RISKS AND UNCERTAINTIES IN COMMERCIAL DEVELOPMENT OF COAL-BASED FUELS

Joel Zipp
Alison Poccia
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I. INTRODUCTION***

Production of significant amounts of synthetic fuel in the 1990's will require the establishment of a large, new, multi-faceted industry over a limited period of time. A synthetic fuel production capacity of 1.5 million barrels per day will require capital investments in excess of $110 billion (in current dollars), some portion of which will have to be provided by outright Federal funding or underwritten by a variety of Federal guarantees.¹

On June 30, 1980 President Carter signed into law the United States Synthetic Fuels Corporation Act (SFCA) of 1980,² a major commitment of public funds to the development of a commercial synthetic fuels industry. Government interest in synthetic fuels is not a new idea. The O'Mahoney-Randolph Synthetic Liquid Fuels Act of 1944³ created a program run by the Office of Synthetic Liquid

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¹. SENATE COMM. ON BANKING, HOUSING AND URBAN AFFAIRS & SENATE COMM. ON ENERGY AND NATURAL RESOURCES, REPORT ON DEFENSE PRODUCTION ACT EXTENSION AMENDMENTS OF 1979, S. REP. NO. 96-387, 96th Cong., 1st Sess. 131 (1979) [hereinafter cited as EXTENDING THE DEFENSE PRODUCTION ACT].
Fuels which sponsored $87.6 million of research and demonstration projects on liquid fuels derived from coal, oil shale, and agricultural and forestry products over a twelve-year period. In 1974, the Federal Non-Nuclear Energy Research and Development Act authorized the Energy Research and Development Administration (ERDA), predecessor of the Department of Energy (DOE), to undertake a wide range of joint ventures with private industry to foster development of alternative fuels. The Synthetic Fuels Corporation (SFC), however, with an initial authorization of $20 billion and another $68 billion projected over a twelve-year period, represents a different kind of undertaking. Federal dollars invested in the SFC are intended to support commercial development, whereas the prior acts supported technological development.

Commercial production of synthetic fuels from coal has proven successful in other countries. Twenty-five plants produced 5 million tons of synthetic oil and liquefied gas per year to fuel the German war effort from 1939 to 1945. In the early 1950's, the Republic of South Africa built a state owned petrochemical and fuel complex, SASOL I, which produces a full range of petrochemical derivatives, including synthetic oil and gas. A second, larger plant, SASOL II, produces liquid fuels from 40,000 tons of coal per day. With the completion of two more plants scheduled by the mid-1980's, South Africa will become substantially independent of crude oil imports. At a time of unprecedented demand for oil and gas, however, and in the face of uncertain supplies and sharply escalating prices of imported fuel, not a single commercial-sized plant for producing synthetic fuels from coal has been built in the United States. Why has

6. Id. §§ 5906-5907 (West 1979).
7. Id. § 8751 (West Supp. 1980).
8. See notes 143-45 infra and accompanying text.
9. CONGRESSIONAL RESEARCH SERVICE, 96TH CONG., 1ST SESS., SYNTHETIC FUELS FROM COAL: STATUS AND OUTLOOK OF COAL GASIFICATION AND LIQUEFACTION, SENATE COMM. ON ENERGY AND NATURAL RESOURCES, 48 (Comm. Print 1979) [hereinafter cited as SYNTHETIC FUELS FROM COAL].
10. STAFF OF HOUSE COMM. ON SCIENCE & TECHNOLOGY, 96TH CONG., 2D SESS., OVERSIGHT OF ENERGY DEVELOPMENT IN AFRICA AND THE MIDDLE EAST 25 (Comm. Print 1980) [hereinafter cited as OVERSIGHT OF ENERGY DEVELOPMENT IN AFRICA AND THE MIDDLE EAST].
11. Id.
12. Id.
13. The largest coal-based synthetic fuels plants operating in the United States are
the private sector failed to invest in synthetic fuels? Why has the government been called upon to subsidize this potentially lucrative new industry?

This article will examine some of the technological, environmental, and market risks involved in launching coal-based, synthetic fuel projects on a commercial scale. A discussion of the financing arrangements for a coal gasification project that has been in the planning stages for many years will illustrate market efforts to minimize those risks. Finally, both the policy implications and the probable effects of the SFCA will be discussed.

II. TECHNOLOGY: STATE OF THE ART

Coal, shale oil, tar sands, and biomass are the major sources for synthetic fuels. Of these, coal and shale oil have the greatest potential; the United States has recoverable coal reserves estimated at more than 250 billion tons and recoverable shale oil reserves of about 600 billion barrels. While tar sands and biomass have equally impressive capacities, the technologies and environmental impacts of the conversion processes for these materials presently are not well defined.

The basic technology for producing gaseous and liquid fuels from coal is known. In the gasification process, lump or pulverized coal is reacted with air or pure oxygen and steam at extreme temperatures to produce a combustible gaseous mixture. When air and steam are used as reactants, a low-Btu gas is produced which, after

Ashland Oil's H-Coal pilot plant in Catlettsburg, Kentucky, and Exxon's Donor Solvent pilot plant in Baytown, Texas. Each produces about 600 barrels of crude oil equivalent per day. Both plants were built as joint ventures with the Department of Energy. [1980] EN. USERS REP. (BNA) No. 371, at 18.

14. Biomass is defined as "the amount of living matter of one or more kinds of organisms present in a particular habitat usually expressed as weight of organisms per unit area of habitat or as volume or weight of organisms per unit volume of habitat." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 218 (1976).


