

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 Outreach

The Department of Energy showcased its newest clean coal technology exhibit at the World Coal Institute's "Coal in the Environment" conference in London, April 3-5, 1991. The conference attracted more than 500 representatives from 45 countries. DOE's Assistant Secretary for Fossil Energy, Robert Gentile, joined the executive director of the International Energy Agency, Helga Steeg, in delivering the conference's joint keynote remarks.

The 20-foot long exhibit, *Clean Coal - A New Era of Clean, Secure Energy*, features information on clean coal technology project locations and the advantages of these advanced technologies in reducing acid rain, greenhouse gas emissions, and solid waste. The exhibit incorporates interactive "pop-up" displays that answer commonly asked questions about clean coal technologies and their benefits. The exhibit backdrop reinforces the theme that coal use can be compatible with the environment. A generic power plant model, projecting from the back-

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Pure Air Flue Gas Project Construction Well Advanced

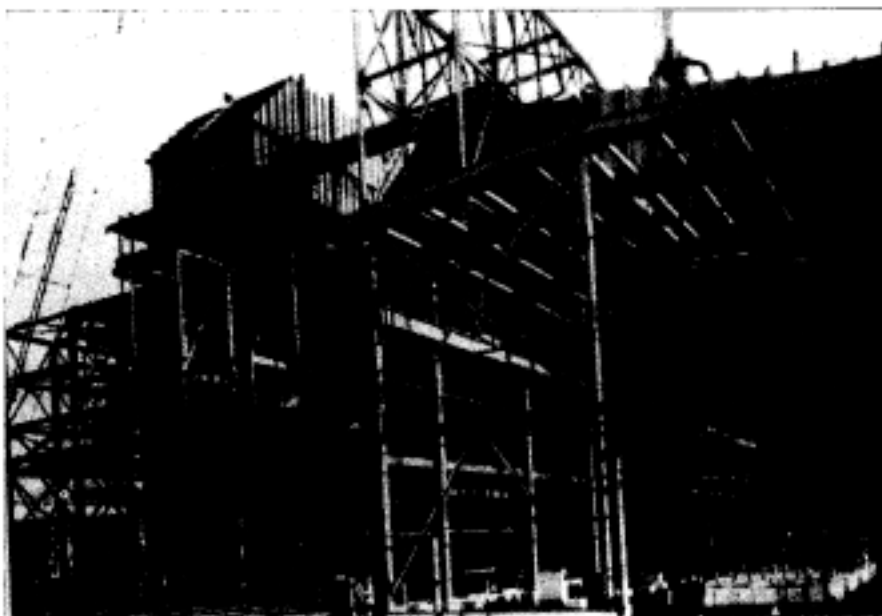
Sized at 528 MWe to take the entire flue gas output of the Northern Indiana Public Service Company's (NIPSCO) Bailly Generating Station, the Pure Air Advanced Flue Gas Desulfurization (AFGD) facility will be the largest single scrubber module operating in the United States following completion of construction in June 1992.

This project is a \$150 million cooperative effort between DOE and Pure Air, a general partnership between Air Products and Chemicals, Inc., and Mitsubishi Heavy Industries America, Inc. under the \$5 billion DOE Clean Coal Technology Program. The DOE cost share is \$63 million - 42 percent of total project cost.

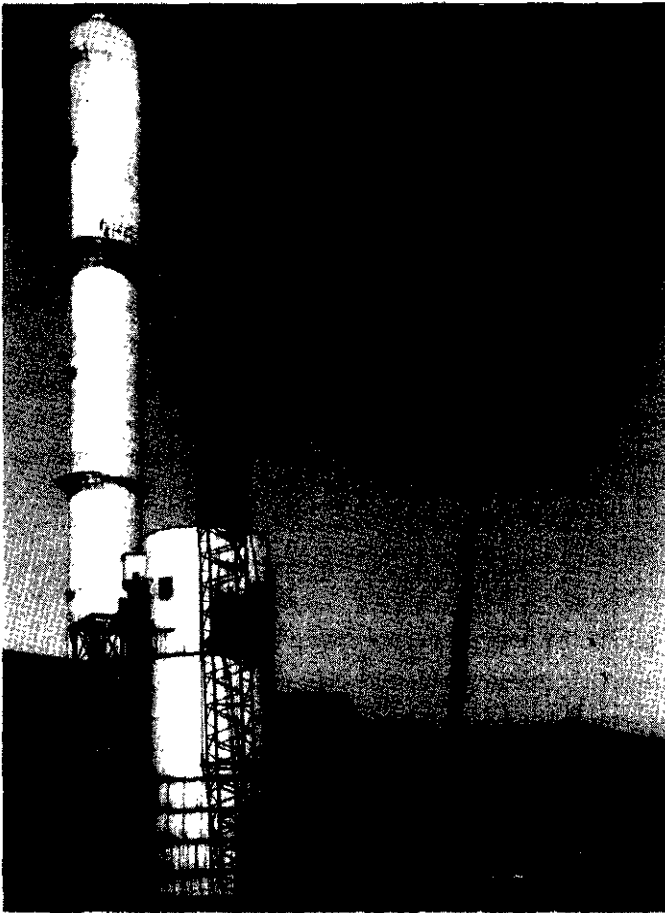
A ground-breaking ceremony was held on April 20, 1990, which coincided with Earth Day. Since then, construction has proceeded through site preparation; foundation installation; and structural erection of a new 480-ft. stack, two 80-ft. limestone silos, and a 40-ft. slurry hold tank. Construction of the absorber and associated duct work is under way, and the mechanical equipment is scheduled to be installed later this year.

The project is progressing on schedule and within budget. Three years of testing

See "Pure Air" on page 2



View of New Pure Air Absorber Tank, Pump Foundations and Flue Gas Ductwork. Right: Outlet Duct to New Stack. NIPSCO 528 MWe Bailly Station, Gary, Indiana.



