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SRC-II DEMONSTRATION PROJECT
PHASE ZERO
TASK NUMBER 3

DELIVERABLE NUMBER 17

DEMONSTRATION PLANT MARKETING PLAN

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THE PITTSBURG & MIDWAY COAL MINING CO.
DENVER, COLORADO

PREPARED FOR

UNITED STATES DEPARTMENT OF ENERGY
UNDER CONTRACT
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DELIVERABLE 17

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SECTION 1
SUMMARY

The marketing plan for the SRC-II Demonstration Plant recognizes the requirement for market preparedness and product acceptance in the development of commercial coal liquefaction plants.

In early 1978, the DOE Deputy Secretary asked the electric utility industry to support the SRC-II demonstration project. A plan was proposed in which the utility industry would purchase and test the demonstration plant fuel oil product for 5 years at a projected long term price. This price would be a premium over the normal cost of utility fuel in order to "subsidize" DOE's effort to develop a domestic source of fuel oil made from coal. In this way, user industries and producer industries would be involved in the Demonstration Project.

Currently more than twenty electric utilities have indicated their willingness to support the SRC-II demonstration program in this manner. A similar arrangement has been proposed for the pipeline gas product and a major gas utility company has indicated willingness to participate.

The marketing plan includes provisions for testing applications and upgrading steps of other light hydrocarbons, non-hydrocarbon by-products, and certain liquid fractions.

SECTION 2
DEMONSTRATION PROJECT - PROGRAM CONCEPT

2.1 SYSTEM DEMONSTRATION

The DOE program for large-scale demonstration of SRC-II coal liquefaction capability provides the basis for development of a coal liquefaction industry. The objectives of the marketing plan for the demonstration program include the involvement of the ultimate product users and those affected by its use to assure that economic and environmental benefits can be achieved as coal liquids become widely available. Market preparedness includes the factors of transportation, handling, combustion, engine performance, emissions, specifications and marketing methods.

2.2 ROLE OF COAL-DERIVED LIQUIDS

The SRC-II Coal Liquefaction Process converts high-sulfur bituminous coal into a range of distillates and light hydrocarbons. The development of this technology has been directed toward providing clean coal-derived fuel oil liquids for use as alternates to petroleum fuels. The main markets for coal-derived liquids are boilers, combustion turbines and other applications where petroleum fuels are widely used today. In addition, the potential has been shown for refining coal liquids into quality transportation fuels such as gasoline, aviation fuel and diesel fuel. Light hydrocarbons from SRC-II provide synthetic natural gas and an alternate feedstock for petrochemical production.

Recognizing that a major portion of the U.S.'s vast resources of coal are suitable for liquefaction, the importance of demonstrating coal liquefaction at commercial scale has increased. A commercial coal liquefaction industry large enough to have a significant impact on the nation's petroleum requirements involves numerous segments of industry and government. Process demonstration will include design, equipment manufacturing, construction, coal production, raw material transportation, environmental and health studies, as well as plant operations to

demonstrate the production of clean fuels. Demonstrating feasibility of product use is equally important and must include the examination of such areas as transportation, handling, and end-use testing concurrently with the plant operation if coal-derived liquids are to become fully accepted as alternates to petroleum.

Therefore, demonstration of SRC-II coal liquefaction must resolve not only SRC-II process development and manufacturing aspects, but also product utilization aspects involving user industries.

2.3 INVOLVEMENT OF OTHER PARTICIPANTS

DOE and P&M believe it to be important that the demonstration program involve those public and private segments of the economy that will be affected and involved in a coal liquefaction industry. For example, if coal-derived liquid fuels will be utilized in boilers, combustion turbines, and other fuels applications, then their users, i.e., electric utility companies, should be involved in the demonstration program. This concept would apply to engine manufacturers, industrial users of other coal-derived hydrocarbon products and by-products - particularly when the coal-derived products are unique. Those industries likely to be involved in the distribution , transportation and handling of such products also need to be included.

Such industry participation should involve extensive studies examin ing the physical, economic, environmental and health aspects of using these fuels in the variety of applications. This will not only insure market preparedness and acceptance in time for commercial use, but will provide public understanding of the implications and limitations regarding handling and use. In addition, end-use testing may indicate incentives for further process modification and improvement to maximize economic and environmental product value.