16. See FORD FOUNDATION, ENERGY: THE NEXT TWENTY YEARS 477 (1979) (hereinafter cited as FORD FOUNDATION, ENERGY) (suggesting only the lack of technology in obtaining biomass from the environment limits its use as a source of energy); [1978] 1 ENERGY MGMT. (CCH) ¶ 3784, at 3805 (suggesting that recovery of oil from tar sands could be economically attractive if there is a "significant breakthrough in this area").

17. [1978] 1 ENERGY MGMT. (CCH) ¶ 3746.

18. A Btu, British thermal unit, is the amount of energy required to raise the temperature of one pound of water one degree farenheit. WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 279 (1976). The gradations of synthetic gas are as follows: Low-
purification to remove particulates and sulfur compounds, may be used as a fuel for process heat or power production. When pure oxygen and steam are the reactants, a medium-Btu gas is produced, consisting primarily of a mixture of hydrogen and carbon monoxide plus varying amounts of methane and other gases. Medium-Btu gas has a higher heating value than low-Btu gas and, after purification, may be used as a gaseous fuel or as a starting point for a variety of chemicals or liquid fuels. Purified medium-Btu gas may also be reacted over suitable catalysts to produce high-Btu gas. This product is a direct substitute for natural gas and may be mixed with natural gas in transmission pipelines.

There are several coal liquefaction processes under study today. In the indirect liquefaction process used at the SASOL plants in South Africa, gasifiers first produce raw synthetic gas from crushed coal. After purification, the carbon monoxide and hydrogen in the gas are converted to liquid hydrocarbons and oxygenated chemicals within fluid-bed reactors. Although ethylene, alcohols, ketones, ammonia, and sulfur are produced, hydrocarbons such as gasoline, diesel fuel, and heavy oil are the main products.

In direct liquefaction processes, a mixture of pulverized coal and an oil-type solvent is reacted with hydrogen under heat and pressure to produce a product that is the functional equivalent of petroleum. Further refining yields fuel for industrial and domestic heating, generation of electricity, and use in automobiles. No com-

Btu gas ranges from 150 to 300 Btu/cubic foot; medium-Btu gas ranges from 300 to 650 Btu/cubic foot; and high-Btu gas compares with natural gas at 900 to 1000 Btu/cubic foot. See, e.g., Office of Consumers' Counsel v. FERC, 655 F.2d 1132, 1136 n.7 (D.C. Cir. 1980).

20. See FORD FOUNDATION, ENERGY, supra note 16, at 308.
21. See, e.g., OVERSIGHT OF ENERGY DEVELOPMENT IN AFRICA AND THE MIDDLE EAST supra note 10, at 25, 53-55, for brief discussions of petrochemical production at SASOL I.
22. See generally [1978] 1 ENERGY MGMT. (CCH) ¶ 3746, at 3769 (catalytic actions required to convert the gas to its final methane form).
23. FORD FOUNDATION, ENERGY, supra note 16, at 308.
26. Id.
27. Id.
28. See id. SASOL II is designed to convert coal into gasoline and diesel products, among other things.
commercial plants for direct liquefaction of coal, however, currently are in operation in the United States.

While the SASOL plants leave little doubt that production of gaseous and liquid fuels from coal is feasible, significant questions remain as to whether this technology is transferable to the United States. Scaling up novel processes is a more difficult venture and greater risks are involved. An additional problem involves the capability of plants to sustain production at design capacity over long periods of time without substantial downtime for maintenance. Coal presents special difficulties because various kinds of coal require different handling techniques, respond differently in chemical reactions, and produce different concentrations of products and byproducts. Techniques successful with one variety of coal may fail with another.

The sheer size of a full-scale synthetic fuel plant presents other problems. Where projects are situated in rural areas, shortages of particular kinds of equipment and of specialized construction skills could develop locally and delay construction. Construction crews on the SASOL II plant peaked at 20,000 workers. A DOE study indicates that a 100,000 barrel per day syncrude plant would require a population increment of 20,500 people at a rural construction site. Significant social dislocations accompanying the influx of workers into isolated communities could result in excessively high labor turnover and decreased worker productivity.


31. The four major varieties of coal are: Bituminous; anthracite; coke; and lignite. WEBSTERS THIRD NEW INTERNATIONAL DICTIONARY 432 (1976).

32. See [1978] 1 ENERGY MGMT. (CCH) ¶ 3746 (different grades of coal may require different gasification processes).

33. See generally SYNTHETIC FUELS FROM COAL, supra note 9, at 55-64 for a discussion of various liquefaction processes using different kinds of coal.

34. EXTENDING THE DEFENSE PRODUCTION ACT, supra note 1, at 138.


36. "[In the construction of the Jim Bridger Power Generating Facility in Rock Springs, Wyoming, the company suffered greatly from productivity problems due to social disruption. Some observers have estimated that the impact of this productivity decline nearly doubled the originally estimated cost of the plant.]" EXTENDING THE DEFENSE PRODUCTION ACT, supra note 1, at 24 (quoting Richard Lamm, Governor of Colorado). For a discussion of placing responsibility for social costs of large-scale power plant construction, see Watson, Measuring and Mitigating Socio-Economic Environmental Impacts of Constructing Energy Projects: An Emerging Regulatory Issue, 10 NAT. RESOURCES LAW. 393 (1977).
III. Environment: A Regulatory Risk

Coal has been characterized as one of the most environmentally disruptive energy sources.\(^{37}\) Underground mining may disturb the natural drainage patterns of subterranean water systems and pollute them with a variety of substances.\(^{38}\) Strip mining, the most economical mining method for many coal deposits,\(^{39}\) may ruin surface land.\(^{40}\) Although adequate reclamation does not necessitate a return to prior conditions, excessive erosion, especially in arid and hilly regions, may make even marginal reclamation impossible.

