

SCOMM

21:8

Do We Really Need a Natural Gas Pipeline from Alaska?

Two of the major decisions on energy facing our country now have to do with natural gas. What are we going to do to counteract the rapid decline of gas reserves in the lower 48-states, and what are we going to do to get Prudhoe Bay gas to market? Many think that the answer to both problems is a transportation system for the latter to the former, but this is not necessarily true. Very high costs as well as the time required for construction both argue against this answer. Should we pay about the same price for a gas transportation system as for the Alyeska oil pipeline when it will carry only about one-tenth of the energy? Can we afford to wait another five years or so for governmental approval and construction of such a transportation system? For the reasons presented below, we believe the answer to both questions is a very firm no.

There is very good reason to believe that a great deal of natural gas remains to be discovered in or offshore of the lower 48-states. In recent years economics dominated by Federal price control has prevented discovery of this gas. There has simply not been the income to pay for the high costs of deeper drilling and offshore drilling. Now there are hopeful signs that Federal policy is becoming more realistic and cognizant of the basic economic fact that more income is needed to pay for higher costs to find and produce this gas.

In about a half-year we shall have a pipeline completed to carry Prudhoe Bay's crude oil to Valdez and thence to market. (Although title to this line is held by Alyeska Pipeline Service Co., it really belongs to all future consumers of this oil because they will be paying for it.) While it was designed to carry 2,000,000 bbl/day, there is serious doubt as to whether we have supplementary transportation systems and readily accessible domestic markets for even the initially planned throughput of 1,200,000 bbl/day. It will probably take several years for both of the latter to develop and even longer for the full capacity of the pipeline to be used. Considering the errors in other estimates made for this line, one might even question whether it will ever be fully used for the designed capacity. Few people remember the original cost estimate was \$900,000,000 while the most recent one is \$7,700,000,000.

Three proposals for transporting Prudhoe Bay natural gas have been made and are now being considered by various governmental agencies. Recently estimated costs of these range from about that of the oil pipeline to half again as much.

Final costs and completion times are anyone's guess at this point in time, but we can be assured that both will probably be greater than present estimates. We believe there is a better, less costly and more rapidly attainable way of solving this problem than constructing a new transportation system when we will soon have another completed which is likely to be underused.

It is unfortunate that natural gas cannot be transported as such in the oil pipeline. However, some petrochemicals manufactured from natural gas could be transported in the pipeline with the oil, and this is the gist of our proposal. We have considered methanol in some detail and have looked at both urea and ammonia in a preliminary way. All are currently manufactured from natural gas in the lower 48-states; we are simply proposing that the site of the conversion plants be moved from the present locations to Prudhoe Bay. This would also free a considerable amount of present natural gas production which could go into readily accessible gas transportation lines and then to gas utilities in the lower 48-states.

Because use of natural gas for household purposes seems to take priority over that for industrial ones, petrochemical plants needing it would appear to have a precarious future in the lower 48-states. Companies owning these should give serious consideration to the movement of these plants to the location of our major uncommitted source of natural gas, namely, Prudhoe Bay. By methods examined earlier, this can be done by building or relocating them on large reinforced concrete barges, transporting the barges to Prudhoe Bay and mooring or beaching them there. It should be emphasized that these barges are not simply transportation vehicles; the plants should be reconstructed or constructed on the barges and fully operable there before leaving their origin. At Prudhoe Bay the plants would not be removed from the barges, which could then serve as operation pads with the former buoyancy chambers then being used for storage of products.

With the Alyeska pipeline having the status of a common carrier, other liquids than simply crude oil can be transported in it. Solids such as urea could be slurried in crude oil or some other medium. Liquids such as methanol could either be batched as in a product line or else blended in some way with the crude oil. We have investigated the dispersion of crude oil in methanol and have learned that with the use of very small amounts of chemical agents, stable dispersions of crude oil droplets in a continuum of methanol can be obtained. These would


be easily pumpable at temperatures ranging from the coldest ever found in Alaska up to the proposed operating temperatures for Alyeska's hot oil line, i.e., 145°F. Perhaps the optimum arrangement might be to have batches of such a dispersion or others in a pipeline mainly devoted to crude oil.

Even at the initial oil production rates, the anticipated production rates for natural gas at Prudhoe Bay probably exceeds what is needed to manufacture all of our methanol, urea and a number of other petrochemicals. There should be no legal restrictions on exporting these as there is for the crude oil. We will also need to develop and perfect other uses for some of these such as the methanol. It and other lower alcohols have been used before as I.C. engine fuels and octane improvement components in hydrocarbon fuels. If we are to phase out lead compounds in gasoline and still have high octane fuels for efficient, high compression ratio engines, then we need to rediscover ways of handling such alcohols in our fuel systems.

What would be the cost and time required to implement such a scheme? Only a detailed study can tell but a few comparisons can show relative orders of magnitude. As for capital costs, there seems to be little doubt that relocating the petrochemical plants would be less expensive than building an entirely new gas transportation system. The environmental impact of petrochemical plants at Prudhoe Bay will be significant but probably less than that of an entirely new pipeline. The material required insofar as it has an impact on the environment will also be less. As for operating costs, liquid-carrying pipelines are always more efficient on a mass or energy basis than are gas-carrying ones. Because it has less environmental impact than the three gas alternatives, it should be more acceptable to environmentalists and this should lead to quicker governmental approval. Implementation time should also be a fraction of that required for the gas alternatives.

We are not suggesting that this scheme be implemented immediately, but we are proposing that a careful study be funded and started as soon as possible. Input and cost estimates should be obtained from all interested parties--the petrochemical companies, the gas pipeline companies, the gas utilities, the environmentalists, Alyeska Pipeline Service Co., the oil refining and marketing companies, the automotive industry, and possibly others. We need to have an

unbiased evaluation of this proposal to be considered along with the three being backed by the gas pipeline companies and utilities. There is no reason why natural gas consumers should pay for another grandiose, expensive slow scheme to fill their needs when a better method may well already exist.



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ESTIMATED POTENTIAL VALUE OF NATURAL GAS LIQUIDS IN 1981

TO

THE STATE OF ALASKA

(Basis: 2.4 Billion Cubic Feet Per Day of Gas)

Product	Total Liquids in Prudhoe Gas (B/D)	Alaska's Share (B/D)	Value as Liquid(1) (\$/B)	Value as Gas(2) (\$/B)	Value Difference (\$/B)	Added Income to Alaska from Royalty Sales(3) (\$/D)	Added Income to Alaska from Severance Tax(4) (\$/D)	Total Income to Alaska (\$/D)	Total Annual Income to Alaska (\$/yr)
ethane	163,700	20,500	6.00(5)	4.00	2.00	41,000	28,600	69,600	25,400,000
propane	87,300	10,900	12.00(6)	5.70	6.30	69,000	38,500	107,500	39,200,000
butane	31,400	3,900	13.00(7)	6.20	6.80	27,000	15,000	42,000	15,300,000
pentanes Plus	<u>6,120</u>	<u>800</u>	<u>13.00(7)</u>	<u>7.20</u>	<u>5.80</u>	<u>4,500</u>	<u>2,500</u>	<u>7,100</u>	<u>2,600,000</u>
Total	280,500	36,100				141,600	84,600	226,200	82,500,000

This is the estimated 1981 value at Prudhoe Bay after allowing for extraction costs and shipment to California.

