DOE/FE-0215P-25 OFFICE OF FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY ISSUE NO. 25, SPRING 1997

CLEAN COAL TODAY

A NEWSLETTER ABOUT INNOVATIVE TECHNOLOGIES FOR COAL UTILIZATION

PROJECT NEWS BYTES

Following the Fifth Annual CCT conference in January, **Tampa Electric** held a dedication ceremony for the Polk Power Station IGCC plant. Speakers included departing Energy Secretary Hazel O'Leary and the Honorable Ralph Regula. The plant has operated very successfully during the last three months. The longest continuing operating run during this time was 40 days. The Texaco oxygen-blown coal gasifier has demonstrated its longest operation to date with 90 percent plant availability exceeding all expectations, particularly since the plant only started producing power in October 1996. The plant is currently preparing to test a Kentucky #9 and an Illinois #6 coal before the next major planned outage in April.

See "Project News Bytes" on page 14. . .

IN THIS ISSUE

FIFTH ANNUAL CCT CONFERENCE ADDRESSES CCTs' FUTURE

Speaking at the Fifth Annual Clean Coal Technology (CCT) Conference in Tampa, Florida in early January, departing Energy Secretary Hazel O'Leary, in luncheon remarks delivered on the last day, favorably contrasted the CCT Program with other "big ticket" government initiatives. O'Leary reflected on the country's mood in 1984 when the program was started, and complimented CCT Program initiators for daring to launch a new government venture following the synthetic fuels experience, when lower oil prices eliminated the potential synthetic fuel market. "The CCT Program," O'Leary remarked, "has not only succeeded but has become a model for government-industry cooperation that even GAO applauds." The program has succeeded because it is environmentally beneficial, industry-driven in terms of portfolio and performance standards, and awarded on the basis of competition.

The Honorable Ralph Regula, Chairman of the House Appropriations Subcommittee on Interior and Related Agencies.

The CCT conference, attended by well over 300 people, including 70 representatives from 16 countries, featured an appearance by The Honorable Ralph Regula, Chairman of the House Appropriations Subcommittee on Interior and Related Agencies. Regula, one of the initial supporters of the CCT Program, argued for expanded use of coal and warned against giving our grandchildren a "legacy of dependence" on imported oil. Principally, the Congressman emphasized the need for outreach, interacting with legislators to convince them of the beneficial effects of CCT development on jobs, economic growth, and U.S. competitiveness.

This message was also emphasized by Patricia Fry Godley, DOE's Assistant Secretary for Fossil Energy, in an opening day plenary session. Godley cautioned against "preaching to the choir," spreading the message only among ourselves. We must, she said, educate our policy makers both domestically and internationally; educate potential customers on the applicability of CCTs to address environmental issues at a decreasing cost of electricity output; and finally, educate the public who will in turn influence policy makers.

See "Conference" on page 2. . .

. . . "Conference" from page 1

The conference was structured around international, domestic, environmental, and technology deployment issues, with a final plenary session summarizing how these issues can be addressed in order to allow clean coal technologies a place to "Power the Next Millennium" — the conference theme.

Alan Heyes, of the UK's Department of Trade and Industry, capsulized the international panel's findings. To encourage CCTs internationally, Heyes recommended that attention be focused in a few key areas, such as India and China, rather than over the entire globe. Particularly, he recommended greater understanding of country-specific barriers and preparation of strategies to overcome these barriers. He cited widespread ignorance of CCT advantages, in spite of many outreach publications disseminated.

"The market," Heyes said, "is big enough for everybody to have a share" in spite of inroads made by natural gas, which is less expensive than coal for new plants in areas with plentiful gas resources. Heyes cited Energy Information Agency (EIA) figures of 5.3 billion tons of coal demand in 2010, mostly in Asia and India, while Godley brought out the potential trillion dollar worldwide power generation market by 2015.

Environmental uncertainty is one area the panelists cited as holding back international expansion of CCTs, particularly insofar as regulations, and requirements for assessments and management plans, vary country by country. Though the World Bank is increasingly seen as setting a norm, even the Bank's rules are not constant. In summarizing findings of the environmental panel, Karl Hausker, of the Center for Strategic and International Studies, made several recommendations to facilitate international development: early definition of projects; avoiding design changes; involving the public where appropriate; and collecting baseline data. He also recommended that the World Bank be pushed for more uniformity in its rules, and that power project developers adhere to and promote strong environmental standards to help developing countries avoid the mistakes of OECD nations and "leapfrog to the best technologies and management systems now." Other panelists stressed the need to avoid resettling populations, and the importance of maintaining close contact with all involved financial institutions.

On the domestic front, Pat Godley quoted EIA figures predicting a 197 million ton increase in US coal consumption between 1995 and 2015, whereby even with losses of market share to natural gas, coal will continue to be the largest single fuel for power generation. Domestic barriers were seen by the conferees to be: low price of gas; high capital cost of coal; higher efficiencies of natural gas combined cycle technology; uncertainties over market deregulation, which will result in life extension instead of commitment to new capacity; and financing difficulties when ability to pay back depends on the competitive market.

The deregulated market was seen by panelists to add uncertainty to CCT prospects, especially in the long term. In his keynote address, Girard F. Anderson, President and CEO of TECO Energy, forecasted that the near-term effect of deregulation could be increased demand for coal because competition and the need to keep prices down will make it advantageous to prolong the life of existing coal plants. Electricity suppliers were expected to opt for life extension instead of building new capacity. Natural gas was generally seen to be the choice for repowering. However, Mike Mudd, of American Electric Power Energy Services, stated that CCT repowering technologies could be the "swing" choice for coal to capture some of the market for intermediate sized power generating stations. Suppliers faced with environmental requirements that could close operations might also opt for retrofit CCTs, if costs could remain competitively low. The U.S. retrofit market is substantially greater than the new capacity market for CCTs, and should be rigorously pursued, according to Mudd.

Patricia Fry Godley, U.S. Department of Energy Assistant Secretary for Fossil Energy

Several panelists emphasized the barriers posed by stricter environmental standards such as EPA's proposals for particulates and ozone, which would put many areas of the country into non-attainment with the National Ambient Air Quality Standards. Air toxics, acid rain, and NO_x regulations were also mentioned. Pat

Godley noted that utilities do not receive proper credit for environmental progress made to date. Clean Air Act standards, for example, have in fact been met ahead of time, and emissions have been reduced 39 percent more than was required by the 1995 deadline. SO_2 emissions have been reduced 27 percent since 1970, while dumping of toxic metals in waterways has fallen 91 percent in the same time frame.

As summarized by DOE's Tom Grahame, domestic issue panelists had a number of suggestions on how to move ahead in spite of obstacles. Reiterated throughout the sessions was the theme of deploying, and "incentivizing" CCTs overseas so they do not lose momentum for eventual domestic applications. Innovative state regulations are another method in which ultra-clean coal technologies might receive the incentives either in place or proposed for renewables, such as wire charges and portfolio standards. Another proposal recommended performance credits, which would eventually become revenue neutral. Finally, some recommended that incentives be withdrawn from all resources, and that marketplace competition dictate winning technologies.

