INTERIM REPORT OF THE NATIONAL PETROLEUM COUNCIL'S COMMITTEE ON SYNTHETIC LIQUID FUELS PRODUCTION COSTS

July 29, 1952

W. S. S. RODGERS, CHAIRMAN

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INTERIM REPORT

OF THE

NATIONAL PETROLEUM COUNCIL
COMMITTEE ON SYNTHETIC
LIQUID FUELS PRODUCTION COSTS
JULY 29, 1952

As instructed by the National Petroleum Council at its October 31, 1951 meeting, the subcommittee on Synthetic Liquid Fuels Production is proceeding with the studies requested by the Secretary of the Interior. The subcommittee has been actively engaged in a continuation of their investigation and the status of the remaining work is as follows:

1. The work on the alternate method of coal hydrogenation has been completed by the subcommittee and a formal report is now being prepared.

2. It has been necessary to defer work on the alternate method of retorting and processing shale oil until data are available from the demonstration retort unit now under construction by the Bureau of Mines. The subcommittee has been advised that this retort will be completed in September, 1952 and it is believed that the subcommittee report on this study can be submitted during the latter part of 1952.

3. Because of manpower limitations of the Bureau of Mines, it has been necessary for the subcommittee to give considerable aid in the design of a Fischer-Tropsch synthesis plant. Many of the design calculations and designs will be that of the subcommittee and agreed to by the Bureau of Mines instead of the procedure envisioned in which the subcommittee would review designs of the Bureau.

   The process design is practically complete and the estimation of the investment cost of the plant is proceeding. It is anticipated that this study will be completed during the latter part of 1952.

At the April 22, 1952 meeting of the National Petroleum Council it was stated that the subcommittee would report on its review of a report by the Ebasco Services, Inc., entitled "Coal Hydrogenation Plants: A Review of Certain Elements of the Bureau of Mines Cost Estimates for Synthetic Liquid Fuels" dated March, 1952. The subcommittee has submitted a summary letter with an attached memorandum concerning the results of its analysis of this report. This letter and memorandum are included as a part of this interim report.

New York 17, N. Y. July 15, 1952

NATIONAL PETROLEUM COUNCIL
SUBCOMMITTEE ON SYNTHETIC
LIQUID FUELS PRODUCTION COSTS

Mr. W. S. S. Rodgers, Chairman
National Petroleum Council
135 East 42nd Street
New York 17, New York

Dear Sir:

The National Petroleum Council's Synthetic Liquid Fuels Production Costs subcommittee has reviewed a report by Ebasco Services, Incorporated of March, 1952 entitled "Coal Hydrogenation Plants: A Review of Certain Elements of the Bureau of Mines Cost Estimates for Synthetic Liquid Fuels." The Ebasco report has been given considerable publicity and unfortunately many of the reviews have presented a distorted picture of the information given in the report. A more factual and detailed comparison of the Ebasco estimate with the subcommittee's report of October 15, 1951 is attached.

Ebasco Services, Incorporated was engaged by the Bureau of Mines to review certain specific sections of their report entitled "Cost Estimate -Coal Hydrogenation, Revised January 11, 1951." In accordance with instructions of the Bureau of Mines, no reference was made to the report of the National Petroleum Council subcommittee. The report of the Ebasco study is limited in scope since it concerns itself only with those points specifically requested by the Bureau of Mines. Because of this limitation, the following statement

was included in the Ebasco report: "This report, therefore, contains no overall conclusion with respect to the project as a whole."

Even so, the Ebasco investigation was sufficiently complete to allow them to conclude as follows: "We do not believe it would be feasible to finance the projects described in the Bureau of Mines report dated October 25, 1951 with private capital under conditions prevailing as of January 1, 1951."

The Ebasco report states that an indicated return on equity capital would have to be from 14-16% in order to attract private investors. Using the capitalization of 50% funded and 50% equity capital as recommended by Ebasco, this would amount to an average rate of 8.4% on the total investment after 50% income taxes. This is comparable to the 6% used by the National Petroleum Council subcommittee for the purpose of calculating the cost of gasoline. The subcommittee's report of October 15, 1951 emphasized that Price Waterhouse and Company had offered the opinion that a minimum of 15% on total investment after taxes would be required.

The Ebasco report clearly presents the additional yearly income required for the necessary investment return of 15%, averaged, on the equity capital. Adding this additional income to the other costs developed by Ebasco results in a gasoline cost of 27.1 cents per gallon. This is considerably different from the 11-17 cents per gallon costs appearing in some published statements.

