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# Clean Coal Today

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

## Clean Coal Briefs

We have a few announcements for our readers as we enter the new year, our fifth year of publication. Arvid Strom is retiring and he will be replaced as editor of *Clean Coal Today* by Phoebe Hamill. Ms. Hamill will continue our efforts to bring you interesting and informative articles concerning the **Clean Coal Technology Program**, and she requests that you pass along to her any comments or suggestions you have on the newsletter and its content. Contact the editor at (301) 903-9439, or Fax (301) 903-9438.

In line with administrative changes and problems that have caused some delays, we have decided to omit the Fall 1994 Issue of the newsletter, allowing the Special Memorial Issue to substitute for that issue. We now are back on schedule with this issue, which highlights the **Third Annual Clean Coal Technology Conference,** held in Chicago, Illinois, September 6–8, 1994. The **Fourth Annual Conference** is scheduled in Denver, Colorado, September 5–7, 1995. Mark your calendars for this not-to-be-missed annual event.

The CCT Program's first major repayment check in the amount of $276,141 has been received from **Tri-State Generation and Transmission Association, Inc.** The payment was calculated as a

*See "Briefs" on page 9 . . .*

### In This Issue



*The Investment Pays Off*

# Third Annual CCT Conference Highlights Program Successes

"The Government Accounting Office (GAO) has given us high marks," said Stephen Miller, President of the Center for Energy and Economic Development (CEED) and a co-sponsor of the Conference, in his opening address at the first plenary session of the Third Annual Clean Coal Technology Conference. About 400 international experts in clean coal technology from 23 nations gathered at the Chicago Hilton and Towers, September 6-8, 1994, to review the effectiveness of the Department of Energy (DOE) Clean Coal Technology (CCT) program and shape future deployment. Patricia Fry Godley, DOE's Assistant Secretary for Fossil Energy, delivered welcoming remarks, emphasizing commercialization of the technology. Godley stated, "Industry's input is vital and will play a key role in shaping a DOE report to Congress on the program's future." She highlighted DOE's responsibility to inform the public and public decision-makers on CCT project accomplishments.

Thomas H. Altmeyer, Senior Vice President of the National Coal Association, elaborated on the May 1994 GAO report. "Its formal report to Congress said that the CCT program could serve as a model for future cost-sharing efforts—a model of

*See "Conference" on page 2 . . .*

**Dwain Spencer, Principal, SIMTECHE, participated on a panel chaired by Patricia Fry Godley, Assistant Secretary for Fossil Energy, at the opening plenary session, which emphasized economic challenges.**

. . ."Conference" from page 1

good management and flexibility, one notably free of the usual political and fiscal missteps." He described the program as the largest peace-time initiative to develop technology.

Jack Siegel, former Assistant Secretary for Fossil Energy, summarized CCT accomplishments. "The program has helped put U.S. technology in the forefront of a booming international market. Over the next 10 years, that market could be as large as $750 billion and the U.S. could gain $200 billion. If this level of penetration is achieved, the export of clean coal technologies could result in up to 200,000 high-quality U.S. jobs over this time period."

Industry analysts provided other data; among these are that coal use is projected to double in the next 30 years, with the potential for the largest increase in the Asia/Pacific region, and U.S. coal use could reach 1 billion tons per year by the year 2010. In 1993, coal-fired utility power plants produced about 57 percent of U.S. electricity. Although these indicators bode well for coal utilization and market penetration, conference participants were hardhitting in outlining the challenges facing future domestic and international commercialization of CCTs. These challenges include: the financial "risk gap," changing regulations, increasingly competitive markets, environmental constraints, and unsettled and fragile international economies.

## "Risk Gap" in Domestic Deployment

A diverse panel of power industry experts, chaired by Pat Godley, identified closing the "risk gap" in domestic deployment as a pivotal issue. "The government's role is concentrated in policy making and the structuring of federal and state support," Godley stated.

Ben Yamagata, Executive Director of the Clean Coal Technology Coalition, noted, "CCTs are not likely to achieve commercial success in the current marketplace without government support, considering the implications of competitive bidding, least-cost planning, utility industry restructuring, and capacity surpluses." He perceived a need for DOE to assist industry by subsidizing the risk of new technology, which might be as much as 25 percent above the cost of mature technologies. "The CCT Program is not only a great success story, it is the way this country can maintain a leadership role in promoting green technologies that fit the realities of the world's needs," he emphasized.

**Jackie Bird, Director, Ohio Coal Development Office, takes advantage of one of the many informal opportunities for information exchange at the conference, following her participation on the first plenary session panel.**

Dwain Spencer of SIMTECHE, and a member of The National Coal Council, cited the Council's report, which recommended incentives to provide a meaningful bridge to commercial acceptance. He stated that the Council recommended a total of $1.4 billion in federal subsidies from 1995 to 2010 to support pressurized fluidized-bed combustion, integrated gasification combined cycle (IGCC), and associated technologies, including advanced flue gas desulfurization. Of the total federal subsidy, $1.1 billion would be for capital cost incentives and $300 million would be for operating cost incentives for the first 5 years of operation of these projects.

Karl McDermott, Commissioner of the Illinois Commerce Commission, recommended identifying a limited number of technologies for replication and development as off-the-shelf technologies, which could provide data for utilities to justify selected technologies as least-cost solutions to state utility regulatory commissions. He also recommended subsidies to offset the risk of

*See "Conference" on page 3 . . .*

**Jack Siegel, former Assistant Secretary for Fossil Energy, delivered the keynote luncheon speech, "The Investment Pays Off," and noted the new exhibits developed by DOE which showcase program accomplishments. Mr. Siegel is shown here with Dr. C. Lowell Miller, Associate Deputy Assistant Secretary, Office of Fossil Energy.**

. . ."Conference" from page 2

new technology, thereby allowing bidders to ensure that CCTs will be the least-cost options.

Jackie Bird, Director of the Ohio Coal Development Office, believed that the "risk gap" is key to determining the next step in the CCT Program. She described some of the approaches Ohio is using to promote coal utilization: funding and deployment of pilot systems that remain in place after testing is complete; allowing coal research and development cost recovery by utilities; issuing a $1-per-ton tax credit for using 90-percent Ohio coal; and reviewing Clean Air Act Amendments of 1990 (CAAA) compliance plans by the Ohio Public Utility Commission.