Conversion to synthetic fuels eliminates most of the pollution problems associated with the direct combustion of coal. The conversion plants themselves, however, create a new set of environmental, health, and safety concerns. The exact nature and magnitude of these environmental impacts will be discovered only through the operation of demonstration plants or full-scale plants.\(^{41}\)

The solid waste from a gasification reactor is similar in quantity to that produced in direct coal combustion. There may be differences, however, in leachability, organic content, and chemical states of the components, depending on the process used. Leachability tests indicate that higher gasification temperatures produce less leachable solid residues.\(^{42}\) Some processes, therefore, will require careful waste disposal.

Depending on the conversion process used, waste process water may be contaminated with tars, oils, soluble organic materials, hydrocarbons, and dissolved inorganic salts. While water purification and reuse procedures have been developed for gasification processes in commercial use in other countries,\(^{43}\) much of the plant's cost may be involved in the control of effluents.\(^{44}\)

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39. See id. at 286.
40. Id. at 296.
41. The total environmental and health impact of coal conversion is not established. While end-use combustion of synthetic fuels is comparable to natural gas combustion, Synthetic Fuels From Coal, supra note 9, at 101-07, the sum of waste products at the conversion site and at the end use may equal or exceed those produced by direct conventional burning of coal. Id. at 77-101.
43. See Oversight Of Energy Development In Africa And The Middle East, supra note 10, at 21-28, for a discussion of water purification at SASOL I and subsequent design changes for SASOL II and III.
44. See generally Oversight Of Energy Development In Africa And The
The vent gases released from coal conversion plants will be essentially free of pollutants.\textsuperscript{45} The size and complexity of these plants and the ever-present possibility of fugitive emissions, however, will necessitate constant surveillance and monitoring.\textsuperscript{46}

Conditions of combustion of any fossil fuel composition produce various amounts of sulfur and nitrogen oxides.\textsuperscript{47} The possible long-range environmental effects of these substances raise serious questions about the wisdom of developing coal-based synthetic fuels as an alternative energy source.\textsuperscript{48} Sulfur and nitrogen oxides released into the atmosphere combine with water to produce acid rains.\textsuperscript{49} Acid precipitation contaminates water supplies, upsets aquatic ecosystems, and increases the concentrations of dissolved toxic trace metals in the soil.\textsuperscript{50} Because they have been purified in the conversion process, synthetic fuels release less sulfur than does coal upon combustion.\textsuperscript{51}

While coal-based synthetic fuels, as compared with coal itself, generally will reduce the release of sulfur compounds and nitrogen oxides, they will not reduce the overall release of carbon dioxide.\textsuperscript{52} Carbon dioxide acts as a blanket, trapping heat within the earth's atmosphere.\textsuperscript{53} A significant increase in the level of atmospheric carbon dioxide due to combustion of fossil fuels could seriously disturb the global climate by raising the mean global temperatures.\textsuperscript{54} According to the National Research Council, climate changes due to carbon dioxide emissions would be irreversible by the time they were

\textsuperscript{45} See FORD FOUNDATION, ENERGY, supra note 16, at 316. ("Most of the air pollutants produced during the coal conversion step must be reduced to low levels for process reasons or to meet product quality requirements, so the amount finally discharged or contained in the product should be small.").

\textsuperscript{46} The Environmental Protection Agency will determine environmental requirements for synfuels projects on a case-by-case basis. It plans to issue nonbinding pollution control standards for six major synfuel production technologies during 1981. [1980] EN. USERS REP. (BNA) No. 385, at 14.

\textsuperscript{47} FORD FOUNDATION, ENERGY, supra note 16, at 336.

\textsuperscript{48} Id. at 341.

\textsuperscript{49} Id. at 338-43.

\textsuperscript{50} Id.

\textsuperscript{51} ENERGY IN TRANSITION, supra note 37, at 487.

\textsuperscript{52} See Synthetic Fuels: Hearings on S. 1377 Before the Comm. on Governmental Affairs, 96th Cong., 1st Sess. 52 (1979) (statement of Gordon T. MacDonald) (synthetic fuels produce two to three times as much carbon dioxide as do natural fuels).

\textsuperscript{53} Id.

\textsuperscript{54} Id. at 52-53.
Another area of concern is the availability of water. In many western regions currently proposed as sites for conversion facilities, water is a scarce resource. Although the magnitude of the problem as a potential source of environmental disruption is a matter of debate, a Ford Foundation study concluded that the water allocation among numerous competing interests is primarily an economic and political problem. The markets as well as legal and political institutions will have to evaluate the demand, price, and availability of water and determine who will pay how much for what quantities of this resource.

The costs of solving the environmental problems raised by synthetic fuel production, unlike those of solving purely technological problems, are determined by standards set by the government. Investors do not ask how much environmental damage a project will do, but how much the required land reclamation, emission controls, worker safety precautions, water conservation, and waste disposal will add to construction and operating costs. The risks that the various agencies involved in environmental regulation will impose impossible or impractical standards, change their requirements midstream, or simply consume precious time in making a decision, are of primary concern to investors. According to the Chairman of the new SFC, the cost of a $2 billion plant increases by $30,000 for each hour that construction is delayed. The Committee for Economic


56. "Reduced flow and hydrological modifications necessary to assure water supplies during periods of low flow will significantly change the basic ecological conditions in these [western] river basins." Water Available for Energy Development in the West: Hearings Before the Subcomm. on Energy Production and Supply of the Senate Comm. on Energy and Natural Resources, 95th Cong., 2d Sess. 51 (1978) (statement of Alan Merson, Reg. Adm'r, Region 8, Environmental Protection Agency).