Based on delivered value in midwest of \$3.00 per MMBTUs and transmission cost of \$1.50 per MMBTUs in 1981.

Based on 12.5% Alaska royalty share.

Based on 0% severance tax.

Based on ethane being worth \$6.00 per barrel at Prudhoe Bay in 1981.

Based on propane being worth \$18.00 per barrel, delivered to California.

Based on butane and pentane being worth \$19.00 per barrel in California.

(1937), wherein the Supreme Court of the United States upheld a Texas statute prohibiting the use of sweet gas in the production of carbon black. Although the State did not prohibit production from the wells in question, the effect was the same because there was no other market for the sweet gas at that time.

10. It is probable that the State may be able to require that a producer of natural gas extract liquid hydrocarbons from the gas before the gas enters an interstate pipeline.

No cases have dealt with the precise issue here under consideration, and accordingly an unconditional opinion cannot be given. There is, however, an abundance of authority recognizing that a State may validly regulate production of oil and gas by virtue of the police power inherently possessed by the State. Summers, The Law of Oil and Gas, § 105 (1927). These authorities are set out above in the discussion of the general power of a State to control production of oil and gas.

The cases dealing with questions most closely related to the one at hand were decided by the United States Supreme Court in 1920 and 1937. Those cases dealt with the authority of a State to regulate and/or prohibit the use of natural gas for the manufacture of carbon black.

*From Moody
"Legal Analysis of Issues
Relating to Natural Gas
Transportation"*

The leading case is Walls v. Midland Carbon Company,

254 U.S. 300 (1920). Wyoming had enacted a statute which provided that:

"The use, consumption or burning of natural gas taken or drawn from any natural gas well or wells, or borings from which natural gas is produced for the products where such natural gas is burned, consumed or otherwise wasted without the heat therein contained being fully and actually applied and utilized for other manufacturing purposes or domestic purposes is hereby declared to be a wasteful and extravagant use of natural gas and shall be unlawful when such gas well or source of supply is located within ten miles of any incorporated town or industrial plant." Walls at 309.

In addition, Section 2 of the statute prohibited "the use, sale or other distribution of natural gas, the product of any well owned, leased or managed by any person, for the purpose of manufacturing or producing carbon or other resultant products from the burning or consumption of such gas, without the heat therein being fully and actually utilized for other manufacturing purposes or domestic purposes". Walls at 310.

The statute was attacked on the grounds that (i) the statute transcended the police power of the State of Wyoming, in that its purpose and effect was not to regulate and conserve natural gas but to prohibit the use thereof; (ii) the statute made a discrimination between owners having equal rights, and thereby violated Article I, §10 of the United States Constitution and the Fourteenth Amendment thereof; (iii) the law deprived the companies of their property by the ruin of their business, and (iv) the statute impaired the obligation of pre-existing contracts.

The United States Supreme Court held that while the prohibition contained in the statute is upon the use or consumption of the natural gas, and not the production thereof, the statute was constitutional. Unfortunately, the Supreme Court's opinion is dedicated to a detailed analysis of the facts, and the opinion cites little authority and few principles of law in reaching its decision.

The Court stated that while it was clear that carbon black has many uses and great utility, this fact is of incidental importance.

"The determining consideration is the power of the State over, and its regulation of a property in which others besides the companies may have rights in and which the State has an interest to adjust and preserve, natural gas being one of the resources of the State. And in this consideration it is more important to consider not for what a particular owner uses the gas, but the proportion of his use to that of others, or it may be, the prevention of the use by others. . . ." Walls at 319.

The Court also said that Wyoming was not "required by the Constitution of the United States to stand idly by while these resources were disproportionately used, or used in such a way that tended to their depletion, having no power of interference." Walls at 324.

The decision in Walls was re-affirmed in Henderson Company v. Thompson, 300 U.S. 258 (1937). Again, the Supreme Court's opinion cited little authority, its decision resting upon a finding that the facts demonstrated that the legislature had acted reasonably.

In Henderson, the plaintiff attacked the validity of orders entered by the Railroad Commission of the State of Texas pursuant to a statute prohibiting the use of "sweet gas" for the manufacture of carbon black. Sweet gas was defined by the statute as any natural gas containing more than one and one-half grains of hydrogen sulfide per 100 cubic feet, or more than 30 grains of total sulphur per 100 cubic feet of gas, or "gas which in its natural state is found by the Commission to be unfit for use in generating light or fuel for domestic purposes." Henderson at 260, n.1. Once again a claim was made that the statute violated the equal protection clause of the Fourteenth Amendment, as well as that the statute violated the due process and contract clauses of the United States Constitution.

The Supreme Court cited Walls for the proposition that "the needs of conservation are to be determined by the Legislature." Henderson at 264. While the plaintiff conceded this, it urged that in the absence of waste, the legislature of the State of Texas lacked the power to regulate production, since in that State the law gives the owner of land title to the gas in place and to that which may migrate to formations under his land. The Court rejected this argument, stating:

"One principal established by the Walls case is that the Legislature may, for the purpose of conserving natural resources, regulate their production and use. The findings of the district court in this case

support the reasonableness of the present statute on that basis. It is also urged that there is this vital difference in the facts: that in the Panhandle field [Texas] the challenged prohibition will not prevent waste, or conserve the supply of sweet gas, since the sweet gas, if not used, will drain into the sour gas area, because of the lower pressures there. Moreover, it is insisted that, unlike the Walls case, there is here in the record convincing evidence that the use of sweet gas in the manufacture of carbon black is not wasteful. Our decision in that case rested upon no particular theory of the nature of the carbon black industry. It was based simply upon the determination that the statute in question was not shown to have been an arbitrary exercise of legislative power." Henderson at 267 (emphasis added).

Thus, there is authority from the United States Supreme Court that a State may, under its police powers, regulate the use, as well as the production, of oil and gas for purposes of conservation. The State has discretion in deciding what is wasteful production and use. However, in both Walls and Henderson, the Court took great effort in discussing the facts to demonstrate that the legislature had not acted unreasonably in prohibiting the use of the gas for the manufacture of carbon black. And in each case the States of Wyoming and Texas were able to demonstrate that the statutes involved were reasonably related to conservation measures.

