



Project Summary

Proceedings: EPA/Industry Forum on Coal Liquefaction (October 1979)

Dorothy G. Weatherman

This report is a summary of the proceedings of the EPA/Industry Forum on Coal Liquefaction, held on October 23 and 24, 1979, in Chicago. The forum brought together representatives of government and industry with the goal of sharing information and increasing cooperation between the two groups.

The meeting was opened by John McGuire, Administrator for EPA Region V, who welcomed the participants and outlined the purpose of the meeting. Frank Princiotta, Director of EPA's Energy Processes Division, presented an overview of EPA's activities in the area of synthetic fuels. Standard-setting procedures, activities, and plans relating to coal liquefaction were discussed by discharge medium as follows: air emissions, Jack Farmer, EPA Emission Standards and Engineering Division; solid wastes, Yvonne Garbe, EPA Hazardous Waste Management Division; and liquid effluents, William Telliard, EPA Effluent Guidelines Division. Terry Thoem, Director of EPA Region VIII's Energy Policy Coordination Office, summarized EPA permit procedures for coal liquefaction facilities.

EPA's research and development activities in coal liquefaction were described by Norbert Jaworski, Deputy Director of EPA's Industrial Environ-

mental Research Laboratory in Research Triangle Park, North Carolina. Robert Hangebrauck, Director of EPA/IERL's; Energy Assessment and Control Division at Research Triangle Park, discussed the plans and activities of this division in coal liquefaction.

State government participation in coal liquefaction development was discussed by two speakers: Harry Enoch, Assistant Director of Technology Assessment, Kentucky Department of Energy; and Daniel Pierce, Chairman of the Illinois Energy Resources Commission.

Industry plans in the area of coal liquefaction were presented by representatives of several firms actively involved in development and use of the technology: Robert C. Green, Exxon Research and Engineering Co.; James B. O'Hara, Ralph M. Parsons Co.; Richard Eccles, Hydrocarbon Research, Inc.; Vernon W. Weekman, Mobil Research and Development Corp.; Barnet Groten, Texas Eastern Corp.; and Sid Thomson, Fluor Corp.

The forum was highlighted by the kind of frank interchange that will lead to closer cooperation in meeting the President's goals for the development of synthetic fuels.

This Project Summary was developed by EPA's Industrial Environmental Research Laboratory, Research Triangle Park, NC, to announce key

findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Summaries of the speakers' remarks

John McGuire, Regional Administrator, EPA Region V

McGuire welcomed the participants and discussed EPA's role in meeting the President's goal of lessening our national dependence on foreign oil. He stressed the importance of cooperation between EPA and industry in meeting national energy and environmental goals.

Frank Princiotta, Director, Energy Processes Division, EPA-Washington

Princiotta summarized the President's program to halve oil imports by 1990 and discussed the status of legislation to implement the program. The roles of the Energy Security Corporation and the Energy Mobilization Board were reviewed, as were EPA projections of U.S. fossil energy resource requirements and energy flows in 1990.

He explained how EPA's research and regulatory programs fit in with the synthetic fuel program, noting that the types and quantities of synfuel pollutants differ substantially from the kind of pollutants with which EPA is familiar. Intelligently planned and sited commercial facilities, he stressed, can be built at acceptable cost and still meet all current environmental regulations.

Princiotta discussed the development of EPA's regulatory strategy for the synthetic fuel industry. Its major goal will be to promote the incorporation of best available controls for all major facilities. It is expected that legally binding regulations will not be promulgated before 1983.

EPA's research program goals and funding levels were outlined, and major findings of the program were summarized. Preliminary indications are that control technology for methanation is probably effective, and will increase the capital cost of a Lurgi gasification plant by 5 percent and operating costs by 10 percent. He stressed that EPA's job is to avoid discouraging commercialization of synthetic fuel technology, but at the same time to protect the environment.

Jack Farmer, Chief, CPB, Emission Standards and Engineering Division, OAQPS, EPA-RTP

Farmer discussed standards-setting procedures, activities, and plans relating to air emissions from coal liquefaction. He reviewed the function of the New Source Performance Standard, which requires the application of the best system of emission reductions, taking into account cost, health, environmental, and energy requirements. To date, EPA has published New Source Performance Standards for 27 source categories and has proposed standards for four additional categories. During 1980, plans call for proposing standards for an additional 15 source categories and issuing final standards for 6 categories.

Farmer outlined the three phases of standards development: first, a short-term study characterizing the source category to determine whether a standard is appropriate; second, data gathering through literature searches and personal contact; and third, analysis and evaluation of the data for development of a draft or recommended standard. Procedures for review of recommended standards, both within and outside EPA, were summarized.

No air standards development projects have yet been initiated for synthetic fuel processes, although Farmer said that a low-Btu gasification project is under serious consideration.