Larry Papay, Senior Vice President and General Manager at Bechtel Corporation, provided luncheon remarks about advancing deployment of CCTs both domestically and internationally. One idea, he said, is to make coal "look like other fuels." Washing and beneficiation can provide a less variable fuel suitable for standard plant designs. He advocated improving coal's environmental performance by increased efficiency, and applauded programs such as DOE's Combustion 2000 effort. Blending coals with other fuels, he said, can also mitigate environmental impact, such as use of natural gas in a PFB topping cycle. Another option is dual-fuel capability, whereby a natural gas combined cycle plant might add space for equipment which could burn coal if it becomes advantageous. Low-cost fossil fuels (heavy oils and petroleum coke, orimulsion, and biomass) may also provide an interim market for CCTs until conditions for coal become more favorable.

In all, despite ongoing barriers to coal use here and abroad, there are significant opportunities for CCT deployment. Actions must be carefully planned to accommodate environmental, economic, and social constraints of each market, but the barriers are not insurmountable, by all accounts of conference speakers.

Larry Papay, Senior Vice President and General Manager, Bechtel Corporation

Charles R. Black, Vice President, Energy Supply, Tampa Electric Company

THANKS TO CCT CONFERENCE SPONSORS

The Fifth Annual Clean Coal Technology Conference not only experienced an increase in attendance (to well over 300 attendees), but also a growing list of co-sponsors. DOE would like to acknowledge the four co-sponsors: Center for Energy & Economic Development, National Mining Association, Electric Power Research Institute, and the Council of Industrial Boiler Owners. Their participation was invaluable, and provided added depth and perspective to the conference program. In addition, thanks go to Tampa Electric Company, the host utility for this year's conference, providing those who attended the site tour an opportunity to visit the newest of the CCT Program's integrated gasification combined cycle facilities. Tampa Electric also hosted a "wandering dinner" at the Museum of Science and Industry, and a visit to its Electric Technology Resource Center. Finally, thanks go to the nine co-sponsors of a Caribbean Theme reception: Air Products and Chemicals Inc.; Babcock & Wilcox, a McDermott Company; Bechtel Power Corporation; Center for Energy & Economic Development; Destec Energy Gasification Business Unit; Foster Wheeler Corporation; National Mining Association; and NOXSO Corporation.

INTERNATIONAL INITIATIVES

WORLD BANK'S CLEAN COAL INITIATIVE

Joseph Gilling, Senior Energy Economist, The World Bank

Joseph Gilling, a Senior Energy Economist at the World Bank, described the World Bank's recent Clean Coal Initiative at the International Business Forum panel of the January CCT conference in Tampa, Florida. While acknowledging pressures on the Bank to fund renewables, Gilling stated that the rate of coal use in developing countries will be significant, and cannot be ignored. "By 2010," Gilling noted, "India and China will take roughly half the world's (coal) requirement."

The CCT Initiative, which has no separate World Bank funding but is melded with current Bank lending operations, was described by Gilling as "cross sector," driven by the need for efficiency in the power and coal sectors of developing nations. Emerging economies often have legal, regulatory, fiscal, and institutional frameworks that provide little or no incentive to capture the low-cost/no-cost management and operational performance improvements across the coal-energy chain.

The Initiative, begun in June of last year, plans a variety of information sharing activities at roundtables and seminars, as well as on the Internet (http://www.worldbank.org). A clean coal finance workshop, co-sponsored by the Bank, and the International Energy Agency's Working Party on Fossil Fuels (chaired by DOE Assistant Secretary for Fossil Energy Pat Godley) was held in Washington, DC, last fall. Papers on the Initiative also were presented at the Energy Efficiency Improvement Conference in Beijing, China, which was sponsored last December by IEA and the Beijing State Planning Commission. Assistance also is provided to ongoing Bank energy projects in China, India, and the Ukraine, among many others. Gilling described the Initiative's main objectives as assisting client countries to restructure their coal, transportation and conversion sectors; to develop and enforce sound environmental practice; and to deploy clean coal technologies/projects.

NEW CHINESE CCT PROJECT

Hydrocarbon Technologies, Inc. (HTI), of Lawrenceville, New Jersey, last December signed a letter of intent with the Chinese Central Coal Mining Research Institute to work jointly toward building a pioneer direct coal liquefaction plant in China. The program was begun in early 1997, and operation is scheduled for 2002. DOE, with HTI, jointly led the delegation to China and will provide a Continuous Bench Unit, for a test run of 50 kg/day on a selected China coal. The commercial plant would produce 50,000 barrels/day of gasoline and diesel fuel while feeding 10-12,000 tons/day of bituminous coal.

The agreement specifies that HTI and the Chinese Central Coal Mining Research Institute will co-fund the initial DOE study phase. Later stages would involve testing up to three Chinese coals using HTI's 50-Kg/day continuous flow pilot plant; a 5 ton/day proof-of-concept phase, in which ABB Lummus also would participate; and basic engineering and design along with a more in-depth feasibility study; detailed engineering, and finally, construction and operation.

U.S./ISRAEL TECHNICAL INFORMATION EXCHANGE

DOE's Fossil Energy and Israel's Ministry of Environment will co-chair an important hazardous waste panel at the 90th Annual Meeting and Exhibition of the Air and Waste Management Association — "Science and Technology: The International Language" — the week of June 8, 1997, in Toronto, Canada. Israel's participation is sponsored by the U.S.-Israel Science and Technology Commission, a bi-national program chaired by the U.S. Secretary of Commerce and Israel's Minister of Industry and Trade. The panel on technology for hazardous waste treatment in Israel, from source reduction to innovative treatment processes, will include discussions on: environmental capabilities and needs; management of emissions, ash, and effluents from coal-fired power plants; economic considerations for conducting joint ventures; and trade. At the conference, FE also will participate in a special workshop on innovative environmental control technology, as seen from a government perspective. Both FE and Israel will present exhibits at the new "International Innovative Environmental Technology Pavilion." Israel's booth will showcase the country's resources and provide an opportunity to meet U.S. technology providers interested in doing business with Israel.

Israel has a special interest in hazardous and solid waste management, co-firing with coal for power generation, recycling, and waste treatment. The country faces increasing demands for environmental protection, development of renewable energy resources, and water conservation, while at the same time promoting expansion in industry and agriculture.

The Air and Waste Management Association can be reached at (412) 232-3444; home page: (http://www.awma.org).

U.S. AID SUPPORT IN INDIA

Gary Staats, DOE-FE Resident Advisor, on loan to the U.S. Agency for International Development (AID) in India, spoke at the Tampa CCT conference regarding joint activities in India. Staats explained that AID provides funding, while DOE provides technical assistance.

A major activity, Staats explained, is AID's Greenhouse Gas Prevention Project, where DOE, Office of Fossil Energy is involved in a subtask to promote efficient coal conversion. Technical assistance funds for working at coal-fired power plants are provided in the areas of efficiency improvement, environmental monitoring upgrades, lifetime assessment/extension, predictive maintenance, application of advanced coal conversion technologies, fuel quality impact, and large fly ash utilization. Some investment grant funding is available for a pilot-scale demonstration of a selected advanced coal conversion technology.