57. FORD FOUNDATION, ENERGY, supra note 16.

58. Id. at 316-23.

59. Id.


61. See generally Synthetic Fuels Legislation: Hearings on S. 932, S. 1308 and S. 1377 Before the Senate Comm. on Energy and Natural Resources, 96th Cong., 1st Sess. 396 (1979) [hereinafter cited as Synthetic Fuels Legislation] (statement of David Ormes, Vice Pres., Banker's Trust Co.) ("changes in regulations can easily cause what was a financially defensible project to become uneconomical").

62. Id. at 395-96.

63. Synthetic Fuels Corporation Nominations: Hearings Before the Senate Comm.
Development, an independent research group of business executives and educators,\textsuperscript{64} reported to the Senate Committee on Energy and Natural Resources that the difficulties in applying current environmental regulations to synthetic fuel production stem partly from the technical complexity of the processes involved and the physical characteristics of the likely locations of the plants.\textsuperscript{65} The Committee, however, concluded: "Most importantly, [the difficulties] stem from the delays and uncertainties surrounding governmental actions on environmental matters. These can add enough to the already high risks in synthetic fuel ventures to effectively discourage private investment in such ventures."\textsuperscript{66}

IV. MARKETS: THE ULTIMATE QUESTION

Technological, environmental, and regulatory uncertainties combine to produce a broad range of estimates for the cost of coal-based synthetic fuels. While the prospect of significant cost overruns during construction kindle fears that debt repayment may be delayed, investors’ long-range concern is with the marketability of the product, measured by the price of synthetic fuels compared to the price of available alternative fuels.\textsuperscript{67} Such alternatives include foreign and domestic fuels. The Arab Oil Embargo of 1973 and the Iranian crisis highlighted the unreliability of foreign oil supplies. The pricing policies of the Organization of Petroleum Exporting Countries (OPEC) appear to be beyond our control or prediction. The foreign policy of the United States, however, will have some impact on both the quantity and the price of imports available, and a viable synthetic fuel industry in the United States may put a ceiling on OPEC price increases.\textsuperscript{68}

Price controls on domestic oil and natural gas have seriously distorted the energy market in the United States by increasing demand and limiting incentive for production.\textsuperscript{69} President Reagan lifted price controls on domestic oil in January 1981,\textsuperscript{70} and the Natural Gas Policy Act of 1978 (Natural Gas Act) provides for decontrol

\textsuperscript{64} Synthetic Fuels Legislation, supra note 61, at 141 (statement of the Research and Policy Comm. of the Comm. for Economic Development).
\textsuperscript{65} Id. at 185.
\textsuperscript{66} Id.
\textsuperscript{67} Id. at 393-97 (statement of David Ormes, Vice Pres., Banker’s Trust Co.).
\textsuperscript{68} Extending the Defense Production Act, supra note 1, at 133.
\textsuperscript{69} Stobaugh & Yergin, Energy Future, supra note 30, at 275-76.
of most natural gas prices by 1985.\footnote{15 U.S.C.A. § 3331 (West Supp. 1980).} The full impact of these actions, however, will not be realized for several years. Electric utilities, which consume thirty-one percent of the fuel used in this country annually,\footnote{[1981] EN. USERS REP. REFERENCE FILE (BNA) at 0109.} remain subject to stringent rate regulation. Government manipulation of the market in which synthetic fuels must compete, directly by price controls and indirectly by tax mechanisms, is a major source of speculation and uncertainty for potential investors.\footnote{Horwitch, \textit{Coal: Constrained Abundance}, in \textit{Energy Future}, supra note 30, at 93, 123.}

In assessing the prospects of a synthetic fuel plant, investors must project the costs associated with current government policies into a politically and economically volatile future. Commercial-sized plants require enormous capital outlays, and lead times are estimated at five years or more.\footnote{Stobaugh & Yergin, \textit{Energy Future} supra note 30, at 282-83.} Unanticipated changes in environmental and other government requirements or in the prices of domestic or imported oil could turn a $1.5 billion project into a financial disaster. While some within the government still argue that the private market should determine the optimum timing and level of commercial synthetic fuels development,\footnote{Market forces, as they are perceived by decision-makers in the private sector, will determine the economically optimal mix of alternative energy technologies to displace the undue reliance on petroleum and natural gas. \ldots An important theme of this report is that the private sector and market forces are the most efficient means of achieving the Nation's energy goals. \textit{Energy Research and Development Administration, A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future} 37 (1976).} the pervasive and multifarious effects of government involvement in the energy field cannot be ignored. To a great extent, the risks investors have faced in the synthetic fuels industry were created and controlled, not by free market forces, but by government actions. The present administration, however, may change the investment climate in the synthetic fuel market.

During the 1970's, American industries of all kinds suffered from tight capital markets.\footnote{Solomon & Belzer, \textit{Looking Ahead: Capital Shortages, Tax Policy, and Economic Planning}, 51 \textit{Notre Dame Law.} 251 (1975).} Regulated utility companies had difficulties in raising sufficient capital for conventional outlays.\footnote{Horwitch, \textit{supra} note 73, at 93, 100.} Special risks and high stakes are involved in building a commercial-sized synthetic fuel facility. It is not surprising that the energy industry
has had difficulty attracting sufficient investment to support such a project. A particularly innovative financing scheme developed by a consortium of pipeline companies for the construction of a coal gasification plant illustrates the crucial role of government actions in investment planning.