Yvonne Garbe, Environmental Engineer, Hazardous and Industrial Waste Division, EPA-Washington

Garbe summarized EPA's standards-setting procedures, activities, and plans relating to solid wastes from coal liquefaction. At present, the Hazardous and Industrial Waste Division is responding to comments generated by publication of proposed regulations to control hazardous wastes.

She explained the structure of the hazardous waste program, which responds to Subtitle C of the Resource Conservation and Recovery Act. Subtitle C provides a cradle-to-grave management system for hazardous waste. Non-hazardous wastes are addressed in Subtitle D.

EPA has established a special waste category for high-volume wastes whose composition, characteristics, and degree

of hazard are not readily known but which are believed to have a low risk. Examples cited by Garbe of wastes in this category are metal mining wastes, gas and oil drilling muds, oil production brines, and cement kiln dust. She noted that the open comment period on the proposed regulations had produced several suggestions to include coal liquefaction waste (slag, char ash, and sludge) in this special category. These suggestions, she said, are receiving serious consideration.

Norbert Jaworski, Deputy Director, Industrial Environmental Research Laboratory, EPA-RTP

Jaworski presented an overview of R&D activities in coal liquefaction. He discussed the laboratory's two major activities: environmental assessment and control technology development. The energy R&D program covers flue gas desulfurization technology, both regenerable and nonregenerable systems, and the use of baghouses and precipitators for particulate control of conventional combustion systems. Other programs are investigating NO_x control and fluidized bed technology.

He discussed the importance of developing procedures and protocols to ensure the consistency of data analysis and chemical analysis performed by outside contractors.

The Laboratory's role in support of EPA is in problem definition—predicting for instance, the potential harmful impact of a synfuels program. While early efforts focused on the environmental assessment methodology, the current emphasis is dictated by the pollution control guidance documents. The Laboratory is heavily involved in the costs and engineering aspects of environmental control systems.

Robert Hangebrauck, Director Energy Assessment and Control Division, Industrial Environmental Research Laboratory, EPA-RTP

Hangebrauck discussed EPA's R&E environmental assessment and control technology plans in coal liquefaction. He outlined the work of the agency major contractors in coal liquefaction—TRW, Hittman Associates, and Radian and discussed the status of relevant field studies.

In addition, EPA also supports the activities of the Synfuels Environment

Center, a group of universities and the Research Triangle Institute, located near the Laboratory in North Carolina. Their efforts are dedicated to the creation of a center of expertise to work toward some environmental understanding in this area. The Center is engaged in pollutant screening studies, in investigating options for gas and wastewater clean-up and solid waste disposal, and in combustion modifications testing.

Hangebrauck discussed the reports generated by the Laboratory, including the standard support plan, source test and evaluation report, environmental assessment report, and pollution control guidance document.

The basic components of the environmental assessment methodology were outlined, as was EPA's phased approach to sampling and analysis. Hangebrauck illustrated these EPA methods using a gasification case study.

Robert Green, Senior Engineering Associate, Exxon Research and Engineering Company

Green described the development status of the Exxon Donor Solvent (EDS) coal liquefaction process. Currently, the results of bench-scale research, operation of small pilot units, and engineering design and technology studies are being integrated with the operation of a 250 ton-per-day pilot plant, which has a planned completion date of spring 1980. Key objectives of pilot plant operation are demonstration of operability, design data acquisition, product yield and quality confirmation, and testing and production of feeds for demonstration of environmental coals.

Green summarized process yields and expected environmental effects of the process. Obstacles to commercialization were discussed, including the current price of hydrocarbon liquids and environmental and permitting difficulties.

James B. O'Hara, Manager, Energy Department, Ralph M. Parsons Company

O'Hara outlined the activities of the Ralph M. Parsons Company in the design, engineering, procurement, and construction of coal liquefaction facilities. The firm does not plan to offer a proprietary liquefaction process, but rather offers familiarity with the major technologies.

He summarized Parsons' experience in construction management and discussed the Company's position in sulfur systems engineering. Parsons has designed 80 percent of the free world's sulfur recovery plant capacity. The Claus unit has been used extensively with streams containing 20 to 30 percent hydrogen sulfide or even less. Parsons has recently built modified sulfur-burning Claus units that can handle streams containing 7 to 8 percent hydrogen sulfide. While at present they would recommend use of the Stretford process for streams containing less than 5 percent hydrogen sulfide, Parsons is developing a new process to handle feeds as low as 1 percent.

Parsons has developed conceptual designs for each of the generic types of coal liquefaction plants, including direct liquefaction, indirect liquefaction, and pyrolysis. He discussed treatment procedures for these plants, and noted that, where costs of conceptual coal liquefaction environmental facilities have been estimated, they have been in the same percentage range as is encountered for grass-roots oil refineries—10 to 15 percent.