Misinterpretations of the true comparison between the Ebasco report and the National Petroleum Council study is due in some measure to the continued revisions to the Bureau of Mines report upon which the studies are based. The Bureau of Mines report of January 11, 1952 is the fourth revision by the Bureau of Mines since issuance of the report of August, 1949 upon which the National Petroleum Council was requested to base its studies.

Each issue of the Bureau of Mines' report has increased chemical production so that the plant now described derives 53% of its revenue from chemicals when selling gasoline at present prices. It is evident that this plant is more of a chemical venture than a synthetic liquid fuels project. It is also apparent that adoption of coal hydrogenation to supply even a moderate percentage of the gasoline requirements of the United States would result in a chemical production far exceeding the demand.

Ebasco used a production rate of 30,000 B/CD of total liquid product, as directed by the Bureau of Mines. No study was made by Ebasco as to the adequacy and capacity of the plant as a whole. The subcommittee had estimated that the plant as designed by the Bureau of Mines would produce only 27,000 B/CD of liquid production.

Ebasco reviewed the investment cost of only two sections of the plant representing about 25% of the total investment required. No appreciable discrepancy exists in the estimated cost of the Hydrogen Purification and

Compression facilities, representing about one-half of the investment review. The Ebasco estimate of power plant facilities is approximately 24% lower than the cost estimate by the subcommittee when placed on a comparable basis. An effort was made to resolve these differences through conferences with Ebasco. However, the subcommittee was unable to obtain any details on the Ebasco investment estimates. Again the size of the utility plant as specified by the Bureau of Mines to Ebasco is believed to be insufficient.

Higher operating labor requirements were estimated by Ebasco than by the subcommittee which in turn was considerably above the Bureau of Mines. The total of direct operating costs determined by Ebasco substantially agrees with the subcommittee estimates and differs materially only with regard to maintenance labor.

Operating costs as developed by Ebasco were on the basis of "a minimum operating force on the basis of an experienced crew in a well run plant." The report stated that during the first three years of operation it might be necessary to have about 25% additional labor to handle start up problems. <u>This additional cost was not included in any of their evaluations</u>.

The Ebasco estimate of total indirect operating costs is considerably lower than the estimate of the subcommittee due mainly to differences in estimates of cost items, such as administration and overhead, depreciation, taxes and insurance. The subcommittee's estimate of administration and

overhead costs was based on a large amount of operating history. It is believed that the estimate by Ebasco is unreasonably low. A depreciation rate of 4% was used by Ebasco. The subcommittee used 5% which is below the depreciation rate now used by the petroleum industry in establishing the cost of gasoline from petroleum. In addition, some discrepancy in depreciation charges is due to the low estimate of plant investment as estimated by the Bureau of Mines.

Ebasco and the subcommittee do not differ to any great extent in the amount or cost of housing involved, nor do they disagree as to the desirability of divorcing the housing burden from the plant. The Ebasco study indicated that local capital would underwrite the housing at Rock Springs. However, the subcommittee was forced to conclude that, at Rock Springs, Wyoming, it would be necessary for the plant owner to underwrite such housing.

The Ebasco report is careful to point out that no provisions were made for wage incentives and similar labor premiums which the subcommittee believed to be necessary for attraction of construction labor in the area involved.

In order to illustrate the comparison of the estimates of gasoline costs by the National Petroleum Council report of October 31, 1951, the Ebasco report of March, 1952 and the Bureau of Mines report of October 25, 1951, revised November 19, 1951, the attached graph has been prepared. Sulphur and ammonia facilities are not included in order to make the comparison easier. The following costs, expressed as cents per gallon of gasoline are shown on this chart.

	NPC	Ebasco	USBM
Manufacturing Costs	25.3	19.5	17.7
Housing Costs	2.6	--	--
Financial Charges	19.0	22.0	8.2
Total Costs	46.9	41.5	25.9
Less By-Product Revenue	5.5	13.4	14.9
Gasoline	41.4	28.1	11.0

The above comparisons clearly demonstrate that the total costs as calculated by Ebasco are appreciably closer to the subcommittee estimate than to the Bureau of Mines figure. The largest difference between Ebasco and the subcommittee is due to the credits for by-product chemicals. Estimated production (and revenue) of chemicals has been increased by the Bureau of Mines since their original report of 1949. Revenue from chemicals in the proportion of sales visualized by the Bureau of Mines would apply only to the first few plants. The subcommittee believes that the project should be evaluated primarily as a synthetic liquid fuels venture.