SECTION 3
SRC-II PRODUCTS/MARKETS

The SRC-II process produces a range of distillates which may be segregated and used in many applications to replace petroleum fuels. Coal liquids may be further processed for use as motor fuels. Light hydrocarbon liquids from SRC-II may be utilized directly (for example, as LPG) or may be treated further for use as chemical intermediates. The design and operation of the SRC-II coal refinery can also result in some flexibility in the relative quantities of each of the hydrocarbon products produced. The result is that coal liquefaction through SRC-II is not dissimilar to a petroleum refinery.

3.1 PRODUCT SLATE AND PRODUCTION QUANTITIES

Table 3-1 shows a possible product slate for the planned demonstration plant and full-size commercial plant, indicating approximate quanti ties of light hydrocarbons, pipeline gas and fuel oil that would be expected. As an illustration of the product flexibility that exists in designing and operating a SRC-II coal liquefaction plant, the present product slate for the demo plant shows no net production of naphtha since it is planned to utilize this material as refinery fuel. This is in part due to the original objective of producing only coal-derived fuel oil and by-product gas in the demo plant for use as utility fuels, and recognizes the fact that secondary product production would be rather small from this plant. In a full commercial plant, the production quantities of products such as naphtha would be large enough to justify their upgrading into transportation fuels and chemical products.

Table 3-2 shows possible product distributions from the demonstration plant, producing primarily utility fuels suitable for extended testing as substitutes for petroleum fuel oils. The lower part of the chart shows a range of products and applications that might be expected from full-scale commercial plants where market value would justify upgrading to a variety of end products.

The "heart" of the demonstration program is the SRC-II Process, whereas some of the upgrading steps implied in the commercial plants shown on the lower half of the chart involve more conventional and proven petroleum refining steps for which large-scale demonstration is not critical at this time. The marketing plan for the demonstration plant is then principally directed toward the production of a broad range fuel oil and by-product pipeline gas and LPG.

3.2 PRODUCT CHARACTERISTICS

Table 3-3 provides a summary of the typical properties of the SRC-II fuel oil that has been produced in moderate quantities at DOE'S Ft. Lewis, Washington SRC Pilot Plant. These properties are compared with typical petroleum fuel oils utilized in utility and industrial boilers and turbines. SRC-II fuel oil may vary somewhat with different coal operating conditions; it is clear that fuel oils (coal-derived liquids) from SRC-II will be somewhat different from petroleum fuel oils used today. Some of these characteristics, such as the low viscosity, pour point sulfur and ash levels represent an improvement. Other properties, such as the relatively high nitrogen content (typical of coal-derived liquids) will require more careful control in the end use to insure maintenance of satisfactory emissions.

3.3 PRODUCT ACCEPTANCE REQUIREMENTS

Testing performed to date (reported in Deliverable 9, Volumes 1 and 2), indicates that coal-derived fuel oils can be efficiently and environmentally burned as substitutes for petroleum; however, more testing needs to be done. Part of the marketing plan would involve extended testing with the fuel oil produced by the Demonstration Plant. Such testing is necessary to fully examine the products from a variety of operating conditions, different types of equipment, long-term effects and boiler performance and emissions.

As a potential combustion turbine fuel, a variety of testing and development of SRC-II is needed to insure that these coal liquids can be used effectively in turbines and that the unique characteristics of

these materials can be exploited to achieve the greatest economic and environmental benefits. In the course of these efforts, new standards and new specifications will emerge that will to assure that the coal liquefaction plant produces an acceptable and consistent product and that the engine and boiler operators will receive reliable environmentally acceptable fuels.

The Demonstration Plant marketing plan recognizes the necessity for parallel development to maximize the opportunity for a commercial coal liquids industry to provide alternates to petroleum. Deliverable 9, Volume 1 discusses many of these development, testing and acceptance standards needs.

