

Clean Coal Today

An Update of the U.S. Clean Coal Technology Demonstration Program

Office of Fossil Energy, U.S. Department of Energy

SCR Holds Promise for Effective NO_x Control CCT Projects Address Higher Costs, Limited U.S. Experience

Clean Coal Briefs

This quarter saw several major projects in the Clean Coal Technology Program complete construction activities and move into initial operations, bringing to 17 the total number of operating facilities in the program. Data generated from these projects will help utilities form their strategies for compliance with the 1990 Clean Air Act Amendments.

Pure Air began running its first advanced flue gas desulfurization unit on June 2. The scrubber is running well, capturing more than 90 percent of the SO₂ emissions from two units at **Northern Indiana Public Service Co.'s Bailly Station**. Construction of the 528 MW scrubber was completed ahead of schedule and within its original budget (see story, p. 5)... Senators **Phil Gramm (TX)** and **Richard Lugar (IN)** were among the guests at a NIPSCO Open House to note the third anniversary of Earth Day... Across the

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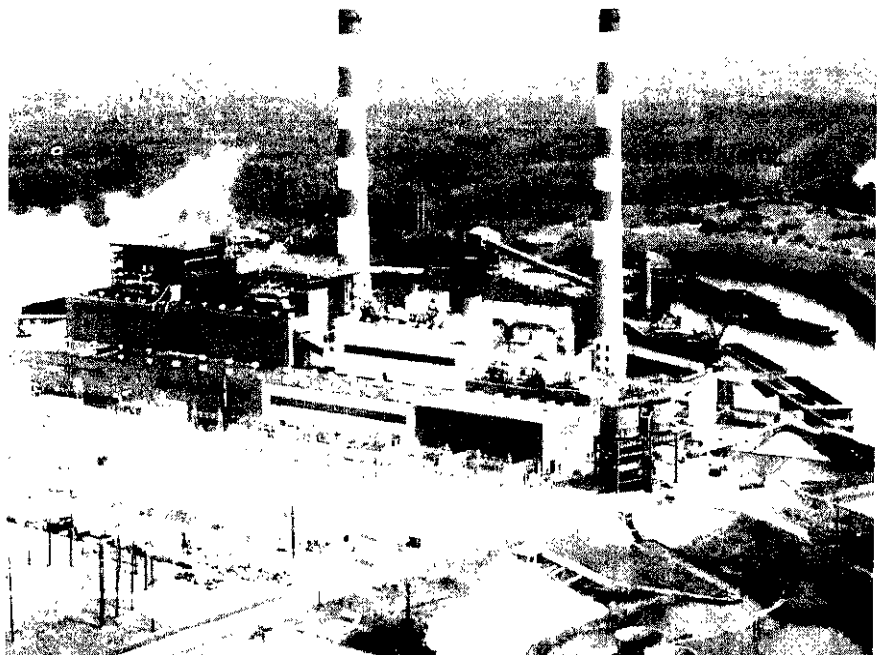
Selective Catalytic Reduction (SCR)—a postcombustion process for destroying nitrogen oxide (NO_x) before it is emitted into the atmosphere—has the potential to be one of the most effective options for reducing NO_x from existing and new fossil fuel-fired power plants.

SCR technology generally involves injecting ammonia into the flue gas of a boiler and passing it over a catalyst where the ammonia reacts with NO_x to produce molecular nitrogen and water vapor, usual components of our atmosphere. SCR can be used alone or with other emission control processes to provide an integrated pollution control system.

In wide commercial use with low sulfur coals in both Japan and Europe, SCR consistently achieves more than 80 percent NO_x reduction—significantly higher than other emerging NO_x control techniques. And because it is installed downstream of the boiler, SCR can be used with all types of boilers. Yet certain issues remain to be resolved if SCR technology is to realize its potential in the United States. Capital costs are higher than those of other NO_x control techniques.

A second concern is the limited U.S. experience with SCR. Because the catalyst

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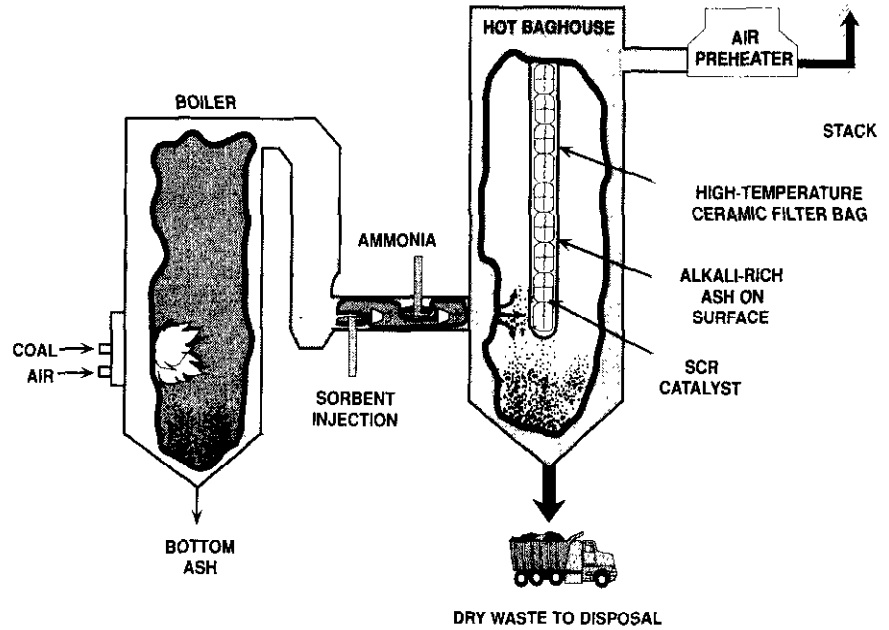


Gulf Power Company's Plant Crist, Pensacola, Florida. SCR Project Site.

can deteriorate as it ages, unreacted ammonia can pass through the SCR reactor. This ammonia combines with other constituents of flue gas, forming sticky solids that can cause corrosion, plugging or other operating problems.

Technical performance and cost data from three projects in the Clean Coal Technology program will help address these concerns with SCR technology. One project will look at SCR with high sulfur coals and a range of catalysts and operating conditions. The other two projects each uniquely combine SCR with other pollution control techniques.

The success of these demonstrations will be especially important if regulations adopted under the Clean Air Act amendments eventually require especially high levels of NO_x reduction. While low-NO_x combustion technologies may be able to achieve enough reduction to meet the law's acid rain requirements, Title I of the new law requires maximum NO_x reduction in all "nonattainment" areas, including a 16-state area in the northeastern U.S.