Allen Grosboll, Executive Assistant to Governor Jim Edgar of Illinois, extended the state's welcome and noted that 8,800 mine workers produced 62 million tons of Illinois coal in 1990. However, due to the CAAA, mining production is expected to drop by 21 million tons by 2000 and probably will never return to 1990 levels. The Illinois legislature has approved $156 million in bond financing for 18 coal-related projects. Grosboll noted that another $193 million has come from DOE, and $0.5 million from other sources. In addition, there is a $3-million Illinois CCT demonstration fund.

James O'Connor, Chairman and Chief Executive Officer of Commonwealth Edison Company, observed that companies are positioning themselves to be more competitive by pursuing partnerships to accommodate change.


**Pure Air on the Lake provided an informative tour of their advanced flue gas desulfurization project at the Northern Indiana Public Service Company Bailly Generating Station, Chesterton, Indiana. A large number of conference participants took advantage of the opportunity to see this landmark example of $SO_2$ control and enjoy the afternoon hospitality.**

"Competition is the key word for us," said Larry Logan, Director of Industry Development and Analysis, Edison Electric Institute. "The industrial customer is really helping to push the debate along. We now have more players; we also have greater access." Logan noted that the Energy Policy Act is the threshold for the future, and the Federal Energy Regulatory Commission is debating the issues of transmission pricing, stranded assets, and retail wheeling. "California is way out in front in proposing full retail competition by the year 2006." One of the concerns is integrated resource planning. "Can you have resource planning that looks at fuel diversity, environmental and social needs, along with full retail competition?" asked Logan.

Robert Edmonds, Vice President of Duke Energy, stated that the challenge was to accommodate the continuing growth in world coal burning while maintaining environmental quality. He believed CCTs could play a critical role. However, he stressed that developing countries are not willing to pay the incremental cost for CCTs that reduce pollution unless they also improve efficiency or reduce cost.

William Harnett, Office of Air Quality, Planning and Standards, U.S. Environmental Protection Agency (EPA),

See "Conference" on page 4 . . .

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**In his luncheon remarks, Jack Siegel noted that CCTs are "saviors" because they are viewed as "options to reducing the costs of acid rain" and "a key to global climate change, which must be dealt with as nations around the world grow economically."**

. . . *"Conference" from page 3*

addressed environmental considerations. "There is a symmetry that is developing. Concerns in the U.S. are also becoming concerns in the rest of the world." Harnett cited a number of EPA actions that will affect the electric utility industry, such as decisions on a national ambient air $NO_2$ quality standard and state and regional control strategies for ozone.

Harnett noted that a European Community directive calls for a 62 percent reduction of $SO_2$. The United Nations Economic Commission for Europe Sulfur Protocol (June 1994) calls for reductions of up to 83 percent in Western Europe by 2000, and 60–70 percent in Eastern Europe by 2010. With respect to future protocols, the highest priority is a second $NO_x$ protocol to reduce ozone, acidification, and eutrophication; other protocols are expected to address persistent organic pollutants as well as hazardous air pollutants and heavy metals.

In Asia, the World Bank is planning for dramatic increases in coal and energy use, and has under way the Rains Project to model global acidification.

## Closing Plenary Session: Challenges to Commercialization and Development

"Challenges to Commercialization and Development" was the topic of the closing plenary session, chaired by Dr. C. Lowell Miller, Associate Deputy Assistant Secretary, Office of Fossil Energy. Speakers delineated recent studies and pending proposals that examine the issues affecting future energy choices.

Robert Sansom, President of Energy Ventures Analysis, addressed a study sponsored by CEED that projects future gas and coal utilization. Sansom noted that there are 50 years of potential gas reserves (8.8 years of proven reserves) compared to 500 years of potential coal reserves. Uncertainties in gas usage include the post-2000 gas price, gas deliverability, new gas reserve additions (cost and quantity), and dependence on Canadian gas supplies. He concluded that for new baseload capacity—additions between 2000 and 2010—coal technology will be the preferred technology choice. He projected that 74 gigawatts of new U.S. coal-fired capacity would be on-line between 2000 and 2010, with CCTs dominating between 2005 and 2010.

Dwain Spenser of SIMTECHE spoke on technology selection in an evolving domestic utility market. He noted that there are a great many uncertainties in this evolving market, including future economic growth, retail and wholesale wheeling, current over-capacity, increasing competition, CAAA implementation, consumer demands for reduced electricity prices, nuclear and hydroelectric relicensing, and the marginal cost of power. With respect to coal technologies, trends favor high efficiency systems, emissions control, and minimizing the impact of emissions control costs on the cost of power. He concluded that IGCC is the only technology to provide the total flexibility needed, adding that trends also favor pressurized-fluidized beds and advanced supercritical pulverized coals with combined $SO_2/NO_x$ control.

Peter Glaser of Doherty, Rumble, and Butler presented an examination of the issue of externalities. Externalities are defined as the cost of goods not paid for by the producer or purchaser but are borne by society. Typically, utility externalities have included environmental impacts from smokestack emissions.

*See "Conference" on page 5 . . .*


**The expanding CCT outreach program includes an ambitious schedule of meetings and conferences. One of the two new CCT exhibits developed for the program features a lightweight modular system, accomodating international shipping and logistics, interchangeable graphic panels, and a video presentation.**

. . . "Conference" from page 4

The cost of meeting regulatory requirements are considered to be internalized. Thus, many externalities have been internalized as part of the cost of CAAA compliance. An important externality is the presumed damage from $CO_2$ emissions, which are not currently regulated. "Given the rapid movement of the utility industry toward increased competition and deregulation, is externalities regulation on the way out?" asked Glaser. "This question will be played out in California . . . , which has been one of the leaders of externality regulation." Glaser queries whether or not full retail competition is compatible with externalities regulation now that the California utility commission is addressing a proposal to restructure utility regulation to allow retail wheeling.

Barry Gale and Richard Bradley represented the DOE Office of Policy, Planning and Program Evaluation. Gale discussed a 1994 DOE siting report, which considered the adequacy of future infrastructure as well as proposed federal actions that can help resolve siting issues. According to Gale, categories of concern include interaction with stakeholders, equity/environmental justice (leveling the playing field), strategic planning, reinventing government, and research.