Respectfully submitted,

SUBCOMMITTEE ON SYNTHETIC LIQUID FUELS PRODUCTION COSTS

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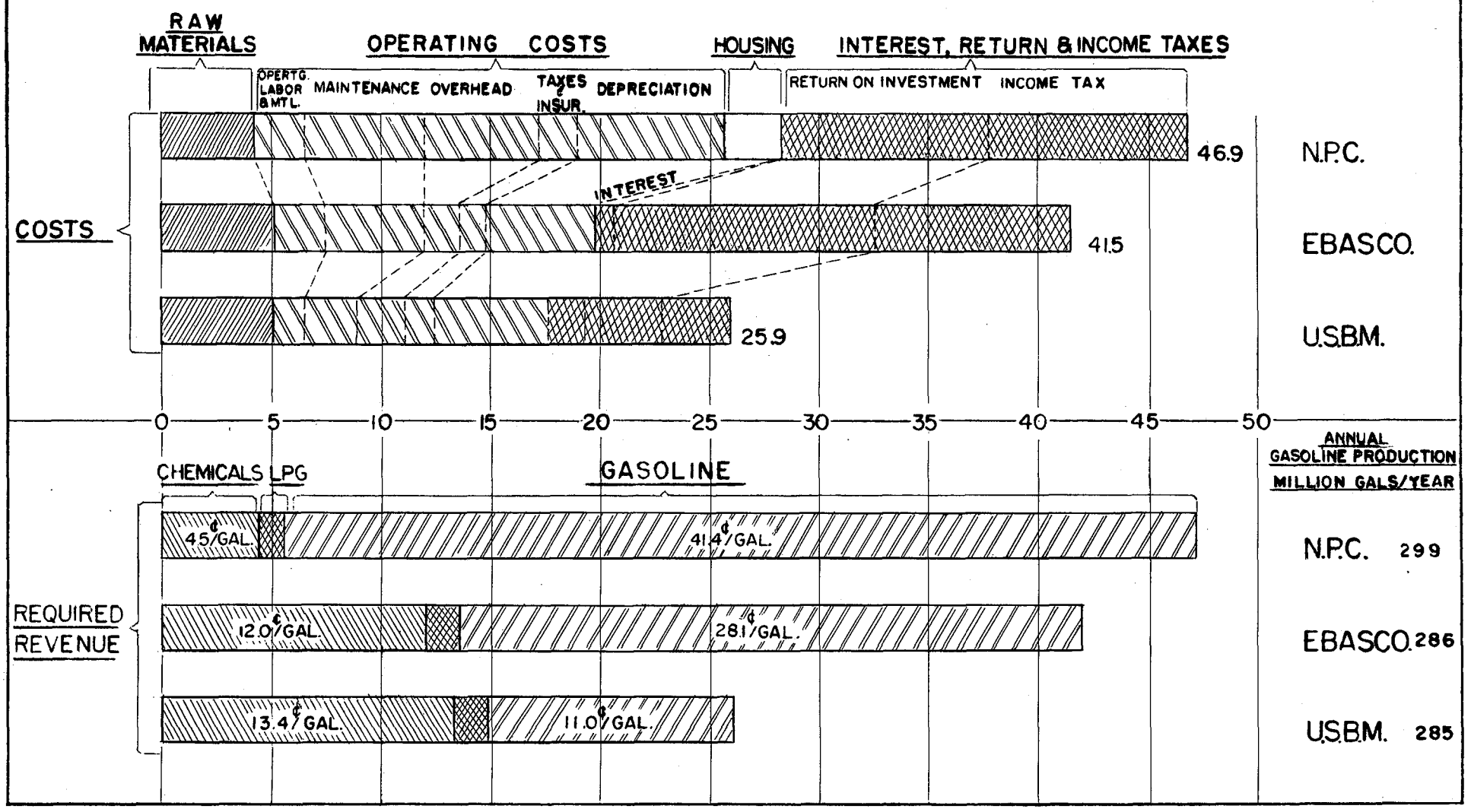
By: _____
L. C. KEMP, JR., CHAIRMAN

COMPARISON OF COAL HYDROGENATION STUDIES

EXPRESSED AS ¢/GAL OF GASOLINE

SULFUR & AMMONIA FACILITIES NOT INCL'D.