**New 480 ft. Flue Gas Stack and Existing Fly Ash Silo
Right: Inlet Duct to New Absorber**

cant improvement over the vintage flue gas scrubbers of the 1970s and early 1980s. Successful demonstration could offer a major new option for reducing sulfur pollutants from coal-burning power plants at about half the cost of conventional scrubber technology.

The AFGD process is similar to the conventional wet flue gas desulfurization (FGD) process with limestone addition and forced oxidation, but has several significant improvements.

nected to a single processing loop. The AFGD arrangement eliminates the pre-quencher used in conventional FGD and combines the SO₂ absorption and oxidation operations in a single vessel.

The advanced design utilizes in-situ oxidation to produce high-quality gypsum from a range of high-sulfur coals. The project will purchase and direct-inject powdered limestone in lieu of on-site limestone milling operations. These features contribute to reduced space requirements and reduced capital and operating costs for achieving SO₂ emissions control.

The AFGD design also eliminates waste disposal problems by converting the sludge waste product to a valuable by-product totally within the scrubber. This is achieved by the use of an "air rotary sparger," which chemically changes the sludge to high-quality gyp-

"Pure Air's "own and operate" approach will guarantee AFGD system performance for NIPSCO over the long-term life of the scrubbing plant"

Pure Air...continued

and operation will follow the completion of construction in June 1992. When complete, the project will have demonstrated the integrated process technology, and an innovative business approach to commercialize cost-effective power plant emission control technology.

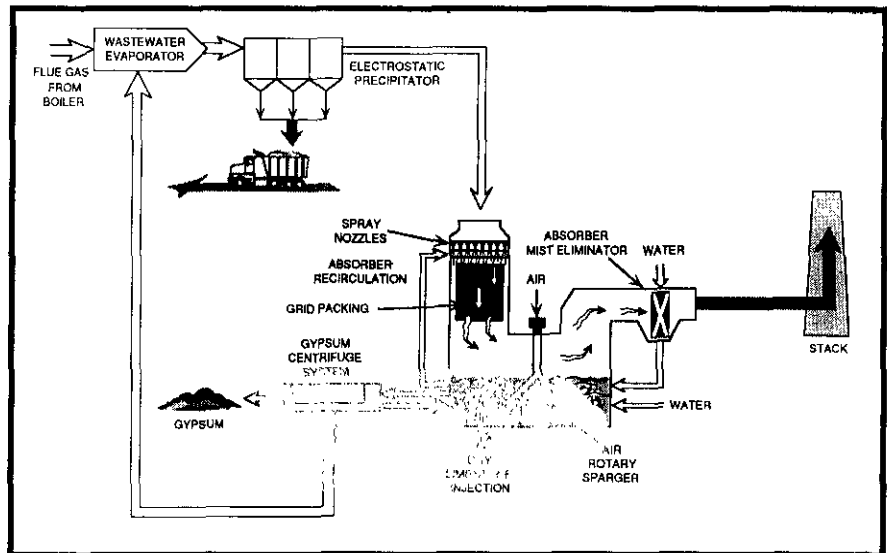
"Successful demonstration could offer a major new option for reducing sulfur pollutants ... at about half the cost of conventional scrubber technology."

The AFGD process achieves a high level of SO₂ removal (90% or greater) on high-sulfur coals at low capital and operating costs, representing a signifi-

The AFGD project will feature a single, large SO₂ absorber module, with no spare or backup scrubber module as is common in conventional scrubber technology. Multiple boilers are con-

sum that can be sold as wallboard feedstock. The AFGD project will also test an innovative waste-water evaporation

See "Pure Air" on page 3



Pure Air Scrubber Process Schematic

Pure Air...continued from pg. 2

discharge" scrubber, i.e., a scrubber with no liquid or solid waste disposal requirements.

An innovative business arrangement will be employed by Pure Air. Normally, a utility company contracts with several different firms to design, build, operate and maintain a scrubber. Most often, the utility itself would own and operate the scrubbing plant. In contrast, Pure Air will assume full responsibility for the AFGD portion of this project by providing financing, design, construction, ownership, operation, and maintenance of the SO₂ pollution control equipment through a project company. Pure Air's "own and operate" approach will guarantee AFGD system performance for NIPSCO over the long-term life of the scrubbing plant, in lieu of the normal business practice of providing only short-term equipment guarantees.

Pilot-plant tests were performed in Japan with U.S. high-sulfur coal and limestone feedstocks to confirm the AFGD process design. All performance targets were achieved, including SO₂ removals of at least 95% and a high level of gypsum purity.

Another test is in progress at Hoosier Energy's Merom, Indiana, Station, to test the long-term operational performance of the air rotary sparger. This 15-month test is scheduled for completion in June 1991.

Wall-Fired Boiler Low NO_x Overfire Air Tests Complete

The first two operating phases of the \$11.7 million Demonstration of Advanced Combustion Techniques for a Wall-Fired Boiler project have been completed. The work is being conducted at the Georgia Power Company's Plant Hammond Station located at Coosa, Georgia, with the Station's 500 MWe pulverized coal-fired Unit 4. The boiler is representative of existing wall-fired utility boilers built prior to the establishment of New Source Performance Standards.

The cooperative effort between DOE and Southern Company Services with funding assistance from the Electric Power Research Institute, will demonstrate nitrogen oxide emission reductions for three configurations of advanced combustion control techniques for application to existing wall-fired boilers: (1) Advanced Overfire Air (AOFA); (2) Low-NO_x Burner (LNB); and (3) Combined AOFA and LNB.

The work is being conducted in four phases. Phase I involved baseline testing with the boiler. Phase II, which began in October 1990 and has just

been completed, involved complete AOFA testing. Twenty-four LNB's have been fabricated and are now being installed in the boiler in preparation for Phase III (LNB testing) and Phase IV (combined AOFA and LNB) operations.