Richard Bradley described "joint implementation," which is part of a larger strategy for addressing global climate change. Joint implementation enables developed countries to team with developing countries so that the cost of emissions reductions in a developing country can be underwritten by a developed country. The developed country would be able to credit the reduction toward meeting its own rollback target.

Bradley noted that the Framework Convention on Climate Change produced an agreement for developed countries to set as a target the return of net greenhouse gas emissions to 1990 levels by the end of the decade. However, if only the developed countries achieve this goal and developing countries do nothing, there would be little impact. Countries with major near-term sources of growth in greenhouse gases are China and other developing countries, with long-term sources from Eastern Europe. Opportunities for the least cost in reduction would be in developing countries.

**Barbara McKee, Director, Fossil Energy International Program Coordination, welcomed international delegates to the conference at an orientation session and moderated a panel that examined issues affecting overseas markets.**

Bradley added, "Joint implementation is one way in which technology transfer is facilitated. Through the U.S. Initiative on Joint Implementation, U.S. companies may propose pilot projects to DOE and a panel composed of representatives from eight agencies." The proposals would be evaluated against criteria including acceptability to the host country, reduction in greenhouse gas emissions, additionality (i.e., reduction must be in addition to measures already taken), inclusion of a tracking mechanism and external verification, identification of non-greenhouse gas impacts on the environment, provisions for annual reports, and balance among the portfolio of projects approved. "We are interested in helping U.S. companies identify opportunities in foreign markets," said Bradley.

George Rudins, Acting Deputy Assistant Secretary for Coal Technology, concluded the conference by highlighting the next steps in the CCT pathway. Ongoing actions include a utility executive seminar series and a systematic analytical examination of domestic and international markets. Continued interaction among technology users, vendors, regulatory bodies, environmental groups, and the general public is part of a commitment to a vigorous outreach effort, according to Rudins.

CCT

## The Center for Energy and Economic Development Co-Hosts Conference with DOE

The U.S. Department of Energy and The Center for Energy and Economic Development (CEED) co-hosted the Third Annual CCT Conference. CEED is a non-profit organization dedicated to producing educational programs, research, and materials that describe new technologies, broad economic benefits, and environmental compatibility of coal. CEED's membership is drawn from the U.S. coal industry and includes companies that are involved in and individuals who work in coal production, transportation, and electric power production.

# CCT International/Domestic Markets Explored by International and Industry Analysts

*"Half the world's population lives in places with no access to distributed electricity," stated Barry Worthington of the United States Energy Association in the opening session of the Third Annual Clean Coal Technology Conference. He noted that developing countries need adequate financing and energy for economic growth, and 85 percent of future increases in energy demand are expected to occur in developing countries.*

**At the closing plenary session, Dr. C. Lowell Miller brought together coal industry experts to discuss challenges to commercialization and development.**

It was emphasized at the CCT conference that coal, with its worldwide abundance and low cost, is expected to continue to be the dominant fuel well into the next century. The combination of clean coal technologies and electrification will be one of the most important global business opportunities in the future.

International participants from 10 countries discussed a variety of issues at the Reverse Trade Mission Panel Sessions on Asia/Pacific Rim and Eastern Europe/NIS. Speakers presented an overview of current and projected energy development, emphasizing the role of coal in the Czech Republic, Poland, Romania, Russia, Ukraine, Slovakia, India, Indonesia, South Korea, and China.

Delays in developing projects, attributed to poor economics, were a special concern for the Eastern European/NIS panel moderated by Robert Donovan of the United States Energy Association. Panelists included Frantisek Vanek of the Czech Republic, Janusz Rakowski of Poland, Octavian Pavnotescu of Romania, Gurgen Olkhovsky of Russia, Oleg Panosovskiy of Ukraine, and Andrej Hanzel of Slovakia.

Various factors within these nations will influence the potential use of clean coal technologies, including the type of indigenous coal, reliance on imports, coal transport, age of existing systems, internal economics, and financing options. All participants expressed an interest in cooperative projects with foreign companies.

Gurgen Olkhovsky, discussing coal transport costs, noted that transportation is "tough" and increases costs of the coal resource for power generation by roughly four times the mine-mouth cost. The primary source of coal in North Russia is in Siberia, while the market in Russia in the west. (Siberian coal is low in sulfur, cheap, and mined in open pits.)

Oleg Panosovskiy discussed economic impacts on the energy infrastructure in Ukraine. Previously, the Soviet Union had set priorities for the country's integrated power system, which has a capacity of 52 gigawatts. "Now the situation in Ukraine is extremely difficult. The focus is on how to resolve nuclear problems, and there is no focus on CCTs. Nearly half the fossil plants are very old and need replacement, but there is no domestic capability to produce boilers and emission control equipment."

Panosovskiy noted that Ukraine needs currency and would like to return to its former position as an exporter of electric power. He indicated that pressurized- and fluidized-bed combustion, IGCC, and conventional pulverized coal with $NO_x$ control were the preferred coal technologies in his country. He also stated that research and development shows the effectiveness of using fluidized-bed combustion on a broad range of Ukraine coals, including low-quality anthracite.

The need for utilization of specific CCT technologies for the most advantageous use of available coal resources was vocalized by all participants. Poland's Janusz Rakowski noted that over half of the salable coal produced in Poland in 1993 was raw steam coal of low quality. Associated with use of this coal are the emissions problems; power plants produced 46 percent of the $SO_2$. Efforts to decrease emissions include switching to bituminous coal, coal cleaning, and constructing two atmospheric fluidized-bed combustion boilers.

Andrej Hanzel of Slovakia commented, "About 30 percent of the fuel used (in Slovakia) is brown coal with 1.65 percent sulfur and 30 percent ash, and 42 percent is black coal with 1.57 percent sulfur and 19.42 percent ash." He continued that scrubber technology clearly is needed in Slovakia. In 1999, emission taxes go into effect and scrubbers would help to reduce these penalties as well as emissions.

Gregory Starheim of General Electric moderated a panel on the Pacific Rim, which included Theodore Atwood of DOE (presenting for Shi Dinghuan of the People's Republic of China), R.M.

*See "Markets" on page 7 . . .*

. . . "Markets" from page 6

Sayid Budihardjo of Indonesia, Jea-ek Son of South Korea, and Indra Mohan Sahai of India. Coal represents a major percentage of rapidly developing energy markets in this area.