Staats explained how U.S. teams visit selected plants to study conditions and use new diagnostics. On one occasion, he noted, real time data reduction capability showed that simply resetting general plant conditions could save 0.4 percent in performance. This figure, while not sounding substantial, translated into several hundred thousand tons of CO_2 per year from a single unit.

DOE will promote and assist in the formulation of advanced coal beneficiation initiatives, designed to put to rest the dispute over whether significant ash reduction can be achieved economically, and whether power plants will realize the benefits cited by U.S. users of washed coal. DOE's efforts have, in fact, helped to catalyze this first private, commercial steam coal washing plant in India, which was launched this February.

A separate DOE technical assistance effort, also funded by AID, is the Fuels Evaluation Test Facility, located at the Research and Development Centre of Bharat Heavy Electricals Ltd., in Tiruchirapalli. This state-of-the-art pilot scale combustion facility, patterned after a similar facility at FETC-Pittsburgh, is designed to promote new low-emissions, low-cost power generation systems. It tests the characteristics of local coals, enabling companies to design environmentally clean plants that can burn the fuel with higher efficiency.

FE INTERNATIONAL HOME PAGE UPGRADES

Fossil Energy's International Activities site on the World Wide Web has recently been upgraded to give it a "new look" with revised layout and graphics. Additionally, new country pages have been added in the following regions: Africa (Botswana, Gabon, Ghana, Kenya, Lesotho, Malawi, Mali, Swaziland, Uganda); Eastern Europe (Albania, Croatia, Slovenia); South Asia/Near East (Bahrain, Jordan, Sri Lanka); Pacific Rim (Laos, Papua New Guinea, Taiwan); Western Hemisphere (Costa Rica, Panama, Peru). Many of the existing country pages have also been upgraded, including addition of hyperlinks to two FE activities in India: the *Indo-U.S. Workshop on Coal Beneficiation* (held February 1996 in New Delhi) and the *Indo-U.S. Workshop on Clean Coal Technologies* (held September 1996 in Madras).

The URL for the Fossil Energy International site is http://www.fe.doe.gov/int/international.html and it can also be accessed via the "International" hyperlink in the Fossil Energy Home Page (http://www.fe.doe.gov).

COMMERCIAL REPORT

Under an agreement signed February 26, 1997, **ASEA Brown Boveri (ABB)** and **Texaco** have created an alliance to expand gasification markets in Europe. Under the agreement, the companies will work cooperatively to seek opportunities to develop, license, build, own, and operate gasification projects, as well as provide services and equipment in the European marketplace, including central and eastern Europe. ABB Lummus Global Inc. will manage the ABB interest through participating companies of ABB Power Generation's Gas Turbine and Combined Cycle Power Plant Division, ABB SAE Sadelmi, and ABB Energy Ventures. Texaco's interest will be managed by the Texaco Global Gas and Power business unit.

RJB Mining (of Yorkshire, England) and **Texaco Inc.** have initiated a joint study exploring the feasibility of developing Britain's first large-scale, state-of-the-art clean coal power station. The proposed new station will be a 400-MWe mine-mouth integrated gasification combined cycle power plant in Kellingley (northern England), using similar technology currently operating at the Tampa Electric clean coal project in Polk County Florida. The station would generate enough power to supply a city the size of Sheffield, England, and would consume about one million tonnes of coal annually. The plant would use a variety of coals. RJB Mining announced that this initiative "will kick-start the development of further clean coal facilities to ensure that the market for coal remains strong well into the next century. . . . This is an opportunity to develop a commercial state-of-the-art power station that can offer electricity, steam, oxygen, and synthetic gas to local businesses."

CQ Inc. and **Startec** have formed a partnership under which CQ will evaluate 100 sites in the United States for building commercial-scale coal pelletization projects. Based on CQ's evaluation, Startec will select the best 40 sites. CQ also will commission and operate Startec's Homer City, Pennsylvania pilot plant, which will produce up to 15 tons/day of cleaned, pelletized coal. Although the Startec process does not clean coal, CQ will add a front-end coal cleaning process to reduce the sulfur and ash content of the coal. CQ indicates that the Startec process can be used at existing coal preparation plants to recover coal fines from coal-cleaning circuits, or at old sites to recover coal fines from slurry ponds and other repositories. **Duquesne Energy, Inc**. also entered into a strategic alliance and licensing arrangement with CQ. Duquesne will build plants to produce a pelletized fuel (E-Fuel™) that combines coal with paper and plastic by-products.

As a direct result of the ongoing Blast Furnace Granulated Coal Injection (BFGCI) Clean Coal Demonstration Project, the **Bethlehem Steel Corporation** has informed DOE of a sale of a replicate system to the United States Steel Corporation. This is the first domestic sale of the technology. The Demonstration Project is being conducted on two commercial blast furnaces at Bethlehem's Burns Harbor, Indiana plant. The BFGCI technology is an innovation that permits the use of a variety of coarse grind coals to be injected directly into a furnace and thus realizes a significant reduction in coke requirements during the iron-making

process. Important environmental and economic benefits are also realized with this novel technology. The technology is supplied and marketed by the British Steel Corporation, which has informed Bethlehem of this sale. This sale is also unique in that it occurred before the testing phase was completed, reflecting highly on the achievements to date as well as the long-range potential of the technology.

The **ENCOAL® Corporation**, a subsidiary of the Zeigler Coal Holding Company, recently announced that their newly formed company – NuCoal, L.L.C. – has signed contracts with Mitsubishi International Corporation for construction of a full-scale Liquids From Coal (LFC) plant in Wyoming. Completion of the facility is subject to obtaining construction and permanent financing and all necessary permits. The new agreements call for the engineering, procurement, and construction of a three-module LFC processing facility capable of processing six million tons of coal feedstock per year. The contract cost of the LFC plant will be approximately $460 million. This major business step is being taken as a direct outgrowth of the ENCOAL® Mild Coal Gasification Clean Coal Technology Project, which was 50 percent funded by DOE. The 1,000 ton-per-day demonstration project near Gillette, Wyoming has provided the technical, economic, and market baseline for a significantly larger commercial plant. Permitting activities for this new plant are now underway. In announcing these agreements, Zeigler officials stated that the "EN" in ENCOAL® could stand for "environment" since the products help reduce emissions of both NO_x and sulfur dioxides, as well as increase combustion efficiencies and reduce wastes at many midwestern power plants where unit train quantities have been tested.

