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COVER Topics spanning the spectrum of physical, life, social sciences, and technology will be presented at the AAAS Annual Meeting, 14 to 19 February, in Washington, DC. A small sampling of slides from one of the more than 200 symposia, technical sessions, and workshops is depicted on the cover (courtesy of K. Dunlap and P. Brehm, D. E. Morse, and R. B. Silver, whose work will be presented at the symposium on "New Perspectives in Cellular Signaling"). The meeting will also include plenary lectures, a special seminar on the neurosciences, poster sessions, exhibits, short courses, and an employment exchange. For details, see page 1437.

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Clean Coal Technology

The United States is going to find it necessary to use more intensely its principal fossil fuel, coal. One of the major technological challenges of the next decades will be to develop means of using it imaginatively as a source of chemicals and in a more energy-efficient manner while reducing the resultant pollution. Progress in the United States in achieving improvements in the use of coal will be beneficial globally and especially in Eastern Europe, the Soviet Union, China, and India.

The recently enacted Clean Air Act will lead to a diminution in acid rain, but it will not be helpful in reducing CO_2 emissions from the burning of coal. The new law affects about half the nation's coal-fired power plants. Most utilities east of the Mississippi River must give precedence in their planning and capital expenditures to reducing SO_2 and other emissions. The responses in many instances will be to install scrubbers. This will be costly and time consuming and will require outages of generating equipment. Such responses will entail a loss of thermal efficiency.

A cost-sharing Clean Coal Technology Program sponsored by the Department of Energy (DOE) is fostering innovations that are likely to have more positive long-term effects. A total of 38 proposals have been approved, a substantial fraction of which deal with improved methods of combating pollution. Two others are of particular interest. One is a pressurized fluid bed combustion (PFBC) combined-cycle demonstration.* The new PFBC plant is now becoming operational at Ohio Power Company's Tidd plant near Brilliant on the Ohio River. The PFBC technology is capable of reducing SO_2 emissions by more than 90% and NO_x emissions by 50 to 70%. With its combined-cycle feature, it has the potential to operate at a thermal efficiency of 45% in contrast to a conventional 36%. The technology lends itself to modular shop fabrication. Engineers state that capital and maintenance costs of additional modules will be less than those of existing conventional boilers. With PFBC, the high-sulfur coals of the eastern United States can be burned in compliance with the environmental standards of the Clean Air Act.

A second interesting new technology co-sponsored by DOE under the Clean Coal Technology Program is the Encoal mild coal gasification project.† The process will convert a sub-bituminous low-BTU coal into a useful higher-BTU solid while producing significant amounts of a liquid fuel.

Major reserves of sub-bituminous coal are located in Wyoming, North Dakota, Montana, Alaska, and Texas. The seams in the Powder River Basin of Wyoming are under minimal overburden and range in thickness from 25 to 60 meters. Mining is highly mechanized. The coal has a sulfur content of about 0.5%, ash, 5%, and water, about 30%. Its heating value is about 8000 BTU per pound. Substantial amounts are sent east of the Mississippi even though the cost of transportation far exceeds that of mining.

Encoal Corporation, a wholly owned subsidiary of Shell Mining Company of Houston, Texas, will have responsibility for supervision of design, construction, and operation of a 1000-ton per day demonstration plant at the Buckskin Mine near Gillette, Wyoming. The plant will use liquids from coal (LFC) technology developed by Shell and SGI International of La Jolla, California. The new technology is based on extensive studies of the behavior of coals heated to different temperatures for various periods of time. At temperatures between 100° and 200°C, H_2O is the principal product. A short exposure at 540°C yields many products, including CH_4, CO, CO_2, H_2O, and aromatic chemicals such as phenol and creosols. The product slate is sensitive to the treatment regimen. The plant will be highly instrumented and automated. The 1000 tons per day are projected to give rise to 500 tons of solids with low sulfur content and heating value of 12,000 BTU per pound. Five hundred barrels per day of a low-sulfur, valuable liquid will also be produced.

Construction of the plant began 26 October 1990. Components will mainly be standard commercial items. As a result, completion is scheduled for mid-1992. Already Encoal is discussing with potential customers contracts for product to be supplied for test burns. If all goes well, the next step would be construction of commercial-scale plants processing 10,000 tons of coal per day. The liquids and the solids from such plants would have a substantial impact on the energy economy of this country.—PHILIP H. ABELSON

*"Tidd: the nation's first PFBC combined-cycle demonstration," *Clean Coal Technol. 1* (March 1990). †U.S. Department of Energy, "Encoal mild coal gasification project" (Washington, DC, June 1990).