Theodore Atwood projected excellent prospects for U.S. and Chinese cooperation, stating that, between 1994 and 2000, China will have the largest power market in the world. China estimates that the annual growth rate of power generation will reach 8.5 percent, and the net increase of installed generating capacity will reach 125 gigawatts between now and the end of the century.

The State Science and Technology Commission is of China establishing a CCT program in the following areas: coal washing, development of coal briquettes for residential use, extension of the use of coal slurries, development of burners suited to Chinese coal (circulating fluidized-bed and integrated gasification combined-cycle), and gasification technology.

In Indonesia, diversification is part of the national energy strategy to reduce dependence on oil. "We have been very dependent for the last 10 years; 5 years ago, oil represented 60 percent of utilized resources," said R.M. Sayid Budihardjo. "The share of coal used today is 30 percent and will grow to 50 or 60 percent by the end of this century." South Korea is heavily dependent on foreign fuels for power generation and also has been pursuing a diversification strategy. Jae-ek Son predicted that total power generation will be 45 gigawatts by the year 2000, and of this, 30 percent will be from nuclear and 29 percent will be from coal.

Indra Mohan Sahai, Chairman and Managing Director of Power Finance Corporation Ltd. of India, focused on the financing strategies of his country's development policies. In the last 6 years, 650 power projects have been funded. He stated, "The Indian capital markets are high interest sources of funding for the power sector—a 15–16 percent interest rate—so they are not the best source." External sources include multilaterals, the World Bank, Oil Producing Export Countries (OPEC), U.S. commercial banks, government funding, and short maturity loans.

Pacific Rim participants reported that environmental concerns have resulted in a movement toward emissions control. Sahai reported, "Environmental laws are even stricter than those in the U.S. Environmental regulations include ambient quality standards for $SO_2$. There are regulatory bodies at the state and federal levels and various financial institutions that insist projects conform to regulations." The Indian Supreme Court shut down an industrial plant that dated to British rule because management did not take action to control pollution. Budihardjo made the comparison.

In closing, Sahai remarked, "Awareness is required for CCT to be used. The concept is generally understood but the specifics are not. There needs to be awareness activity concerning the options available, feasibility, costs, and benefits." His suggestions included conducting seminars in major cities, targeting senior power executives, distributing news releases to technical and financial publications, and promoting fast track pilot projects.

## U.S. Initiatives for International Business Development

Representatives from the U.S. coal industry, corporations, and utilities participated in a panel discussion on international business, moderated by Barbara McKee of DOE and Delores Kern of the National Coal Association.

Bud Piland of McDermott, Inc., noted that corporations seeking international business select projects where there is a competitive advantage (i.e., in the technology, financing, local manufacturing, and/or existing relationships), and

See "Markets" on page 8 . . .

**A conference overview was presented at the morning orientation for international participants. Sun Chun, Director, DOE Pittsburgh Energy Technology Center, explained aspects of the CCT Program to several of the international visitors from 23 nations who gathered at the Chicago Hilton.**

# Status of Clean Coal Technology Demonstration Projects

**Ohio Power Co. Tidd PFBC Demonstration Project.** (Brilliant, OH)
*Test runs of 29 and 31 days were completed in October 1994 and January 1995, respectively. To date, approximately 10,700 hours of coal-fired operation have been logged. Testing is scheduled to end on March 31, 1995, after which two months of equipment inspections will be conducted. Final project reports will be completed by December 1995.*

**CQ, Inc. Coal Quality Expert.** (Homer City, PA)
*A fully functional Coal Quality Expert prototype, which will predict the impact of coal quality upon boiler operations, maintenance, bus bar costs, and emissions, is scheduled for completion by July 1995.*

**EER Corporation. Enhancing the Use of Coal by Gas Reburning and Sorbent Injection.** (Hennepin and Springfield, IL)
*The final report of the results of long-term testing at Hennepin has been issued. At the Lakeside Station of City Water, Light & Power in Springfield, IL, long-term operations were completed in June 1994. The long-term results show that an average 66% of the $NO_x$ and 60% of the $SO_2$ were removed. The project goals were 60% and 50%, respectively. An alternate sorbent supplied by NOVACON was tested. The final report for the Lakeside Station is being drafted.*

**Rosebud Syncoal Partnership. Advanced Coal Conversion Process Demonstration.** (Colstrip, MT)
*Shipments of "SynCoal" product to utility and industrial customers for handling tests and test burns continue. Since operations began, the plant has processed more than 580,000 tons of raw coal.*

**York County Energy Partners. Circulating Fluidized-Bed Cogeneration Project.** (North Codorus Township, PA)
*The Draft Environmental Impact Statement was released for public comment in late November. Public hearings on the draft were held December 14–16, 1994, and January 18, 1995, in York. Gilbert/Commonwealth, the project's architect and engineering firm, has also been selected as the construction manager for the plant.*

**ABB Combustion Engineering. IGCC Repowering Project.** (Springfield, IL)
*Efforts continue to address the high capital cost projection for the project.*

**ABB Combustion Engineering. SNOX Flue Gas Cleanup Project.** (Niles, OH)
*ABB has requested a time extension to complete the project. Operations continue. The host company, Ohio Edison, will receive ownership and operate SNOX after the demonstration project has been completed.*

**Appalachian Power Co. PFBC Utility Demonstration Project.** (New Haven, WV)
*Value engineering activities are continuing with the objective of refining the preliminary design for a 340-MW greenfield plant.*

**Babcock & Wilcox. Coal Reburning for $NO_x$ Control.** (Cassville, WI)
*Project is complete. The final report has been received and is in review.*

**Babcock & Wilcox. SNRB™ Flue Gas Clean-Up Project.** (Dilles Bottom, OH)
*The final report for SNRB™ air toxics testing was re-issued. A partial draft of the final report has been received for review.*

**Bethlehem Steel Corp. Blast Furnace Granulated Coal Injection.** (Burns Harbor, IN)
*Plant construction is complete and start-up activities are under way. Moderate amounts of granulated coal are being injected through 18 of the 28 tuyeres in "D" Furnace and through 4 of the 28 tuyeres in "C" Furnace.*