SO_xNO_xRox Box (SNRB) Process Schematic

Southern Co. Services

In this project, sponsored by Southern Company Services, nine reactors (six small and three large) will be used with nine different catalysts to provide data for scale-up, performance, and cost

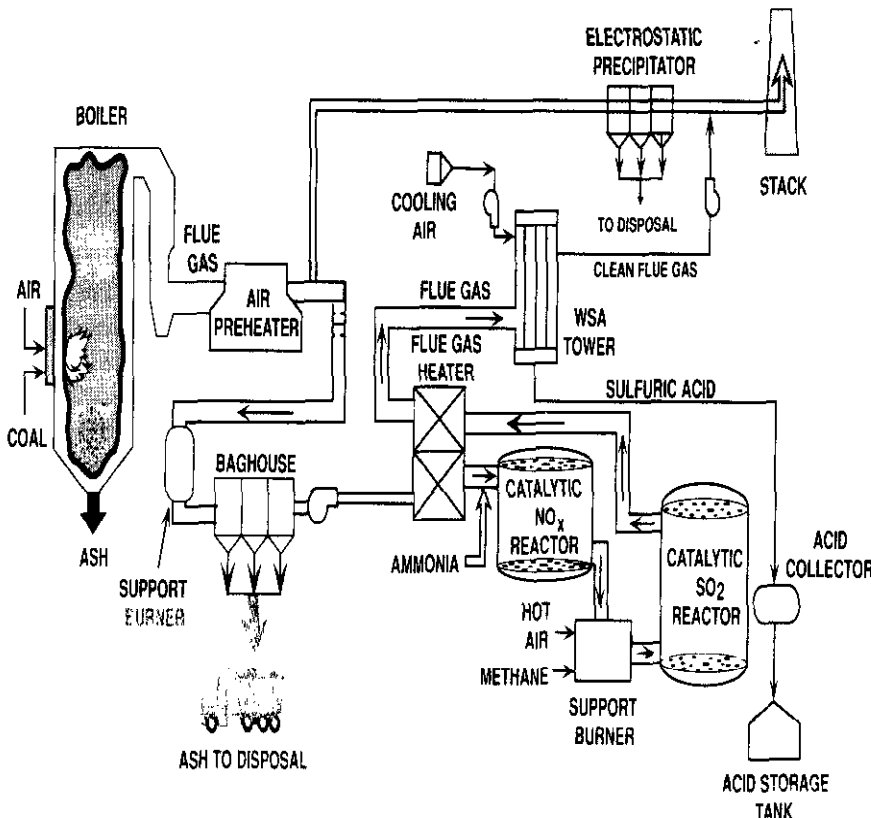
evaluation. Flue gas slip streams (0.2 or 2.5 MWe) at 700°F from a 75 MWe boiler at Gulf Power Company's Plant Crist, Pensacola, Florida, will be used for the tests.

After ammonia injection, the flue gas will pass over the SCR catalyst beds where more than 80 percent of the NO_x will be reduced to nitrogen. The hot flue gas will be cooled in the air preheater prior to release to the stack.

High sulfur coals (2.6 to 3.1 percent sulfur) will be used for the tests, which are scheduled to begin in the Spring of 1993.

SNRB

Babcock & Wilcox Co. is premiering tests of the SO_xNO_xRoxBox (SNRB) process using a 5 MWe flue gas slip-stream at Ohio Edison's R.E. Burger Plant in Dilles Bottom, Ohio. With this integrated emissions control technique, hydrated lime is injected into the gases, reacting with SO₂ and SO₃ to form particulates of calcium sulfite and calcium sulfate. Ammonia is then injected into the flue gas which flows to a high temperature baghouse for particulate and NO_x removal. A unique feature of SNRB is that the SCR catalyst is in-



SNOX SO₂/NO_x Control Process Schematic

See "SCR" on page 3

Clean Coal Technology SCR Projects Summary

Project	Sponsor	Capacity (MWe)	SCR Catalyst		SCR Operating-Design Conditions		
			Type	Manufacturer	Temp (°F)	Solids Loading	%NO _x Removal
SNRB	B&W	5	Zeolite	Norton	850	Clean	>90%
SNOX	CE	35	Plate (V ₂ O ₅ /TiO ₂)	Haldor Topsoe A/S	700	Clean	>90%
SCR	SCS	2.5	Honey Comb (HC/N ₂ O ₅ /TiO ₂ /SiO ₂)	Nippon S.K.K.	700	High Dust	>80%*
		2.5	Large Plate (V ₂ O ₅ /TiO ₂)	Siemens A.G.	700	High Dust	>80%*
		2.5	Honey Comb (HC/N ₂ O ₅ /TiO ₂)	W.R. Grace	700	High Dust	>80%*
		0.2	Honey Comb (Low Dust)	Engelhard	700	Low Dust	>80%*
		0.2	Honey Comb (High Dust)	Engelhard	700	High Dust	>80%*
		0.2	Plate (V ₂ O ₅ /TiO ₂)	Haldor/Topsoe A/S	700	High Dust	>80%*
		0.2	Plate (V ₂ O ₅ /TiO ₂)	Hitachi Zosen	700	High Dust	>80%*
		0.2	Honey Comb	U.S. Supplier	700	High Dust	>80%*
		0.2	Honey Comb (HC/N ₂ O ₅ /TiO ₂ /SiO ₂)	W.R. Grace	700	High Dust	>80%*

SCR...continued from pg. 2

stalled with the bags, resulting in a significant saving of space.

Approximately 90 percent NO_x, 70-80 percent SO_x, and 99+ percent particulates are expected to be captured in the SNRB system using high sulfur coals. Initial testing on the Burger plant SNRB unit has demonstrated that these performance goals can be achieved.

In support of the Clean Coal project

a bag fabric evaluation unit at the Colorado Springs Martin Drake Plant has accumulated 2,500 operational hours.

SNOX

In the SNOX project, being conducted by ABB Environmental at Ohio Edison's Niles Station, a 35 megawatt slipstream is sent to the SCR reactor which is located downstream of a baghouse and a flue gas reheater.

More than 90 percent of the NO_x in the heated particulate free flue gas reacts with ammonia in the presence of a Haldor Topsoe A/S catalyst to form nitrogen and water vapor.

The effluent from the SCR reactor is then passed over an oxidation catalyst to convert the SO₂ to SO₃. Then the flue gas is cooled in a proprietary heat exchanger, condensing the SO₃ and water to produce saleable sulfuric acid.

The SNOX process is designed to remove more than 90 percent of NO_x and 95 percent of SO₂.

Construction of the demonstration unit was completed in December 1991 and the test program began in March of 1992. Preliminary results indicate that emission reduction goals will be met. Full load operational tests will begin early this summer.

SCR technology promises many benefits as a pollution control technique—high effectiveness, wide boiler applicability, ease of retrofit, lack of mechanical parts and ease of operation. But with its promise also comes its challenges of high cost and reliability with U.S. coals.

Detailed performance and economic data from each of these Clean Coal Technology projects will help determine the future for SCR technology as a cost-effective pollution control strategy in the U.S. ■

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Tidd Plant Sets New Technical Operations And Environmental Performance Records

More than 720 hours (30 days) of continuous operation were achieved at American Electric Power's Tidd Plant in Brilliant, Ohio in June and July, setting a new record for extended operation. The run included 100 hours at full bed height, a target previously set for the plant. Following the run, the plant was brought to an orderly shut-down to allow engineers to examine the effects of the record setting test run. Prior to the record setting run, the longest previous run at the Tidd site was 154 hours.

