a full bed level of 127 inches. Power generation rates in excess of 50 megawatts were achieved.

On May 8, the Council of the City of Springfield, Illinois, voted to approve the $271 million **ABB Combustion Engineering integrated coal gasification combined cycle project** planned for the Lakeside Station of City Water Power & Light. The project will allow the city-owned utility to increase capacity of its Lakeside Station while utilizing the region's high-sulfur coal.

Negotiations were completed in June on the **Pressurized Fluidized Bed Demonstration Project** proposed by the **Dairyland Power Cooperative**. Under the cooperative agreement submitted to Congress for a 30-day review, Iowa Power would host the demonstration at its 70-megawatt facility in Des Moines, Iowa. The $203 million project would be conducted over a 6-year period with initial operation scheduled for 1995. ■



A high-temperature SNRB baghouse module is dropped into place at Ohio Edison's Burger Station in Dilles Bottom, Ohio.

Catalyst Suppliers Selected In Southern Company's SCR Project

Southern Company Services, Inc., has completed conceptual design activities—including agreements with seven catalyst suppliers—for tests of the selective catalytic reduction (SCR) process at a Florida power plant.

If tests are successful, the project could lead the way to commercial availability of this highly effective NO_x control technology in the United States. This $15.8 million project will take place at Gulf Power Company's Plant Crist near Pensacola, Florida.

Widely used throughout Europe and Japan, SCR systems have been extremely effective in destroying up to 80 percent of the NO_x formed during coal combustion. Questions remain, however, about the impact of the process on plant equipment and operations, as well as its cost, when operated in a U.S. utility environment.

By testing various catalysts under representative utility operating conditions with high-sulfur U.S. coals, data from this project could help overcome these problems.

In an SCR system, controlled amounts of ammonia are mixed with combustion gases. This mixture then passes through a reaction chamber built alongside the boiler. In the presence of a catalyst, the NO_x reacts with ammonia to form harmless molecular nitrogen and water.

Because SCR is a post-combustion process, it can be used on any boiler type. Although data are not available for U.S. cyclone boilers, cyclones promise to be good candidates because they cannot be easily retrofitted with existing NO_x control technologies.

At the Crist plant site, nine catalysts representing various shapes and sizes will be tested. The SCR facility will include three 2.5-megawatt-equivalent reactors and six smaller 0.20 megawatt reactors. A flue gas slipstream taken from Unit No. 5 of the Christ plant, which burns 3 percent sulfur coal will supply the combustion gas for the reactors.

Engelhard Corp., W.R. Grace Co., and Norton Co. have been selected to provide honeycomb-shaped catalysts for the small reactors. W.R. Grace and Nippon Shokybai will each provide honeycomb catalysts for a large reactor; Halder Topsoe and Hitachi Zosen will provide ceramic-based plate shaped catalysts for the small reactor and Siemens will supply a steel-based plate catalysts for a large reactor.

Testing with these various catalysts will allow a comprehensive evaluation of both the process chemistry and economics of SCR technology when operated with high-sulfur U.S. coals with both high- and low-ash loadings.

Detailed engineering is under way. The project is scheduled to be completed by mid-1994. ■

Round IV Update

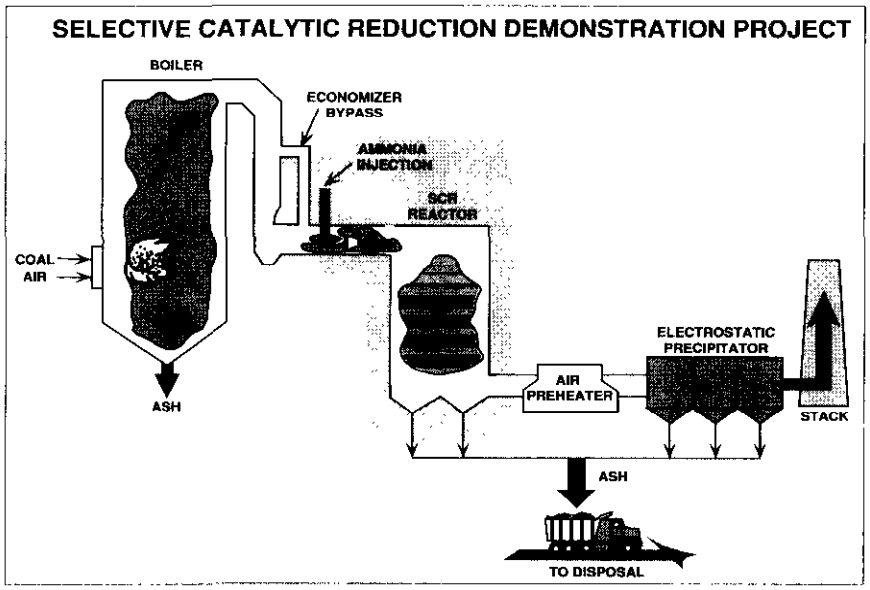
Proposals for 33 new government-industry projects, valued at a total of more than $6.5 billion, met the May 17 deadline for submitting proposals under the fourth round of the Clean Coal Technology Program. Proposers will be vying for nearly $570 million in federal funds—the most in the program's history.