D.M. Jackson, Manager, Program Development, Gulf Mineral Resources Company

Jackson outlined the development status of SRC-II, which is being tested at the SRC pilot plant in Fort Lewis, Washington. The SRC fuel oil is envisioned for use in utility/industrial boilers, combustion turbines, and medium-speed diesels.

He also discussed the results of a boiler test performed with 5,000 barrels of the broadrange fuel at a Consolidated Edison generating station in Manhattan. The test indicated acceptable levels of NO_x, particulates, and other emissions.

The results of a Phase Zero assessment of SRC-I and -II were also discussed. The assessment, which covered design, environmental assessment, site acquisition, and market assessment of products, suggested a substantial and continuing economic attractiveness, at least in the utility sector, for a liquid fuel derived from coal. The study also revealed that maintaining and rehabilitating existing oil-fired capacity is far more attractive than abandoning it and replacing it with new equipment, generally base-load direct coal-fired. He noted that the indirect price of oil, at which utilities will abandon their oil-fired

equipment and build coal-fired, can reach as high as \$50 a barrel, indicating the attractiveness of coal-oil liquids in the utility sector.

Jackson discussed Gulf's involvement as a prime contractor and financial positioner in a program to design, build, and operate an SRC-II demonstration module.

Harry Enoch, Assistant Director, Technology Assessment, Kentucky Center for Energy Research

Enoch presented an overview of the State of Kentucky's activities in the area of coal conversion. Demonstration projects currently underway include the H-coal pilot plant in Catlettsburg, Kentucky; and SRC-I demonstration module in Newman, Kentucky; and a commercial-size ammonia plant using coal as its feedstock for hydrogen production. The scope of the latter project has been changed to production of methanol from coal syngas and methanol to gasoline, using the Mobil-M process. This project is located in Baskett, Kentucky.

The State of Kentucky is conducting background studies to find suitable sites for large coal conversion facilities. Potential sites are identified and catalogued based on several general criteria, including availability of land, water, coal, and transportation. The state will begin soon to investigate sites that are out of the coalfields and off rivers.

Enoch challenged the conclusions of a DOE report, *Environmental Analyses of Synthetic Liquid Fuels*, which identified no adequate sites for synfuels plants in the State of Kentucky.

William Telliard, Branch Chief, Effluent Guidelines Division, EPA-Washington

Telliard discussed standards-setting procedures, activities, and plans relating to liquid effluents from coal liquefaction. The Effluent Guidelines Division is developing a program that will lead to the creation of New Source Performance Standards for the synthetic fuel industry. Their priorities will be set by those industries with the shortest schedule before coming on-line; that is, those with an immediate need for a permit to operate. They are discussing efforts in gasohol and gasification, and plan to address the 65 priority pollutant groups. Present estimates call for proposed regulations for liquefaction to be issued in 1983.

He stressed the need for treatability information, which, in the absence of a regulation, gives the permit writer source information with which to work.

Telliard also briefly outlined the major steps involved in the development of effluent guidelines: waste characterization, alternative treatment technologies, economics, and engineering costing.

Terry Thoem, Director, Energy Policy Coordination Office, EPA-Region VIII

Thoem discussed permitting procedures as they relate to coal liquefaction facilities. He noted that the intent of most federal environmental legislation is to delegate regulatory programs to the states. Once a program is delegated to a state, EPA assumes an oversight role, with the state issuing the permit and EPA providing technical assistance if needed.

Thoem summarized the various tools used in regulation of air quality, including New Source Performance Standards, State Implementation Plans, Prevention of Significant Deterioration permits, the concept of Best Available Control Technology, ambient increments, and visibility regulations. He also described mechanisms for water quality and solid waste control, including the provisions of the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, the Solid Waste Act, and the Resource Conservation and Recovery Act.

He noted that EPA is investigating ways to simplify the permit process, including consolidating permit requirements and streamlining the application process. He said that EPA is committed to processing all energy facility permit applications in 6 months.

Richard Eccles, Vice President, Hydrocarbon Research, Inc.

Eccles described the activities of Hydrocarbon Research, which does not commercialize technology, but rather develops it and makes it available, performing front-end activities such as laboratory work, planning, and early design. HRI coal liquefaction involvement described by Eccles includes a 3.5 ton-a-day process development unit used to simulate the operation of the Catlettsburg H-Coal pilot plant, a process development unit at the Wilsonville SRC facility, participation in the second-generation gasification project of the Illinois Coal Gasification Group, and development of a new process called

coal/oil integrated liquefaction (COIL), an ebullated bed with coal and oil fed as a mixture.