WABASH WINS POWERPLANT AWARD

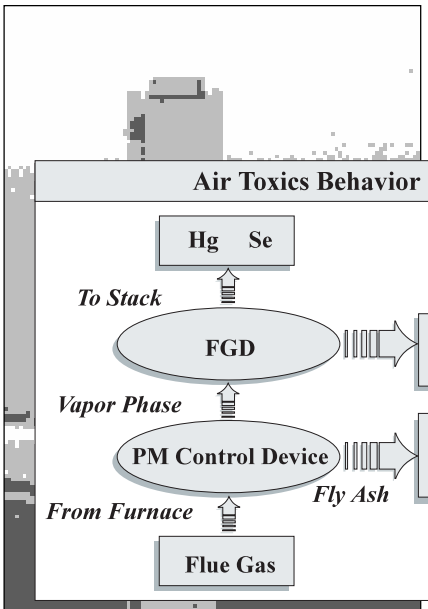
The Wabash River Coal Gasification Repowering Project, located in Terre Haute, Indiana, has been selected as *Power* magazine's *1996 Powerplant of the Year*. The 262-megawatt unit is a joint venture between Destec Energy, Inc. and PSI Energy, Inc. Since 1991, the U.S. Department of Energy has received this prestigious award four times for Clean Coal Technology Demonstration Program projects. The Wabash integrated gasification combined cycle project set a record of more than 500 hours of coal operation from December 10, 1996 to January 14, 1997. This run represented the longest operating campaign of the gasifier to date. In addition, a new monthly record was set in December 1996 as the plant operated on coal for 372 hours.

The Wabash CCT project has repowered the oldest of six pulverized coal units at the site using a "next-generation" coal gasifier, and an advanced gas turbine and heat-recovery steam generator. The project has completed one-third of its commercial-scale demonstration phase. During the first year, SO_2 emissions were lower than 0.1 lb/million Btu, which is well below the Clean Air Act Amendments of 1990 (CAAA) requirement of 1.2 lb/million Btu. CAAA NO_x emissions limitations, 65 ppm on oil and 25 ppm on coal gas, were also met during the first year of demonstration. The unit is designed to use 2,544 tons/day of high-sulfur, Illinois Basin bituminous coal.

Once the project has completed its demonstration phase, the technology will be available to serve a U.S. market of more than 95,000 megawatts of existing coal-fired utility boilers that are older than 30 years of age, as well as plants in foreign markets. Many of these plants are without air pollution controls and are candidates for repowering with integrated gasification combined-cycle technology. Repowering these plants with IGCC systems will improve plant efficiencies and reduce SO_2, NO_x, and CO_2 emissions.

In addition to pioneering a new technology for the 21st-century, the demonstration project created 800-1,000 new construction jobs and more than 100 permanent jobs at the Wabash River facility.

AIR TOXICS: HAZARDOUS EMISSIONS FROM COAL COMBUSTION



Recognizing the importance of detecting and measuring hazardous air pollutants (HAPs) in stack gases, the U.S. Department of Energy (DOE), in partnership with industry, has engaged in environmental monitoring on 24 projects funded under the DOE Clean Coal Technology Program. This, and other HAP-related efforts undertaken by DOE's Office of Fossil Energy, are critical to addressing the concerns raised in the Clean Air Act Amendments of 1990 (CAAA) regarding HAPs. Of most concern are the volatile forms of mercury. Utilities are considered to be the third leading source of mercury emissions. Through coordinated DOE/industry efforts, data is being provided to the U.S. Environmental Protection Agency (EPA) for use in determining what type of regulations, if any, are necessary.

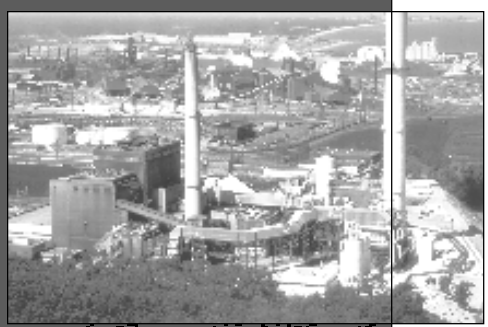
The CAAA lists 189 elements and compounds as HAPs (those known or suspected of causing cancer or other serious health effects). Some 90 percent of the list consists of organic compounds produced by industrial activity, but many inorganic substances (elements, halides, radionuclides) are also classified as air toxics. These inorganics often exist in coal as trace amounts of mineral impurities, with exact composition varying by coal type. During coal combustion, most "trace elements" adhere to the fly ash and become airborne with the flue gas particulates, while others such as mercury and selenium escape in a vapor state.

Title III, Section 212 of the CAAA mandates that EPA evaluate the human health risks caused by air toxics emissions, and determine if controls are warranted from polluting sources. As this affects utilities, several studies — none of which are yet completed — are required:

- EPA must address the risk to public health from toxic utility emissions;
- EPA must report on utility mercury emissions and control costs;
- EPA must monitor and report on HAP deposition from all source categories including power plants in the Great Lakes and coastal waters, and recommend regulatory measures; and
- The National Institute of Environmental Health Science must report on the effects of threshold levels of mercury on human health.

Before passage of the CAAA, toxic emissions from

Toxics monitoring took place at Pure Air on the Lake's Advanced Flue Gas Desulfurization Demonstration Project



electric power plants had been studied only briefly, and little regulation was put forth to control these pollutants. In January 1993, EPA started an emissions data collection program using state-of-the-art sampling and analysis techniques. Participating were DOE (coordinating efforts through its R&D Program), and the private sector-funded Electric Power Research Institute (EPRI), and the Utility Air Regulatory Group. DOE contracted with environmental firms and gathered emissions data from nine coal-fired plants, three of which were CCT demonstration projects. These utilities represented different coal types, process configurations, furnace types, and pollution control methods. Phase I of the assessment presents raw data from emissions testing, with a report published in September 1996 by the University of North Dakota Energy and Environmental Research Center ("A Comprehensive Assessment of Toxic Emissions from Coal-Fired Power Plants: Phase I Results from the U.S. Department of Energy Study.") A separate study, "Summary of Air Toxics Emissions Testing at Sixteen Utility Plants," encompassed further toxics testing and was prepared for DOE by Burns and Roe and published in July 1996. Phase II of the DOE/EPRI effort currently in progress will conduct sampling at other sites including an integrated gasification combined-cycle plant under the CCT Program. It will use the results from Phase I to determine what configurations and coal types require further assessment.

SNOX™ Flue Gas Cleanup Demonstration Project was another toxics monitoring site

All Phase I sites employed either electrostatic precipitators or fabric filters for particulate (PM) controls, and five of the sites also used vapor phase controls such as flue gas desulfurization (FGD) or spray dryer absorbers. As a result of advances in sampling and analytical equipment, and lower detection limits, the ranges of emissions measured in Phase I proved to be much lower than the range of emissions previously published. CCT Program environmental monitoring produced similar results. For example, high concentrations of chromium (Cr) and nickel (Ni) were present in earlier studies, caused by stainless steel probes contaminating the gas stream. Phase I results have significantly mitigated concerns relative to HAPs emissions from coal-fired power generation, and enabled focus on but a few flue gas constituents. The results have the potential to make any forthcoming EPA regulations less strict, which could save consumers money in electric bills. Additionally Phase I found:

- Existing PM control equipment achieved near 100% removal efficiencies for trace elements with the exception of mercury and selenium;
- FGD controls can effectively reduce halogen and halide gases at near 100% efficiencies; and
- Organic and radionuclide emissions varied from site to site but were low overall.