At the same time, the plant's environmental performance has met or exceeded expectations for eliminating sulfur dioxide and nitrous oxide emissions. Environmental tests conducted in February showed that the Tidd unit was in compliance with sulfur dioxide, nitrogen oxides, carbon monoxide and particulate emission limits.

The test run began on June 8, 1992. Its completion brings the project's total accumulated run time to more than 2,100 hours. In February, the plant reached its maximum generating capacity of 70 megawatts. Demonstration runs will continue through March of 1994.

Problems encountered to date—such as cyclone pluggages, fuel injector pluggages, bed-ash or sorbent agglomeration—have been evaluated by the project engineering staff and have been resolved with facility modifications or operational changes.

Future plans include parametric tests (using different coals and sorbents) as well as evaluation of hot gas cleanup filters using a flue gas slipstream from the facility. Both programs are expected to be underway by the end of the summer.

Nearly 200 engineers, government

officials, educators, engineering consultants and representatives of other electrical utilities attended the second annual Technology Transfer Open Houses held at the Tidd Plant on June 5 and June 8. The open houses included technical presentations and plant tours.

Sponsors included the Ohio Coal Development Office, The Babcock & Wilcox Company, and American Electric Power. Participants learned about the design of the Tidd PFBC Plant and its operational experience since first generating electricity from a combined-cycle operation in late 1990, and the ceramic, hot-gas filter system that will be exposed later this year to part of the PFBC gases.

The project is one of the first large scale plants to become operational under DOE's CCT Program. DOE is providing \$60.2 million of the total estimated project cost. ■

ENCOAL Plant Starting Up

Plant startup and pre-operational testing are under way at ENCOAL Corporation's demonstration facility near Gillette, Wyoming. The \$72 million project, 50 percent cost shared by DOE, will soon begin the planned two-year operating period.

The 1,000-ton per day plant will convert low-rank Powder River Basin subbituminous coal from the Triton Coal Company's Buckskin Mine into two marketable fuels—a low sulfur coal-derived liquid fuel, similar in quality to a low sulfur No. 6 fuel oil, and a solid fuel that has the benefits of high rank eastern bituminous coals, but without the high-sulfur content.

As planned during startup of the project, the plant was operated up to 70 percent capacity in a fully integrated mode, and produced specification solid fuel.

Full scale production of products for

burn tests is expected to begin by mid-summer. ENCOAL has negotiated contracts with both industrial and utility users for combustion tests of all fuels produced in the first year of plant operation.

The two fuels produced in the process constitute 60 percent of the original input coal by weight, but contain 90 percent of the coal's original heating value.

The ENCOAL project has progressed quickly since the signing of the Cooperative Agreement in September of 1990.

One month after DOE approval, a formal ground-breaking ceremony was conducted at the project site marking the first Clean Coal III project to begin construction.

Construction and commissioning of the mild gasification plant was completed in May, 1992. ■

Round V Update

On July 6, 1992, DOE issued the fifth and final of its originally-scheduled solicitations (Program Opportunity Notice (PON) for Clean Coal Round V) in the multi-billion dollar Clean Coal Technology Demonstration program.

Proposals are due by December 7, 1992, and DOE expects to announce its selections by May 6, 1993.

Approximately \$568 million in federal matching funds will be made available by DOE for the projects selected in this round of the CCT program.

In the PON, DOE is emphasizing projects that would demonstrate technologies that "shall advance significantly the efficiency and environmental performance of coal-using technologies and be applicable to

See "Round V" on page 11

Pure Air FGD Scrubber Begins Operations

Indiana Utility Leads Nation in Clean Air Act Compliance

At Northern Indiana Public Service Co.'s (NIPSCO) Bailly Station along the shores of Lake Michigan, near Gary, Indiana, advanced clean coal technology is allowing the utility to become the first in the U.S. to meet new sulfur dioxide emissions standards from the Clean Air Act Amendments of 1990.

Pure Air—a general partnership between Air Products and Chemicals, Inc. and Mitsubishi Heavy Industries America, Inc.—began operating its first advanced flue gas desulfurization facility on June 2. Operations have gone extremely well, with the facility capturing at least 90 percent of the SO₂ emissions from the power plant while making a high quality gypsum product that is being sold to a nearby wallboard plant.

The \$150.5 million project—that includes design, construction and three years of operation—is one of 42 government/industry efforts being funded through the Department of Energy's Clean Coal Technology program.

The pioneering technology is allowing the utility to meet its Clean Air

requirements nearly two years ahead of its deadline while holding down costs to ratepayers and avoiding coal mining job losses in the midwest.

The Pure Air advanced desulfurization system—with the largest capacity SO₂ absorber in the western hemisphere and the largest in the world to operate with high sulfur coals—is treating the flue gases from two boilers (Units 7 and 8) at the Bailly Station which have a combined capacity of 528 megawatts. Emissions from the plant will be reduced by about 50,000 tons of SO₂ per year.

The project was brought on line two weeks ahead of schedule and within its budget, despite a collapse of the cooling water recirculation lines at the plant last summer which took several months to repair.

The Pure Air scrubber has several advanced features compared to first generation scrubbers. The absorber uses a high-velocity co-current design, so that the scrubbing slurry flows in the same direction as the flue gas. This co-current design allows a relatively high flue gas velocity—about 20 feet per second, versus eight to 12 for a conventional unit. This allows for smaller space requirements.

Because of the system's high degree of reliability, no spare or backup modules are required, resulting in a substantial cost saving.

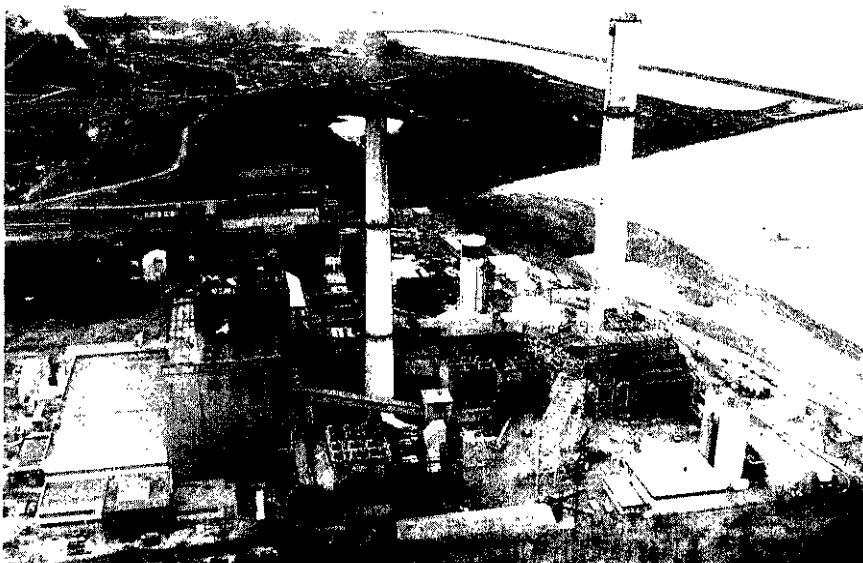
Another key benefit of the technology is its ability to produce high-grade (93 percent purity) gypsum as a byproduct instead of the waste sludge typically produced with older scrubbers. A long-term gypsum sales agreement has already been signed with the U.S. Gypsum Corporation for use at a nearby wallboard plant.