**Bethlehem Steel Corp. Coke Oven Gas Cleaning System.** (Sparrows Point, MD)
*The project has been postponed to allow for rehabilitation of the coke ovens.*

**Pure Air. Advanced Flue Gas Desulfurization Demonstration Project.** (Chesterton, IN)
*The FGD scrubber is operating and has demonstrated the capability to reduce $SO_2$ emissions by greater than 95%, thereby removing some 60,000 tons of $SO_2$ on an annual basis. PowerChip™ gypsum operations commenced in January 1994, allowing for rail transport of some by-product gypsum.*

**Babcock & Wilcox. Low-$NO_x$ Cell™ Burner Retrofit.** (Aberdeen, OH)
*Completion of reporting requirements is under way. A draft long-term test report is under review. A draft of the project's final report was received in June 1994. Dayton Power & Light has accepted ownership of the LCNB™ demonstration retrofit. Further, Allegheny Power Systems, through its subsidiary, West Penn Power, has purchased retrofit LNC™ burners and coal feed piping for two 555 MWe boilers.*

**Southern Co. Services. Chiyoda Thoroughbred 121 FGD Process.** (Newnan, GA)
*Long-term test results have demonstrated $SO_2$ removals achieving a high of 97%. Using the standard 2.3% sulfur coal, normal $SO_2$ removal is 94%. Particulate removal is 99% and limestone utilization is about 97%. Since the scrubber came on line in October 1992, there have been 98% reliability and 98% availability. In March 1994, the electrostatic precipitator was deenergized and the Chiyoda reactor began operations as both a particulate and $SO_2$ scrubber. This test continued until the end of 1994. The University of Georgia has successfully demonstrated that the gypsum stack will support the growth of vegetation. Demonstration operations for the scrubber were completed in December 1994. The report is being prepared. The project will continue through 1997 with gypsum stack monitoring. Georgia Power has assumed operation of the Chiyoda scrubber.*

**Southern Co. Services. $NO_x$ Reduction for Tangentially Fired Boilers.** (Lynn Haven, FL)
*Project is complete. Results indicate fully successful operation. Reports have been issued.*

*See "Status" on page 11 . . .*

. . . "Status" from page 10

**Southern Co. Services. $NO_x$ Reduction for Wall-Fired Boilers.** (Coosa, GA)

*Long-term testing of the Advanced Over Fire Air (AOFA), Low-$NO_x$ Burners (LNB), and combined AOFA and LNB has been completed. Low-$NO_x$ Digital Control System (LNDCS) engineering and selection of the initial Artificial Intelligence Software supplier are complete. Testing of the LNDCS with the software package is scheduled to begin in March 1995.*

**Southern Co. Services. SCR for High-Sulfur Coal Boilers.** (Pensacola, FL)

*Test operations are in progress. $NO_x$ removal and ammonia slip results for all catalysts are as good as, or better, than design expectations.*

**Air Products and Chemicals, Inc. Liquid Phase Methanol Process.** (Kingsport, TN)

*DOE's draft NEPA document was issued for public review. Design of the liquid phase methanol process demonstration is under way. Construction is expected to begin in summer 1995.*

**AirPol, Inc. Gas Suspension Absorption (GSA) Project.** (Paducah, KY)

*The test program has been completed and results indicate that the GSA is capable of 90+% $SO_2$ removal efficiencies. A published article in Power Magazine (October 1993) compared the GSA system favorably to other dry and wet scrubbing processes. The final technical report is being prepared.*

**Alaska Industrial Development Authority. Healy Clean Coal Project.** (Healy, AK)

*Design, engineering, fabrication and permitting efforts are proceeding. The "General Construction" contract was awarded in December 1994. Construction is expected to begin in Spring 1995.*

**Bechtel Corp. Confined Zone Dispersion FGD Project.** (Indiana County, PA)

*Final Report is in preparation.*

**DMEC-1 Ltd. Partnership. Pressurized Circulating Fluidized Bed Demonstration Project.** (Pleasant Hill, IA)

*The results of plant configuration studies are being analyzed, and the available options are being studied by the host utility.*

**EER Corp. Gas Reburning and Low-$NO_x$ Burners on a Wall-Fired Boiler.** (Denver, CO)

*Long-term baseline testing of the GR-LNB system indicates that while $NO_x$ can be reduced to 70%, meeting project objectives, the mean has been in the range of 66% to 68%. The Low-$NO_x$ Burners have been modified in an effort to bring operating performance up to objectives at lower boiler operating levels. The project has been extended and is now expected to be completed in December 1995. The results of the demonstration have shown that this lower capital cost method for $NO_x$ reduction is successful. The final report of the project is in preparation.*

**ENCOAL Corp. Mild Gasification Project.** (Gillette, WY)

*The project's operating phase has been extended to September 1996. Approximately 5,600 hours of operation on coal have been logged to date. Some 33,300 barrels of liquid product and 30,400 tons of solid product (in blends ranging from 15–92%) have been shipped to industrial and utility customers, respectively, and successfully burned. A 2-month maintenance shutdown was completed in mid-February, and the plant is back in operation.*

**LIFAC N. America. LIFAC Sorbent Injection Desulfurization Demonstration Project.** (Richmond, IN)

*Using sorbent recycling, LIFAC is able to maintain over 70% reduction of $SO_2$ with peak reduction reaching 85%. Operations ended in early June 1994. Final reports are scheduled to be released in mid-1995.*

**NOXSO Corporation. NOXSO Flue Gas Cleanup System.** (Evansville, IN)

*The NOXSO Corporation has assumed direction of the project, and is now the prime participant. Proof-of-concept testing has been completed and project definition activities are complete. Final design for the 175-MWe plant at ALCOA's Warrick Station in Evansville, Indiana, is in progress. Construction is scheduled to begin in the summer of 1995.*

**Public Service Co. of CO. Integrated Dry $NO_x/SO_2$ Emissions Control System.** (Denver, CO)

*Testing of the integrated sodium and urea injection began in June 1994 and will be completed in mid-1995. Overall, 80% $NO_x$ reduction has been demonstrated at full load. Four series of air toxics testing have been completed. Results indicate that the baghouse successfully removes nearly all organic compounds, and dioxins/furans were below or very near their detection limits. Arapahoe 4 has operated over 25,000 hours since the combustion modifications were completed in May 1992. The availability factor during this period was over 96%.*