V. THE GREAT PLAINS COAL GASIFICATION PROJECT: A PRIVATE SECTOR RESPONSE

In March 1975, the Michigan Wisconsin Pipe Line Company (Michigan-Wisconsin) and its affiliate, ANG Coal Gasification Resources Company (ANG), filed an application with the Federal Power Commission (FPC) seeking a certificate of public convenience and necessity in order to permit ANG to sell synthetic natural gas from a proposed coal gasification plant, commingled with natural gas, to Michigan-Wisconsin. While the FPC had no direct power to regulate production, transportation, or sale of synthetic gas under the Natural Gas Act, it may have had the authority to set the rates that Michigan-Wisconsin, an FPC jurisdiction natural gas pipeline company, could charge its customers for commingled natural and synthetic gas. By structuring the project to bring it within the jurisdiction of the FPC, the companies hoped to reduce the risk that the coal gas produced would be too expensive to be competitive. If the FPC had jurisdiction, it could authorize the regulated pipeline company to charge a higher rate for all gas to reflect the rolled-in cost of the synthetic gas. Michigan-Wisconsin also sought permission to include interest on debt and return on equity investment during construction of the gasification plant in its current rates, thus assuring investors of a return on capital even before their investment produced any fuel for sale. Although the FPC usually required that carrying costs on construction funds be included in the rate base only after the plant became operative, the companies urged that a surcharge to cover interest on debt and a return on equity during

82. FERC Op. No. 69, supra note 78, at 14,282-83.
83. Id. at 14,287.
construction was necessary to procure financing.84

Between 1975 and 1978, four hearings were held before the FPC and its successor, the Federal Energy Regulatory Commission (FERC),85 to consider the scope and purpose of the project.86 The FERC changed the original plan. The final plan envisioned a plant designed to produce during its initial phase an average of 125 million cubic feet of high-Btu gas per day (half the original amount) from lignite coal obtained from an adjacent strip mine.87 The plant would be built in Mercer County, North Dakota by Great Plains Gasification Associates, a consortium of five affiliates of natural gas pipeline companies.88 While economic conditions made cost projections uncertain, project sponsors estimated that, in 1978 dollars, the total installed cost of the gasification plant would be approximately $900 million.89 The associated coal mine would cost an additional $85 million.90 A 7.5% annual rate of inflation was assumed, bringing the estimate of the capital costs of the plant and mine to approximately $1.2 to 1.5 billion.91 An analysis considering the impact of inflation, cost overruns, and change in plant output concluded the initial cost of gas could range from $5.56 to $8.62 per thousand cubic feet.92

A major factor underlying the sponsors' choice of financing was the magnitude of the investment required for the project in relation to the small quantity of coal gas to be produced.93 In an effort to reduce their exposure to risk, particularly with respect to the debt financing, and at the suggestion of the DOE, the sponsors chose

84. Id.
85. 16 U.S.C. § 792 (1977) created the FPC. 42 U.S.C.A. §§ 7151, 7172 (West Supp. 1980) created the FERC and transferred to it the powers formerly vested in the FPC.
86. Included in the scope and purpose of the project were its technological feasibility and anticipated environmental impact, the marketability of the synthetic gas, and the proposed financing plan. See Office of Consumers' Counsel v. FERC, 655 F.2d 1132 (D.C. Cir. 1980).
87. Id. at 1135-36.
88. Id. at 1135.
89. Id. at 1135 n.4.
90. Id.
91. Id.
93. See Office of Consumers' Counsel v. FERC, 655 F.2d 1132, 1135-36 (D.C. Cir. 1980) (construction costs estimated as exceeding $1 billion while production capacity reduced from 250,000 Mcf to 125,000 Mcf of synthetic gas per day).
"ratepayer project financing." Project financing typically requires a credit capacity from some source to provide assurances loans will be repaid. In this case the ratepayers, as ultimate consumers of the commingled gas, would guarantee the loans.

For the Great Plains project, financing would be 75% debt, initially obtained from commercial lenders, and 25% equity, consisting of paid-in equity and reinvestment of both the investment tax credit and the proposed 15% after-tax return on equity investment during construction. The prospective lenders and equity investors agreed to sponsor the project only if the FERC approved an "all-events tariff." The all-events tariff was a rate schedule that guaranteed recovery of debt principal in all events.

During the time the Great Plains proposal was under consideration, the FPC, in an effort to stimulate research, development, and demonstration (RD&D) efforts by jurisdictional companies, issued Order No. 566. Order No. 566 established a procedure whereby companies contemplating RD&D projects costing more than $50,000 and requiring high risk financial support could apply to the FPC for advance assurance of rate treatment. If the FPC found the proposal met its criteria for necessity and feasibility, in advance, it could assure investors that operational costs of the project would flow through to the customers and that RD&D expenditures for the project would be reflected in the rates charged for gas.

When the Great Plains proposal was cast as an RD&D proposal instead of as a conventional gas supply project, the FERC observed that the technological, environmental, and economic uncertainties surrounding the production of high-Btu gas from coal could deter potential entrepreneurs from undertaking coal gasification investments and that the Great Plains project was needed to eliminate or reduce those uncertainties. In thus finding that the project qualified for treatment as an RD&D project, the FERC did not re-

94. Id. at 1137.
95. Id.
96. FERC Op. No. 69, supra note 78, at 14,282.
97. Id. at 14,283.
98. Id.
100. Id.
101. Id.
102. The FERC had by that time replaced the FPC. 42 U.S.C.A. §§ 7157, 7172 (West 1979).
103. FERC Op. No. 69, supra note 78, at 14,286.
quire standard financing and tariff arrangements. The FERC considered each of the special financing arrangements proposed by the Great Plains consortium. Except for reducing the return on equity from 15% to 13% and allowing equity return only for costs "prudently incurred" in case of project failure, the FERC substantially approved the financing package and issued a certificate of public convenience and necessity based upon it.