AOFA involves: (1) depleting the air from the burner zone to minimize nitrogen oxides formation; (2) improving the mixing of overfire air with furnace gases to achieve complete combustion; and (3) supplying air over furnace tube wall surfaces to prevent slagging and furnace corrosion. AOFA is expected to reduce NO_x emissions by about 35%. Preliminary evaluation of current tests indicate reductions of more than 25% of baseline emissions.

LNB's utilize controlled fuel/air mixing to preclude formation of NO_x. LNB technology is expected to reduce emissions by about 45%, and the combined AOFA-LNB approach is expected to achieve as much as 60% reductions compared to conventional burners.

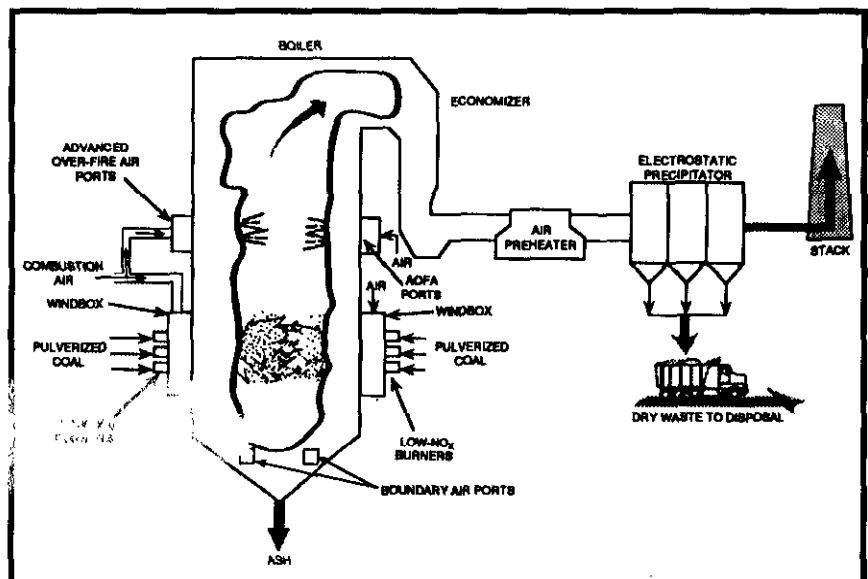
The project is on schedule and within budget. Phases III and IV should be completed in late 1992.

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Comments are welcome.
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Advanced Wall-Fired Boiler Process Schematic

Passamaquoddy Cement Kiln Project Begins Operations

The Passamaquoddy Recovery Scrubber Clean Coal Project at Dragon Products Company's cement plant in Thomaston, Maine, started pre-operations equipment checkout in January and the units operated smoothly until the regular seasonal plant shutdown in February.

The innovative process desulfurizes kiln gas, reduces raw materials requirements and the need for landfill space at the plant by recycling waste kiln dust, and produces saleable by-products. The scrubber processes 250,000 cubic feet of kiln gas per minute.

Initiation of the operations phase of the project should take place in May 1991. Following completion of the start-up phase, the new recovery scrubber will be tested in a long-term demonstration run of 13 months as the final phase of the 36 months long project.

Total estimated project cost is \$12.5 million. \$5.9 million will be provided by DOE, with the balance to be supplied by the Dragon Products Company and the Passamaquoddy Tribe. The Recovery Scrubber process was developed

while the cement plant was owned by the Tribe, which retained ownership of the process when the plant was sold.

The Recovery Scrubber uses high-potassium waste dust produced from cement-making to remove SO_2 from the flue gas of the coal-fired cement kiln. Recovered kiln dust and water are slurried in a tank, and the kiln flue gas is bubbled through the slurry in the Recovery Scrubber. The SO_2 in the gas reacts with the potassium compounds in the slurry to form potassium sulfate. The potassium sulfate is more soluble

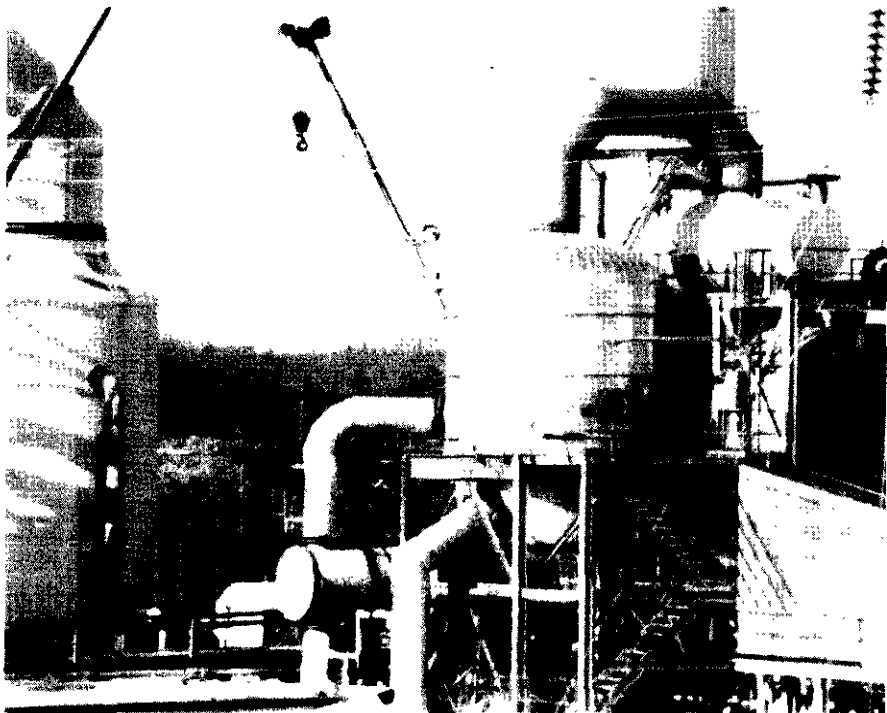
than the calcium compounds in the slurry, thus the calcium compounds settle from the solution and are processed for recycle to the kiln feed system.