The 33 projects are located in 17 states. Technologies proposed for demonstration include highly efficient power generating concepts, advanced pollution control systems, new fuel forms, and advanced coal cleaning and upgrading techniques.

Proposals are being reviewed by a board of seven senior federal goernment officials assisted by more than 80 technical experts from the Energy Department's Headquarters and field offices in Pittsburgh, PA and Morgantown, WV.

The department will announce the winning projects by the middle of September.

Public abstracts of the proposed projects can be obtained by calling the Fossil Energy Office of Communications at 202/586-6503. ■



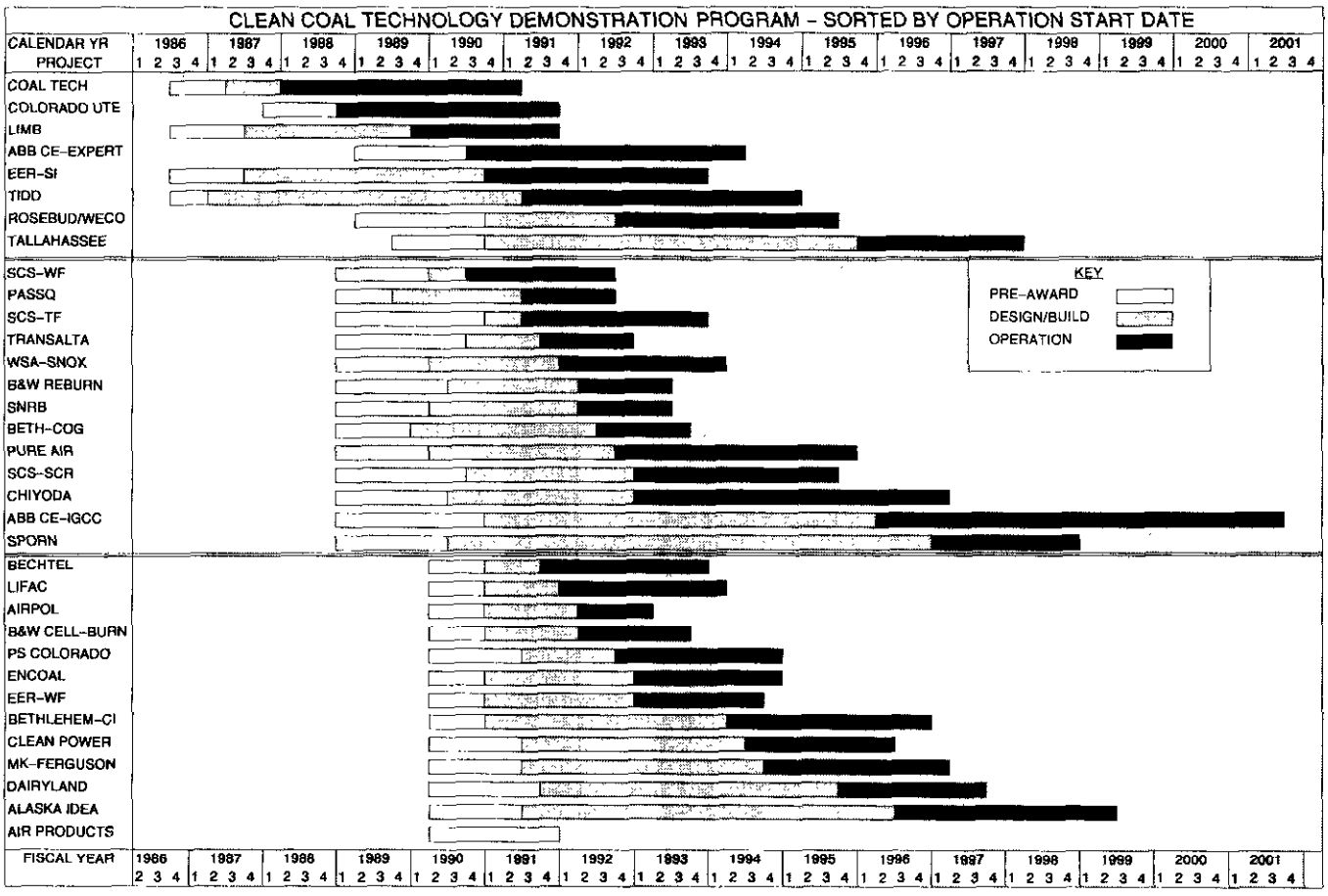
Status of Clean Coal Technology Demonstration Projects