Contributing to the gypsum's high degree of purity is a novel device called an air rotary sparger located in the absorber module. The sparger combines stirring and air distribution within the absorber, facilitating the oxidation of sludge to gypsum. Merging these functions in one piece of equipment will provide better mixing within the base of the absorber, making a higher quality gypsum.

Another unique feature of the Pure Air system is the way it treats wastewater from the scrubber. Wastewater is injected into the flue gas ductwork upstream of the existing electrostatic precipitator. The hot gases evaporate the water, and dissolved solids will be captured by the precipitator along with the fly ash.

At Bailly, capital costs are expected to be held to \$160 per kilowatt, compared to the \$300 per kilowatt cost of building conventional wet scrubbers. And the scrubber's improved energy efficiency and high reliability will mean lower operating and maintenance costs as well.

In addition to these advanced technical features, the project is showcasing a first-of-its-kind innovative business arrangement whereby Pure Air financed, designed, built, and will own, operate, and maintain the scrubber facility for the utility for a 20-year period. Such an arrangement lessens the capital funding requirements for the utility, and allows the utility to maintain its focus on power generation and distribution. ■



NIPSCO Bailly Station. Pure Air SO₂ Scrubber and New Stack are to Right of Power Plant (528 MWe)

B&W Low-NO_x Cell Burner Tests Under Way

The Babcock & Wilcox company (B&W) has completed parametric tests of a new Low NO_x Cell™ burner (LNCB)™ system that had been retrofitted onto Dayton Power & Light's (DP&L's) 605 MWe No. 4 boiler at their J.M. Stuart Station near Aberdeen, Ohio.

The LNC™ burners met a major project goal reducing NO_x emissions by more than fifty percent.

The boiler was originally fired with B&W's standard two-nozzle cell burners. These burners, designed in the 1960s for high heat release, are actually two burners close coupled to form a "cell" that produces rapid fuel/air mixing and a relatively small flame zone.

Cell burners thus produce a very hot flame and a corresponding high level of NO_x formation. Because of the close burner groupings, cell burners cannot be replaced with standard low-NO_x burners without extensive water wall modifications. B&W, with funding assistance from the Electric Power Research Institute, developed the LNC burner as an economical low NO_x "plug-in" replacement for cell burners.

In November 1991 DP&L started up boiler No. 4 with 24 newly retrofitted LNC burners. During the start-up, very high carbon monoxide (CO) concentrations (up to 12 percent) were observed in the lower furnace below the burners. The level of NO_x reduction in the boiler was only about 35%, well below the project goal.

By retracting the coal impellers in all the burners to focus the flame more tightly, NO_x emissions reduction increased to about 45%, but this only slightly reduced the CO concentration in the lower furnace (about 8-10 %).

The LNC burners were a net to minimize CO concentration in the lower furnace. B&W and DP&L continue to investigate potential long-term solutions to the lower furnace reducing gas condition.

The impeller retraction test indicated that impellers having a narrower spray angle would improve NO_x reduc-

tion. Numerical modeling showed that the CO problem could be resolved by inverting alternate LNC burners and their NO_x ports on the bottom row of burners. This would insure a combustion air supply for the reducing gases in the lower furnace.

Inversion of alternate Low NO_x Cell burners and replacement of the LNC burner coal impellers with those of a shallower deflection angle were completed during a scheduled eleven-day outage of the boiler that began April 26, 1992. During that time, DP&L inspected the boiler and noted that the pendant superheater surface was cleaner than usual.

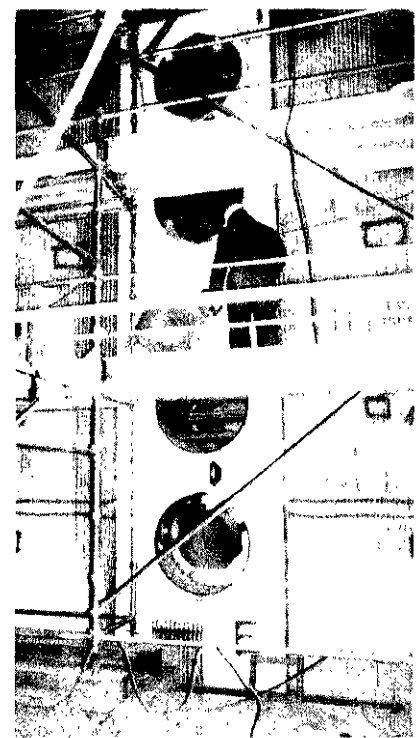
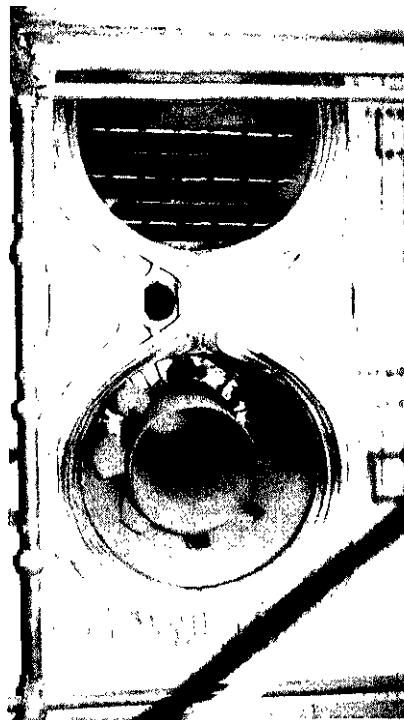
Parametric testing began May 14, 1992. Preliminary results show that the impeller change and burner inversion were successful. The Low NO_x Cell burners are now achieving better than 50% NO_x reduction. Long-term testing should begin mid-July. If success continues, the project will be the first commercial-scale, full burner retrofit demonstration of this technology on a utility boiler.

Cell type burner units account for approximately 24,000 MWe of electric

generation capacity in the U.S. Within the U.S., there are 34 utility boilers (all designed by B&W), equipped with cell-type burners. Of this total, approximately 90% are of the two-nozzle cell type, ranging from 300-1,300 MWe with the average size of these boilers being 766 MWe.

These units produce approximately 13 percent of the pre-NSPS utility NO_x emissions and are likely to be targets of NO_x reduction regulations.

The LNC burner, assuming successful demonstration of the technology, will offer a viable alternative to commercial low-NO_x burners, selective catalytic reduction, and thermal de-NO_x systems at reasonable capital and operating costs. ■



Above: Workers at Dayton Power & Light Co. J.M. Stuart Plant Finalize Installation of Two Low NO_x Cell Burner Arrangements in Boiler Wall of 605 MWe Unit No. 4.

Left: Close-Up Shows Adjustable Louver Dampers in Upper Opening and LNC Burner in Lower Opening. Coal Enters Through Center Nozzle-Outer Vanes Impart Swirl to the Secondary Air.

state, the LIFAC sorbent injection desulfurization unit began initial operations in June. Tests at **Richmond Power & Light's** Whitewater Valley Station are expected to run through 1994.