A Report
to the
Subcommittee
of the
National Petroleum Council's Committee
on
Synthetic Liquid Fuels Production Costs

Review of Ebasco Services, Incorporated Report of March, 1952 on Coal Hydrogenation

by

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Introduction

A subcommittee of the National Petroleum Council's Committee on Synthetic Liquid Fuels Production Costs has reviewed the Ebasco Services Incorporated report of March, 1952 entitled "Coal Hydrogenation Plants: A Review of Certain Elements of the Bureau of Mines' Cost Estimates for Synthetic Liquid Fuel". This report was based on a report by the Bureau of Mines entitled "Cost Estimate for Coal Hydrogenation Revised January 11, 1952".

The Ebasco report was limited in scope to certain items specified by the Bureau of Mines. For example, the investment costs estimates of only two units of the entire plant comprising about 25% of the total plant investment were made by Ebasco. No investigation was made by Ebasco as to the capacity of the plant as a whole, as to the utility requirements, as to the adequacy of equipment and processes proposed, and other important factors involved. That this is a serious limitation is reflected by a statement in the Ebasco report that "This report, therefore, contains no overall conclusion with respect to the project as a whole". Even so, the investigation by Ebasco was sufficient to allow them to conclude as follows: "We do not believe it would be feasible to finance the projects described in the Bureau of Mines report dated October 25, 1951 with private capital under conditions prevailing on January 1, 1951".

In spite of the above conclusions the Ebasco report has received distorted reviews and presentations in the press, and elsewhere, and it has been frequently implied that the Ebasco report refuted the National Petroleum Council study of October 15, 1951 on Synthetic Liquid Fuels Production Costs.

The study presented here attempts to show actual comparisons between the Ebasco report of March, 1952 with that of the National Petroleum Council Subcommittee report on Synthetic Liquid Fuels Production Costs dated October 15, 1951.

Scope of Ebasco Report

The work done by Ebasco covered only the following points specifically requested by the Bureau of Mines:-

1. Construction cost of power plant facilities for steam and electric plant.

2. Construction cost of a plant for the purification and compression of hydrogen.

3. Analysis of all operating costs except coal mine, catalyst and chemicals, Tetraethyl lead, and sulfur and ammonia production.

4. Analysis of the feasibility of orderly marketing for the stated volume of chemicals and the revenue from this sale.

5. Investigation of necessity of providing housing facilities

6. Evaluation of financing program.

7. Expression of opinion as to the methods employed by the Bureau of Mines in the preparation of the estimates and suggestions as to effective methods of improving the presentation of projects.

The Ebasco report is a review of the revised Bureau of Mines report dated January 11, 1952. At the Bureau's request no reference was made by Ebasco to the National Petroleum Council's Subcommittee report of October 15, 1951.

The report of January 11, 1952 is the fourth revision of the Bureau of Mines coal hydrogenation plant study. The original study reviewed by the subcommittee was the Bureau of Mines report RI-4564 of August 1949. The first revision of the Bureau of Mines report was dated October 25, 1951 and was first released at National

Petroleum Council's meeting of October 31, 1951. This report was withdrawn and a revision of November 25 was submitted to the subcommittee for their review. The subcommittee's comments on this revision was presented at the January 29, 1952 meeting of the Council.

The January 11 revision which has not been reviewed by the National Petroleum Council's subcommittee, contains data on a theoretical plant located at Rock Springs, a theoretical plant located at West Kentucky and a 240,000 barrel case, six plants of which are in Western Kentucky and two plants in Rock Springs, Wyoming. The comments herein pertain to the single plant at Rock Springs, Wyoming.

1. Construction Cost of Power Plant Facilities

The cost of the steam and power plant as estimated by Ebasco was $51,400,000 as compared to the National Petroleum Council cost of $79,000,000 and the Bureau of Mines cost of $55,500,000. The Ebasco power estimate was based upon a size predicated on a capacity furnished by the Bureau of Mines. The subcommittee has regarded this capacity as insufficient. In addition no power facilities were included for the mines, coal transportation, water supply, or community needs. The National Petroleum Council power plant included certain facilities, such as the transformer substation, which was assumed by Ebasco to be in other portions of the estimate of the hydrogenation plant. The subcommittee also followed the designs proposed by the Bureau of Mines in that the boiler plant was housed for winter operations in Wyoming. Correcting the two estimates to a common basis to facilitate comparisons, the Ebasco estimate would be increased to approximately $57,000,000 and the National Petroleum Council estimate would be $75,300,000. This difference of about