TABLE 3-1

TYPICAL SRC-II PRODUCT SLATE

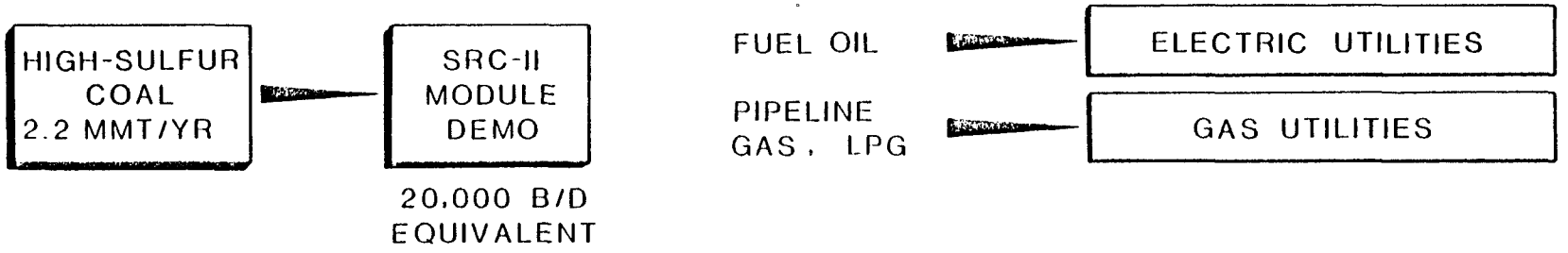
DEMO MODULE WITH 6,700 T/SD COAL FEED AND COMMERCIAL PLANT
(FIVE MODULE) WITH 33,500 T/SD HIGH-SULFUR COAL FEED

PRODUCT	DEMO MODULE	COMMERCIAL
METHANE	45 MM SCF/D	170 MM SCF/D
LPG (PROPANE)	2,300	6,870 B/D
BUTANE	1,600 B/D	3,500 B/D
NAPHTHA (C_5 - 350°F)	--	13,200 B/D
FUEL OIL (350° - 900°F)	11,500 B/D	57,500 B/D
AMMONIA	30 T/D	150 T/D
SULFUR	160 T/D	800 T/D
PHENOLS	7 T/D	35 T/D