The neighboring state of Ohio also inaugurated commercial-scale operations on two new projects, both demonstrating technologies designed to remove multiple pollutants with a single process while avoiding waste disposal problems. At **Ohio Edison's Niles plant** in eastern Ohio, test of the **SNOX** process began on March 23. About one third of the flue gases from the plant's 115 megawatt units is being treated. In addition to meeting emission goals, early tests are showing the process can produce high quality (93 percent pure) sulfuric acid—nearly 50 tons have already been made . . . Down the river at **Ohio Edison's R.E. Burger Station** in Dilles Bottom, tests of the **SO_xNO_xRO_xBox (SNRB)** commenced on May 18. A five megawatt slipstream of flue gas is being treated with the innovative process . . . All indications are that the process should easily meet its performance goals for SO_x, NO_x, and particulates . . . **Clean Coal Today** readers are encouraged to attend a one day technology transfer open house at the Burger Station to see the SNRB system in action. The day-long technical program and tour—sponsored by the **Ohio Coal Development Office**—will be held twice—once on Friday, August 21 and again on Monday, August 24. Advance registration is required but there is no fee involved. To register, call **1-800-444-SNRB**. Two highly successful similar events have already been held at the Tidd plant.

Start-up activities also began at the **ENCOAL** plant in Gillette, Wyoming in June. Still nearly three months ahead of schedule, the plant is expected to be in full operation by mid-July. Operations will run for two years. **Wisconsin Power & Light** and **Texaco Power** have each signed contracts to purchase the plant's products . . . In a related item,

Shell Oil Company announced that it plans to sell **Shell Mining** (parent of **ENCOAL**) to **Zeigler Coal Holding Co.** The Clean Coal project is not expected to be affected by the sale.

The department also approved a re-assignment of the City of Tallahassee's CFB repowering project to the **York County Energy Partners**, a subsidiary of **Air Products & Chemicals**. The relocation will involve building a grass-roots 250 megawatt cogeneration plant that will provide both power to Metropolitan Edison and steam to a nearby manufacturing plant. The circulating fluidized bed combustion technology will be provided by **Foster Wheeler USA**. Federal funding for the project remains at about \$75 million. Project total cost is now \$374.3 million.

On July 1, **Gulf Power Company, Southern Company Services** hosted an open house and groundbreaking to kick off construction for its selective catalytic reduction project at its **Plant Crist** in Pensacola, Florida. Information from the demonstration of this technology on U.S. coals will be critically important in upcoming years as final NO_x regulations are put into place (see story p. 1).

Assistant Secretary for Fossil Energy James G. Randolph represented the Energy Department on June 25, 1992, at a ceremony to commence operations at the **Advanced Coal Conversion Process Demonstration** sponsored by the **Rosebud Syncoal Partnership**. Also attending was PETC Director **Sun W. Chun**, along with other federal, regional and local elected officials . . .

On April 22, **Secretary of Energy James Watkins** paid an impromptu visit to Ohio Edison's Lorain station where he met with plant personnel to discuss results from the **LIMB and Coolside** tests. The Secretary was in the area conducting a technology transfer meeting.

INTERNATIONAL NEWS: Clean coal technologies were highlighted for an audience of some 22,000 attendees at

the **EXPOMIN**, held in Santiago, Chile on May 12-16. Technical information was provided to potential users, international government officials and regulators . . . The Clean Coal program also participated in the **ECOBRAZIL '92**, an international exhibition designed to accompany the Rio Conference on the Environment . . . The Deputy Assistant Secretary for Coal Technology led a 15-member trade mission to Indonesia and Thailand the week of June 19. Ten industrial representatives accompanied the mission, the goal of which was to promote sales of U.S. coal equipment in these two rapidly growing countries. ■

Round IV Update

DOE's Round IV Clean Coal projects are moving closer to award.

Three projects, expected to be awarded in mid-July 1992, are: (1) **Micronized Coal Reburning Demonstration for NO_x Control on a 175-MWe Wall-Fired Unit**, at Shawnee Fossil plant near Paducah, Kentucky, (2) **Wabash River Coal Gasification Repowering Project**, at PSI's Wabash River Generating Station, West Terre Haute, Indiana, **Piñon Pine IGCC Power Project**, at Tracy Station near Reno, Nevada.

Final negotiations have begun on five of the six remaining projects selected under Round IV.

ThermoChem Inc.'s project for the demonstration of a pulse combustor is still in fact-finding and not expected to be submitted for approval until mid July 1992.

The total dollar value of the Round IV projects is \$1.5 billion, of which DOE's share is \$567 million.

With the addition of the Round IV projects, there are 42 active projects in the Clean Coal program, approaching a total value of \$4.6 billion, of which DOE's share is about \$1.7 billion.

Status of Clean Coal Technology Demonstration Projects

EER Corporation. Enhancing the Use of Coals by Gas Reburning and Sorbent Injection. (Hennepin and Springfield, IL)
Long-term load following testing of GR-SI continues at Hennepin achieving more than the project goals of 60 percent NO_x reduction and 50 percent SO₂ reduction. Long-term testing at the Springfield site, temporarily suspended in April after the March start-up, is scheduled to resume in the third quarter of 1992.

Babcock & Wilcox. LIMB/Coolside Demonstration Project. (Lorain, OH)
The final Coolside Topical Report and the LIMB Extension Final Report are being completed.

American Electric Power. Tidd PFBC Demonstration Project. (Brilliant, OH)
Technology Transfer Open Houses were held at the Tidd Facility on June 5 and 8 with more than 200 persons in attendance. As of July 10, the plant has operated about 2,100 hours on coal, with 740 hours of continuous operation recently completed.

Rosebud Syncoal Partnership. Advanced Coal Conversion Process Demonstration. (Colstrip, MT)
The operations phase at full capacity commenced in June and will continue through early 1996. At present, four test burns of the syncoal product are scheduled. An initial shipment of 5,000 tons of Syncoal to Northern States Power for a test burn was completed. The plant was dedicated on June 25, 1992.

CQ, Inc. Coal Quality Expert. (Homer City, PA)
CQ, Inc., and associated subcontractor have agreed on employing object oriented code for the expert system. The programming language is to be Borland C++ (Release 3). Over 100 algorithms are under development based on the data gathered during the bench, pilot, and full-scale tests and burns. The Acid Rain Advisor package was released in June 1992.

York County Energy Partners. Circulating Fluidized Bed Cogeneration Project. (York, PA)
The original City of Tallahassee project has officially been transferred to the York County Energy Partners to complete a cogeneration venture to supply power to Metropolitan Edison and steam for export to industry at a site in York, PA.

Pure Air. Advanced Flue Gas Desulfurization Demonstration Project. (Gary, IN)
Construction was completed the 2nd quarter of 1992. Full-scale operations began June 2, 1992, ahead of schedule and within budget. The FGD unit is initially being operated to reduce SO₂ emissions by 90 percent, and the plant is producing gypsum that is being sold to a nearby wallboard manufacturer.