CCT-I Projects	Status
Advanced Cyclone Combustor with Integral Sulfur, Nitrogen, and Ash Control. Coal Tech Corp., Williamsport, PA.	Project work has been completed with the air-cooled combustor having logged some 900 hours of operation representative of industrial application. Publication and distribution of the final report is planned for mid-1991.
Enhancing the Use of Coals by Gas Reburning and Sorbent Injection. Energy and Environmental Research Corporation, Hennepin and Springfield, IL.	Evaluation of the results of 32 basic gas reburning tests completed in March at the Hennepin site (tangentially-fired boiler) has shown the strong effect of excess air on NO_x reduction. A second series of parametric gas reburning tests is in progress. Start-up of the sorbent injection system was initiated. At the Springfield site (cyclone-fired boiler), all civil construction work has been completed. Boiler outage activities were initiated in May and continued in June.
LIMB Demonstration Project Extension. The Babcock & Wilcox Co., Lorain, OH.	Coolside duct injection tests (1,729 operating hours) have been successfully completed with up to 70% SO_2 removal. Combinations of four sorbents and three coals are being tested in the current LIMB extension demonstration scheduled for completion late this summer.
Nucla CFB Demonstration Project. Colorado-Ute Electric Association, Inc., Nucla, CO.	The project has completed the scheduled two year testing program (15,707 hours) demonstrating New Source Performance Standards reductions for SO_2 and NO_x emissions. Preparation of the Final Technical Report and Economic Evaluation report is continuing with completion scheduled for October 1991.
Prototype Commercial Coal/Oil Coprocessing Project. Ohio Clean Fuels, Inc., Warren, OH.	After allowing a series of extensions to restructure the project and review of the most recent proposal which failed to meet financial goals, the Department ended its sponsorship of the project.
TIDD PFBC Demonstration Project. American Electric Power Service Corp. on behalf of Ohio Power Co., Brilliant, OH.	Over 300 hours of operation have been logged including a continuous run of more than 60 hours reaching a full bed level of 127 inches. Power generation rates in excess of 50 MWe of power were achieved.
Advanced Coal Conversion Process Demonstration. Western Energy Co., Colstrip, MT.	DOE approved formation of the Rosebud SynCoal Partnership between Western Energy Co. and Northern States Power Co. Installation of piling has been completed and construction work on foundations is in progress.
Development of the Coal Quality Expert. Combustion Engineering, Inc. & CQ, Inc., Homer City, PA.	Utility scale combustion tests in combination with smaller scale tests to determine correlations have been conducted on selected Wyoming and Oklahoma coals.
Arvah B. Hopkins Circulating Fluidized Bed Repowering Project. The City of Tallahassee, Tallahassee, FL.	Design activities are continuing. DOE has approved the circulating fluid bed boiler sub-contract to Foster Wheeler Corp.

CCT-II Projects	Status
Advanced Flue Gas Desulfurization Demonstration Project. Pure Air, a Joint Venture, Co., Gary, IN.	Design is essentially complete and construction is about 46% complete. The SO_2 absorber is structurally complete and work has begun on resin lining of the absorber and ancillary equipment.
180 MWe Demonstration of Advanced Tangentially-Fired Combustion Techniques for the Reduction of NOx Emissions for Coal-Fired Boilers. Southern Company Services, Inc., Lynn Haven, FL.	Short- and long-term baseline performance testing was completed. The Low NO_x Concentric Firing System (LNCFS) Level II equipment (one of three basic air/coal feed configurations to be tested) was installed during the plant outage in April 1991. Preliminary results of operating the LNCFS Level II system indicated NO_x reductions of up to 35% compared to the baseline emissions data.