Trace elements exiting the furnace in association with solid particles are largely trapped by the PM control devices. However, particles less than 5 microns in size (pollens are 10-100 microns in size) pass more readily through PM equipment and may rep-

Emission Factor Ranges for Trace Elements ($lb/10^{12}$ Btu)

	DOE Data	Previous Data
Antimony (Sb)	<0.1-2.4	
Arsenic (As)	0.1-42	<1-860
Beryllium (Be)	<0.1-1.4	<1-32
Cadmium (Cd)	<0.1-3.0	1-490
Chromium (Cr)	<0.1-51	10-5000
Cobalt (Co)	<0.1-6.8	
Lead (Pb)	0.6-29	
Manganese (Mn)	1.1-22	30-2400
Mercury (Hg)	0.5-14	1-22
Nickel (Ni)	0.3-40	1-2500
Selenium (Se)	<0.1-130	

GLOBAL CO_2 CONTROL AGENDA

The impact of global regulation of CO_2 emissions was an underlying theme throughout many presentations at the Fifth Annual Clean Coal Technology Conference in Tampa, Florida in January. Just as the need to significantly reduce sulfur dioxide (SO_2) emissions was the driving force behind the establishment of the U.S. Department of Energy Clean Coal Technology (CCT) Demonstration Program over 10 years ago, growing international concern and attention to greenhouse gas emissions will be a major impetus driving the future of clean coal technologies, according to a number of speakers. While global greenhouse gas emissions involve various substances, including chlorofluorocarbons (CFCs), the focus of discussion was on CO_2 emissions in particular.

As discussed throughout the conference, energy use and coal use in particular will continue to increase significantly into the next century, most notably in developing economies such as India and China. The International Energy Agency reported an increase in demand rising from around 3.5 billion tons today to over 5.3 billion tons by the year 2010. Any increased use of coal will be accompanied by increased CO_2 emissions, thereby the Catch-22 unfolds in efforts to reduce these emissions.

In fact, Michael Miller, director of the Environmental Control Business Area for the Electric Power Research Institute, stated unequivocally that "If there is any hope of stabilizing the increase in CO_2 emissions, electric generation technologies which produce less CO_2 per unit of electricity output or ton of coal burned will be a must." He cited integrated gasification combined cycle and advanced pressurized fluidized-bed combustion cycles as two examples, both of which have grown out of the DOE CCT Program. These technologies improve combustion efficiencies and can reduce CO_2 emissions about 20-25 percent compared to conventional technology. Miller warns that policy efforts to reduce these emissions will result in restrictions "so onerous that coal cannot compete if these restrictions are to be met," or, high efficiency, generation-based CCTs could emerge as the key to meet much more modest goals.

INTERNATIONAL EFFORTS CHRONOLOGY

—1992— The evolution of international efforts to curb CO_2 emissions really began in 1992, and a final agreement at the ministerial level should come in December 1997. Linda Silverman, of the U.S. Department of Energy Policy Office, described the evolution of global climate change negotiations, starting with the United Nations Framework Convention on Climate Change that was signed at the Earth Summit in Rio de Janeiro in 1992, during the Bush Administration. The Convention was ratified by some 50 countries, and entered into force in March 1994. The Convention contains a non-binding aim for developed countries (Annex I) and transition countries to stabilize their greenhouse gas emissions to 1990 levels by the year 2000.

—1993— Shortly after President Clinton came into office, he gave an Earth Day address in which he committed the United States to meeting the commitments of this Framework Convention on Climate Change, which resulted in the "Climate Change Action Plan" in October 1993. The plan contained 44 mitigation actions that took an interagency approach, coordinating among the U.S. Departments of Energy, Transportation, and Agriculture, and the U.S. Environmental Protection Agency. These actions were aimed at reducing greenhouse gas emissions in all sectors of the U.S. economy by 106 million metric tons. However, there is a large gap between this goal and the actual reduction, which Silverman attributes in part to faster than expected economic growth, reduced oil prices, and drastically reduced funding for some of the actions in the plan. She also pointed out that most developed countries are having similar difficulties in meeting their targets due to comparable and more complex problems. Germany and the United Kingdom are the only OECD countries that will meet the 2000 aim, she said.

—1995— The next official action took place at the First Conference of the Parties (COP 1) held in Berlin in March 1995. The goal was to determine whether the non-binding Convention signed in Rio was adequate. Most parties convening at COP 1 were not meeting the goals, and they agreed that something more was needed. Silverman explained that this lead to the "Berlin Mandate," which defined the boundaries for the next negotiation and next agreement that would cover the post-2000 period. The Berlin Mandate led to several initiatives: 1) quantified emissions limitations and reduction objectives (QELROs), 2) a Joint Implementation pilot program that would reduce, avoid, or sequester greenhouse gases, and 3) no new commitments for developing countries be required beyond those in the Berlin Mandate.

—1996— COP 2 was held in Geneva, Switzerland in July 1996. A "Geneva Declaration" called for Annex I parties to adopt legally binding commitments by COP

3, which is scheduled for Kyoto, Japan, in December 1997. This declaration was based on a scientific report from the Intergovernment Panel on Climate Change that showed "a balance of evidence suggests a discernible change in the global climate," the most definitive statement to date on the science of global climate change. At that time, as Silverman describes it, the United States "took a very firm position that we would only agree to verifiable medium term targets that are realistic and achievable, with maximum flexibility" (with emissions trading and joint implementation).

—1997— The final agreement is to be established at COP 3 in Kyoto. The major issues to be resolved are QELROs, or targets and timetables; policies and measures; advancing commitment of all parties; and compliance. The United States is interested in taking a multi-year approach, from 3-10 years, allowing individual countries flexibility to decide how to reduce their emissions within that time frame. Rather than differentiating among the Annex I parties, the United States also believes that there should be a commonly applied target with flexibility on how to reach that target.

Silverman explained that flexibility of emissions trading allows for an increase in cost effectiveness, and equalizes marginal costs of reducing emissions, which provides incentives for technological development and deployment (including clean coal technologies). Silverman believes that the focus taken by the United States on realistic, verifiable information "preserves the issue of clean coal technology." In fact, she claims that a more stringent climate control regime would create different incentives for CCTs. As she pointed out, "coal is not going away...the extent that we can increase efficient technologies and bring in new advanced technologies will go a long way to address this problem, so a binding target would increase the need for CCT." She concluded that joint implementation could expand technology export opportunities.

LOOK AT TOTAL CO_2 PICTURE

Another perspective on overal CO_2 emissions reductions was presented by Mark Mills, president of Mills, McCarthy & Associates, who described the total fuel energy cycle with respect to CO_2 emissions. Rather than focusing solely on the emissions resulting from electricity generation (in this case coal-fired facilities), Mills expanded the discussion to a range of electrotechnologies that are emerging, which can reduce the environmental impact of power generation.

Mark Mills, President, Mills, McCarthy & Associates, Inc.