Southern Co. Services. NO_x Reduction for Tangential-Fired Boilers. (Lynn Haven, FL)
Long-term test data from operating the Low NO_x Concentric Firing System (LNCFS) Level II equipment (one of three basic air/coal feed configurations to be tested) indicated full load NO_x reductions up to 40 percent compared to the baseline emission data. Long-term data for Level III show that NO_x emissions have been reduced by as much as 48 percent compared to baseline values. A portion of Level I diagnostic testing has been completed with preliminary results indicating full load NO_x reductions of 35 percent below baseline.

Southern Co. Services. NO_x Reduction for Wall-Fired Boilers. (Coosa, GA)
Long-term testing of Advanced Overfire Air (AOFA) has been completed. Statistically reliable data indicate, depending upon load, a NO_x reduction of 24 percent. Long-term testing of the Low NO_x burners (LNB) was completed with 94 days of data collected. A 48 percent reduction of NO_x at full load was indicated. Diagnostic, chemical emissions, and long-term testing for the LNB plus AOFA configuration will be resumed in August 1992, after the scheduled tuning of new mills and retuning of the burners.

Passamaquoddy Tribe. Cement Kiln Flue Gas Recovery Scrubber. (Thomaston, ME)
The cement kiln flue gas scrubber plant was restarted on May 12. While operating, the scrubber facility has consistently exceeded 90 percent SO₂ removal, and has allowed the previously landfilled kiln dust to be recycled to the cement making process.

Babcock & Wilcox Co. Coal Reburning for NO_x Control. (Cassville, WI)
Results of parametric and optimization testing recently completed indicate NO_x emissions are reduced by about 55 percent between full load (110 MW) and 70 MW. Long-term operation will proceed in a load following manner.

Bethlehem Steel Corp. Coke Oven Gas Cleaning System. (Sparrows Point, MD)
The coke ovens were placed on "cold idle" on January 24, 1992. The project has been postponed for at least two years to allow for rehabilitation of the coke ovens.

Southern Co. Services. Chiyoda Thoroughbred-121 FGD Process. (Newnan, GA)
Construction is nearly complete with the exception of the gypsum stack area. Tie in to the boiler is expected to occur during the next scheduled outage in September 1992.

ABB Combustion Engineering. IGCC Repowering Project. (Springfield, IL)
Efforts continued on the mechanical designs for the gasifier and heat exchangers. Process flow diagrams and material and energy balances have been completed and submitted for review.

American Electric Power Service Corp. PFBC Utility Demonstration Project. (New Haven, WV)
Value engineering activities directed at improving the PFBC grassroots plant efficiency and economic performance are continuing.

Southern Co. Services. SCR for High-Sulfur Coal Boilers. (Pensacola, FL)
Design work is more than 80 percent complete and construction, which began March 23, 1992, is in progress. Detailed measurements of baseline flue gas conditions at the Plant Crist project site are complete. Seven suppliers of nine catalysts have been selected. A formal ground breaking ceremony for the project was held July 1, 1992, at Plant Crist.

Babcock & Wilcox Co. SNRB Flue Gas Clean-Up Project. (Dilles Bottom, OH)
Initial operation activities at the demonstration facility continue. NO_x reductions above 90 percent have been achieved, with SO₂ reductions of 75 percent.

ABB Combustion Engineering. SNOX Flue Gas Cleanup Project. (Niles, OH)
The SNOX facility is being operated at 70 percent capacity and is producing 93 percent pure sulfuric acid. Mechanical problems in the ammonia feed system which prevent full capacity operations are being resolved.

Bethlehem Steel Corp. Blast Furnace Granulated Coal Injection. (Burns Harbor, IN)
Process design and detailed engineering are continuing. A revised Environmental Assessment for the project is being reviewed by DOE.

Bechtel Corp. Confined Zone Dispersion FGD Project. (Indiana County, PA)
Slurry injection tests using dolomitic lime have indicated that the expected level of SO₂ emissions reduction of 50 percent can be reached and possibly exceeded. Six months of continuous parametric testing will be followed by six months of testing under optimum conditions.

AirPol, Inc. Gas Suspension Absorption Project. (Paducah, KY)
Construction of the facility commenced during the 2nd quarter of 1992. Erection of the plant is scheduled for the 3rd quarter of 1992, with operations to commence at the start of the 4th quarter.

Alaska Industrial Development Authority. Healy Clean Coal Project. (Healy, AK)
Design work continues. Boiler flow tests are complete and cold flow tests of the coal feed system have been initiated.

Public Service Co. of CO. Integrated Dry NO_x/SO₂ Control System. (Denver, CO.)
Baseline testing of the boiler with urea injection was completed in March 1992. Installation of the majority of remaining project equipment occurred during the outage which started March 20, 1992, and ended in early June 1992. Start-up of all major systems has begun.

Tampa Electric Company. Integrated Gasification Combined Cycle Project. (Tampa, FL)
A NEPA public scoping meeting will be held in Fort Meade, FL, on August 12, 1992. Tampa Electric is preparing a permitting site certificate application for the State of Florida.

LIFAC N. America. LIFAC Sorbent Injection Desulfurization Demonstration Project. (Richmond, IN)
Construction is about complete. The start of operations was delayed to mid-1992 primarily due to additional design and permitting requirements, including redesign of the humidification section of the activation reactor to improve process performance. Parametric testing began in early June 1992.

Air Products and Chemicals, Inc. Liquid Phase Methanol Process. (Daggett, CA)
Negotiations are complete. DOE awaits submittal of several key documents.

Babcock & Wilcox, Inc. Low-NO_x Cell Burner Retrofit. (Aberdeen, OH)
Every other lower burner and NO_x port were inverted and shallow angle replacement impellers were installed by May 9, 1992, to mitigate excessively high CO concentrations occurring in the lower furnace when operating to achieve high NO_x emissions reductions. These modifications permitted recent NO_x emission reductions of greater than 50 percent and low CO concentrations in the lower furnace.

ENCOAL Corp. Mild Gasification Project. (Gillette, WY)
Plant start-up testing is underway. As planned, the plant was operated at about 70 percent capacity in a fully integrated mode. Specification solid process derived fuel was produced. Full operations should begin in the third quarter of 1992.

MK-Ferguson Co. NO_xSO Flue Gas Cleanup System. (Niles, OH)
Preliminary design activities are proceeding.

DMEC-1 Ltd. Partnership. Pressurized Circulating Fluidized Bed Demonstration Project. (Pleasant Hill, IA)
A NEPA public scoping meeting was held July 8. Preliminary design activities are continuing.

Energy and Environmental Research Corp. Gas Reburning and Low-NO_x Burners on Wall-Fired Boiler. (Denver, CO)
Construction is about complete. Optimization testing of gas reburning started in April 1992, with GR/LNB operations expected to commence after the burner and pulverizer fine tuning work is completed. Check-out and testing of equipment is underway.

Wabash Joint Venture. Wabash River Coal Gasification Project. (W. Terra Haute, IN)
Report to Congress submitted in early June to both legislative bodies.