The Great Plains tariff and financing package authorized by the FERC constituted a significant departure from past FERC practice. For example, in *Tecon Gasification Co.*, the FPC rejected a proposal to construct a naphtha feedstock gasification facility using a financing arrangement containing essentially the same features as were authorized for the Great Plains project. In *Tecon Gasification*, the FPC held that "the gas shortage should not, and legally cannot, be used to justify unsound and uneconomic projects that will never be built without the guarantees sought and the transfer of all risks to the consumer. . . ." 

The FPC issued *Tecon Gasification* during the Arab Oil Embargo of 1973. One year later, when presented with a proposal to construct the nation's first major coal gasification project in *Transwestern Pipeline Co. (WESCO)*, it recognized that coal gasification was one means by which the United States could reduce its vulnerability to foreign oil markets. Moreover, the FPC acknowledged that investors in needed experimental projects would require some assurance of recovering their investment. Nevertheless, in *WESCO* the FPC rejected many of the financing and tariff features approved by the FERC in its Great Plains decision.

Several customers of the pipeline companies involved in the

104. *Id.* at 14,289.
105. *Id.* at 14,289-90.
107. *Id.* at 844-46.
108. *Id.* at 848.
110. *Id.* at 1299.
111. *Id.*
112. The FPC's order issuing a conditional certificate of public convenience and necessity for WESCO was affirmed on appeal by environmental interests in *Silentman v. FPC*, 566 F.2d 237, 242 (D.C. Cir. 1977). The proposed WESCO plant, originally conceived to produce 250 million cubic feet of high-Btu gas per day from New Mexican coal, was never built. The project's proponents subsequently requested a rate base adjustment for the expenditures incurred for the study, design and planning of the plant. FERC denied the request. *Transwestern Pipeline Co., [1979] UTIL. L. REP. (CCH) ¶ 12,201, at 13,923-24.*
Great Plains project intervened in the FERC certification proceedings. The administrative law judge who issued the initial decision on the Great Plains application found that it would be inequitable to have one-third of the country's gas customers pay all the costs of the project while the benefits of learning whether it was practicable to manufacture and market coal gas would inure to the nation as a whole. When the case was heard before the full Commission, the FERC noted that while the parties might prefer some form of taxpayer support to spread the costs of the project, no proposal for such support was before it. In granting the requested certificate of convenience, however, the FERC ordered that if any legislation was enacted through which financial support for the project might be available, the Great Plains sponsors should seek such support. Under reconsideration and clarification of its order in February 1980, the FERC reiterated that “the applicants will be expected to pursue actively all reasonable measures to spread the direct financial costs of this project more widely by broadening the support as much as possible.”

Not content with this proviso, the intervenors took an appeal from the FERC's decision to the United States Court of Appeals for the District of Columbia. In Office of Consumers' Council v. FERC, the court of appeals decided that while the FERC's jurisdiction included authority to regulate commingled natural and synthetic gas, it did not extend to financing and regulating a facility devoted exclusively to the production of synthetic gas, especially prior to the occurrence of a jurisdictional event. The court held that the FERC exceeded its statutory authority in attempting to create a ratepayer-based financing package for construction of a commercial-sized coal gasification plant, as its ratesetting and certificating powers were not granted to it for that purpose. In reversing the FERC's action for lack of jurisdiction, the court noted

114. Id. at 1137 (quoting the Initial Decision of the Administrative Law Judge, 28 J.A. 396, at 403, 427 (June 6, 1979)).
116. Id.
118. Office of Consumers' Counsel v. FERC, 655 F.2d 1132 (D.C. Cir. 1980).
119. 655 F.2d 1132 (D.C. Cir. 1980).
120. Id. at 1143; see Henry v. FPC, 513 F.2d 395 (D.C. Cir. 1975). The jurisdictional event would be the commingling of the synthetic gas with natural gas. 655 F.2d at 1143.
121. 655 F.2d at 1145.
that Congress recently had created an integrated, comprehensive plan for developing the nation's alternative fuels industries. It held that the FERC improperly had ignored contemporaneous legislative acts in attempting to extend its own authority in order to fill a perceived national need for commercial development of synthetic fuels. In concluding its opinion, the court echoed Tecon Gasification:

This court fully understands the urgency which underlies our country's strivings to achieve energy self-sufficiency, and we recognize also that promotion of coal gasification may serve that goal. But despite the stress of the energy crisis, federal involvement in synfuel promotion can only proceed pursuant to legal authority conferred by statute.

Thus, unless the Natural Gas Act is amended to give the FERC jurisdiction over such facilities, the indirect route of using an existing regulatory scheme to underwrite risks and encourage private investments in large-scale coal gasification projects has been foreclosed. In the meantime, Congress has chosen to promote the synthetic fuels industry directly with a major commitment of federal dollars.

VI. THE SFC: GOVERNMENT RESPONSE

Spurred by cutbacks in supplies of foreign oil, President Carter addressed the nation on July 15, 1979:

In little more than two decades we've gone from a position of energy independence to one in which almost half of the oil we use comes from foreign countries, at prices that are going through the roof. Our excessive dependence on OPEC has already taken a tremendous toll on our economy and our people. This is the direct cause of the long lines which have made millions of you spend aggravating hours waiting for gasoline. It's a cause of the increased inflation and unemployment that we now face. This intolerable dependence on foreign oil threatens our economic independence and the very security of our Nation.