**Tampa Electric. Integrated Gasification Combined Cycle Project.** (Lakeland, FL)

*A groundbreaking ceremony was held on November 2, 1994, and site preparation activities are currently under way. Approximately 10 million cubic yards of earth (of an eventual total of 12 million) have been moved. Gasification and power block foundations have been poured. Engineering is approximately 90% complete.*

**Custom Coals International. Self Scrubbing Coal: An Integrated Approach to Clean Air.** (Springdale, PA; Richmond, IN; Ashtabula, OH)

*Plant construction is coming to an end. Equipment shakedown is in progress. Custom Coals has requested approval to proceed with the operational phase of the project. Operations and testing are scheduled to begin in late spring 1995.*

**New York State Electric and Gas. Milliken Clean Coal Technology Demonstration Project.** (Lansing, NY)

*Construction is complete. Unit 2 started scrubbing operations January 17, 1995. Full split module operation with units 1 and 2 is scheduled for July 1995.*

**TAMCO Power Partners. Toms Creek IGCC Demonstration Project.** (Coeburn, VA)

*Project definition and preliminary design activities are under way. A power purchase agreement is being sought.*

**Tennessee Valley Authority. Micronized Coal Reburning for $NO_x$ Control.** (Undetermined)

*TVA's Shawnee Station has withdrawn from being the host site. A new site location is being explored.*

**ThermoChem, Inc. Demonstration of Pulse Combustion in an Application for Steam Gasification of Coal.** (Gillette, WY)

*An alternative site for the demonstration project has been proposed.*

*See "Status" on page 12 . . .*

. . . "Status" from page 11

**Sierra Pacific Power. Piñon Pine IGCC Project.** (Reno, NV)
*The Final EIS was released for public comment on September 30, 1994. A favorable Record of Decision was issued by DOE on November 8, 1994. By December 1994, all permits required for plant construction had been obtained, including issuance of the state's Utility Environmental Protection Act approval by the Public Service Commission of Nevada. In January 1995, DOE approved Sierra Pacific's request to move into the construction phase of the project.*

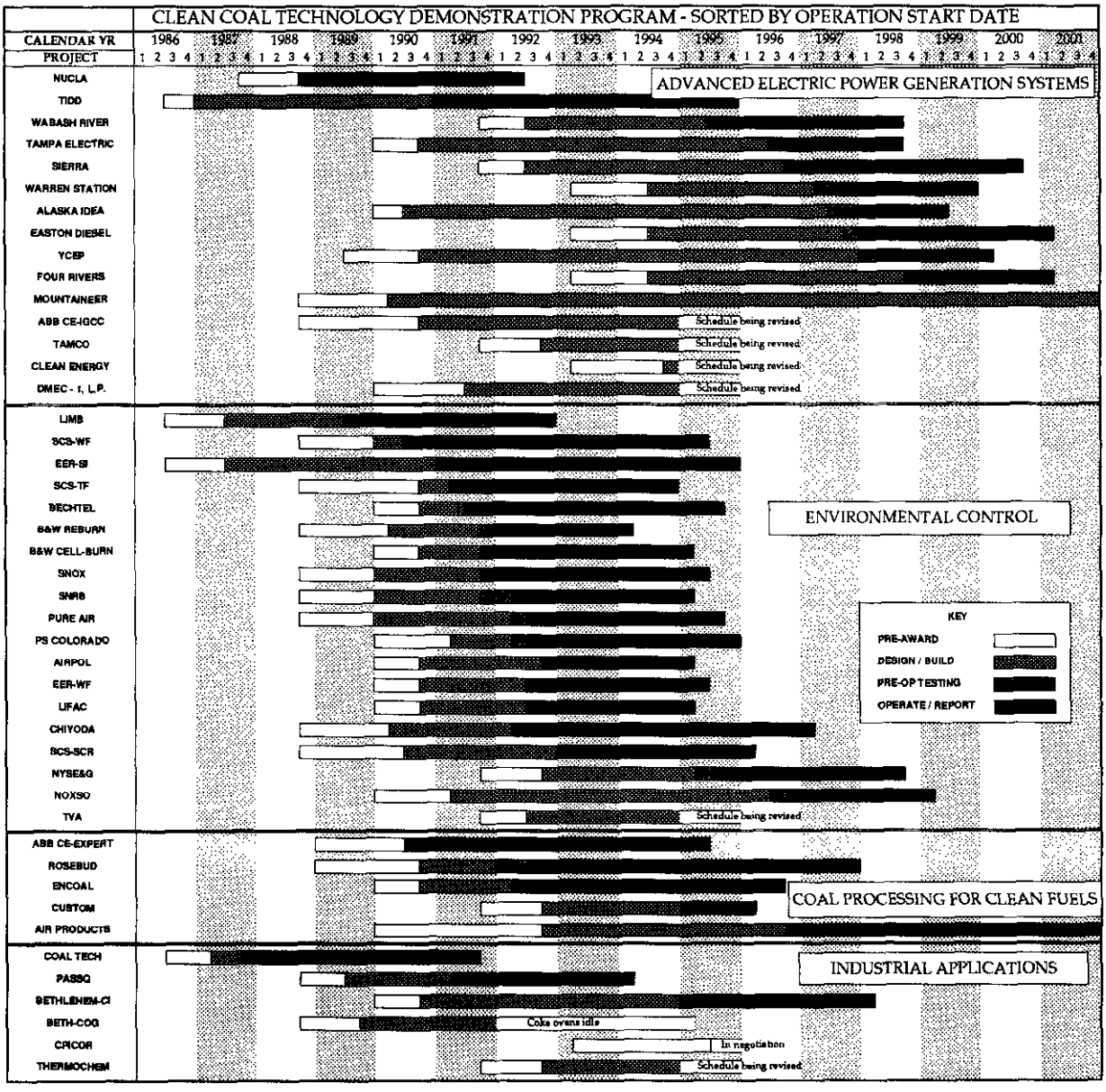
**Wabash River Joint Venture. Wabash River Coal Gasification Repowering Project.** (W. Terre Haute, IN)
*Plant construction continues and is approximately 80–85% complete. Start-up activities are scheduled to begin in June 1995.*