TABLE 3-2

SRC-II PRODUCT DEVELOPMENT

DEMO PLAN - 1980'S



COMMERCIAL PLAN - 1990'S

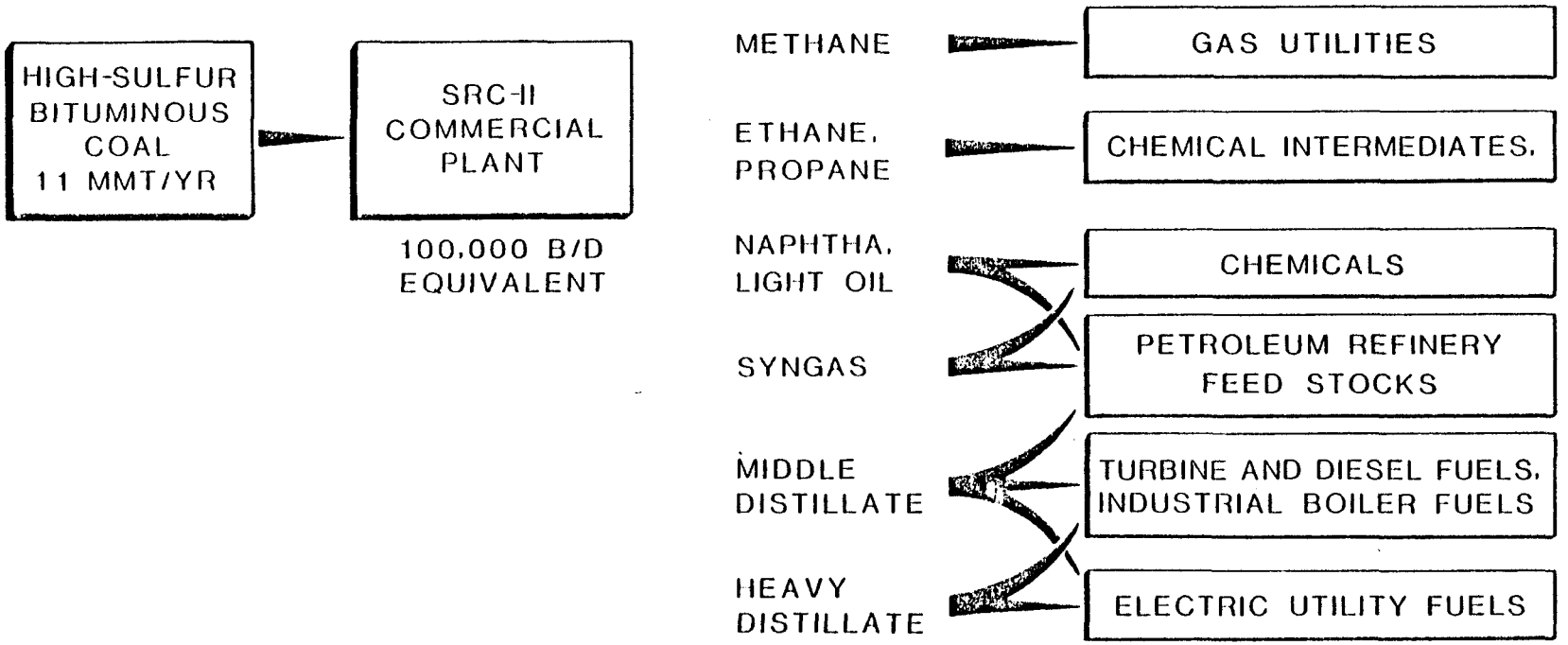


TABLE 3-3

SRC-II FUEL OIL PROPERTIES

		TYPICAL PETROLEUM PRODUCTS		
	SRC FUEL OIL	NO. 2	NO. 4	NO. 6
GRAVITY (°API)	8.3	>30	23	12
VISCOSITY (CS, 100°F.)	4	3	14-20	900
FLASH POINT (°F.)	> 150	>130	>150	>150
POUR POINT (°F.)	-23	<-20	<+10	<+60
SULFUR (%)	0.25	.05	<1.00	0.3-2.2
SEDIMENT (%)	< 0.03	——	0.05	0.25
CARBON RESIDUE (%)	<0.3	<0.3	5.5	6-16
ASH (%)	0.02	.003	0.01	0.05
NITROGEN (%)	1.0	0.2	.02	0.4
NET HEATING VALUE (BTU/GAL.)	148,000	135,000	138,000	146,000

SECTION 4

THE DOE PROGRAM OF UTILITY DEVELOPMENT

4.1 DOE PROPOSAL

On January 30, 1978, DOE Deputy Secretary, John F. O'Leary called upon utility industry executives to consider support for the Department's plans for an SRC-II Demonstration Project.

4.2 UTILITY INDUSTRY - AD HOC STEERING COMMITTEE

In response to this request an Ad Hoc Industry Steering Committee was formed. It included executives from Consolidated Edison Company of New York, Florida Power and Light Company, Houston Lighting and Power Company, Los Angeles Department of Water and Power, New England Electric Systems, Pacific Gas and Electric Company, and Public Service Electric and Gas Company of New Jersey. The Committee Chairman was Charles F. Luce, Chairman of the Consolidated Edison Company of New York.

The Ad Hoc Committee proceeded to take the following actions in response to DOE's request:

1. To assess the industry's need for synthetic liquid fuels through the year 1990.

2. To estimate the availability and cost of conventionally derived liquid fuels through the same time period.

3. To review the actions necessary to obtain the required amounts of synthetic fuels, focusing on research and development, government and private industry actions and other critical factors.

4.3 UTILITY INDUSTRY TECHNICAL REVIEW

The Electric Power Research Institute, at the request of the Ad Hoc Committee, conducted a technical review of the status of alternative coal liquefaction processes in February 1978. The EPRI Technical Review Panel encouraged the utility industry to participate in the high-risk demonstration phase of the commercialization process as a purchaser/user of these fuels. The EPRI panel further encouraged the industry to support development of three major liquefaction processes; SRC-II, H-Coal and EDS.

4.4 PRINCIPLES OF AGREEMENT

During 1978, the Ad Hoc Steering Committee, acting through representatives of Consolidated Edison Company of New York and representatives of the Department of Energy, prepared a draft of a "Principles of Agreement", based on Deputy Secretary O'Leary's proposal that industry agree to buy the output of the SRC-II Demonstration Plant for five years at the projected long-term price of SRC-II coal liquids. The price, at that time, was projected as $21 per barrel in 1977 dollars. The Department of Energy and other participants were to bear the higher expected costs of product from this first Demonstration Plant and assume the upside risk. Individual utility companies participation shares under this agreement would be a percentage of the plant's production, a ratio determined by that utility company's oil consumption (or oil and gas) to the industry's total consumption of oil (or oil and gas).