24% from the subcommittee estimate could not be reconciled in conferences with Ebasco. Ebasco Services would not make any details of their estimate available to the subcommittee nor comment upon any details of the subcommittee estimate. One factor contributing to the difference between the estimates is that the Ebasco construction cost assumed "no premium for protracted overtime, travel allowance or similar inducements". The subcommittee assumed that overtime required for a six day work week would be necessary to attract labor in the Rock Springs area. It would also appear that indirect construction costs, engineering and fee estimates by Ebasco for the power plant did not bear its share of these costs of the entire coal hydrogenation plant.

2. Construction Costs of Hydrogen Purification and Compression Facilities

The difference between Ebasco and the National Petroleum Council on the hydrogen purification and compression facilities is not great as demonstrated by the following table:

	National Petroleum Council	Ebasco
Plant Capacity/CD	27,000	30,000
Hydrogen Capacity	9,900	10,700
Investment Costs		
Material & Labor	$41,500,000	$44,144,000
Other Construction Costs	11,700,000	6,933,000
Contingency	5,000,000	5,107,000
Total	$58,200,000	$56,184,000

It is evident that when considering the difference in size of the plant, the only significant deviation is the estimate of other construction costs which include such items as tool handling, contractor costs, engineering, purchasing, labor premium and the like. Ebasco estimated that these items would be only 16% of the

direct material and labor costs. This is considerably below the factor of 28% based on the experience of the National Petroleum Council subcommittee and which was comparable to the factor of 29-1/2% used by the original consultant of the Bureau of Mines. This is in addition to a contingency allowance of 15% of the total ex-fee. The subcommittee and Ebasco have reduced the contingency allowance, perhaps too drastically, to about 10% of the total cost ex-fee. The Ebasco estimate of $56,000,000 compares to the Bureau of Mines original estimate for these facilities of $43,808,000 and which in the latest report was revised to $57,948,000. It is satisfying to note that the latest estimates of the Bureau of Mines, National Petroleum Council and Ebasco are all in reasonable agreement.

3. Operating Costs

No great differences can be found between the operating costs developed by Ebasco and those developed by the subcommittee except in maintenance, labor and indirect operating costs. Actually the operating manpower as developed by Ebasco is slightly higher than that developed by the subcommittee and considerably higher than that developed by the Bureau of Mines. Furthermore, Ebasco emphasized that their estimate is based on leveled-out operation and that perhaps 25% more men will be needed during the first three years of operation. This was compensated for in the subcommittee's calculations by provision of start-up expenses in the capital requirements. Neither the Bureau of Mines nor Ebasco provided such capital.

Ebasco's analysis of maintenance costs yields an annual expense of 3.1% of the plant investment as compared to 3.9% for

the National Petroleum Council and 1.7% for the Bureau of Mines. Ebasco's maintenance labor cost also was determined by a manned maintenance staff. It is the experience of the industry that this procedure is apt to give low results. It is the sub-committee's belief that maintenance costs as developed by Ebasco are too low.

The subcommittee's indirect operating expenses are nearly double the indirect operating expenses used by Ebasco.

The largest single item of discrepancy is expenses for general and administrative overhead. Again Ebasco has tried to man the general and administrative functions while the subcommittee has used a factor of 50% of its operating and maintenance labor and material costs. This factor was in accord with actual petroleum industry operations and was checked by various operating companies, as well as by Price Waterhouse and Company as an accurate basis for estimating these charges. The next largest difference of indirect operating expenses involves depreciation. Ebasco used a rate of 4% as compared to the use of 5% by the subcommittee. If the cost of synthetic gasoline is to be compared with the selling price of gasoline from crude petroleum comparable depreciation rates should be used. The present day gasoline price includes depreciation rates higher than 5%.

4. Marketing of Chemicals

The quantities of tar acids produced from the coal hydrogenation plant are specified by the Bureau of Mines. The tar acid production estimated by the Bureau of Mines for the Ebasco study has been increased over that originally given to the subcommittee. Further, Ebasco chose to market limited quantities of certain of these chemicals at high prices whereas the National Petroleum Council

had contemplated the sale of all the tar acids from a single plant at a lower market value.

The subcommittee calculations would indicate that the extraction of the toluene-xylene and benzene chemicals would not result in a reduction in gasoline costs.