It is arguable that, under the authority of Walls and Henderson, a State could require that liquid hydrocarbons be removed from any natural gas produced as long as it reasonably could be demonstrated that such a requirement

would prevent waste or otherwise would be in the interest of conservation. For example, if it could be demonstrated that the dry gas (after the liquids had been removed) was of sufficient B.T.U. content to generate enough heat for its needed uses, and that the extracted liquids themselves could then be used as an energy source, or as a valuable raw material or feedstock, waste is prevented (and conservation is thereby served) - that is, more total utility is derived from the gas produced than if the liquids were not so extracted. Obviously, the questions of whether conservation will be served and waste prevented, are scientific, fact questions which will have to be answered by qualified experts, and accordingly the power to require extraction should be vested by the Legislature in the State's conservation agency where decisions may be reached with appropriate protection of the rights of all.

The Walls case has been cited many times by Courts for the proposition that a state has complete authority to regulate the use, as well as the production, of natural gas. One case cites Walls in stating that "its [the gas] extraction and use is subject to regulation, or even complete restriction or suppression, by the state." Herkness v. Irion, 11 F.2d 386, 388 (E.D. La. 1926).

One Texas case was found wherein the Supreme Court of Texas upheld the general authority of the Railroad Commission to regulate the production of oil and gas through

proration and other orders. One of the orders entered by the Railroad Commission directed "that all of the gas from the Bammel Field shall be processed for its liquid hydrocarbons and condensates therein efficiently extracted and the residue gas either returned to said sand from which it was produced or utilized for light and fuel and other lawful uses. . . ." Unfortunately, this order was not attacked in the Courts, and therefore the Texas Supreme Court never ruled on the enforceability of the order. However, the Court was aware of the order and made clear that the Railroad Commission did have the power to regulate the manner of production in the Bammel Field. Corzelius v. Harrell, 186 S.W.2d 961, 971 (Tex. 1945).

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March 12, 1977


Senate President John Rader
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Dear Senator Rader:

The enclosed critique of the recently issued FPC "Initial Decision on Proposed Alaska Natural Gas Transportation System" will, we think, be of interest to you. One of the reasons we feel the State of Alaska must take the initiative in examining the "ALASKAN METHANOL WAY" is because the Federal Government staff work has been so inadequate, as the critique shows.

We hope you found the booklet sent to you on February 7th over our Arctic Enterprises letterhead to be useful and interesting. We wonder whether the State is now ready to sponsor a study on the ALASKAN METHANOL WAY in the light of the FPC Decision.

Sincerely,

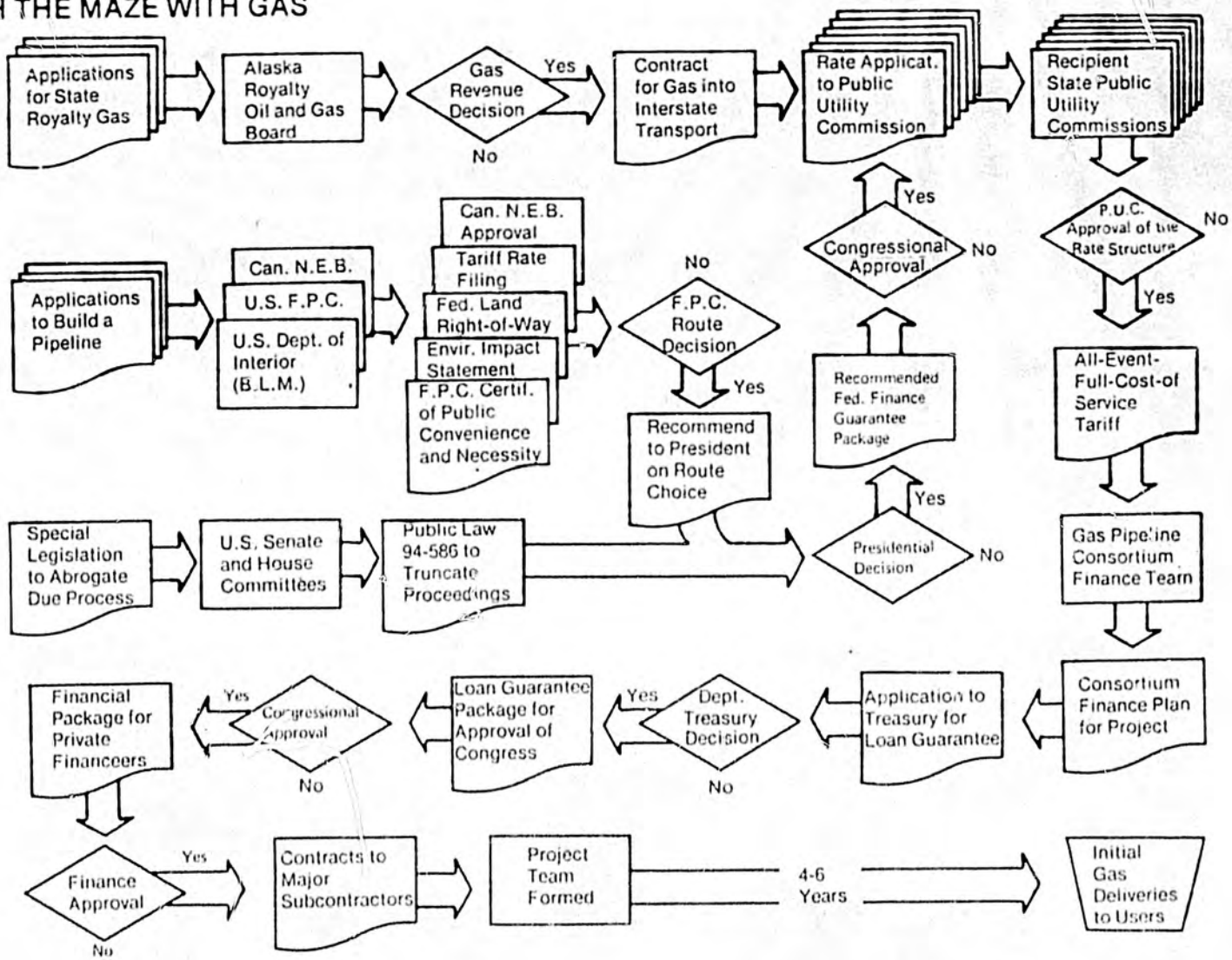


William H. Kumm
Principal, KM Associates and,
President, Arctic Enterprises Inc.

enclosure

WHK:agk

THROUGH THE MAZE WITH GAS



CRITIQUE OF THE FPC REPORT

"EL PASO ALASKA COMPANY DOCKET
CP 75-96 ET AL.
INITIAL DECISION ON PROPOSED
ALASKA NATURAL GAS
GAS TRANSPORTATION SYSTEM"
FEB. 1, 1977

K M ASSOCIATES
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February 28, 1977

CRITIQUE OF THE FPC REPORT

"EL PASO ALASKA COMPANY DOCKET CP 75-96 ET AL.
INITIAL DECISION ON PROPOSED ALASKA NATURAL
GAS TRANSPORTATION SYSTEM" FEB. 1, 1977

1.0 Purpose of this Critique

With reference to Public Law 94-586, Oct. 22, 1976. ^{1/}

We are responding both in general to the report and in particular to the part of the report dealing with alternatives to the gas pipeline approaches.^{2/} (We, **K M ASSOCIATES Consultants**, are not Federal officers.)