4.5 EASTERN OIL-BURNING GROUP

In the spring of 1979, the Ad Hoc Steering Committee was advised that the administration was pursuing the construction of the SRC-II commercial-size plant and continued to seek utility support. The Department of Energy indicated it was seeking support in accordance with the earlier proposal, but only from East Coast oil-burning utilities. In the second quarter of 1979, individual meetings were held with each of the major oil burning Eastern utilities in which the DOE solicited an

indication of the utilities' support based upon a "Principles of Agreement". The utilities contacted have indicated their intended support of the program and are willing to commit to their participation, or are at least seriously considering doing so. A list of the utility companies who have indicated willingness to commit or who have a serious interest are included in Appendix A. Support from the Eastern utility group will constitute over 50% of the product that could be produced during a 5-year operating period of the Demonstration Plant.

4.6 EPRI ROLE

The Ad Hoc Steering Committee has proposed that the Electric Power Research Institute represent the industry group in its involvement in this program. The Principles of Agreement calls for the preparation by utilities of a product demonstration plan which outlines types and durations of the demonstration burns of various types of fuel-burning equipment in sites selected for the demonstration. This would maximize the industry's experience and prepare it for the introduction of coal-derived liquid fuel oils on a commercial basis.

4.7 GAS UTILITY SUPPORT

As mentioned before, the SRC-II process produces a substantial amount of synthetic natural gas as a by-product. Consolidated Natural Gas Company has reviewed the SRC-II process and the proposed demonstration program and believes that it can ultimately represent a potentially attractive source of synthetic natural gas (SNG) (refer to the Consolidated Natural Gas study, Deliverable 9, Volume 6 - Market Opportunity for Methane from SRC-II). The Consolidated Natural Gas Company has indicated its willingness to purchase the SNG by-product from the SRC-II demonstration program on a basis comparable to the electric utilities' agreement to purchase the SRC-II fuel oil product. CNG would also purchase additional quantities of LPG if they are produced.

The marketing plan for the SRC-II demonstration program recognizes the vital role of the gas and electric utility industries in the demonstration of the product application and testing. The utility industry's

support of DOE's SRC-II Demonstration Program through commitments to purchase product at prices in accordance with the projected long-term market price reflects the seriousness of the industry's concern for the development of economically and environmentally viable coal-derived alternates to petroleum and natural gas. This marketing plan assures an established and workable interface between the producers of synthetic fuels and the industrial consumers, thereby achieving the Department of Energy's objectives of expeditious development of alternative fuels.

SECTION 5
PRODUCT APPLICATION PROGRAM

Establishing market acceptance of coal-derived liquids and related by-products from coal liquefaction processes like SRC-II is a part of the marketing plan. Extensive testing in utility and industrial boilers and combustion turbines is necessary to achieve market acceptance. Volume 1 of Deliverable 9 discusses the testing and development program required by boiler and turbine operators and manufacturers. Experience to date in combustion testing is included in Volume 2 of Deliverable 9. While results so far are encouraging, only relatively small-scale equipment and short-duration tests have been performed.

5.1 FUELS TESTING

The marketing plan for the SRC-II Demonstration program recognizes the continuing requirement for product testing in a variety of applications. For example, by having the utilities support group decide upon the plan and disposition for the fuel oil product it receives, tests of a prototype stationary combustion gas turbine as a precursor to the combined cycle power plant can be included as a part of the utility test plan under the direction of EPRI. One of the participating utilities would be host to the turbine program. DOE may divert some portion of the fuel products for industrial testing outside the utility support program.

5.2 PRODUCTS DEVELOPMENT AND UPGRADING

The Demonstration Program will be designed so that certain product fractions such as naphtha and middle distillate may be recovered for testing in product upgrading programs.