**Arthur D. Little, Inc. Coal Diesel Combined Cycle** (Easton, MD)
*The cooperative agreement was signed by DOE on July 12, 1994. ADL is finalizing its subcontract agreements with Cooper-Bessemer for engine supply and commercialization, and CQ Inc. for coal/water slurry supply.*

**Clean Energy Partners L.P. Clean Energy Demonstration Project.**
*The cooperative agreement for this IGCC demonstration was signed by DOE on December 2, 1994.*

**Four Rivers Energy Partners, L.P. Second Generation Pressurized Circulating Fluidized-Bed Cogeneration Project** (Calvert City, KY)
*The cooperative agreement was signed by DOE on July 26 with an effective project start date of August 1, 1994. Initial efforts are focusing on the National Environmental Policy Act process.*

**Pennsylvania Electric Co. Warren Station Externally Fired Combined-Cycle Demonstration Project** (Warren, PA)
*The cooperative agreement was signed by DOE on August 1, 1994. A mussel survey of the Allegheny River downstream of the project site was completed in September 1994. The results were submitted to the U.S. Fish and Wildlife Service, and consultation under the Threatened and Endangered Species Act was completed in November 1994. A draft Environmental Assessment for the project was issued in February 1995 for state and public comment.*



# Upcoming Events

| Date | Event | Contact |
|---|---|---|
| March 20–23, 1995 | ***20th International Technical Conference on Coal Utilization and Fuels Systems,*** Clearwater, FL | Barbara Sakkestad<br>(202) 296-1133 |
| March 28–31, 1995 | ***15th EPRI-EPA-DOE $SO_2$ Control Symposium,*** Miami Beach, FL | Ms. N.L. Maceil<br>FAX: (412) 892-4160 |
| May 7–10, 1995 | ***13th International Conference on Fluidized Bed Combustion,*** Orlando Hyatt, Kissimmee, FL | Leslie Friedman<br>Amer. Soc. Mech. Engrs.<br>(212) 705-7788<br>FAX: (212) 705-7856 |
| June 11–15, 1995 | ***73rd Annual National Conference of Regulatory Utility Commission Engineers,*** Owyhee Plaza Hotel, Boise, ID | Randy Lobb<br>(208) 334-0350 |
| Sept. 5–7, 1995 | ***Fourth Annual Clean Coal Technology Conference,*** Marriott City Center, Denver, CO | Kim Yavorsky<br>(412) 892-6244 |
| Sept. 11–15, 1995 | ***12th Annual International Pittsburgh Coal Conference,*** Pittsburgh, PA | Ann McDonald<br>(412) 624-7440 |
| Oct. 22–25, 1995 | ***14th Conference on Coal Gasification Power Plants,*** San Francisco, CA | Ms. L. Nelson<br>TELFAX: (415) 855-2041 |

# CCT Reports Update

**The following DOE report has been published and is available from NTIS.**

| | | |
|---|---|---|
| March 1994 | DOE/MC/24132-3746<br>NTIS: DE94004120 | *TIDD PFBC Demonstration Project Topical Report—First Eighteen Months of Operation* |

**The following DOE reports have been prepared. A limited number of copies are available from U.S. Department of Energy, Morgantown Energy Technology Center, ES&H Program Support Division, P.O. Box 880, Morgantown, WV 26507, ATTN: Dr. Suellen Van Ooteghem, N-02.**

| | | |
|---|---|---|
| Sept. 1994 | DOE/EIS-0215 | Final Environmental Impact Statement for the Proposed Piñon Pine Power Project/Tracy Station, Nevada (2 volumes) |
| Nov. 1994 | DOE/EIS-0221 | Draft Environmental Impact Statement for the Proposed York County Energy Partners Cogeneration Facility, York County, Pennsylvania |
| Feb. 1995 | DOE/EA-1007 | Draft Environmental Assessment for the Warren Station Externally Fired Combined-Cycle Demonstration Project |

**From the Pittsburgh Energy Technology Center, the following report has been prepared. Limited copies are available from Lloyd Lorenzi at (412) 892-6159.**

| | | |
|---|---|---|
| March 1995 | DOE/EA-1029 | Draft Environmental Assessment for the Liquid Phase Methanol Project |

**The following papers, authored by DOE employees or CCT participants, were delivered at the Third Annual Clean Coal Technology Conference, Chicago, Illinois, September 6–8, 1994. Copies are available from the authors. For further information, contact Doug Archer, Office of Clean Coal Technology, at (301) 903-9443.**

"Combustion Engineering IGCC Repowering Project." L.J. Peletz, ABB Combustion Engineering Systems.

"Piñon Pine Power Project—An Update." M. Gonzalez, Foster Wheeler U.S.A. Corporation; J.W. Motter, Sierra Pacific Power Company; and P.E. Nicks, The M.W. Kellogg Company.

"The Wabash River Coal Gasification Repowering Project—An Investment in the Future." J.J. Cook, PSI Energy, Inc., and L.A. Lednicky, Destec Energy, Inc.

"Tampa Electric Company Integrated Gasification Combined Cycle Project Current Status." D.E. Pless, TECO Power Services.

"The Toms Creek Clean Coal IGCC Demonstration Project." M.R. Schmid, Tampella Power Corporation.

"Application of British Gas/Lurgi Gasification Process in the U.S. DOE Clean Coal Technology Program—Round Five." K.S. Johnson, Duke Energy.

"The Healy Clean Coal Project." R. Gleiser, Joy Technologies.

"500 MW Demonstration of Advanced Wall-Fired Combustion Techniques for the Reduction of Nitrogen Oxide ($NO_x$) Emissions from Coal-Fired Boilers." J.N. Sorge and S.M. Wilson, Southern Company Services, Inc.

"Status of Babcock & Wilcox's Clean Coal Technology Combustion Modification Projects: Coal Reburning for Cyclone Boiler $NO_x$ Control and Low $NO_x$ Cell™ Burner Demonstrations." A.S. Yagiela, T.A. Laursen, G.J. Maringo, R.J. Kleisley, and H. Farzen, Babcock & Wilcox; C.P. Bellanca, H.J. Duong, and D.A. Moore, Dayton Power and Light; J.M. Campbell and R.J. Newell, Wisconsin Power & Light; R.W. Corbett, U.S. Department of Energy; and W.G. Maiden, Allegheny Power Systems.