The Administration proposed a multifaceted energy program designed to reduce the present 8.5 million barrels per day level of

122. Id. at 1149-52.
123. Id. at 1152.
124. Id. at 1153.
petroleum imports by 4.5 million barrels per day in ten years.\textsuperscript{126} Central to this program was a commitment to develop a synthetic fuels industry capable of producing 2.5 million barrels per day of crude oil equivalent by 1990.\textsuperscript{127} To reach this goal, President Carter proposed the creation of an independent corporation that would stimulate production of synthetic fuels by using federal funds to underwrite the risks that the private sector was unwilling to assume.\textsuperscript{128}

After almost a year of congressional hearings, reports, and debate, the Energy Security Act of 1980 established the SFC, vested with the responsibility for achieving the national goal of a domestic synthetic fuel production capability equivalent of at least .5 million barrels per day of crude oil by 1987 and the equivalent of at least 2 million barrels per day of crude oil by 1992.\textsuperscript{129} In its initial phase, the SFC was authorized to solicit proposals for synthetic fuels projects\textsuperscript{130} and to award financial assistance in the form of price guarantees, purchase agreements, loan guarantees, loans, and joint ventures to qualified applicants.\textsuperscript{131} In the absence of suitable proposals, the SFC, on its own initiative, may build up to three synthetic fuel projects that it deems essential to the development of a synthetic fuels industry.\textsuperscript{132} Twenty billion dollars was appropriated for this first stage.\textsuperscript{133}

Within four years, the board of directors of the SFC must submit its comprehensive strategy designed to achieve the production goals set by the SFCA.\textsuperscript{134} Upon congressional approval of the comprehensive strategy, the SFC may submit periodic requests to Congress for further appropriations that may total $68 billion over the next twelve years.\textsuperscript{135} The SFC will make no financial commitments after 1992 and will cease to exist in 1997.\textsuperscript{136}

Although sponsors and advocates of the SFC have stressed its independence from the restrictions imposed on government agen-
cies,\textsuperscript{137} the powers, procedures, and policies of the Board of Directors of the SFC are not substantially different from those accorded the Administrator of ERDA\textsuperscript{138} under the Federal Non-Nuclear Energy Research and Development Act of 1974.\textsuperscript{139} Like the SFC, the Administrator of ERDA was directed to conceive and implement a comprehensive plan, solicit proposals, and provide financial assistance to synthetic fuels projects in the form of joint ventures, purchase agreements, price guarantees, and loans.\textsuperscript{140} The Administrator also was authorized to form joint federal-industry corporations to "design, construct, operate and maintain one or more experimental demonstration or commercial-size facilities or other operations which will ascertain the technical, environmental and economic feasibility of a particular energy technology."\textsuperscript{141} A 1978 amendment to the Federal Non-Nuclear Energy Research and Development Act of 1979 gave the Administrator authority to make loan guarantees for alternative fuel demonstration facilities.\textsuperscript{142}

The principal difference between the ERDA program of 1974 and the SFC program of 1980 is not in the institutional structure or even in the forms of governmental assistance, but in the goals. The purpose of ERDA was "to establish and vigorously conduct a comprehensive, national program of basic and applied research and development, including but not limited to demonstrations of practical applications, of all potentially beneficial energy sources and utilization technologies."\textsuperscript{143} In contrast, "the Synthetic Fuels Corporation's exclusive objective will be the development of domestic production capacity; it will not engage in research and development

\textsuperscript{137} The Energy Security Corporation [established as the Synthetic Fuels Corporation] would be private and independent, with broad financial authority backed by Treasury financing to provide incentive to private firms (and participating State and local governments), to achieve production of petroleum substitutes. As a private Corporation, specifically not an instrumentality of the Federal government, it would function under laws governing such entities and would be exempt from most restrictions governing Federal agency operations.

\textsuperscript{138} See notes 5 & 6 supra and accompanying text for a brief statutory history of the Energy Research Development Agency.


\textsuperscript{140} Id. §§ 5903, 5905, 5906(a) (West 1976).

\textsuperscript{141} Id. § 5906(b).

\textsuperscript{142} Id. § 5919 (West Supp. 1980).

\textsuperscript{143} Id. § 5902(b)(1) (West 1976).
activities." 144

With the SFC, the government has moved from research and development (R&D) to demonstration and deployment (D&D) of synthetic fuels technology.145 The decision has been made that the potential public benefit from reduced oil imports outweighs the risks that have prevented private investors from undertaking such projects.146 Indeed, the board of directors of the SFC is directed to award financial assistance only after a determination "that adequate financing for the project would not otherwise be available to a proposed synthetic fuel project on reasonable terms and conditions which would permit such project to be undertaken." 147 Although the stated purpose of this requirement is to ensure that SFC funding will supplement and not supplant private investment, the result will be selective subsidization of projects that private industry has deemed to be an unappealing investment. 148

The private sector, not the government, will be the primary producer and consumer of synthetic fuels. Some, therefore, have argued that substitution of government decisionmaking for private decisionmaking at the deployment stage could result in serious distortions in the energy market.149 Projects with government backing would have a decisive economic advantage that could foreclose privately sponsored alternatives. Government financing could lead to prolonged and expensive subsidization of noncompetitive technologies. 150