2.0 General Nature of the Comments

We have neither the expertise nor the requirement to evaluate the specifics of the decision for one or another pipeline. We can, however, comment on the decision methodology used by the Federal Power Commission within the terms given by the Commission in the report. We will also comment extensively on the one area of the report within the governmental mission, that is, "alternatives".

^{1/} Public Law 94-586, Oct. 22, 1976

Section 6 OTHER REPORTS

"Sec. 6(a) Not later than July 1, 1977 any Federal officer or agency may submit written comments to the President with respect to the recommendation and report of the Commission and alternative methods for transportation of Alaska natural gas for delivery to the contiguous states ..."

^{2/} "El Paso Alaska Company Docket CP 75-96 ..." pp. 248-9

2.1 Comments on the FPC Decision Methodology

Several sectors of the economy are supplied by regulated industries. One fundamental feature of the jurisdictional aspects of regulation is that some "public convenience and necessity" be served by the regulations. It is true that the issue of jurisdiction is usually dealt with pro forma because of judicial reluctance to interfere with the intent of legislation. It is still true, however, that the premise of public convenience and necessity must be established.

In the report of the FPC no such foundation has been established. This point is not trivial. The Commission, in its own words, finds the Alaska North Slope gas issue unusually important financially,

"The present level of discovered gas reserves will justify only one transportation system, and the billions of dollars of capital costs for initial construction are simply so high that it would be cheaper in the foreseeable future to add to an existing line rather than to commence another.

"The magnitude of the physical undertaking and cost of building a gas transportation system from Alaska apparently exceeds any prior U.S. private undertaking. The estimated \$8-\$11 billion costs are such that the resolve to go forward will require a financial commitment over the construction period of a substantial amount of that funding normally available to all utilities." (page 9)

and unusually difficult procedurally,

"But these (technical) impediments pale when compared to those problems covered throughout the entire period of the hearing by the failure of those owning the reserves to enter into sales contracts ... This refusal, by itself, has prevented the expeditious and orderly examination of sizing the pipeline, financing, marketability, and a host of related matters, including disputes as to which companies would ultimately buy the gas." (page 12)

"... (As a result) the Commission would not insist on compliance with the general Commission requirement that sales agreements be on file before this phase of the application is completed." (pages 12-13)

"In addition to the lack of sales (of gas) agreements, there is still no approved production agreement for oil or gas from the Prudhoe Bay Field." (page 14)

2.2 Conclusion About the Decision Methodology

The Commission's findings in view of the factual and administrative uncertainties would seem suspect. Perhaps the Commission report itself best summarizes our misgivings -

"The net result of the lack of sales contracts and lack of an approved field production agreement is that the record has been closed without a deliverability schedule of gas which will be sold and without knowing the purchasers of this gas. The record has been closed without knowing more than the alleged general cost of field gathering and gas conditioning facilities or who would pay for them. The record has been closed without specific estimates of reserves on the Lisbourne and Kuparuk formations which are part of the Prudhoe Bay Field. These record deficiencies in the usual case would require that the entire proceeding be held in abeyance pending their resolution. Here an overwhelming consensus on the part of the Commission, the Congress and the Executive Branch has been to go forward anyway and to pick a pipeline. It is not the best way to make rational decisions." (page 15)

We agree.

3.0 The Public Convenience and Necessity

The usual practice is that a public convenience and necessity is served when a regulatory commission asserts such a view. This particular case must be considered an exception. The report cites numerous issues which, on their face, raise questions about the premise of public convenience and necessity. Nevertheless, because of the tradition of regulatory practice, we will seek to

show that neither the public convenience nor the public necessity is automatically served by the pipeline choice.

3.1 Public Convenience

If disturbing the ordinary affairs of the public and its sub-groups can be considered as public inconvenience, then the recommendations of FPC will definitely cause "inconvenience."

The disturbances fall into three categories: physical/environmental, financial/economic and judicial/institutional.

Physical/environmental: The Commission treats the physical environmental issues with considerable thoroughness. The report shows that a considerable disturbance of the environment will occur for any pipeline, which recommends the least "impactful", i.e., the Arctic Gas proposal. The Commission is considerably less even-handed in its treatment of the sociological issues of the pipeline approaches. In particular, the Commission weighs the total Arctic Gas impact against the total El Paso or Alcan impact while quietly ignoring the ratio of intrusion to the base environment. That is to say, the El Paso and Alcan intrusions are in regions where prior intrusion, largely in the TAP's (oil) area, have occurred. The Arctic Gas intrusion is in practically virgin territory or upon very small or fragile ecologies, i.e., the North Slope. The "overwhelming consensus" seems to have overwhelmed a careful treatment of the North Slope intrusion issue.

Financial/economic: The Commission did examine economic and financing issues at considerable length in spite of having no concrete cost, price or wellhead value data. In the case of

"inconvenience" to the economy, the very substantial impact upon utility capital markets of the pipeline finance requirements were dealt with somewhat briefly.^{3/} This in spite of the fact that the material in Appendix I examined the capital market impact at some length and concluded that a sizeable disturbance would develop.

Concerning the impact upon the general public, the Commission displayed the results of a gas cost model submitted by the Federal Energy Administration.^{4/} The model showed relative gas costs given wellhead prices of 55¢ and \$1.00 and transport tariffs of \$1.29 to \$1.60. Possibilities of wellhead prices of \$1.42 or higher or tariffs in excess of \$1.60 were ignored. Yet the economic impact of gas at \$3.00 to the city gate is substantial.^{5/}

Judicial/institutional: The relative disturbance recommended by the Commission with respect to federal operations, new legislation, interstate court battles, even public/private standing is staggering. In the Chapter "Potpourri" the Commission's Judge recommends:

- A) Sections 13(a), 13(b) be deleted from the "Alaska Natural Gas Act of 1976".
- B) Jurisdiction over rates and operations of LNG ships be conferred on the Commission.
- C) The Treasury Department should develop a plan for Federal participation in the finance of the pipeline. (pages 426-7)

^{3/} FPC Report, page 378.