Such electrotechnologies are replacing other processes including chemicals, all of which are major contributors to overall CO_2 emissions. For example, Mills cited a net CO_2 reduction of 1,800 ton/year per application for medical waste destruction using microwave technology in lieu of trucking and burial.

Other processes that can be replaced by electrotechnologies range from substituting microwave energy for combustion of fuels and industrial heat processes, to infrared drying instead of gas-fired drying, and electricity-driven ultrasound technologies that are replacing a range of chemical cleaners.

An important message from Mills is to take a truly "global" perspective of CO_2 emissions. He suggests that as international emissions limits are set, a broad, cradle-to-grave regulatory approach be adopted, rather than placing unachievable limits on CO_2 emissions from electric generating facilities. This will foster improvements in and greater use of electrotechnologies, while still allowing affordable electric power generation from coal-fired facilities.

A point reiterated by many at the Conference was that efficiency increases of CCTs over conventional combustion-turbine technologies using coal will decrease CO_2 emissions significantly. As stated by Larry Papay, Senior V.P. and General Manager at Bechtel Corporation, if the international community ever agrees upon greenhouse gas emissions quotas, the quotas could encourage use of CCTs relative to conventional coal technology, but could discourage coal use relative to natural gas use. Papay believes that joint implementation could subsidize CCTs in developing markets, where the technology of choice might have been conventional coal technology. On the other hand, it was noted that too-quick action at COP 3, forcing immediate regulation, could hinder coal use. Indeed, there is a general concensus that any new emission limitations should proceed in a timely, sensible manner, which is more likely to lead to sensible results.

STATE CLEAN COAL ACTIVITY

Success in development of clean coal technologies is not limited to the U.S. Department of Energy Clean Coal Technology Demonstration Program projects. A number of states have participated in DOE CCT projects, and also have launched their own projects to further RD&D on CCTs. In this issue of *Clean Coal Today*, we are presenting some news on progress made by states that is of interest to the clean coal community. We encourage readers to let us know of other similar activities, to be shared in upcoming issues.

Jackie Bird, Director, Ohio Coal Development Office

OHIO

The Ohio Coal Development Office (OCDO), of the Ohio Department of Development, recently announced four grants in its ongoing support of clean coal technology R&D. A $2.35 million, two-year field project to use a coal combustion by-product to seal a long-abandoned coal mine and block acid mine drainage, will receive $1.17 million funding from the OCDO. This will be a joint project with American Electric Power (AEP) and the State of Ohio, which also will receive funding from a coalition of public, private, and academic partners. The by-product to be used for this project is fixated flue gas desulfurization (FGD) material, which has low permeability. The by-product will be strategically placed to seal the mine, which then will be flooded, preventing further contact of air and coal remains, thereby preventing oxidation of pyrites, the chief cause of acid mine drainage. OCDO also awarded a $798,751 grant to Dravo Lime Company for the first pilot scale testing of the company's Tecolytic nitrogen oxide removal in conjunction with its enhanced lime scrubbing sulfur dioxide removal process. The process will produce a by-product that can be used as a fertilizer. CONSOL Coal Group was awarded a $174,487 grant to convert wet flue gas desulfurization (FGD) sludge into aggregates that may be used in highway construction, the manufacture of lightweight concrete blocks, and the creation of blocks for underground coal mining. Finally, OCDO awarded a $180,000 grant to Sorbent Technologies, which recently completed a successful demonstration of supported-sorbent (fluesorbent) injection for SO_2 control on a high-sulfur, coal fired utility gas stream. Now the company will complete testing by optimizing the formation of these by-products and demonstrating their value in actual field applications. For additional information on these and other Ohio projects, contact: Ms. Jackie Bird, Ohio Coal Development Office, 77 South High Street, Columbus, OH 43215-6108; phone, (614) 466-3465.

NORTH DAKOTA

In news from North Dakota, the Lignite Research Council, which funds projects under its Lignite Research, Development and Marketing Program, is reviewing two applications for clean coal projects. The Energy & Environmental Research Center will determine whether the use of limestone instead of river sand as the bed material in the Heskett fluidized-bed combustor, will improve efficiency of the Heskett Station. Babcock & Wilcox has requested funding for engineering and development of advanced coal-fired low emission boiler systems, under which the firm will develop a coal power plant system that can achieve very low emissions and high efficiencies. In addition, the Lignite Research Council recommended for approval, an amended grant application request from the Center SynCoal® participants (BNI Coal, Ltd., and Minnkota Power Cooperative), to assist in modifications at the Milton R. Young Station to permit use of an upgraded syncoal product. The North Dakota Industrial Commission approved the application on February 27, paving the way for the state funding. The Program also provided $12.2 million for a clean coal project to build a new $110+ million

anhydrous ammonia plant at the Great Plains Synfuels Plant near Beulah, North Dakota. The plant is in the start-up phase, and is expected to be fully operational this spring. It is projected to produce approximately 1,000 tons of anhydrous ammonia daily, and will use synthesis gas from the coal gasification process as a feedstock for the anhydrous ammonia fertilizer. For additional information on these and other projects, contact Mr. Clifford Porter, Director, Lignite Research Council, P.O. Box 2277, Bismarck, ND 58502-2277; phone (701) 258-2755.

SSEB LEGISLATIVE DIGEST

In September, the Southern States Energy Board (SSEB) published the *Energy and Environment Legislative Digest 1996*, which is a compilation of representative energy and environmental quality legislation enacted by the SSEB 16 member states and 2 territories during the 1996 legislative session. The member jurisdictions are: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, the Virgin Islands, and West Virginia. While much of the focus of the compiled legislation dealt with natural gas and petroleum, coal and minerals legislation continues to be a significant area of concern for member states. For example, Mississippi appropriated $30 million toward development of a 400 megawatt lignite-fired generating plant, and five states passed laws to reorganize or restructure electric utility regulation. Other areas of interest are air quality and hazardous waste and substance management. This book is available from the Southern States Energy Board, 3091 Governors Lake Drive, Suite 400, Norcross, GA 30071; Phone: 770-242-7712; (E-Mail: sseb@clever.net). It also can be viewed on the SSEB Home Page (http://www.clever.net/sseb).

NEW JOINT DOE FIELD OPERATIONS

In case you are wondering about new acronyms appearing in this newsletter, the Morgantown and Pittsburgh Energy Technology Centers have merged to form the Federal Energy Technology Center (FETC). FETC will operate at the two sites but under one management team. The merger is a product of DOE's Strategic Alignment Initiative, a plan to cut costs and improve the efficiency of the government's energy program.

Rita Bajura, a career federal executive, has been chosen to head the new FETC. She was a senior manager at Morgantown Energy Technology Center, has 16 years of experience in joint industry-government partnerships, and helped implement the "product team" approach now being used by the FETC.

Changes have been under way at Fossil Energy Headquarters also, where a new organization defined by "product line" has dispersed management of individual projects funded under the CCT program. Clean Coal and R&D projects are now managed together, grouped by technology.