Vernon W. Weekman, Jr., Manager, Process R&D, Mobil Oil Corporation

Weekman discussed the conversion of methanol to gasoline. Mobil is negotiating with the Government of New Zealand for the development of a fixed-bed unit for the conversion of natural gas. The unit will use a unique new zeolite catalyst developed by Mobil.

Mobil is also working on a fluid-bed version and has completed a 4 barrel-a-day pilot plant with DOE. They are currently negotiating with DOE, the Government of the German Federal Republic, and two German companies for a scale-up to 100 barrels a day. The gasoline produced in this process is environmentally cleaner than conventional gasoline, according to Weekman, who said that process waste streams are comparable to those of a refinery.

Barnet Groten, Director, Research and Technology, Texas Eastern Corporation

Groten presented a summary of Texas Eastern's energy activities, which include interstate gas and liquid products transmission systems, and oil and gas production. Research and development activities include heavy oil production, secondary and tertiary recovery of petroleum from conventional reservoirs, development of unconventional gas sources, and investigations in synthetic fuels technology.

He discussed environmental aspects of the three processes that are ready for commercialization: Lurgi gasification followed by methanation to SNG, production of methanol, and Fischer-Tropsch to liquid fuels.

Evaluation of Lurgi gasification, in the form of Environmental Impact Statements, is continuing. The environmental aspects of the methanol module in a coal-to-methanol plant are as well understood as those of any methanol plant based on natural gas reforming.

Texas Eastern has recently contracted with SASOL, Limited, to evaluate the cost of building a Fischer-Tropsch plant at a U.S. site, employing U.S. coals, and conforming with U.S. environmental requirements. South Africa's 20 years of operational experience with this process has created a thorough understanding of its environmental effects.

Groten noted an important distinction between the abovementioned indirect processes and the direct technologies, which involve a synthetic crude product that is far less fully characterized and a process that has reached neither the scale nor the endurance level of any of the indirects.

Sid Thomson, Manager, Environmental Engineering, Fluor Engineering and Construction, Inc.

Thomson characterized Fluor's activities in the engineering and construction of environmentally acceptable coal liquefaction plants. Fluor is participating in the SASOL projects with the government of South Africa. Through their experience with SASOL and other projects, they have found that environmental impacts resulting from the indirect processing of coal to liquids by the Fischer-Tropsch process can be mitigated by proper design based on present knowledge.

He described the process and its products in detail, using as an example the WESCO Project, for which an uncontested Environmental Impact Statement was issued and which received a permit to operate and construct from the State of New Mexico.

Daniel M. Pierce, Chairman, Illinois Energy Resources Commission

Pierce detailed the activities of the State of Illinois in synthetic fuels, including a fluidized-bed project with Combustion Engineering at Great Lakes Naval Training Station. The state has been unsuccessful in attracting and retaining federal support for other projects.

He discussed the impact of the Administration's energy program on syn-fuels development, noting that we may see some shortcuts taken in environmental regulation.

Illinois' qualifications as a site for gasification and liquefaction plants were outlined. Pierce discussed a coal gasification project being developed by Allis-Chalmers. Illinois has authorized \$18 million in coal development funds for this kiln gas project at the Wood River Plant. The Illinois Power Company and a national consortium of 15 to 20 electric utilities are helping to fund the project. Its long-term objective is to make a gasifier out of the kilns that are now used in iron ore work and to

roduce a low-Btu natural gas to be fed into Illinois Power's existing steam boiler plant at Wood River.

Pierce also outlined plans for the Cumberland Energy Plex, a total-concept energy facility planned for southeastern Illinois. Plans call for the construction of four new coal mines, supplying 4,000 tons of coal per day to power plants. The Energy Plex would also produce synthetic natural gas and ammonia.

Dorothy G. Weatherman is with Hittman Associates, Inc., Columbia, MD 21045.

D. Bruce Henschel is the EPA Project Officer (see below).

The complete report, entitled "Proceedings: EPA/Industry Forum on Coal Liquefaction (October 1979)," (Order No. PB 81-113 052; Cost: \$15.50, subject to change) will be available only from:

National Technical Information Service

5285 Port Royal Road

Springfield, VA 22161

Telephone: 703-487-4650

The EPA Project Officer can be contacted at:

Industrial Environmental Research Laboratory

U.S. Environmental Protection Agency

Research Triangle Park, NC 27711

United States
Environmental Protection
Agency

Center for Environmental Research
Information
Cincinnati OH 45268

Postage and
Fees Paid
Environmental
Protection
Agency
EPA 335



Official Business
Penalty for Private Use \$300

PS 0000329
U S ENVIR PROTECTION AGENCY
REGION 5 LIBRARY
230 S DEARBORN STREET
CHICAGO IL 60604