^{4/} Cited in the report on page 302.

^{5/} The FEA gas marketability model is "proof" the entire pipeline concept is a wise investment from a national point of view. We merely note that a much larger set of marginal cost/marginal benefit analyses would seem to be required given the private market reluctance to underwrite the concept.

In other places in the report the Commission advocates a legal battle with the State of Alaska over its "Hire Alaskan" statute (page 267), its royalty gas allocability (p. 18-19), and the terms of the statute (Alaska Natural Gas Act of 1976) (page 256).

There are not a few comments in the Report which suggest a sort of "Eminent Domain" attitude developing about the gas itself.

For example -

"This, while stating their (the oil producers) concern for the national interest and the requirements of this country for energy at an early date, their prime consideration for early sale turns on other more parochial interests. The only conclusion possible from their actions is that the national interest to ARCO, EXXON, SOHIO, etc., lies somewhere below their own economic interest ..." (page 13-14)

While the national security aspects of energy have extended Federal power over state's rights and private property, we do note that considerable "inconvenience" seems associated with the Commission's propositions.

3.2 Public Necessity

There is no doubt that the public can be legally and reasonably "inconvenienced" if an adequate "necessity" exists. Indeed that is very much a functional definition of most of government. The real issue turns on the question, "Is a new pipeline necessary to deal with Prudhoe Bay gas?"

The proposition that a pipeline is necessary is not established anywhere in the report. The page and one-half on alternatives is not even a legitimate Commission comment much less a proper treatment of the issue.

We believe that the legislative record supports the

point that the Commission had to make a thorough study of alternatives. This sanction is in addition to the philosophical imperative of the certification requirement. We note that our own interest is very much in possible non-pipeline methods of energy transport.

This interest biases our concern but has not biased our judgement. Given the huge cost of the pipeline approaches, the complex evolution of a project, etc., the possible methods of moving the energy or rather hydrocarbons south by another means must be explored.

To sum up, are there any alternatives to a new gas pipeline?

In view of the "inconveniences" to the public discussed above it is essential that the "necessity" of a new gas pipeline be thoroughly established. The only legitimate procedure is to exhaustively examine all alternative techniques of hydrocarbon transport and reject them on proven and substantive (as opposed to jurisdictional) grounds.

4.0 Alternatives

The prior discussion can be said in another context. The FPC is statutorily limited to the consideration of natural gas distributed and marketed as a fuel by jurisdictional gas utilities. On the other hand it is obvious that larger national energy policy issues are involved, indeed were so involved in several places in the report. When the level of a decision making process is elevated the criteria may change and the answer may be different. Hence the footnote on page 248 of the report - "Since the object is to bring natural gas to market, the use of methanol in the lower 48 states was not extensively investigated." - is simply presumptuous. Should not the object be, "Bring energy to market?"

4.1 The Basic Alternative

In the national energy context, the plain fact has to be admitted that of all the estimated recoverable energy in the Prudhoe field, only 22% of it is gas. Moreover, at the planned transport costs, the gas energy is costing \$1.60 per million BTU's to deliver to the lower 48 while the oil energy will cost 88¢ per million BTU's. A priori it seems clear that utilization of the gas must be done with careful consideration of the oil recovery issue. This latter consideration opens up one very simple alternative. To not take any of the gas away from Prudhoe Bay.

Consider that tertiary recovery of oil in the lower 48 has been done using field gas, that local purchases of non-field gas are used and that in one case nitrogen is being manufactured at 75¢ per Mcf in order to increase recovery.

The solution gas, gas cap, oil recovery rate questions were not addressed by the FPC.

4.2 Considering the Environment

We are surprised that the Commission failed to mention in its "Alternative Transportation Methods" (about one page, total) the most prominent man-made feature in Alaska, the Trans-Alaska Pipeline. The Commission also gave little attention to the other prominent feature of Prudhoe Bay, the presence of the Arctic Ocean.

4.3 Available Capacity in the Trans-Alaska Pipeline

As has been brought out in Senate Joint Commerce and Interior Committee hearings on the disposition of Alaska North Slope Crude Oil during the Autumn of 1976, there is, and will

continue to be, excess carrying capacity in this liquids pipeline into the foreseeable future.

This is further substantiated in the FEA Nov. 30, 1976 draft document "An analysis of the alternatives available for the transportation and disposition of Alaskan North Slope Crude", FEA document no. FEA/G-76/477.

The Trans-Alaska liquids pipeline has a design throughput of 2 MMBD (Million barrels per day). It is currently built only to a throughput of 1.2 MMBD. At the lower 48 state West Coast market (the PADD V market) the following is the data from the report, page 00133.

"FEA Surplus Forecast

FEA's current estimate of the crude oil excess in PADD V is presented below: (MB/D is thousands of barrels per day)

<u>1978</u>	<u>MB/D</u> <u>1980</u>	<u>1985</u>
600	900-1100	700-1300 "

Clearly the Trans-Alaska liquids pipeline will have excess capacity for many years. Some of this capacity could be used for another oil-compatible liquid on a batch basis, in the manner of pipelines in the lower 48 states.

4.4 The Asset, Its Use and The "Alternatives" Section of the Report

The existence of the surplus capacity would suggest that one alternative method of moving the gas energy would be to transform the gas into an oil-compatible liquid. Methanol is such an oil-compatible liquid. It could be made from oil-associated natural gas at Prudhoe Bay, and batch shipped in the Alyeska pipeline if

the government deemed it to be wiser than constructing new gas pipelines. It is obvious that a lesser capital cost would be involved in using an under-utilized asset than building a new gas pipeline. Only the capital cost of methanol synthesis, and the batch shipment inventory tankage would be involved. Since no new pipeline would be required the statement -

"According to FEIS of DOI, the total common-destination capital cost would be almost 1.5 times that of the Arctic Gas proposal ..." (page 248)

- would indicate the DOI believes the methanol synthesis operation require some \$12 billion, that is, the stated Arctic Gas cost of \$8 billion times 1.5.

This patently absurd conclusion raises the question, where did these values come from?

4.5 The Commission's Treatment of "Alternatives"

The FPC report says, on page 248, "that ... while methanol production and transport might be technically viable, several severe drawbacks make it impractical. First, the methanol conversion is costly". The FEA report then goes on to cite the Department of Interior Final Environmental Impact Statement to the effect that "... the total common-destination capital cost would be almost 1.5 times that of the Arctic Gas proposal, and the total operating cost would be three times greater."