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144. [1979] EN. USERS REP. (BNA) No. 310, at 3.
145. The distinction between research and development activities and commercial-sized demonstration and deployment activities is derived from FORD FOUNDATION, ENERGY, supra note 16, at 543-68.
146. "Investors have not been willing to commit sizeable funds to projects involving technologies which have been untested at commercial scales of operation. . . . However, given the goals set by the President, we cannot afford the years of delay that would be required to proceed through a more extensive technical evaluation. . . ." Hearings on Energy Financing Legislation Before the Senate Committee on Banking, Housing, and Urban Affairs, 96th Cong., 1st Sess. 54 (1979) (statement of Robert Carswell, Deputy Secretary, Dept. of the Treasury).
148. At least one, admittedly rather small scale, coal-based synthetic fuels project has been undertaken, entirely with private funding, in Southern California. [1979] ENERGY MGMT. (CCH) Supp. No. 341, at 13.
149. See Synthetic Fuels Legislation, supra note 61, at 161 (statement of the Research and Policy Comm. of the Comm. for Economic Development) ("governmental policies that have distorted the economics of energy production and conservation in the past are now acting to discourage needed investment in new technologies.") (emphasis in original).
150. Private industry is much better able than any government bureaucracy to stop the development of a particular project if it later turns out that it is not as promising as it once appeared. By letting the government commit us to one or more particular technologies, we create a set of political forces which make
spite of the SFC's commitment to encouraging a diversity of technologies,\(^{151}\) it appears probable that the magnitude of commercial-sized undertakings will have a chilling effect on technological innovation because of the high stakes involved. The Ford Foundation study concluded that the government should resist pressures for government involvement in demonstration and deployment of synthetic fuels production facilities.\(^{152}\) The study also concluded that spending public funds on such projects is not a substitute for decontrolling oil prices, streamlining environmental regulation, or otherwise rationalizing the framework in which private sector decisions are made.\(^{153}\)

The private sector, on the other hand, is geared towards producing profits for investors, and this objective may not produce a result that responds to the national interest. Some have suggested that private oil companies, which control the bulk of the resources required for synthetic fuels production, already are distorting the market by pegging the cost of alternative fuels to the cost of competing domestic petroleum.\(^{154}\) In any case, where the goal is to reduce oil imports by raising domestic production, some government intervention in the marketplace may be necessary to induce production above the level at which costs are competitive with the cost of imported oil.\(^{155}\)

Granting this inherent inefficiency in any D&D program with a production goal that is independent of market forces, the SFC will mimic free market decisionmaking as much as possible. In selecting proposals for support, the SFC will consider the extent of federal assistance required, the potential cost per unit of production, the overall production potential of the technology, and the potential of the technology for complying with applicable regulatory requirements.\(^{156}\) Further, if a project involves production of purchase by an

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\(^{151}\) Energy Financing Legislation, supra note 137, at 156-57 (statement of Robert Pindyck, Prof. of Economics, M.I.T.).

\(^{152}\) FORD FOUNDATION, ENERGY, supra note 16, at 558-60.

\(^{153}\) Id. at 561.

\(^{154}\) Horizontal divestiture of large oil companies, on the other hand, could reduce both the capital and the technical expertise available for development of synthetic fuels. Solomon & Riesmeyer, The Development of Alternate Energy Sources: A Legal and Policy Analysis, 30 OKLA. L. REV. 319, 332-33 (1977).


entity with rates that are regulated, the SFC will consider whether the regulatory body is likely to issue a ratemaking decision that will protect the financial interests of the investors and the SFC.157

Congress was aware of efforts to commercialize coal gasification and included a provision in the SFCA that the Secretary of Energy, who is authorized to act on behalf of the SFC prior to its formal organization, should give expedited consideration to proposals for commercial-sized high-Btu coal gas plants.158 In conformity with this legislative directive, the DOE recently guaranteed $2.02 billion in loans159 for the Great Plains projects.160

As a result of the holding in Office of Consumers' Counsel v. FERC,161 the project sponsors restructured the project to operate as a nonjurisdictional entity.162 Under an offer of settlement approved by the FERC and unchallenged by the intervenors,163 the ratepayers will pay only for gas received and will not bear any costs if the project fails. The only guarantee the project sponsors sought and obtained was advance assurance that the cost of gas will be recovered from the ratepayer when the gas actually begins to flow.164 In view of the large sums of money to be committed, it was recognized that the project could not proceed without such cost-recovery assurances.

VII. CONCLUSION

Despite the eventual success in securing financial commitments for the Great Plains project, it should not be viewed as precedent for similar coal gasification projects. The FERC specifically held that the rate authorization contained in the settlement offer is to be

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157. Id. § 8731(1).
158. Id. § 8723(e).
162. Great Plains Gasification Associates, FERC Op. No. 119, [1981] UTIL. L. REP. (CCH) ¶ 12,442, at 15,462 (April 30, 1981). As finally structured, the ratepayers will not finance the construction of the project, id. at 15,465, the debt will be guaranteed under the federal loan guarantee, and the project sponsors equity will be at risk in the event of project failure. Id. In addition, the price of the gas will be fixed in accordance with an established formula. Id.
163. Id. at 15,462.
164. Id. at 15,465.
treated as *sui generis*. This holding, coupled with the controversy surrounding the federal loan guarantee for the Great Plains project, clearly indicates limited government support for such projects. In view of potentially limited government support for such future projects, it would appear that the prospects for the private synthetic fuels industry in the United States presently are no more certain than they were prior to the enactment of the SFCA.

As was the case in South Africa with SASOL I, the primary return from the Great Plains project will be knowledge, not profit. If the Great Plains project shows coal gasification on a commercial scale to be technologically feasible, environmentally sound, and financially rewarding, it may well be expected that private industry will be more willing to invest in such projects in the future. Until the results of the Great Plains project are known, private investment in, and the rapid development of, synthetic fuel in the United States does not appear to be realistic.

165. *Id.* at 15,469.

166. The level of disagreement within the Administration required the President to personally solve the dispute. [1981] EN. USERS REP. (BNA) No. 415, at 1121-22.

167. See OVERSIGHT OF ENERGY DEVELOPMENT IN AFRICA AND THE MIDDLE EAST, supra note 10, for a discussion of South Africa's SASOL projects.

168. *See* Office of Consumers' Council v. FERC, 655 F.2d 1135, 1137 (D.C. Cir. 1980) (project justified as a test of the viability of coal gasification technology, not as a gas supply project).