See "Status" on page 11

FIRST ANNUAL CLEAN COAL TECHNOLOGY CONFERENCE

September 22-24, 1992

REGISTRATION INFORMATION:

The registration fee for this conference is \$125 for General Attendees, and \$75 for Government Attendees/Presenters. Onsite registration will be \$200. Registration costs include all lunches, continental breakfasts, breaks, receptions, and proceedings. To register by phone please call Burns and Roe at 703-207-0800 or fax 703-207-8538.

Burns and Roe/CCT Conference
2812 Old Lee Highway, Suite 135
Fairfax, VA 22031

Registrations should be completed by August 15, 1992. Cancellations will be accepted and refunds provided until September 7, 1992.

HOTEL INFORMATION:

All events will be held at the Sheraton Cleveland City Centre Hotel in Cleveland, Ohio (800) 321-1090 or (216) 771-7600. A group rate of \$89 per night for a single and \$99 per night for a double is available. To take advantage of the special rate, please contact the hotel directly and request the Department of Energy's room block. Reservations must be made by September 7, 1992. The Sheraton Cleveland City Centre Hotel is located approximately 13 miles from the airport in downtown Cleveland.

CONTACTS:

For further information regarding the conference please contact Ms. Denise H. Calore, U.S. Department of Energy's Clean Coal Technology Program, 703-235-2623, or Mr. Robert H. Robey, Burns and Roe Enterprises, 703-207-0800.

TUESDAY EVENING (SEPTEMBER 22, 1992)

Registration (3:00 p.m. - 7:00 p.m.)
Reception Cocktail Party (6:00 p.m.-8:00 p.m.)
(Sponsored by Centerior Energy)

WEDNESDAY MORNING (SEPTEMBER 23, 1992)

Plenary Session (9:00 a.m.)

Moderator: Jack S. Siegel, Dep. Asst. Sec., Coal Technology, U.S. DOE
Opening Greeting: Donald E. Jakeway, Director, Ohio Department of Development

Introductory Remarks/NES Implementation:

The Hon. James G. Randolph, Asst. Sec. for Fossil Energy, U.S. DOE

State Regulatory View of Compliance Strategies:

Craig A. Glazer, Chairman, Public Utilities Commission of Ohio
Perspective of Utility Investing in a Major CCT Power Generating Technology: Girard F. Anderson, Pres. and Chief Operating Officer, Tampa Electric Co.

Perspective of Utility Investing in a Major CCT Retrofit Technology: Gary L. Neale, Pres. and Chief Operating Officer, Northern Indiana Public Service Company.

Regulatory Panel Session (10:45 a.m. - 12:30 p.m.)

Moderator: Ashley C. Brown, Commissioner, PUC of Ohio

Panel Members:

Daniel W. Fessler, Pres., CA Public Utilities Commission
Bill Tucker, Chairman, WY Public Service Commission
James R. Monk, Chairman, IN Utility Regulatory Commission (invited)
Wendell F. Holland, Commissioner, PA Public Utility Commission (invited)

WEDNESDAY AFTERNOON (SEPTEMBER 23, 1992)

Luncheon Speaker (12:30 p.m. - 2:00 p.m.):

Thomas Altmeyer, V.P. for Govt. Affairs, Nat'l Coal Assoc.

Concurrent Technical Sessions (2:00-5:15 p.m.)

Session 1: Advanced Power Generation Systems

Session 2: High Performance Pollution Control Systems

Government Export Panel Session (2:00-3:30 p.m.)

Moderator: Peter J. Cover, Program Manager, Coal & Technology Exports, U.S. DOE

Panel Members:

Robert A. Siegel, U.S. Agency for International Development (Invited)
Dr. Joseph Yancik, U.S. Department of Commerce/ITA
John W. Wisniewski, Export-Import Bank of the U.S.

WEDNESDAY AFTERNOON (cont.)

Jack Williamson, U.S. Trade and Development Program (Invited)
Harvey A. Himberg, Overseas Private Investment Corporation (Invited)

Industry Export Panel Session (3:45-5:15 p.m.)

Moderator: Ben N. Yamagata, Exec. Dir. Clean Coal Technology Coalition

Panel Members:

Kurt Yeager, Electric Power Research Institute
John Banister, Mission Energy (Invited)
Walter Scudzio, Shell Oil (Invited)
Charles Johnson, East-West Center (Invited)
TBD, Foster Wheeler

THURSDAY MORNING (SEPTEMBER 24, 1992)

Utility Panel Discussions (8:30-10:00 a.m.)

Moderator: George T. Preston, V.P., Generation and Storage Div. Electric Power Research Institute

Panel Members:

James J. Markowsky Ph.D., Sr. V.P. and Chief Engineer, American Electric Power
Stephen C. Jenkins, V.P., Commercial Development, Destec Energy, Inc.
Randall E. Rush, Director, Clean Air Compliance, Southern Company Services, Inc.
George P. Green, Manager, Electric Supply Resources, Public Service of Colorado
Howard C. Couch, Manager, Environmental and Special Projects, Ohio Edison

Concurrent Technical Sessions (10:15a.m.-12:00 p.m.)

Session 3: Advanced Power Generation Systems

Session 4: NO_x Control Systems

Session 5: Coal Processing Systems

Luncheon Speaker (12:00-2:00 p.m.): The Hon. William G.