An evaporation process is used to produce two saleable by-products: dry potassium sulfate for fertilizer, and distilled water. This unique process produces no waste products.

In usual cement-making operations, the waste kiln dust is too high in potassium and sodium content to reuse directly in the kiln feed. This dust is removed from the flue gas by a dust collector and hauled to a landfill.

All systems operated successfully during the initial start-up program. The

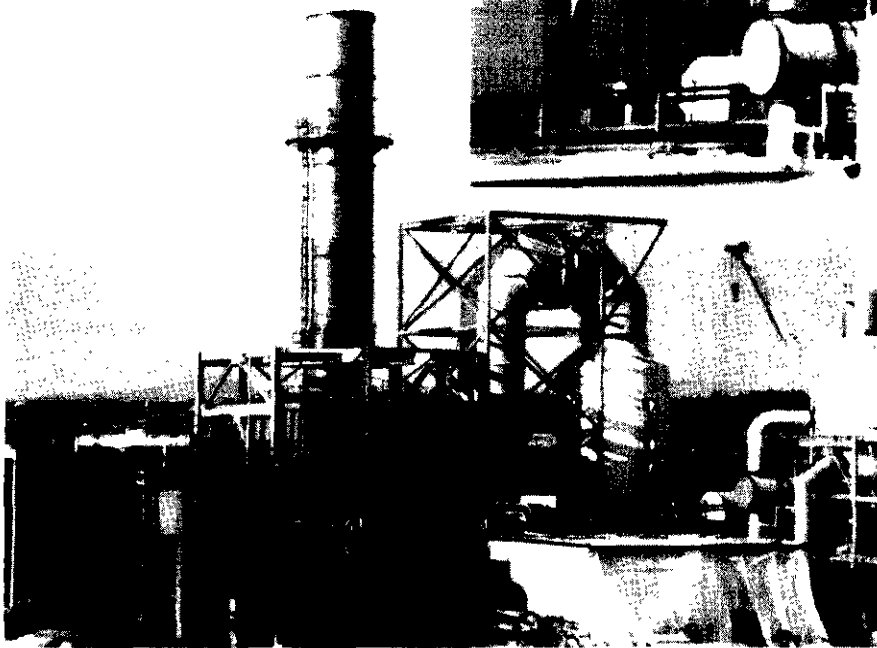
See "Cement Kiln" on page 5

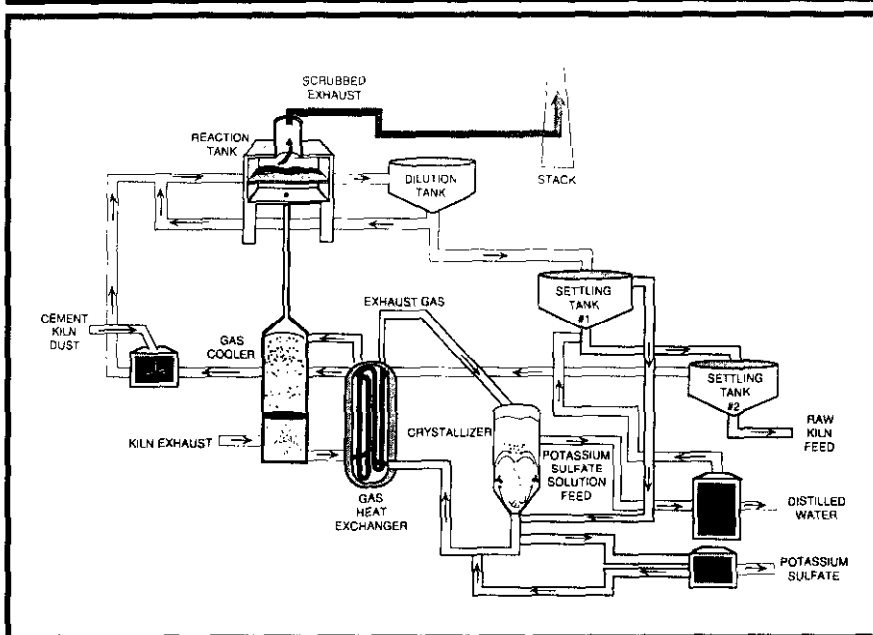


Above: Equipment at Dragon Products. View of gas cooler on left. Center of photo shows the crystallizer with associated heat exchange equipment.

Below left: Gas cooler with view of flue gas exit pipe to reaction tank and final clean, scrubbed flue gas (250,000 scfm) exhaust stack.

Opposite top: Schematic of Passamaquoddy Cement Kiln Flue Gas Process.





Cement Kiln...continued from pg. 4
 evaporator - crystallizer successfully produced potassium sulfate crystals. The scrubber was operated under normal process conditions, with initial SO₂ removal rates in excess of 95%, which exceed the Passamaquoddy Tribe's claims for the process. The only system that still requires final testing is the potassium sulfate pelletizer system.

Research conducted by Dragon Products Company indicates that the Recovery Scrubber process technology can also be applied to flue gas streams from fossil fuel-fired utility plants, waste-to-energy plants, and certain other industrial plants by substituting biomass ash for kiln dust as the source of potassium.

Outreach...continued from pg. 1
 drop, shows where the different types of clean coal technologies can be installed.

The exhibit and this newsletter are part of a broad outreach effort established last summer to better determine and supply the information needs of the distinct audiences interested in clean coal technologies.

The outreach initiative provides information on environmentally acceptable clean coal use options, including both the benefits and lessons being learned from the joint government-industry demonstration projects now underway. The purpose is to provide the information necessary for decision

makers and the general public to make informed choices on future energy options.

Five major "interest groups" are the focal points of the program: technology users and vendors; state institutions-regulators-legislators; concerned environmental groups; educators and educational institutions, and exporters/importers.