What is the source of the attributed DOI information? Does it represent the result of a definitive economic analysis by the government of the alternative to the proposed action?

The DOI EIS task force specifically examined the environmental aspects of the three competitive applications to build natural gas pipelines because a right-of-way would be required over federal lands for a new pipeline. The DOI EIS task force was not charged with examining the economic aspects of the issue.

The element of the DOI which was charged with the examination of the economic and technical issues of Alaska gas transportation did so under the mandate of section 302 of P.L. 92-153, the so-called "Trans-Alaska Oil Pipeline Act." This section of this act required the examination to be completed within two years of the enactment of the original law in November 1973. The DOI study was completed in November 1975. The June 1975 draft of the study report "Alaskan Natural Gas Transportation Systems. Economic and Risk Analysis Conclusions and Results" said, on pages 4 and 5: "Of all the various types of systems to transport North Slope gas that have been discussed, only two have received the support of private industry to the extent that they have been proposed in applications before U.S. and Canadian regulatory agencies." And,

"DELIVERY SYSTEM ISSUES NOT ADDRESSED BY THIS STUDY

- ENVIRONMENTAL IMPACT
- REGIONAL ECONOMIC IMPACTS AND CONCERNS
- INTERNATIONAL POLITICAL IMPLICATIONS
- U.S. AND CANADIAN GAS RATE REGULATION
 - RATE BASE
 - RATE OF RETURN ON RATE BASE
 - FAIR TRANSPORTATION CHARGES
- OTHER TRANSPORTATION SYSTEMS
 - ALTERNATIVE PIPELINE ROUTES
 - CONVERSION TO METHANOL
 - SUBMARINES, AIRCRAFT, ETC."

As the final report of the DOI section 302 study also says, on page 28 of the INTRODUCTION, the DOI did not examine the

alternatives. In fact the report even allows that it only examined systems which ... "are similar but not identical to the systems presented to the Federal Power Commission in the formal applications." (Last paragraph on page 24 of "Alaskan Natural Gas Transportation Systems. A report to the Congress, pursuant to Public Law 93-153 December 1975".)

If the DOI EIS group did not examine the economics of the alternatives and the DOI "302 study" team did not examine the economics, where does the statement about the common-destination capital cost of the (methanol) alternative come from? The answer to the question is that it comes from the application filed by the Arctic Gas Consortium!

The Federal Power Commission February 1977 document is based on the earlier FPC documents, specifically the April 1976 Final Environmental Impact Statement on Alaska Natural Gas Transportation System. Volume II, the El Paso System volume, says on page II-376 in Section II ALTERNATIVES TO THE PROPOSED ACTION, as follows:

"This section discusses the alternatives to implementing the proposed project. These alternatives include:

- 1) Alternative Pipeline Routes
- 2) Alternative Sites for LNG Facilities
- 3) The Alternative of No Action
- 4) The Alternative Modes and Systems
- 5) Alternative Sources of Energy
- 6) Energy Conservation

"Alternatives 1, 2 and 3 are covered on the following pages. The discussion of alternatives 4, 5, and 6 are adopted by reference from the U.S. Department of Interior's Final Environmental Impact Statement issues in March 1976 for the Alaskan Natural Gas Transmission System."

The March 1976 DOI Final EIS makes certain admissions in the section 8-F on alternative transportation systems, starting on page 116. Specifically, on page 124 in the fourth paragraph, the following is stated:

"According to the Canadian Arctic proposal (CAG P.L. 1974), the total common destination capital cost of a methanol pipeline would be almost 1.5 times that of the Alaska Natural Gas Transportation System and the total operating cost, 3 times greater."

In short, the entire FPC treatment of alternatives to gas pipelines is lifted almost virgo intacto from the pipeline applicant's original filing.

But the Arctic Gas Consortium did not examine the methanol alternative. This is acknowledged in the Hearing Report of the Joint Hearings before the Committees on Interior and Insular Affairs and the Commerce, U.S. Senate of February and March 1976, pursuant to S. Res. 45, the National Fuels and Energy Policy Study. The committee report on the transportation of Alaskan Natural Gas, in Part 2 of Serial No. 94-29 (92-119) gives the following answers to the Questionnaire "Issues concerning the Transportation of Alaskan Natural Gas". The questionnaire was prepared by the committee staff to invite answers from hearing witnesses and interested parties. On page 1025 of the Hearing Record the following is stated:

"The following responses are submitted by the Alaskan Gas Pipeline Company to the questionnaire..."

On page 1134 and 1135 of the Committee Hearing report, in answer to the following question, Arctic Gas says:

"Question III STATUS OF REGULATORY APPROVALS

D. Alternatives

Please provide estimates of the costs environmental impacts, construction lead times and other relevant facts concerning:

(1) An alternative pipeline route from the North

Slope to Fairbanks and then paralleling the Alcan Highway:

- (2) Conversion of the natural gas to methanol and shipment by the Trans-Alaskan oil pipeline or tanker or submarine; and
- (3) Other possible alternatives.

Response:

... Arctic Gas has not studied the possibility of shipment of methanol in the Trans-Alaska oil pipeline nor by tanker or submarine..."

If the Arctic Gas did not examine the batch basis methanol concept, where do all the FPC judgements, "... extremely energy-inefficient", "...requires large amounts of fresh water", "...the total operating cost would be three times greater", come from?

● "Energy Inefficiency"

Referring to page VI-328 of the June 1975 DOI draft, Environmental/impact Statement, Part VI Alternatives, Volume 1 of 2, the following is stated:

"One of the main drawbacks of the (methanol) method is its lower overall efficiency to a common destination, which is only 48.2% with a loss of 2,546 BBTUD in contrast to the natural gas pipeline system, which has a 90% efficiency and only 489 BBTUD loss. The total common destination capital cost was calculated to be almost 1.5 times that of the natural gas pipeline and the total operating cost to be 3 times greater".

These are the same words as before, only the order in the sentence has been reversed. The DOI draft EIS goes on:

"Environmental Impact

"Because the methanol pipeline system at present appears to be economically unfeasible although technically viable when compared with the natural gas pipeline and because the energy loss in conversion to methanol, not all of its potential environmental effects are considered in detail".

What the February 1977 report of the FPC is in fact citing at the bottom of page 248, is a sentence out of the Arctic Gas Consortium application with respect to a comparison between

the proposed natural gas pipeline and hypothetical methanol pipeline over the same route. Aside from the technical and economic questionableness of simply quoting of the applicant's data, the FPC has slightly oversimplified the issue.