The Ebasco report indicates that 53% of the estimated revenue would come from chemical sales when selling gasoline at present prices. In effect this plant is a chemical plant making a by-product of synthetic fuels rather than a synthetic fuel plant making a by-product of synthetic chemicals. It is readily apparent that for any large scale adoption of coal hydrogenation to supplant even a small proportion of the fuel now supplied by the petroleum industry would make chemicals available completely out of proportion to those that might be absorbed. The Ebasco report reduced the percentage of chemicals which might be absorbed from the plants producing 240,000 barrels of synthetic fuels. Even this quantity of liquid fuels does not provide as much as the present annual increase in gasoline requirement of the United States.

5. Necessity of Housing Facilities

The important difference between the National Petroleum Council and the Ebasco reports with respect to permanent housing facilities is not whether facilities are required nor the exact amount needed but who would have to assume the financial risk involved.

Both agree that it is highly desirable for the plant owners to divorce the plant from involvement with the housing burden and all its complications to the greatest extent possible.

The financial risk results from the value of the housing being dependent on (a) a single industry and (b) an industry of

unproven economic soundness. The Ebasco investigation accepted the assurances of local or state people that they would shoulder this risk. The subcommittee investigation revealed that no responsible financial agency would accept the risk under these conditions. In National Petroleum Council evaluations based on the owner assuming varying amounts of this risk the effect of the maximum case was 2¢ per gallon.

Housing for construction workers on large projects is required in remote locations. If temporary housing itself is not provided then an equivalent amount of money will be required in the form of labor premiums.

6. Financing Program

Finance charges recommended by Ebasco were even higher than those used by the subcommittee. They indicated that equity capital would have to be at least 50% and in order to attract this equity capital a return of 14 to 16% would be necessary. This return, average, would result in a return on total capital of 8.4% per year after taxes as compared to the 6% per year used by the subcommittee. Using the Ebasco financing recommendations, the cost of gasoline by coal hydrogenation, even when based on the Bureau of Mines estimates as adjusted by Ebasco, would amount to 27.1¢ per gallon. During the first year of operation Ebasco indicated that the cost would be substantially higher even if no unusual operating costs were experienced. All of the Ebasco calculations are based on the Bureau of Mines assumption that the plant will produce 30,000 B/CD whereas the subcommittee has calculated that the plant has only a capacity of 27,000 B/CD with a larger plant investment. Further the Ebasco case takes full credit for by-product chemicals, including

realization for ammonium sulphate and sulfur.

7. Methods Employed by Bureau of Mines

Ebasco comments concerning the methods employed by the Bureau of Mines in the preparation of estimates are similar to those made by the subcommittee with the exception of development of certain costs as discussed above.

Comparison of Costs

The comparative analysis of the Ebasco and NPC studies are presented in tabular form on the attached tables as follows:

Table 1 - Investment
Table 2 - By-Product Income
Table 3 - Economics
Table 4 - Notes

These tables clearly indicate that the largest single difference between the National Petroleum and Ebasco reports is in the realization from chemicals. It will be noted from Table 3 that total costs before by-product credits are 46.9¢ per gallon of gasoline for the National Petroleum Council study compared to 42.7¢ per gallon of gasoline for the Ebasco studies. By-product credits expressed as cents per gallon of gasoline amount to 5.5¢ for the National Petroleum Council study and 15.6¢ for the Ebasco study. Deduction of these credits results in a gasoline cost of 41.4¢ per gallon for the National Petroleum Council study and 27.1¢ per gallon for the Ebasco study. As mentioned previously the subcommittee has considered the project as a synthetic fuels venture designed to supply a substantial part of this country's fuel requirements. Each revised study of the Bureau of Mines places increasing emphasis on consideration of the coal hydrogenation plant as a chemical venture.