Increasingly, as part of the outreach program, DOE clean coal technology program officials are participating in conferences and exhibitions conducted by state and local government, business and other non-technical sponsors.

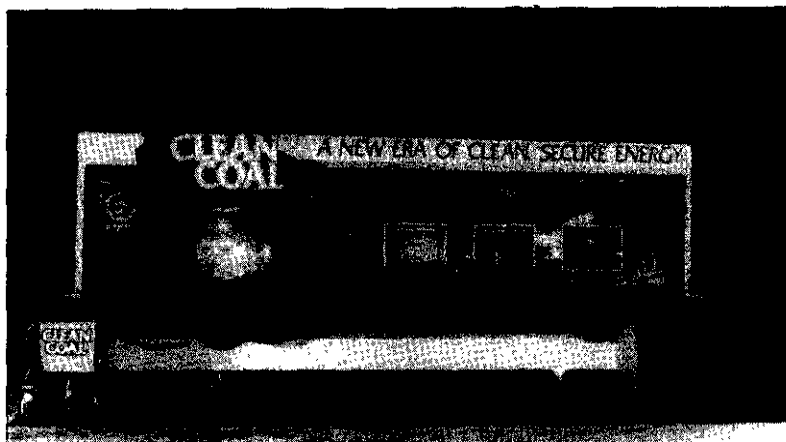
In many of these conferences, either the new 20-foot long exhibit, or a 10-foot long exhibit, is displayed to attract attendees' interest in these advanced technologies.

Thus far in 1991, presentations have been made at legislative breakfasts in Atlanta, GA, and Richmond, VA. Four more of these meetings with state legislators are currently planned, with others likely to be scheduled later this year.

The Clean Coal Technology Program was also featured at the World Coal Conference in New Orleans in February.

In March, clean coal technology was either on the agenda or part of DOE exhibits at the Women's National Democratic Club Symposium in Washington, DC; the Electric Utility Business Environment Conference in Denver; the National Science Teachers Association Annual Convention in Houston; and the Acid Rain Compliance Planning Conference in Palm Beach.

As emphasized in the Energy Department's recently released *National Energy Strategy*, one of the goals is to improve the scientific literacy of all America: "to ensure that the public has the necessary information to make the appropriate energy choices." The Clean Coal Technology outreach effort is a key element of that strategy.



The Department of Energy's New Clean Coal Technology Exhibit Stresses Environmentally Compatible Coal Utilization

ENCOAL Mild Gasification Project Breaks Ground in Many Ways

The ENCOAL Corporation of Houston, Texas has become the first CCT-III participant in DOE's Clean Coal Technology Program to begin construction.

In October 1990, one month after DOE signature of the Cooperative Agreement, a formal ground-breaking ceremony was conducted at the Triton Coal Company's Buckskin Mine near Gillette, Wyoming, which is the project site for the 1000-tons per day mild coal gasification plant.

In advance of the severe winter weather normally experienced in northern Wyoming, ENCOAL was able to complete a 175-foot storage silo and the concrete foundation (pad) for the 150-foot x 140-foot main process building. A second 194-foot silo should be completed by April 1991.

To complete the pad, the M. W. Kellogg Company (ENCOAL's engineering, procurement and construction contractor) and its subcontractors poured nearly 3000 cubic yards of concrete in a 32-hour marathon session. The effort was the largest continuous pour ever completed by Kellogg and the largest ever in Wyoming.

Kellogg has rapidly moved through the 60% completion point for detailed design of the plant, and has begun to issue bids for major pieces of equipment. All remaining requests for bids for erection and outstanding off-site activities are expected to be released in time for the resumption of construction in April 1991.

As aptly stated by DOE's Assistant Secretary for Fossil Energy, Robert Gentile, at the ground-breaking ceremony, "This project continues to break new ground in the nation's quest for both energy security and environmental protection. Its record-setting pace confirms the judgement of both the government and its industrial partners who have invested in its success."

Total estimated cost of the four-year demonstration project is \$72.6 million, with DOE providing half of the funding. ENCOAL expects to complete detailed design by June 1991 and construction by early 1992 in order to have adequate time for an all-system shakedown and start-up testing a year from now. ENCOAL is well along the way to securing all needed permits to allow for full plant operation by September 1992.

When completed, the plant will process 1,000 tons per day of sub-bituminous coal to produce two new clean burning products: a low-sulfur "coal derived liquid" (CDL) similar in quality to No. 6 fuel oil; and a solid, "process derived fuel" (PDF) similar in quality to eastern bituminous coals, but without the high sulfur content of these coals. It is anticipated that the fuels produced during the project's two-year demonstration period will be burned in commercial utility and industrial boilers.

"Our ability to produce clean liquid fuels from our own coal supplies strikes at the heart of those who would hold us hostage to imported oil," Gentile said of the ENCOAL project. "And because these fuels are clean, we also show that coal use does not mean compromising our commitment to the environment."

The mild coal gasification process to be demonstrated at the Wyoming facility was jointly developed by SGI International of La Jolla, California, and Shell Mining Company of Houston, Texas. This technique, termed "Liquids from Coal" (LFC) is particularly well-suited for low rank coals located in Wyoming, Montana, North Dakota, the Gulf Coast, and Alaska.

In the LFC process, raw coal, heated under carefully controlled temperatures and pressures, is chemically converted to the two fuels. The coal is first heated by hot gases to remove the moisture, and then conveyed to a second "pyro-

lyzer" vessel where it is further heated to about 1000°F. Released gases are passed through a cyclone for cleaning, then cooled to condense the CDL product; the noncondensed gases are combusted to provide heat for the process. The PDF product has very low sulfur content but very high heating value (about 12,000 Btu/lb).

The LFC plant is designed to produce its solid and liquid products at an overall yield of about 60 percent by weight with 90 percent of the heating value recovered. All process and plant byproducts are either consumed internally, or captured in a closed system and disposed of by state-of-the-art technologies having no adverse impacts on the environment. The ENCOAL plant will be a remarkably clean and efficient operation.