Figure 1 titled PRINCIPAL PROCESS STEPS IN DELIVERING ENERGY TO MARKET BY VARIOUS TRANSPORTATION SYSTEMS, of subsection 2.1 of Chapter V-B of the Arctic Gas applicant's filing is attached as an exhibit. As can be seen, the applicant's treatment of the alternative methanol pipeline includes a gas processing plant which is common to both the gas pipeline proposed approach and the methanol alternative. In fact, the methanol alternative would not use a gas processing plant. Thus some 7% of the BTU's of the Natural Gas Liquids (NGL) are used by the methanol approach, but they are sacrificed by any gas pipeline approach. Second, the figure shows that the applicant's treatment of the methanol pipeline alternative shows a block labeled "SNG Plant" and another block labeled "Gas Pipeline" before the "common destination" is reached at the bottom of the illustration page. It need only be pointed out that it is not necessary to take methanol, an unregulated chemical and fuel, and put it through the last two blocks of the sequence in order to serve the regulated natural gas market place. Methanol would be sold, as now, outside of FPC regulated channels and therefore does not require the further BTU losses that would occur with the last two blocks to the "common destination". Once the methanol pipeline alternative is relieved of the losses attendant to the three unnecessary blocks, the BTU loss for the methanol pipeline alternative, and

the capital cost of these three blocks are not present.

- Fresh Water Issue

The FPC report makes another statement about the "Alternative Transportation Methods" in regard to methanol as the only alternative commodity discussed. The following sentence is from the top of page 249 of the FPC February 1, 1977 report:

"Second, methanol conversion requires large amounts of fresh water. Estimates range from 125 gallons to 300 gallons of water required for every ton of methanol produced."

Using the same procedure as that used above of tracing back through the existing FPC, DOI and FEA documentation on the subject, we find, in the March 1976 DOI FEIS, at the top of page 128:

"Because the North Slope fresh water is frozen most of the year, the processing water probably would also have to be taken from the Beaufort Sea and then subjected to desalination before it could be used in the methanol plant. Desalination facilities could add considerably to the plant cost. The Maritime Administration report (1975, already cited earlier) suggests that, after the submarines (submarine tankers capable of carrying crude oil or methanol from the North Slope to the East Coast via the Arctic Ocean) were in operation, their methanol-ballast water could be converted for use in the methanol process and thus eliminate the need for taking water from the North Slope (i.e. the Beaufort Sea)."

It need hardly be added that potable water is not required from the desalination facility, that such plants are in use today, and their cost and reliability is reasonable, not prohibitive. This does not appear to be an overwhelming reason for dismissing this alternative transportation method.

- Energy Efficiency/Inefficiency

The FPC February 1977 report says as follows on page 249, in the first paragraph:

"Third, the methanol scheme is extremely energy-inefficient. The chemical conversion of natural gas to methanol and the possible reconversion to synthetic natural gas requires large amounts of energy."

This assertion requires a little analysis. First, the same sentence could have been written about naphtha, a similar clean storable liquid fuel to methanol. Naptha is an oil refinery product, produced through a process involving a chemical conversion energy loss. The FPC and FEA, however, currently permit various municipal gas utilities to use naphtha as a synthetic natural gas (SNG) feedstock. This SNG conversion consumes energy too. Should not the FPC be required to show the BTU losses for this SNG energy source process, as the basis of comparison for the methanol commodity fuel transport alternative to natural gas pipelines, with and without SNG produced from the methanol? Methanol does not have to be reconverted back to SNG to have many market uses, as has already been mentioned.

Second, as was previously mentioned, the natural gas liquids can go to market along with the methanol as a "carrying fluid". 7 percent more energy can thus be marketed, compared with the "dry pipeline quality natural gas" which must be prepared for the gas pipeline transportation approach.

Third, the chemical synthesis of methanol (CH_3OH) from natural gas or methane, (CH_4) requires more carbon than is available from the gas, for maximum conversion efficiency, or minimum BTU loss. The addition of carbon from a local source on the North Slope of Alaska could be very useful. There are abundant coal reserves on the North Slope. The conversion of the coal to methanol is conversely, rich in carbon and shy in hydrogen. Thus, a synergistic process is

possible which would reduce the methanol synthesis BTU shrinkage substantially, in both instances.

Fourth, the new natural gas pipeline, if approved and built is many years from completion. For the duration of the time that a natural gas energy utilization or transportation system is delayed, once the oil production begins in 1977, there will be a gas energy BTU shrinkage caused by the pumping power of the reinjection of the gas into the formation. This represents some 10% loss in gas BTU's until the day that a gas pipeline is completely finished. A methanol transportation system, on the other hand, based on modular plants and the use of the existing trans-Alaska pipeline on a batch basis can be built up incrementally and eliminate the 10% reinjection energy cost much earlier than any gas pipeline system. This is not a trivial point but the FPC appears to have chosen to ignore it.

Fifth, the gas pipeline applicants have based their discussion of the throughput required to make a new gas pipeline economic on the use of the gas cap as well as the solution gas. The use of this gas will have a shrinkage effect on the oil production BTU's or the gas cap contribution to the pressure must be substituted by another form of active pressure maintenance, again at a BTU loss. Because a methanol delivery system can be implemented on only the solution gas, there is a BTU shrinkage tradeoff in this aspect also.

The FPC analysis of gas distribution considers the "displacement" of lower 48 gas supplies at some length. Geographic displacement is considered a legitimate method of "substitution".

There is an analogous market "displacement" phenomenon between one and another uses of gas, coal and oil - even between various supplies of gas.

The principle of substitution in the energy marketplace can be applied to methanol, for example, in the automotive fuel sector of the national economy. Natural gas would not be readily used in the automotive fuel sector. When a barrel, or gallon, of methanol is substituted for a barrel, or gallon, respectively, of gasoline in a 1-in-10 mixture ratio, the internal combustion engine used in the automotive sector will operate as well on 10 units of mixture as on 10 units of gasoline. Gasoline has double the BTU heating value by volume of methanol. Therefore, substituting natural gas derived methanol for foreign oil derived gasoline in the automotive fuel sector more than makes up for the methanol synthesis loss in BTU's, and provides a source of domestic fuel in a market place with a very high social utility. This aspect of the methanol is totally ignored in the FPC documentation, but it is mentioned in the DOI March 1976 FEIS in the ALTERNATIVES volume on page 126, as follows:

"Methanol has many uses as a well-known petrochemical feedstock, a solvent, or a fuel, alone or mixed with gasoline for internal combustion engines. Less well known uses might, with proper development, provide a methanol market for applications in turbogenerators, peak load shaving for limited periods, fuel cells for running motors, and production of single-cell protein... While these uses might make major contributions to other energy and food problems, they would not solve the dilemma of natural gas distribution companies, who want and need gas for their customers. If methanol were produced from Arctic gas, only incentives for further drilling in the continental United States, namely higher field prices, could provide this gas supply. Still, paying high transportation costs for remote Arctic gas would add unnecessarily to the country's energy bills."