CCT-II Projects	Status
Demonstration of Advanced Combustion Techniques for a Wall-Fired Boiler. Southern Company Services, Inc., Coosa, GA.	Long-term testing of Advanced Overfire Air (AOFA) for evaluation of NO_x reduction has been completed with 80 days of data collected. Based on preliminary performance testing of AOFA, NO_x reduction of 20% has been measured. The 24 new Low NO_x Burners (LNB) were installed during the March 1991 outage at Hammond Plant Unit No. 4 and LNB testing is in progress.
Cement Kiln Flue Gas Recovery Scrubber. Passamaquoddy Tribe, Thomaston, ME.	Construction and start-up activities were essentially completed in March. Following a brief shutdown, plant operations resumed in June with the scrubber to come on-line in June after replacing the heat exchanger.
Demonstration of Coal Reburning for Cyclone Boiler NOx Control. The Babcock & Wilcox Co., Cassville, WI.	Design work is essentially complete. The Environmental Assessment to support construction activities has been approved. Construction has begun with the installation of foundations. Work to be done during the Nelson Dewey Generating Station spring outage was completed in preparation for the installation of the reburn system during the boiler outage scheduled for September 1991.
Innovative Coke Oven Gas CleaningSystem for Retrofit Applications. Bethlehem Steel Corp., Sparrows Point, MD.	Erection of major mechanical equipment and structural steel has been completed and hydrostatic testing of vessels is in progress. Preoperational tests and start-up are scheduled for this fall.
Demonstration of Innovative Applications of Technology for the CT-121 FGD Process. Southern Company Services, Inc., Newnan, GA.	Construction activity is well underway and final design activities continue. Hydrostatic testing of the limestone slurry tank has been successfully completed and internals are being installed in the jet-bubbling reactor.
Combustion Engineering IGCC Repowering Project. Combustion Engineering, Inc., Springfield, IL.	Work continues toward establishing design, cost and schedule baselines for repowering the City Water Light and Power Lakeside Station. Cold flow modeling of the gasifier internals and dry coal feed system continues.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers. TransAlta Resources Investment Corp., Marion, IL.	Most of the major equipment items have been ordered and construction is approximately 50% complete. Engineering and design work continue with operation scheduled for the end of 1991.
PFBC Utility Demonstration Project. American Electric Power Service Corp., as agent for The Appalachian Power Co. and the Ohio Power Co., New Haven, WV.	Detailed life cycle cost studies comparing PFBC repowering and greenfield plants against conventional power plants with scrubbers are continuing.
Demonstration of Selective Catalytic Reduction Technology for the Control of NOx Emissions from High-Sulfur Coal-Fired Boilers. Southern Company Services, Inc., Pensacola, FL.	Detailed design is in progress on the slip stream ductwork and internals to ensure that the flow regime is representative of actual operation.
SOX-NOX-ROX Box Flue Gas Clean-Up Demonstration Project. The Babcock & Wilcox Co., Dilles Bottom, OH.	The construction phase has been approved and installation activity began in mid-April and initial major process equipment installation is proceeding ahead of schedule. All long lead time equipment is on-site.
WSA-SNOX Flue Gas Cleaning Demonstration Project. Combustion Engineering, Inc., Niles, OH.	Design work is complete and all major equipment and materials have been procured. Construction is proceeding on schedule with significant work completed on the heat exchanger, fabric filter and support towers. Operation is expected to begin in November 1991.