An advanced computerized control system will vary operating parameters to adjust for changes in the feed coal composition, and to customize the quality of the product fuels depending on specific market needs. Integral to the control system will be two on-line elemental analyzers supplied by Gamma-Metrics of San Diego, California.

One analyzer will be installed at the front end of the process to monitor moisture, ash, sulfur, and other elements in the coal. The other will be located at the back end to enable adjustments in product quality and yield.

The early development work for these analyzers was done at DOE's Morgantown Energy Technology Center (METC) in the late 1960s and early 1970s. To encourage further commercial development, METC transferred the technology to the private sector via the Electric Power Research Institute in the mid 1970s.

If ENCOAL's project is successful, a full-scale commercial plant, about 10 to 20 times the size of the demonstration plant, could be built and operating by the mid- to late-1990s.

B&W Low NO_x Cell Burners Fabricated

Babcock & Wilcox (B&W) has completed the fabrication of the 24 coal nozzles and 24 NO_x ports to be used in the CCT-III B&W Full-Scale Demonstration of Low NO_x Cell Burner Retrofit Project, at the Dayton Power & Light J. M. Stuart Generating Station near Aberdeen, Ohio.

This complete retrofit of the 605-MWe, base-loaded Unit #4 boiler will constitute the first commercial-scale retrofit demonstration of this technology in the United States.

Each of the existing 24 two-nozzle cell burners will be replaced with an arrangement of one lower coal nozzle and one upper NO_x port, which together comprise a single low-NO_x cell burner (LNCB). Each LNCB is designed to fire all the fuel input, previously sent to a two-nozzle cell burner, through a single, larger coal nozzle under sub-stoichiometric air conditions. The remaining air required to complete the combustion process is introduced into the furnace via a NO_x port located

directly above the burner port.

Using this staged combustion technique, the LNCB technology is expected to reduce the formation of both fuel and thermal NO_x emissions by at least 50% compared to uncontrolled emissions, without degradation of boiler performance, and at a reduced cost to competing technologies.

Retrofit construction is scheduled to take place during a six-week outage of Unit #4 starting in September 1991, followed by an 18 month period of boiler testing and emission monitoring. Pre-retrofit baseline testing of Unit #4 was completed in November 1990.

Tidd Receives 1991 Power Plant Award

American Electric Power's Tidd Pressurized Fluidized Bed Combustion (PFBC) Demonstration Plant is a recipient of *Power* magazine's 1991 Power Plant Award. The magazine said that the award was earned because Tidd represents a coal-fired power plant of the future and a major step forward for

the Clean Coal Technology Program.

Since initial coal firing late last November, the facility, located in Brilliant, Ohio, has accumulated about 200 hours of operation on coal, reaching a load factor in excess of 80 percent. The longest sustained run to date is 35 hours.

The project recently began a planned three-year demonstration program to provide the data base and experience needed for design, operation, and maintenance of commercial PFBC plants.

At full load the 70-MWe PFBC combined cycle plant will burn about 30 tons per hour of coal. Sulfur removal is expected to meet or exceed 90 percent, and nitrogen oxide emissions are expected to be less than half those of conventional coal-fired boilers.

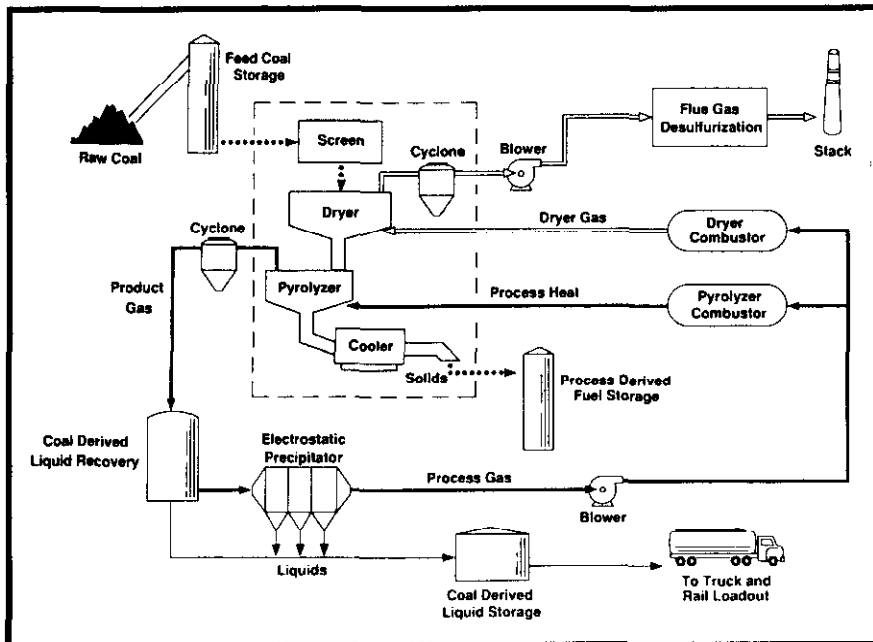
PON-IV Update

The fourth Program Opportunity Notice (PON) for the Clean Coal Technology (CCT) Program was issued on January 17, 1991, establishing the final schedule for receipt of proposals and DOE selection of projects, May 17 and September 17, 1991, respectively.

A pre-proposal conference was held in Washington, DC, on February 5, 1991, with about 120 non-DOE representatives of prospective bidders in attendance. Answers to questions developed by DOE or received from interested parties, were mailed on March 4 to all parties that received copies of the PON.

Thirty-five active projects with a total estimated cost of \$3.3 billion (industrial partners will provide \$2 billion or 61% of funds) have resulted from the prior three PON's.