Rosenberg, Asst. Admin. for Air and Radiation, U.S. EPA

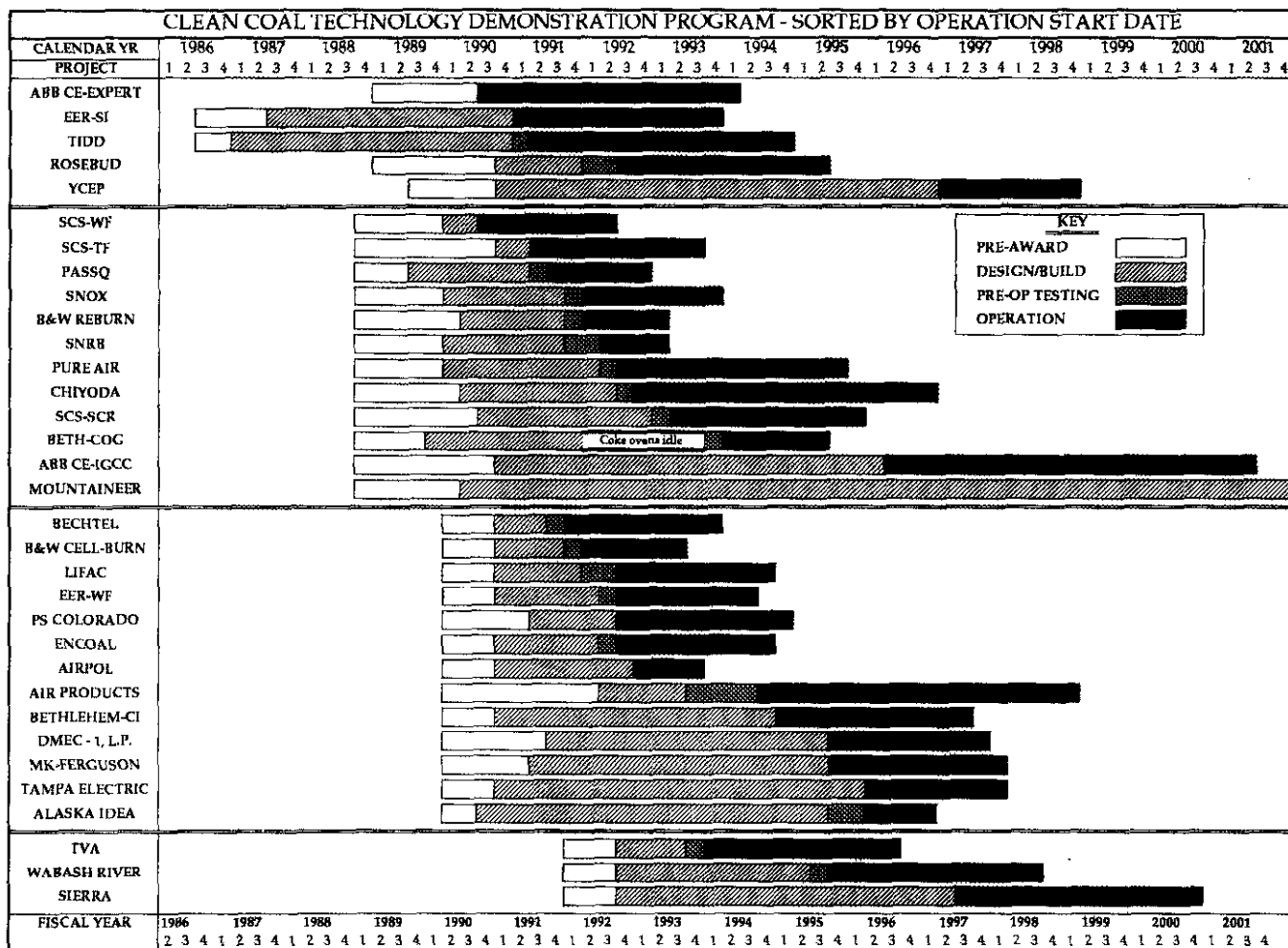
THURSDAY AFTERNOON (SEPTEMBER 24, 1992)

Concurrent Technical Sessions (2:00-5:15 p.m.)

Session 6: Advanced Combustion/Coal Processing

Session 7: NO_x Control System

Session 8: Retrofit for SO₂ Control



Status...continued from pg. 9

Sierra Pacific Power. Piñon Pine IGCC Project.

(Reno, NV)

Report to Congress submitted in early June to both legislative bodies.

Tennessee Valley Authority. Micronized Coal Reburning for NO_x Control.

(Paducah, KY)

Report to Congress submitted in early June to both legislative bodies.

Round V...continued from pg. 4

either new or existing facilities." Improved environmental performance is likely to become increasingly important as utilities and other energy companies seek ways to meet expected growth in energy demand while complying with the more stringent emission standards now going into effect.

Increased efficiency also reduces emissions of carbon dioxide, one of several so-called "greenhouse gases."

Presently, 42 projects are in negotiation or are under way or have been completed in the previous four rounds of the CCT program which began in 1986. These projects, which involve

joint government/industry funding totaling \$4.6 billion, are located in 20 states.

Round V will allow government cost-sharing for certain project specific development activities such as design verification tests and materials testing tied directly to the demonstration. DOE's share of the cost of these activities would be limited to 10 percent of its overall contribution to the project, and no government funds could be used to build new testing facilities.

In drafting the solicitation, DOE received input from both industry and public sources as well as the Congress. Two public meetings were held last

year to receive industry input, and a draft solicitation was distributed in April of this year for comments.

DOE will hold a pre-proposal conference on August 6, 1992, at the DOE Headquarters Auditorium in Washington to clarify any specific questions related to the solicitation.

To receive a copy of the PON, contact: U.S. Department of Energy, P.O. Box 2500, Attn: Document Control Specialist, PR-33, Washington, DC 20013. Copies are also available in Room IJ-005, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC, between 9 a.m. and 3 p.m. weekdays. ■

Upcoming Events

Date	Event	Contact
September 15-17, 1992	<u>Twelfth Annual Gasification and Gas Stream Cleanup Systems Contractors Review Meeting</u> , Morgantown Energy Technology Center, Morgantown, WV	METC Conf. Svcs. 304-291-4108
September 22-24, 1992	<u>First Annual Clean Coal Technology Conference</u> , Sheraton Cleveland City Centre Hotel, Cleveland, OH	D. Calore 703-235-2623
October 12-16, 1992	<u>Pittsburgh Coal Conference</u> , Green Tree Marriott, Pittsburgh, PA	G. Elia 412-892-5862
October 18-22, 1992	<u>ASME International Joint Power Generation Conference</u> , Hyatt Regency, Atlanta, Georgia	G. Elia 412-892-5862
October 27-28, 1992	<u>Ninth Annual Heat Engines, PFBC, and Gas Stream Cleanup Systems Contractors Review Meeting</u> , Morgantown Energy Technology Center, Morgantown, WV	METC Conf. Svcs. 304-291-4108

CCT Reports Update

The following Clean Coal Technology Program Reports and Comprehensive Reports to Congress have been released since the last issue of Clean Coal Today. Copies of the Reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

- Jun 92 DOE/FE-0255P Piñon Pine IGCC Power Project (Sierra Pacific Power Company).
- Jun 92 DOE/FE-0256P Micronized Coal Reburning Demonstration for NO_x Control on a 175-MWc Wall-Fired Unit (Tennessee River Valley Authority).
- Jun 92 DOE/FE-0257P Wabash River Coal Gasification Repowering Project (Wabash River Coal Gasification Repowering Project Joint Venture).
- Aug 91
NTIS/DE92007602 Healy Clean Coal Project, Healy Coal Firing at TRW Cleveland Test Facility.

The following papers, authored by DOE employees or CCT participants, have been delivered at recent conferences. Copies are available from the authors. For further information, contact Doug Archer, Office of Clean Coal Technology at 703-235-2628.

"PFBC Plant Operations—Tidd." Dennis K. McDonald, The Babcock & Wilcox Co.; *Power-Gen '91*, Tampa, FL, December 1991.

"Industrial Pressurized Fluidized-Bed Combustors, 1992." Donald L. Bonk, Thomas J. Hand, and Mark Freier, Morgantown Energy Technology Center; *American Power Conference*, Chicago, IL, April 1992.

"The Iowa Power PCFB Demonstration Project/Ahlstrom Pyroflow Pressurized Circulating Fluidized Bed Technology." S.J. Provol, Pyropower Corporation; and G. Kruempel and S. Ambrose, Iowa Power; *American Power Conference*, Chicago, IL, April 1992.

"The PSI Energy Wabash River Coal Gasification Repowering Project." J.U. Bott, PSI Energy, Inc.; and D.G. Sundstrom, Destec Energy, Inc.; *American Power Conference*, Chicago, IL, April 1992.

"PFBC Plant Operations." Fred L. Kisinger, The Babcock & Wilcox Co.; *American Power Conference*, Chicago, IL, April 1992.