4.6 A Broader Consideration of Alternatives

The foregoing is not meant to break a butterfly on a wheel. The analysis of the sources is done to prove that the FPC treatment of alternatives is not only inadequate but intellectually dishonest.

The broadest look at alternatives requires consideration of several categories. First, there is the alternative of doing nothing, that is, leave the cap gas untouched and reinject the solution gas. This has some probable value in its effect on ultimate oil recovery.

A second category is beneficiation of the product into a more tractable product to ship. Within this category is the alternative of low value beneficiation - say, for example, ammonium nitrate, which would allow for annual shipment to the lower 48 during the summer retreat of the pack ice. Or, on the other hand, much more extensive processing in situ could yield a product for the TAP's line or even air freight.

Perhaps none of these alternatives are sound and economic uses for the gas. Perhaps they are. We shall never know from the FPC treatment.

5.0 To Sum Up

The FPC report can be seriously faulted because its conclusions on the Alternatives are neither supported by the documents cited in the report, nor by any independent federal analysis of the technical and economic aspects of several alternatives. Only the methanol approach was even mentioned in the FPC report. That much, much more could be learned about that particular activity is

suggested from Congressional testimony. In 1975 a study was performed by the Associated Universities of Oak Ridge for the FEA. It showed that the methanol approach using the Trans-Alaska liquids pipeline on a batch basis should be examined in detail. The principal investigator reported, in testimony before the previously cited joint hearings before the Senate Committees on Interior and Insular Affairs and Commerce, as follows, from pages 1770 and 1771 of Part 3, Serial No. 92-72 (Commerce):

"SENATOR STEVENS. In your opinion is there enough merit in this strategy to warrant an extensive study of it at this point and if so, how long would you guess such a study would take?

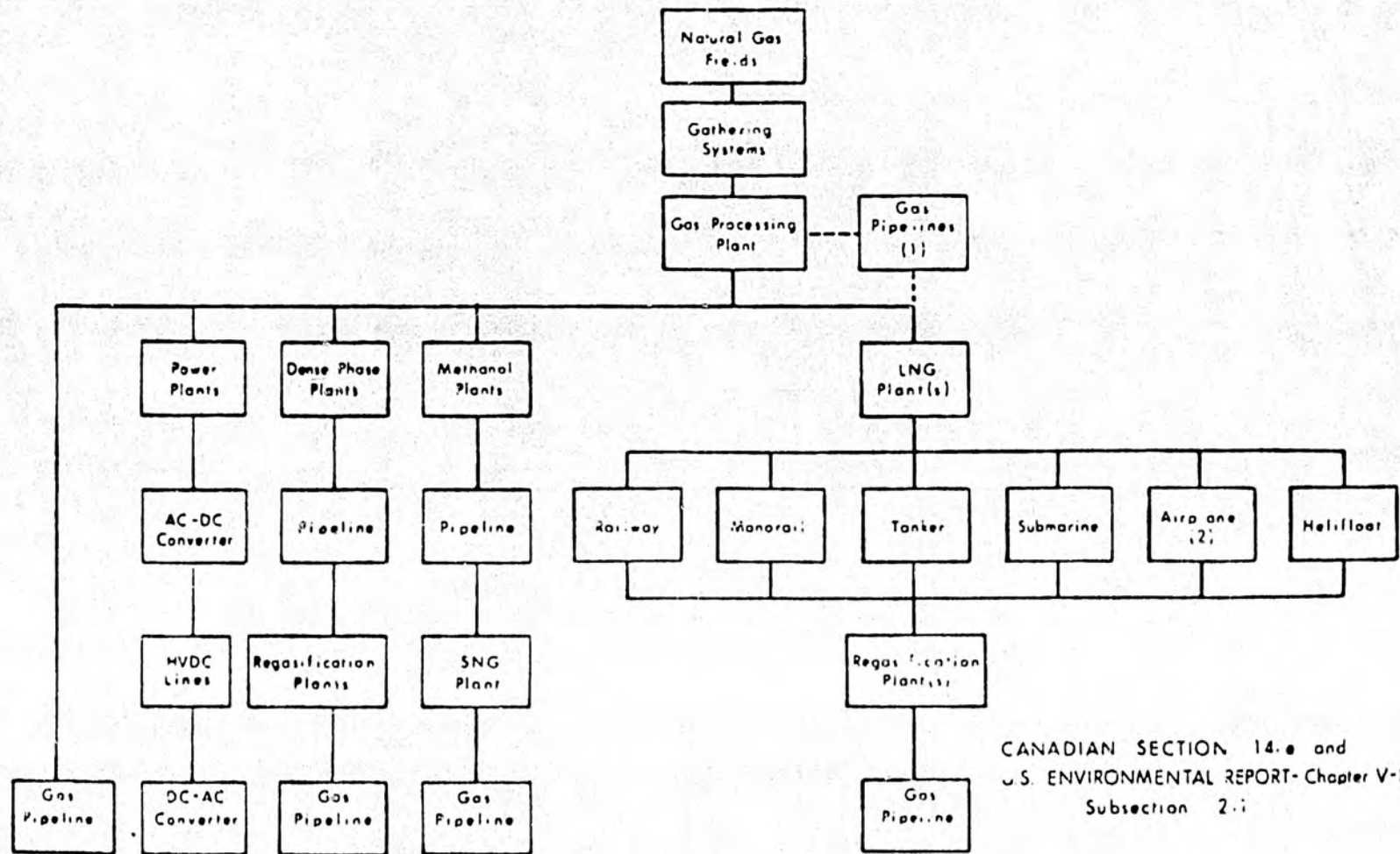
"DR. THOMAS. To your first question, I think yes; there is enough merit to warrant a comprehensive study. I think such a study could be conducted, if it were undertaken promptly within a 6 month time frame. I suspect the cost would be trivial compared to the investment at stake here."

and on page 1772:

"SENATOR STEVENS. What would be the cost of the independent study for 6 months?

"DR. THOMAS. I think one could do this within 6 months on the order of \$200,000 - \$400,000 ..."

PRINCIPAL PROCESS STEPS IN DELIVERING ENERGY TO MARKET
BY VARIOUS TRANSPORTATION SYSTEMS



CANADIAN SECTION 14.6 and
U.S. ENVIRONMENTAL REPORT- Chapter V-B,
Subsection 2.1

- (1) For the tanker or submarine system, pipelines are required to move the natural gas to a central LNG Plant
- (2) Short range and Long range alternatives were estimated.

Block Diagram From Arctic Gas
Consortium Application Filed With Department of Interior