For PON-IV information contact: U.S. DOE, Office of Placement & Administration, Operations Branch "A-1" (PR-321.1), Room No. 1I-065, 1000 Independence Avenue, SW, Washington, DC 20585, Attn: Herbert D. Watkins (Procurement Member, Source Evaluation Board), Telephone: 202-586-1026.



ENCOAL Process Schematic

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. A final report is scheduled for April 1991.

Enhancing the Use of Coals by Gas Reburning and Sorbent Injection. Energy and Environmental Research Corporation, Hennepin and Springfield, IL.

The gas reburning system has been operated at the Hennepin site (tangentially-fired boiler) and results of 32 basic tests are being evaluated. Start-up of the sorbent injection system will begin as soon as system modifications are completed. Civil construction work started in November at the Springfield site (cyclone-fired boiler) will be completed in April 1991.

LIMB Demonstration Project Extension. The Babcock & Wilcox Co., Lorain, OH.

Duct injection tests (1,729 operating hours) have been successfully completed with up to 70% SO₂ removal. A topical report on the Coolside tests is being reviewed for release in early 1991. LIMB testing is scheduled to continue until mid 1991.

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 sulfur and nitrogen oxides emissions. A final report is scheduled for October 1991.

Prototype Commercial Coal/Oil Coprocessing Project. Ohio Clean Fuels, Inc., Warren, OH.

Participant is proceeding with project development at own expense. Principal is negotiating with refinery operators to provide for integration of the process into a refinery.

TIDD PFBC Demonstration Project. American Electric Power Service Corp. on behalf of Ohio Power Co., Brilliant, OH.

Start-up activities have been completed and the program has begun the three-year operations demonstration phase. The plant has reached a load factor in excess of 80%. The longest sustained run to date is 35 hours.

Advanced Coal Conversion Process Demonstration. Western Energy Co., Colstrip, MT.

In February 1991 a 40% design review was held at DOE/Pittsburgh Energy Technology Center. The Western Energy - Northern States Power Group had a groundbreaking ceremony on March 28, 1991 at the Colstrip site.

Development of the Coal Quality Expert. Combustion Engineering, Inc. & CQ, Inc., Homer City, PA.

Pilot scale combustion tests of 70% WY - 30% OK coal samples have been completed. Pilot scale data will be compared to data collected from completed and planned large scale combustion tests. Test work will continue.

Arvah B. Hopkins Circulating Fluidized Bed Repowering Project. The

Design activities are continuing. The circulating fluid bed boiler sub-contract has been submitted to DOE for review.

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 40% complete. The major mechanical contract was awarded in March. DOE has approved the continuation application for activities through December 1991.

180 MWe Demonstration of Advanced Tangentially-Fired Combustion Techniques for the Reduction of NO_x Emissions for Coal-Fired Boilers. Southern Company Services, Inc., Lynn Haven, FL.

Short-term baseline performance testing was completed. Long-term baseline performance testing continued with completion scheduled by April 1991. Design review of the Low NO_x Concentric Firing System is continuing with installation scheduled during the plant outage in April 1991.

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 more than 60 days of data collected. Fabrication of all equipment and materials is on schedule to allow the start of the installation of the Low NO_x Burners (LNB) during the Spring 1991 outage at Hammond Plant Unit No. 4. Following evaluation of the LNB, the combined LNB/AOFA installation will be evaluated in long-term tests.

Cement Kiln Flue Gas Recovery Scrubber. Passamaquoddy Tribe, Thomaston, ME.

Construction and start-up activities were essentially completed in March, and fully integrated operations will be initiated when cement production is resumed.

Demonstration of Coal Reburning for Cyclone Boiler NO_x Control. The Babcock & Wilcox Co., Cassville, WI.

Detailed design activities continue. The Environmental Assessment to support construction activities has been approved. The installation of foundations has begun in order that the remaining construction activities can be completed during an April outage at the Nelson Dewey Generating Station.

Innovative Coke Oven Gas Cleaning System for Retrofit Applications. Bethlehem Steel Corp., Sparrows Point, MD.

Erection of major mechanical equipment and structural steel was completed and hydrostatic pressure testing has been initiated. A computerized interactive self-tutorial training system was developed for operating and maintenance personnel.

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. The fiberglass reaction vessel and limestone slurry tank shells have been fabricated.

Combustion Engineering IGCC Repowering Project. Combustion Engineering, Inc., Springfield, IL.

Preliminary engineering for repowering the Lakeside Power Station is continuing. Cold flow modeling of the gasifier internals and dry coal feed system is underway.

Low NO_x/SO_x 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. A design review was held in January at the Southern Illinois Power Cooperative facility in Marion, IL.

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.

CCT-II Projects

Status

Demonstration of Selective Catalytic Reduction Technology for the Control of NO_x Emissions from High-Sulfur Coal-Fired Boilers. Southern Company Services, Inc., Pensacola, FL.

Preliminary engineering continued with most areas practically finished except for resolution of some key issues on the interface between the selective catalytic reduction equipment and Plant Crist. Portions of the detailed design engineering phase were initiated and definition of some major equipment specifications is in progress.

SOX-NOX-ROX Box Flue Gas Clean-Up Demonstration Project. The Babcock & Wilcox Co., Dilles Bottom, OH.

Design efforts continue. Long lead equipment has been ordered. Hot dust bag tests are planned.

WSA-SNOX Flue Gas Cleaning Demonstration Project. Combustion Engineering, Inc., Niles, OH.

Design and construction activities continue. Foundations are being poured for erection of equipment scheduled for November 1991.

CCT-III Projects

Status

Blast Furnace Granulated Coal Injection System Demonstration Project. Bethlehem Steel Corp., Burns Harbor, IN.

Negotiations with British Steel Corporation for a licensing agreement and conceptual design and engineering efforts needed to prepare process component bid packages are continuing.

Confined Zone Dispersion Flue Gas Desulfurization Demonstration. Bechtel Corp., Indiana County, PA.

Detailed design was completed in January 1991. Equipment has been purchased and construction will begin in early 1991.