SECTION 6
PRODUCT DISPOSITION/TRANSPORTATION

6.1 FUELS

Fuel oil products from the Demonstration Plant will be transported primarily by unit trains and barges to coastal points designated by the electric utility support group. Delivery to power plant sites with port-loading facilities will enable barge transfer to most East Coast power plant locations so that individual members of the utility support group may conduct combustion test burns as appropriate. While SRC-II fuels are suitable for pipeline transportation, the relatively small quantities from the SRC-II Demonstration Plant do not justify pipeline shipment at this time. During Phase I, the transportation options will be reviewed in detail prior to finalizing product transportation arrange ments.

6.2 PIPELINE GAS AND LIGHT HYDROCARBONS

Provisions are included in the Demonstration Plant for the distribution of test quantities of light hydrocarbon and naphtha by rail and truck. Pipeline gas will be distributed through a feeder line to the Consolidated Natural Gas System. This will require installation of approximately twenty miles of nominal eight inch line as specified in the Demonstration Plant design (Deliverable 1).

6.3 BY-PRODUCTS

By-products including ammonia, sulfur and tar acids will be prepared for sale at the Demonstration Plant and transported by rail or truck to industrial customers. Slag will be investigated for aggregate and filler applications.

SECTION 7
COMMERICAL FACILITY MARKETING PLAN

7.1 MARKET PREPAREDNESS

Commercial sized SRC-II facilities would produce a range of distillates and other coal liquid products. Refining some portion or all of the raw coal liquids into motor and aviation fuels is a reasonable prospect described in Volume 8 of Deliverable 9. While many of these products will be essentially identical to their petroleum counterparts, some difference in physical and chemical characteristics will exist in others. For industry to be prepared to refine and use these products, further testing and experimentation are needed leading to an adequate data base on which appropriate standards and specifications can be established.

7.2 PRODUCT FLEXIBILITY

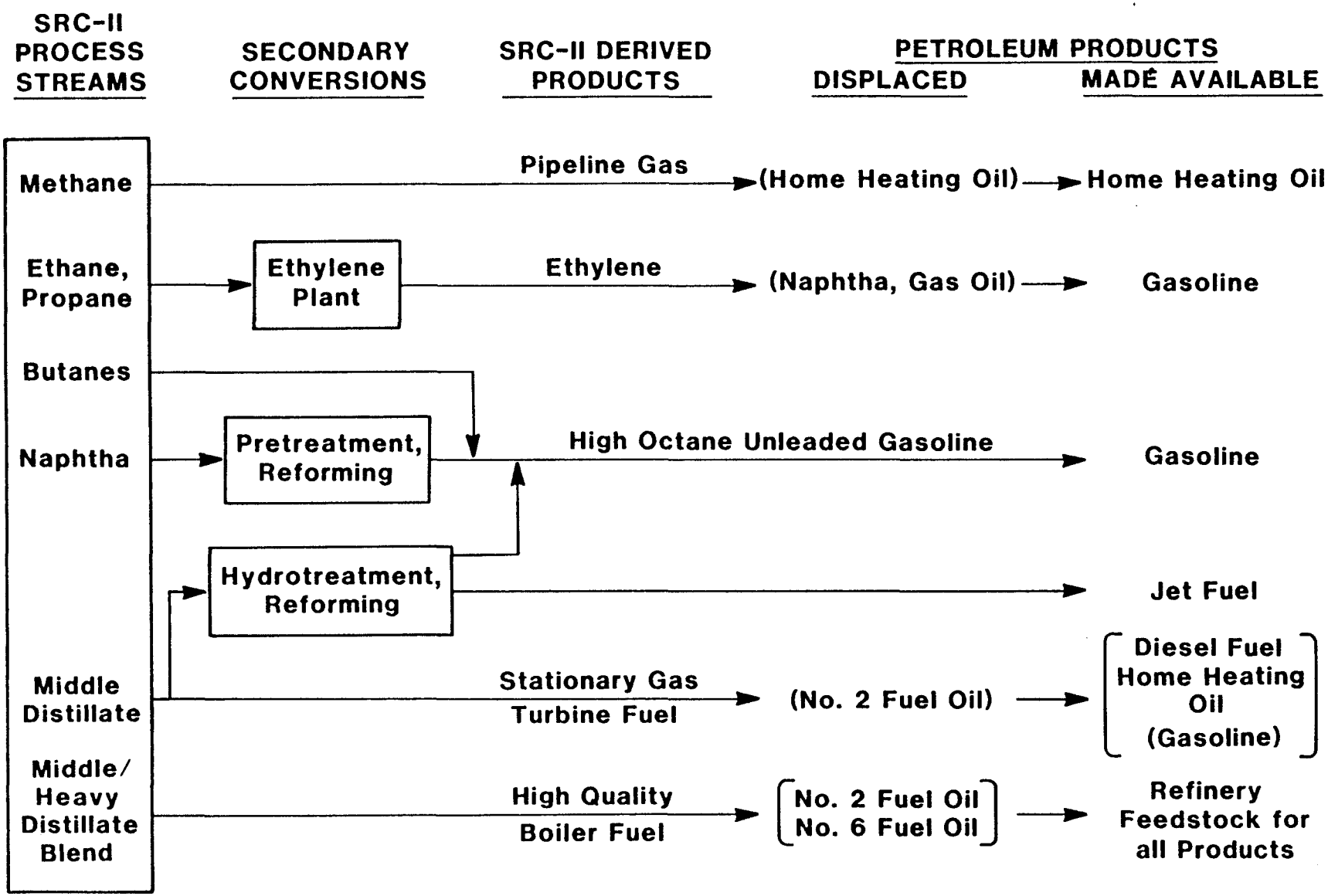
The SRC-II Process (as well as other coal liquefaction processes) when coupled with process steps for upgrading can provide considerable flexibility in terms of the slate and mix of hydrocarbon products that can be made. Table 7-1 shows a some of the possible product slates from an SRC-II coal refinery and indicates the refined petroleum products that can be displaced to the extent that they can be supplied from coal liquefaction. Within the flexibility of the petroleum refinery, these displaced products can permit production of the additional or alternative refined petroleum products as indicated on the far right hand side of the chart. Gasoline and jet fuel represent a portion of the product that can be produced directly from coal liquefaction. However, through the production of such products as ethylene from SRC-II produced ethane and propane, additional naphtha and gas oil made available at the petroleum refinery can lead to higher gasoline production. Thus, commercial coal liquefaction with SRC-II could lead to additional motor fuel both directly and indirectly.