CCT-III Projects	Status
Blast Furnace Granulated Coal Injection System Demonstration Project. Bethlehem Steel Corp., Burns Harbor, IN.	Negotiations were completed with British Steel Corporation for a licensing agreement. Process design and detailed engineering for process components are continuing.
Confined Zone Dispersion Flue Gas Desulfurization Demonstration. Bechtel Corp., Indiana County, PA.	Tie-in of the new duct extension was completed during the boiler shutdown in early May, as scheduled. Based on successful wind tunnel testing, the atomizer nozzles were placed on order for installation at Seward station.
10 MW Demonstration of Gas Suspension Absorption. AirPol, Inc., Paducah, KY.	Process design is continuing. A new project schedule reflecting a delay in the operation date to October 1, 1992, has been proposed by the participant to accommodate the availability requirements of the host site.
Healy Clean Coal Project. Alaska Industrial Development and Export Authority, Healy, AK.	The Cooperative Agreement was awarded April 11, 1991. Design activities are in progress.
Integrated Dry NO_x/SO_2 Emission Control System. Public Service Company of Colorado, Denver, CO.	Design work is in progress with emphasis on control systems and the urea injection system. Engineering began on the low NO_x burners and the NO_x ports.
Air-Blown/Integrated Gasification Combined Cycle Project. Clean Power Cogeneration, inc., Tallahassee, FL.	Conceptual process and plant design studies, and work toward establishing cost and schedule baselines are continuing.
LIFAC Sorbent Injection Desulfurization Demonstration Project. LIFAC North America, Richmond, IN.	All major tie-in activities were completed during the March outage of the Richmond Power & Light's Whitewater Valley Unit No. 2. (The balance of the LIFAC equipment can be installed without impacting plant operations.) All long lead procurement activities have been completed.
Liquid Phase Methanol Process. Air Products and Chemicals, Inc., Dakota Gasification Co., Beulah, ND.	The negotiation schedule has been extended to Fall 1991 to evaluate an alternate site.
Full-Scale Demonstration of Low-NO_x Cell Burner Retrofit. The Babcock & Wilcox Co., Aberdeen, OH.	Fabrication of the low-NO_x cell burners was completed. All twenty-four sets of burners and NO_x ports have been shipped to the Dayton Power & Light job site for installation during the planned September 1991 boiler outage.
ENCOAL Mild Coal Gasification Project. ENCOAL Corp., Gillette, WY	The project remains ahead of schedule with detailed design 90% complete and major equipment items to be delivered and assembled by mid-summer.
Commercial Demonstration of NOXSO SO_2/NO_x Removal Flue Gas Cleanup System. MK-Ferguson Co., Niles, OH.	Project definition and design activities are in progress following execution of the Cooperative Agreement in March 1991.
Pressurized Circulating Fluidized Bed Demonstration Project. Dairyland Power Cooperative, Alma, WI.	Negotiations were completed with a partnership formed by Dairyland Power Cooperative and Iowa Power, Inc., DMEC-1 Limited Partnership, to demonstrate repowering of a 70 MWe PCFB integrated with a topping combustor and gas turbine. The host site is Iowa Power's Des Moines Energy Center located in Pleasant Hill, Iowa. The proposed agreement was submitted for Congressional review in June.
Evaluation of Gas Reburning and Low-NO_x Burners on a Wall-Fired Boiler. Energy and Environmental Research Corp., Denver, CO.	Purchase orders for long lead items are being made to allow retrofit work to proceed during the Cherokee Station boiler outage scheduled to begin August 16, 1991. Baseline test data will be collected during June-July 1991.



Upcoming Events

Date	Event	Contact
July 11 - 12, 1991	Coal and the Environment—Asia 2010 Conference, East-West Center, Honolulu, HI	S. Walbridge 202-586-7735
July 15 - 18, 1991	Coal Preparation Utilization Control Contractor's Review Meeting, Westin William Penn Hotel, Pittsburgh, PA	K.R. Downey 412-892-6029
July 31 - August 1, 1991	Western Fuels Association Conference, Kansas City, MO	S. Oldoerp 202-586-7164
August 11 - 14, 1991	National Conference of State Legislatures, Marriott's Orlando World Center, Orlando, FL	D. Profazi 303-830-2200
September 5 - 7, 1991	South/West Energy Council Annual Meeting, Albuquerque, NM	B. Brennan 202-586-7164
October 6-10, 1991	ASME International Joint Power Generation Conference, San Diego, CA	Marisa Scalice 212-705-7793
October 13-16, 1991	Ninth International Conference on Coal Research, Shoreham Hotel, Washington, DC	G. Runyon 202-463-6152
November 4-6, 1991	Power Supply USA, Washington Convention Center, Washington, DC	B. McBride 703-359-8080

CCT Reports Update

The following papers, authored by DOE employees or CCT participants, have been delivered at conferences over the past several months. Copies are available from the authors. For further information, contact the Office of Clean Coal Technology at 202-586-7148.