10 MW Demonstration of Gas Suspension Absorption. AirPol, Inc., Paducah, KY.

Process design is continuing. Site availability scheduling discussions with TVA are in progress.

Healy Clean Coal Project. Alaska Industrial Development and Export Authority, Healy, AK.

An application to the Alaska PUC by Golden Valley Electric Assoc. for a purchase power agreement has been returned for clarification. Project initiation awaits award of the Cooperative Agreement.

Integrated Dry NO_x/SO₂ Emission Control System. Public Service Company of Colorado, Denver, CO.

The Cooperative Agreement was awarded March 11, 1991. Design activities are in progress.

Air-Blown/Integrated Gasification Combined Cycle Project. Clean Power Cogeneration, inc., Tallahassee, FL.

The Cooperative Agreement was awarded March 18, 1991. Conceptual process and plant design studies, and cost and schedule baseline activities have been started.

LIFAC Sorbent Injection Desulfurization Demonstration Project. LIFAC North America, Richmond, IN.

Construction activities began for the LIFAC tie-in to the Richmond Power & Light's Whitewater Valley Unit No. 2. This outage construction is scheduled for completion by April 1991.

Liquid Phase Methanol Process. Air Products and Chemicals, Inc., Dakota Gasification Co., Beulah, ND.

Negotiation schedule has been extended to Fall 1991 to evaluate an alternative 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 has been completed. Dayton Power & Light needed to delay the outage planned for construction work for this project until September 1991 because of an extended outage required for a severe turbine problem on another boiler. Consequently, a six month schedule extension is required.

CCT-III Projects

Status

ENCOAL Mild Coal Gasification Project. ENCOAL Corp., Gillette, WY.

The 60% detailed design review was held in February 1991. All requests for bids, including erection of the Process Derived Fuel system, have been received and are under review. The project remains ahead of schedule.

Commercial Demonstration of NOXSO₂/NO_x Removal Flue Gas Cleanup System. MK-Ferguson Co., Niles, OH.

The Cooperative Agreement was awarded March 10, 1991.

Pressurized Circulating Fluidized Bed Demonstration Project. Dairyland Power Cooperative, Alma, WI.

Negotiation schedule has been extended to mid-1991. The Pathfinder Plant located at Sioux Falls, South Dakota has been selected as an alternative site because the originally proposed Alma, Wisconsin site became unavailable.

Evaluation of Gas Reburning and Low-NO_x Burners on a Wall-Fired Boiler. Energy and Environmental Research Corp., Denver, CO.

Design and permitting activities are proceeding well. Process design continued to optimize locations for flue gas recirculation/gas reburning nozzles and overfire air nozzles. Preparations are being made to place purchase orders for long delivery items by April 1991 to allow retrofit work to proceed during the Cherokee Station boiler outage scheduled to begin August 16, 1991.

CLEAN COAL TECHNOLOGY DEMONSTRATION PROGRAM - SORTED BY OPERATION START DATE																																																						
CALENDAR YR PROJECT	1986			1987			1988			1989			1990			1991			1992			1993			1994			1995			1996			1997			1998			1999			2000			2001								
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FISCAL YEAR	1986			1987			1988			1989			1990			1991			1992			1993			1994			1995			1996			1997			1998			1999			2000			2001								

KEY

- PRE-AWARD [White box]
- DESIGN/BUILD [Light gray box]
- OPERATION [Dark gray box]

Upcoming Events

Date	Event	Contact
April 15 - 18, 1991	<u>Tenth IEA/Coal Combustion Meeting.</u> Marriott, Andover, MA	K. R. Downey 412-892-6029
April 22 - 25, 1991	<u>16th International Conference on Coal and Slurry Technologies.</u> Sheraton San Key, Clearwater, FL.	B. Sakkestad 202-296-1133
April 22 - 26, 1991	<u>11th International Conference on Fluidized Bed Combustion.</u> LeGrande Hotel, Montreal, Canada. (Energy, Mines and Resources)	Dr. E. J. Anthony 613-996-2868
June 10 - 13, 1991	<u>Second U.S./Canadian Coal/Heavy Oil Coprocessing Technology Workshop & Fourth U.S./Canadian Coprocessing Coordinating Committee Meeting.</u> Ritz Carlton, Atlanta, GA	S. D. Laczko 412-982-6145
June 17 - 28, 1991	<u>Seminar on Economics and Commercial Implementation of Clean Coal Technologies in the International Marketplace.</u> Argonne National Laboratory, Argonne, IL.	S. Walbridge 202-586-7735
July 11 - 12, 1991	<u>Coal and the Environment - Asia 2010, Conference.</u> East-West Center, Honolulu, HI.	S. Walbridge 202-586-7735
July 15 - 18, 1991	<u>Coal Preparation Utilization & Environmental Control Contractor's Review Meeting.</u> Westin William Penn Hotel, Pittsburgh, PA	K. R. Downey 412-892-6029

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*. A complete listing of reports since the inception of the Program was provided in the last issue. Copies of the publications and Reports to Congress are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Date	Rpt. No.	Title
Feb 91	DOE/FE-0219P	Clean Coal Technology Demonstration Program: Program Update 1990 (As of December 31, 1990)

CCT III Comprehensive Reports to Congress

Date	Rpt. No.	Title
Jan 91	DOE/FE-0211P	Healy Clean Coal Project (Alaska Ind. Dev. and Export Auth.)
Jan 91	DOE/FE-0212P	Integrated Dry NO _x /SO ₂ Emission Control System (Pub. Svc. Co. of Colorado)
Jan 91	DOE/FE-0213P	Commercial Demonstration of the NOXSO SO ₂ /NO _x Removal Flue Gas Cleanup System (MK-Ferguson Co.)
Jan 91	DOE/FE-0216P	Air-Blown Integrated Gasification Combined-Cycle Demonstration Project (Clean Power Cogen. Ltd. Part.)