7.3 TRANSPORTATION/HANDLING REQUIREMENTS

At the commercial scale, most of the products of the SRC-II coal refinery can be transported by pipeline. Existing pipelines in the Appalachia river region currently are used for crude and refined petroleum products and natural gas. These represent in place and potentially available transportation for the refined products of coal liquefaction.

TABLE 7-1

SRC-II COAL LIQUEFACTION SUPPLYING PETROLEUM DISTILLATE PRODUCTS



APPENDIX A

ELECTRIC AND STEAM UTILITIES INDICATING STRONG INTEREST IN SUPPORT OF THE SRC-II PROGRAM

1.	Consolidated Edison Co. of New York, Inc.	(New York)
2.	Public Service Electric & Gas Co.	(New Jersey)
3.	Long Island Lighting Co.	(New York)
4.	Niagara Mowhawk Power Corporation	(New York)
5.	Boston Edison Co.	(Massachusetts)
6.	New England Gas & Electric Association	(Massachusetts)
7.	Eastern Utilities Associates	(Massachusetts)
8.	Baltimore Gas & Electric Co.	(Maryland)
9.	Florida Power & Light Co.	(Florida)
10.	Jacksonville Electric Authority	(Florida)
11.	New England Electric System	(Massachusetts)
12.	Northeast Utilities	(Connecticut)
13.	United Illuminating Co.	(Connecticut)
14.	Philadelphia Electric Co.	(Pennsylvania)
15.	Public Service Co. of New Hampshire	(New Hampshire)
16.	Central Maine Power Co.	(Maine)
17.	Delmarva Power & Light Co.	(Delaware)
18.	Potomac Electric Power Co.	(District of Columbia)
19.	Florida Power Corp.	(Florida)
20.	Pennsylvania Power & Light Co.	(Pennsylvania)
21.	Power Authority of the State of New York	(New York)
22.	Orange and Rockland Utilities, Inc.	(New York)
23.	Rochester Gas & Electric Corp.	(New York)
24.	Central Hudson Gas & Electric Corp.	(New York)