TABLE 1

COMPARISON OF INVESTMENT REQUIRED
ROCK SPRINGS, WYOMING, COAL HYDROGENATION PLANT

	NPC Report of 10/15/51	Ebasco Report (a, b) March 1952
Coal used as raw material, Tons/CD	12,960	13,370
Capacity, liquid products, B/CD	27,000	30,000
Gasoline Production, B/CD	19,490	18,670
Gal/CD	818,580	784,140
Investment Required		
Total plant	$396,300,000	$351,333,000
Construction housing	7,000,000	--
Coal Mine	12,700,000	13,000,000
Process royalties	1,000,000	2,025,000
Start-up expense	18,500,000	--
Working capital	37,400,000	21,500,000
Interest during construction	--	15,719,000
Total investment excluding housing	$472,900,000	$403,577,000
Housing for employees	48,000,000	--
General community facilities	12,000,000	--
Housing fund	--	250,000
Total investment	$532,900,000	$403,827,000

Notes: a - Includes facilities for recovery of sulfur and ammonium sulfate.
b - Depreciation costs under Ebasco:
Total plant and interest @ 4%/year - $40,225/CD; round to $40,230/CD.
Coal mine included with cost of coal.

NOTES ON INVESTMENT DIFFERENCES

1. Total plant:
Ebasco includes the following not included by NPC: Aromatics recovery, Ammonium sulfate and Sulfur recovery.
Ebasco estimated only part of total plant amounting to $107,000,000. Remainder was Bureau of Mines estimates.
Also note differences in capacity.
2. Start-up expense:
NPC - $18,500,000
Bureau of Mines (Ebasco) assumed included in capital cost of units.
3. Interest during construction:
None shown by NPC due to uncertainties of financing method.
4. Housing and community facilities:
Basic differences in philosophy between NPC and Ebasco.
5. Both NPC & Ebasco estimates are of Jan. 1, 1951.

TABLE 2

COMPARISON OF BY-PRODUCT INCOME
ROCK SPRINGS, WYOMING, COAL HYDROGENATION PLANT

	NPC Report of 10/15/51			Ebasco Report March 1952		
	Units /CD	Price	$/CD	Units/CD	Price	$/CD
Liquid Fuels						
Motor gasoline, Bbls.	19,490	--	--	18,670	--	--
LPG, Bbls.	6,390	3.0¢/Gal	8,051	7,111	4.0¢/Gal	11,928
Total liquid fuels, Bbls.	25,880			25,770		
Chemicals						
Phenol. Lbs.	85,000	15.8¢/Lb.	13,430	120,000	15.5¢/Lb.	18,600
o-Cresols, Lbs.	27,000	7.5¢/Lb.	2,025	18,100	15.5¢/Lb.	2,805
m, p-Cresols, Lbs.	111,000	10.5¢/Lb.	11,655	137,000	15.5¢/Lb.	21,235
Xylenols, Lbs.	182,000	5.5¢/Lb.	10,010	68,500	13.5¢/Lb.	9,248
Benzene, Gals	--	--	--	32,200	33.5¢/Gal.	10,787
Toluene-Xylene, Gals.	--	--	--	107,800	25.5¢/Gal.	30,723
Ammonium Sulfate, Tons	--	--	--	359	$45/T	16,155
Sulfur, Tons	--	--	--	47	$21/T	987
By-Product Income			45,171			122,468

NOTES ON BY-PRODUCT INCOME DIFFERENCES

1. By-Product realizations:
   At prices shown, and with motor gasoline at 11¢/Gal., by-products (LPG and chemicals) account for the following percentages of the total sales:
   NPC 33.4%
   Ebasco 58.7%