NOTE FROM THE EDITOR

In this first issue following the Fifth Annual Clean Coal Technology Conference, January 7-10 in Tampa, Florida, you will note that there are several articles presenting highlights of the conference. A full Proceedings, in both electronic and paper form, will be available from: Ms. Jean Lerch, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585, (202)586-7920. Also available are a limited number of both the pre-conference Proceedings and Technical Papers volumes.

In a continuing effort to keep you apprised of important activities relating to clean coal technology, this issue also premiers a **State Clean Coal Activity** page. I look forward to hearing from readers on new material to include in this feature. As always, I welcome suggestions and input for items we should feature, briefs to include, whether commercial or international, and suggestions for coverage of relevant issues.

CLEAN COAL TODAY

Published quarterly by:
The Office of Fossil Energy

U.S. Department of Energy (FE-22)
Washington, DC 20585

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. . . "Project News Bytes" from page 1

The **Wabash River Coal Gasification Repowering Project** set a record of more than 500 hours of coal operation from mid-December 1996 through mid-January 1997. The run was the longest operating campaign between shutdowns of the Destec oxygen-blown coal gasifier to date. In addition, a new monthly record was set in December as the plant operated on coal for 372 hours.

In December 1996, binding written agreements between Western SynCoal® Company, Minnkota Power Cooperative, Square Butte Electric Cooperative, BNI Coal, Ltd. and Center SynCoal® Partnership were signed for the construction of a $32.8 million, 100 ton/hour (feed rate) scale up of the **Rosebud SynCoal® Partnership's Advanced Coal Conversion Process** technology at Center, North Dakota. The Center SynCoal® Project would be integrated into the existing Minnkota Milton R. Young lignite-fired power plant that houses a 250-MW unit and a 438-MW unit. Rosebud SynCoal® Partnership has also signed a Technology Marketing Agreement with Ube Industries, Ltd., of Tokyo, Japan. Under the agreement, Ube Industries has been granted a non-exclusive right to represent Rosebud in marketing and commercialization of the SynCoal® technology outside the United States.

Construction for the **Air Products Liquid Phase Conversion Company's Liquid Phase Methanol (LPMEOH™) Demonstration Project** was completed on January 31, 1997. With start-up underway, demonstration operations of the 80,000-gallon-per-day LPMEOH™ Demonstration Unit at the Eastman Chemical Company complex in Kingsport, Tennessee, are expected to begin in early April 1997. The four-year operational period will demonstrate the technical feasibility and gain commercial acceptance of the LPMEOH™ technology. The LPMEOH™ technology was developed to enhance the economics and efficiency of integrated coal gasification combined cycle (IGCC) power generation by producing a clean burning, storable liquid (methanol) during periods of low power demand from the clean coal-derived gas. Together, these technologies will be able to fill local needs for electric power, transportation fuels, and manufactured chemical products.

STATUS OF CCT DEMONSTRATION PROJECTS

ADVANCED ELECTRIC POWER GENERATION

DMEC-1 Ltd. Partnership – *PCFB Demonstration Project.* In combination with the **Four Rivers Energy Partners, L.P.** – *Four Rivers Energy Modernization Project*, these projects have been restructured and re-sited to Lakeland, Florida's McIntosh Unit 4. (Lakeland, FL)

The Ohio Power Co. – *Tidd PFBC Demonstration Project.* The project ended December 31, 1995. DOE released the Final Report and will close out the project after a final audit. (Brilliant, OH)

Tri-State Generation and Transmission Association, Inc. – *NUCLA CFB Demonstration Project.* The project was completed April 1992. (Nucla, CO)

York County Energy Partners – *ACFB Demonstration Project.* Discussions are under way with a major utility to re-site this project. (Site pending)

Clean Energy Partners, L.P. – *Clean Energy Demonstration Project.* The project is being restructured. (Site under negotiation for an east coast location.)

Sierra Pacific Power Co. – *Piñon Pine IGCC Power Project.* The Cooperative Agreement has been modified to formally move into Budget Period 3 (operation Phase III) effective February 1, 1997. Due to some winter-related delays, the plant is currently in a final commissioning and startup mode using coke breeze and Utah coal. (Reno, NV)

Tampa Electric Co. – *Tampa Electric Integrated Gasification Combined-Cycle Project.* The plant has been operating for 40 out of 45 days during the December 1996 - January 1997 time period. (Mulberry, FL)

Wabash River Joint Venture – *Wabash River Coal Gasification Repowering Project.* In 1996, the gasifier accumulated over 2,000 hours of operation on coal and the combined cycle operated over 1,500 hours on syngas. (West Terre Haute, IN)

Alaska Industrial Development and Export Authority – *Healy Clean Coal Project.* Construction and engineering efforts are at a peak with construction about 80 percent complete. The erection of structural steel and the on-site fabrication and installation of all major equipment is essentially complete. The retrofit to Unit No. 1 was completed on schedule. Unit No. 1 has been restarted in preparation for performance testing of the low-NO_x burners and over-fire air system that is scheduled to begin in March of 1997. Construction remains on schedule for completion in August of 1997. (Healy, AK)

Arthur D. Little, Inc. – *Coal-Fueled Diesel Engine Demonstration Project.* DOE is preparing an Environmental Assessment report. R.W. Beck was selected as the A&E firm. (Fairbanks, AK)

Pennsylvania Electric Co. – *Externally Fired Combined-Cycle Demonstration Project.* Project activity has stopped, as DOE and Penelec assess the technical readiness of the ceramic air heater — the critical element of the power island. (Warren, PA)

ENVIRONMENTAL CONTROL DEVICES

The Babcock & Wilcox Co. – *Demonstration of Coal Reburning for Cyclone Boiler NO_x Control.* The project is complete. The Final Report has been received. (Cassville, WI)

The Babcock & Wilcox Co. – *Full-Scale Demonstration of Low-NO_x Cell Burner Retrofit. The project was completed in September 1995.* The Final Report has been received. (Aberdeen, OH)

Energy and Environmental Research Corp. – *Evaluation of Gas Reburning and Low-NO_x Burners on a Wall-Fired Boiler.* Testing was completed in December 1995. The Final Report is in preparation. (Denver, CO)

Southern Company Services, Inc. – *Demonstration of Advanced Combustion Techniques for a Wall-Fired Boiler.* Long-term testing of the advanced overfire air (AOFA), low-NO_x burners (LNB), and combined LNB+AOFA systems are complete. Final testing of GNOCIS in a closed-loop configuration is continuing. The project has been extended until October 1997 to allow completion of GNOCIS testing. (Coosa, GA)

Southern Company Services, Inc. – *Demonstration of Selective Catalytic Reduction Technology for the Control of NO_x Emissions from High-Sulfur, Coal-Fired Boilers.* The project testing was completed in December 1995. An Economic volume and the three-volume Final Technical report can be obtained from the National Technical Information Service (NTIS) by referring to the respective NTIS numbers as follow: DE97050872, DE97050873, DE97050874, and DE97050875. (Pensacola, FL)

Southern Company Services, Inc. – *180-MWe Demonstration of Advanced Tangentially-Fired Combustion Techniques for Coal-Fired Boilers.* The project was completed in June 1994. The Final Report has been published. (Lynn Haven, FL)