"Gas Reburning in Tangentially, Wall-, and Cyclone-Fired Boilers—An Introduction to Second Generation Gas Reburning." D.A. Engelhardt, R.T. Keen, M.E. Light, R.Z. Beshai, T.M. Sommer, and B.A. Folsom, Energy and Environmental Research Corporation; T. Booker, City Water, Light & Power Company; J.M. Pratapas, Gas Research Institute; T.J. May, Illinois Power Company; E.G. Rindahl, Public Service Company of Colorado; and H.J. Ritz, U.S. Department of Energy.

"Demonstration of Selective Catalytic Reduction (SCR) Technology for the Control of Nitrogen Oxides ($NO_x$) Emissions from High Sulfur, Coal-Fired Boilers at Plant Crist SCR Test Facility." W.S. Hinton, C.A. Powell, and J.D. Maxwell, Southern Company Services, Inc.

"TVA Micronized Coal Reburn Project Update." C. Howlett, Fuller Company.

"Rosebud SynCoal Partnership SynCoal Demonstration." R. Sheldon, Rosebud SynCoal Partnership; S.J. Heintz, U.S. Department of Energy.

"Continuous Operation and Commercialization of the ENCOAL Mild Coal Gasification Project." J.P. Frederick, ENCOAL Corporation; and R.E. Nickell, SGI International.

"The CQE Project: Producing Innovative Software for Economical Deployment of Coal Technologies." D. O'Connor, Electric Power Research Institute; and S. Stallard, Black & Veatch.

"Self-Scrubbing Coal: An Integrated Approach to Clean Air." K.E. Harrison, Custom Coals Corporation.

"Continuing U.S. Interest and Export of Recovery Scrubber Pollution Control Technology." G.L. Morrison, Passamaquoddy Technology, L.P.

"Status of the Demonstration of Pulse Combustion in Steam Gasification." M.N. Mansour, K. Durai-Swamy, W.G. Steedman, and H. Said, ThermoChem, Inc.

"Blast Furnace Granular Coal Injection." D. Kwanoski and L.L. Walter, Bethlehem Steel Corporation.

"Coal Tech's Air Cooled Slagging Combustor—Recent Developments." C.A. Smith, U.S. Department of Energy; and B. Zauderer, E.S. Fleming, and B. Borch, Coal Tech Corporation.

"Clean Power from Integrated Coal-Ore Reduction." B.J. Halper, Air Products and Chemicals, Inc.

"Two Years of Outstanding AFGD Performance, Pure Air on the Lake Bailly Scrubber Facility." J. Henderson and D.C. Vymazal, Pure Air; D.A. Styf, Northern Indiana Public Service Company; and T. Sarkus, U.S. Department of Energy.

"The Clean Coal Technology Program 10 MWe Demonstration of Gas Suspension Absorption for Flue Gas Desulfurization." F.E. Hsu, AirPol, Inc.; T.A. Burnett and V.M. Norwood, Tennessee Valley Authority; and S.K. Marchant and G.W. Pukanic, U.S. Department of Energy.

"Commercialization of the LIFAC Sorbent Injection Process in North America." J. Viiala, Tampella Power Corporation; and J.D. Hervol and C. Keating, ICF Kaiser Engineers, Inc.

"CT-121 Scrubber Demonstration Mid-Project Performance Results." D.P. Burford, Southern Company Services, Inc.; I.G. Pearl, Radian Corporation; and H.J. Ritz, U.S. Department of Energy.

"Demonstration of Gas Reburning—Sorbent Injection on a Cyclone-Fired Boiler." R.T. Keen, B.A. Folsom, A. Marquez, R. Payne, J. Opatrny, and T.M. Sommer, Energy and Environmental Research Corporation; and H.J. Ritz, U.S. Department of Energy.

"Commercialization of the SNOX Process Through the Clean Coal Technology Program." D.C. Borio, D.J. Collins, and T.D. Cassell, ABB Environmental Systems; and D.E. Gray, Ohio Edison Company.

"Current Progress with the Integrated Dry $NO_x/SO_2$ Emissions Control System." T. Hunt, Public Service Company of Colorado; E. Mali, Babcock & Wilcox; J. Stallings, Electric Power Research Institute; R. Smith and L. Muzio, Fossil Energy Research Corporation; and D. Jones, Noell, Inc.

"The NOXSO Clean Coal Project." J.B. Black and C.A. Leonard, NOXSO Corporation; M.D. Morrell, Morrison Knudsen Corporation; and G.G. Elia, U.S. Department of Energy.

"Milliken Station Demonstration Project FGD Retrofit Update." C.E. Jackson, Gilbert/Commonwealth; D.T. O'Dea, New York State Electric & Gas Company; and G.G. Elia, U.S. Department of Energy.

"Coal-Fueled Diesels for Modular Power Generation." R.P. Wilson, Jr., Arthur D. Little, Inc.

"*Warren Station Clean Coal Technology Project DOE Clean Coal* Five Project." K.M. Gray and S.T. Higgins, Pennsylvania Electric Company; M.R. Bary, Black & Veatch; and R.B. Reuther, U.S. Department of Energy.

"The Future of Atmospheric Circulating Fluidized Bed Combustion." D.C. Wolfson and B.F. Hahn, Air Products and Chemicals, Inc.

"DMEC-1 Pressurized Circulating Fluidized Bed Combustion." G.E. Kreumpel, Midwest Power; and R. Dryden, Pyropower Corporation.

"American Electric Power Pressurized Fluidized Bed Combined Cycle Technology Status." M. Marrocco and D.A. Bauer, American Electric Power Service Corporation.

"Four Rivers Energy Modernization Project Advanced Pressurized Circulating Fluidized Bed Combustion Process Project Overview and Status." E.P. Holley, J.J. Lewnard, and D.C. Vymazal, Air Products and Chemicals, Inc.; K.W. Richardson, Foster Wheeler Energy Corporation; G. Von Wedel, LLB Lurgi Lentjes Babcock Energietechnik GmbH; and W.F. Domeracki, Westinghouse Electric Corporation.

"Flexible Electric Power Generation: The Integrated Gasification/ Liquid Phase Methanol (LPMEOH™) Demonstration Project." W.R. Brown and R.B. Moore, Air Products and Chemicals, Inc.