TABLE 3

COMPARISON OF N.P.C. & EBASCO ESTIMATES
COAL HYDROGENATION STUDIES

	National Petroleum Council			Ebasco Services			NPC Excess Over Ebasco Cents/gal. (Negative numbers in parenthesis)
	Per Calender Day	Per Year	Cents per Gallon of Gasoline	Per Day	Per Year	Per Gallon of Gasoline	
Raw Materials							
Coal	$ 27,115	$ 9,897,000	3.31	$ 33,425	$ 12,200,000	4.26	(.95)
Catalyst and Chemicals	6,507	2,375,000	.79	4,904	1,790,000	.63	.16
TEL	209	76,000	.03	2,268	828,000	.29	(.26)
Total Raw Materials	$ 33,831	$ 12,348,000	4.13	$ 40,597	$ 14,818,000	5.18	(1.05)
Operating Costs:-							
Operating: Labor	11,424	4,170,000	1.40	12,912	4,713,000	1.65	(.25)
Supervision	1,714	626,000	.21	1,767	645,000	.23	(.02)
Supplies	2,964	1,082,000	.36	1,950	712,000	.25	.11
Maintenance: Labor	27,651	10,093,000	3.38	13,627	4,974,000	1.74	1.64
Material	14,819	5,409,000	1.81	16,090	5,873,000	2.05	(.24)
Payroll Extras	8,158	2,978,000	1.00	5,178	1,890,000	.66	.34
Administration and Overhead	29,271	10,684,000	3.58	11,031	4,026,000	1.41	2.17
Research and Development	2,740	1,000,000	.34	-	-	-	.34
Local Taxes and Insurance	16,290	5,946,000	1.99	9,586	3,499,000	1.22	.77
Depreciation	55,246	20,164,000	6.75	40,063	14,623,000	5.10	1.65
Amortization of Process Royalties and Start-up Expense	2,671	975,000	.33	-	-	-	.33
Housing and Community Facilities	21,461	7,833,000	2.62	-	-	-	2.62
Ammonia and Sulfur Recovery	-	-	-	8,164	2,980,000	1.04	(1.04)
Total Operating Costs	$194,409	$ 70,960,000	23.77	$120,368	$ 43,935,000	15.35	8.42
Total Manufacturing Costs	$228,240	$ 83,308,000	27.90	$160,965	$ 58,753,000	20.52	7.38
Interest, Income Taxes and Return:-							
Interest Expense				10,068	3,675,000	1.28	(1.28)
Return	77,737	28,374,000	9.50	82,977	30,287,000	10.59	(1.09)
Income Taxes	77,737	28,374,000	9.50	80,974	29,555,000	10.32	(.82)
Total Interest, Taxes and Return	$155,474	$ 56,748,000	19.00	$174,019	$ 63,517,000	22.19	(3.19)
Total Costs	$383,714	$140,056,000	46.90	$334,984	$122,270,000	42.71	4.19
Less Sales of Chemicals							
Tar Acid Chemicals	37,120	13,549,000	4.54	51,882	18,937,000	6.62	(2.08)
Benzene, Toluene and Xylenes	-	-		41,510	15,151,000	5.29	(5.29)
Sulfur and Amonium Sulfate	-	-		17,134	6,254,000	2.18	(2.18)
Total Chemicals	$ 37,120	$ 13,549,000	4.54	$110,526	$ 40,342,000	14.09	(9.55)
Liquid Fuels	$346,594	$126,507,000	42.36	$224,458	$ 81,928,000	28.62	13.74
Less LP Gases	8,051	2,938,000	.98	11,918	4,350,000	1.52	(.54)
Gasoline	$338,543	$123,569,000	41.38	$212,540	$ 77,578,000	27.10	14.28

TABLE 4

NOTES ON DIFFERENCES

1. Operating Labor

	Number of Employees
NPC	238/shift
Bureau of Mines	156/shift
Ebasco	259/shift, plus 5 day-jobs

2. Maintenance Percentages

	%/yr. Capital Investment
NPC	3.9
Bureau of Mines	1.7
Ebasco	3.1 (Back calculated; not factor estimated)

3. Unit Supervision & Clerical

	% of Operating Labor
NPC	15
Bureau of Mines	15
Ebasco	13.7 (Back calculated; not factor estimated)

4. Payroll Extras (Social Welfare)

	% of Labor Costs
NPC	20
Bureau of Mines	16
Ebasco	18

5. Operating Materials

	Basis
NPC	20% maintenance materials
Bureau of Mines	20% maintenance labor & materials
Ebasco	Not factor estimated

6. TEL

Higher in Bureau of Mines & Ebasco cases because aromatics (high knock rating components) not blended to gasoline.

7. General Administrative Costs

	Basis
NPC	50% of operating maintenance supervisory labor; operating maintenance materials
Bureau of Mines	50% of operating, maintenance, supervisory labor; operating, maintenance materials
Ebasco	Not factor estimated; back calculated to be 25% of operating maintenance, supervisory labor; operating, maintenance materials

8. State, County & Local Taxes

	%/Year of Capital Investment
NPC	1.5
Bureau of Mines	1.0
Ebasco	1.0

9. Depreciation

	%/Year	Years of Life	Investment Dollars
NPC	5	20	$403,300,000
Bureau of Mines	4	25	371,440,000
Ebasco	4	25	365,600,000

In addition, the Bureau of Mines assumes that funds set aside for depreciation can be invested to yield a return. This is shown as, "average interest income." According to the Bureau of Mines, this is "equivalent to use of 25-year sinking fund method at 3-1/2% interest rate." The net effect is to show an income equal to 25% of the depreciation costs. This practice was not followed by Ebasco.

NOTE: None of above include ammonia and sulfur recovery facilities.