"Coal Gasification Based Combined Cycle Power Generation System Design," J.C. Hester, CRSS Capital, Inc., *Power-Gen '90*, December 1990.

"Efficiency of the WSA-SNO$_x$ System for Reducing SO_2 and NO_x," D.A. Collins, Combustion Engineering, Inc., and R.J. Evans, U.S. Dept. of Energy, Pittsburgh Energy Technology Center, *Environmental and Economic Impacts of Coal Utilization*, January 1991.

"Application of Gas Reburning-Sorbent Injection Technology for Control of NO_x and SO_2 Emissions," W. Bartok, B.A. Folsom, T.M. Sommer, J.C. Opatrny, E. Mecchia, R.T. Keen, EER, Inc., T.J. May and M.S. Krueger, Illinois Power Company, *EPRI-EPA Joint Symposium on Stationary Combustion NO_x Control*, March, 1991.

"Flue Gas Scrubbing and Waste Elimination an Application of the Recovery Scrubber," G.L. Morrison, Passamaquoddy Technology *World Coal Conference*, April, 1991.

"The NOXSO Flue Gas Treatment Process - A Better Idea," L.G. Neal, NOXSO Corp., *Duquesne Light Seminar on Clean Air*, April, 1991.

"The Relationship of Fluidized Bed Technology to the U.S. Clean Coal Technology Demonstration Program," G. Weth, J. Geffken, U.S. Department of Energy, D.A. Huber, Burns & Roe, *11th International Conference on Fluidized Bed Combustion*, April 1991.

"Tidd PFBC Demonstration Plant Start-Up," M. Marrocco, John E. Hollback, and H. Kevin Stogran, American Electric Power Service Corporation, *11th International Conference on Fluidized Bed Combustion*, April 1991.

"Operational Data from 110 MWe Nucla CFB," M.A. Friedman, Combustion Systems Inc., T.J. Heller, Colorado-Ute Electric Association, T.J. Boyd, Electric Power Research Institute, *11th International Conference on Fluidized Bed Combustion*, April 1991.

"Pressurized Fluidized Bed Combustion: A Commercially Available Clean Coal Technology," L. Carpenter, W. Langan, R. Dellefield, G. Nelkin, T. Hand, U.S. Dept. of Energy, Morgantown Energy Technology Center, *11th International Conference on Fluidized Bed Combustion*, April 1991.

"The Healy Clean Coal Project: A DOE Clean Coal Demonstration - Round III," J.T. Wilbur, Stone and Webster Engineering Corp, *Conference on Coal and Slurry Technologies*, April 1991.

"The Demonstration of Confined Zone Dispersion Process for Flue Gas Desulfurization at Seward Station of Pennsylvania Electric Company," J.Z. Abrams and A.G. Rubin, Bechtel Corp., S. Higgins, Pennsylvania Electric Company, A. Baldwin, U.S. Dept. of Energy, Pittsburgh Energy Technology Center, *American Power Conference*, April 1991.

"The Hopkins Repowering Project: A Utility Scale Circulating Fluidized Bed Boiler," G.S. Brinkworth, City of Tallahassee, J.M. Hobday, U.S. Dept. of Energy, K.S. Mazur, Bechtel Corporation, Bruce L. Sturdevant, R.W. Beck & Associates, S.J. Goidich, Foster Wheeler Energy Corp., *American Power Conference*, April 1991.

"The Liquids From Coal Mild Gasification Process: Handling and Combustion Properties of the Solid Process Derived Fuel," T.G. McCord, Encoal Corp., M.A. Siddoway, W.F. Farmayan, Shell Development Co., *Low Rank Fuels Symposium*, May 1991.

"Western Energy Company Advanced Coal Conversion Process," R.W. Sheldon, Western Energy Co., *Low-Rank Fuels Symposium*, May 1991.

"Demonstration of Advanced Tangentially-Fired Combustion Techniques for the Reduction of Nitrogen Oxide Emissions from Coal-Fired Boilers," R. Hardman and S. Wilson, Southern Company Services, Inc., L. Smith and L. Larsen, Energy Technology Consultants, *American Waste Management Association Meeting and Exhibition*, June 1991.