AirPol, Inc. – *10-MWe Demonstration of Gas Suspension Absorption.* The project was completed in June 1995. (West Paducah, KY)

Bechtel Corporation – *Confined Zone Dispersion Flue Gas Desulfurization Demonstration.* The project has been completed and the Final Report has been issued. (Seward, PA)

LIFAC-North America – *LIFAC Sorbent Injection Desulfurization Demonstration Project.* The Final Report is in preparation. (Richmond, IN)

Pure Air on the Lake, L.P. – *Advanced Flue Gas Desulfurization Demonstration Project.* Project operations are complete. The Final Report has been issued. (Chersterton, IN)

Southern Company Services, Inc. – *Demonstration of Innovative Applications of Technology for the CT-121 FGD Process.* The Final Report is in preparation. (Newnan, GA)

ABB Environmental Systems – *SNOX™ Flue Gas Cleaning Demonstration Project.* The project was completed in October 1995. The Final Report has been published. (Niles, OH)

The Babcock & Wilcox Co. – *LIMB Demonstration Project Extension and Coolside Demonstration.* The project was completed in November 1992. (Lorain, OH)

The Babcock & Wilcox Co. – *SO_x-NO_x-Rox Box™ Flue Gas Cleanup Demonstration Project.* The project was completed in September 1995. The Final Report has been received. (Dilles Bottom, OH)

Energy and Environmental Research Corp. – *Enhancing the Use of Coals by Gas Reburning and Sorbent Injection.* Testing was completed for both Illinois Power, Hennepin Station, and City Water, Light & Power, Lakeside Station. The Final Report is in preparation. (Hennepin and Springfield, IL)

New York State Electric & Gas – *Milliken Clean Coal Technology Demonstration Project.* Mist Eliminator testing and ESP Upgrade Evaluation were completed in October 1996. Reports are in preparation and are scheduled to be released in March 1997. Heat pipe performance test report is being prepared and should be released in late Spring 1997. Design Coal Testing of the scrubber is currently on hold due to a disruption of the supply of high sulfur coal. Testing will resume by late Summer 1997. (Lansing, NY)

New York State Electric & Gas – *Micronized Coal Reburning Demonstration for NO_x Control.* Construction at the Kodak site is complete. The system is undergoing startup and shakedown. Formal testing should start in early Spring 97. The modifications for deep stage burning of micronized coal for part 1 of the demonstration at Milliken Station is complete. Burner simulation is scheduled to begin in March 1997. Testing should begin in early April 1997. Modifications for Part 2 of the demonstration, injector distribution, should begin in early Fall 1997. (Lansing, NY and Rochester, NY)

NOXSO Corporation – *Commercial Demonstration of the NOXSO SO_2/NO_x Removal Flue Gas Cleanup System.* Construction of the liquid SO_2 facility has been completed and is in startup and shakedown. The host site was lost, and discussions are ongoing with a major utility to re-site this project. (Site pending)

Public Service Company of Colorado – *Integrated Dry NO_x/SO_2 Emissions Control System.* Testing of the new urea injection lance system has been completed. Integrated testing of the sodium injection system in conjunction with the urea system has also been accomplished. The Final Report for the project is in preparation. (Denver, CO)

COAL PROCESSING FOR CLEAN FUELS

CQ Inc. And ABB Combustion Engineering, Inc. – *Coal Quality Expert.* CQE was released in December 1995 and is now being offered commercially. The Draft Final Report has been reviewed and is being edited. (Homer City, PA)

Custom Coals International – *Self Scrubbing Coal™: An Integrated Approach to Clean Air.* The plant continues to increase its availability as process optimization progresses. The plant has processed over 650,000 tons of raw coal and shipped over 400,000 tons of clean coal product. The Carefree™ Coal test burn was completed at Pennsylvania Power and Light's Martins Creek Plant in November 1996. Self-Scrubbing™ Coal test burns are scheduled for the middle of 1997. (Central City, PA; Martins Creek, PA; Richmond, IN; Ashtabula, OH)

Rosebud SynCoal® Partnership – *Advanced Coal Conversion Process (ACCP) Demonstration.* The ACCP facility continues to process raw subbituminous coal, producing over 942,000 tons of SynCoal® product to date. Nearly 835,000 tons of SynCoal® product has been supplied to customers, including industrial (primarily cement and lime plants) and utilities. SynCoal® product continues to be supplied to Units 1 and 2 of Montana Power's Colstrip Power Station. (Colstrip, MT)

ENCOAL® Corp. – *ENCOAL® Mild Coal Gasification Project.* ENCOAL® recently completed a comprehensive maintenance check while making process improvements. ENCOAL® continues to operate the plant in a production mode while preparing several Final Reports. (Gillette, WY)

Air Products Liquid Phase Conversion Company, L.P. – *Liquid Phase Methanol Process Demonstration Project.* Construction of the LPMEOH™ Process Demonstration Facility was completed on January 31, 1997. Start-up is underway, with demonstration operations expected to begin in early April 1997. (Kingsport, TN)

INDUSTRIAL APPLICATIONS

Bethlehem Steel Corporation – *Blast Furnace Granulated Coal Injection System Project.* Bethlehem Steel Corporation continues to operate two commercial blast furnaces retrofitted with Blast Furnace Granulated Coal Injection equipment at modest injection rates. (Burns Harbor, IN)

CPICOR™ Management Company, L.L.C. – *Clean Power from Integrated Coal/Ore Reduction (COREX®).* DOE representatives met with CPICOR™ team members as an initial step in the NEPA process. DOE will issue a Notice of Intent for preparing an Environmental Impact Statement on this project. (Vineyard, UT)

Coal Tech Corp. – *Advanced Cyclone Combustor with Internal Sulfur, Nitrogen, and Ash Control.* The project was completed in September 1991. The Final Report has been received. (Williamsport, PA)

Passamaquoddy Tribe – *Cement Kiln Flue Gas Recovery Scrubber.* The project was completed in February 1994. (Thomaston, ME)

UPCOMING MEETINGS

May 13-14: *Third Annual Conference on Unburned Carbon on Utility Fly Ash*, Pittsburgh, PA; Contact: Center for Conference Management, 800-441-9927 (outside Pennsylvania) or 800-441-0875 (inside Pennsylvania)

July 22-24: *Advanced Coal-Fired Power and Environmental Systems Conference*, Pittsburgh, PA; Contacts: T. Feeley, 412-892-6134 and T. Dorchak, 304-285-4305

October 28-30: *APEC Experts' Group on Clean Fossil Energy Fifth Annual Seminar*, "Clean Fossil Energy: The APEC Choice for Today and Tomorrow," Reno, Nevada; Contact: Jean Lerch, 202-586-7920; e-mail, jean.lerch@hq.doe.gov

Week of April 27, 1998: *Sixth Annual Clean Coal Technology Conference*, Reno, Nevada; Contact: Jean Lerch, 202-586-7920; e-mail, jean.lerch@hq.doe.gov