ACTION PAPER

NORTH SLOPE NATURAL GAS: TRANSPORTATION ALTERNATIVES AND THE PROMISE OF A WORLD SCALE PETROCHEMICAL INDUSTRY

NORTH SLOPE NATURAL GAS: TRANSPORTATION ALTERNATIVES AND THE PROMISE OF A WORLD SCALE PETROCHEMICAL INDUSTRY

A REPORT BY

COMMONWEALTH NORTH

Prepared by the

GAS PIPELINE STUDY COMMITTEE

March 1980

PREFACE

The Board of Directors of Commonwealth North commends the Gas Pipeline Study Committee for the quality of their research and the report they have produced. The issues they have addressed since their formation on August 22, 1979 have been constantly changing. The players have mostly been outside the state in Salt Lake City, Washington, D. C., New York, Houston and Newport Beach.

Every few weeks a new development has emerged which has postponed deadlines, altered government and industry pronouncements and thrown the entire gas line project into greater confusion and complexity.

As the resolution of the issues addressed in this report is far from complete, the Board accepts this study as an interim statement. Our hope is that the Committee will remain as a standing committee to observe the forthcoming developments and to provide guidance as to their interpretation.

MAX HODEL,
President
Commonwealth North

March 1980

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FOREWORD

When oil was discovered on the North Slope, few Alaskans realized that it would be the natural gas, more than the oil, that would provide the greatest promise for on-going employment and revenues for the people of Alaska.

The competition to build a pipeline to move the gas to market produced a spirited contest. The most controversial bidder, Northwest Pipeline Company, won the nod from President Carter through skillful maneuvering and unmasked political influence.

But two and one-half years later, the project still writhes in controversy, and the hopes of in-state processing of the resource seem slim.

Most Alaskans ardently supported an all-Alaska route for the pipeline. Many still believe it is the best solution, especially as Northwest continues to flounder in its desperate search to finance the cross-Canada project which began at an estimated $6 billion level and has already scaled to $23.5 billion.

For many reasons, the all-Alaska line could be a great benefit to the nation as a whole. As far as Alaska's interests go, however, the more vital issue is how the gas liquids, the prime feedstock for the petrochemical industry, can be utilized within the state.

Louisianans still rue the day they signed contracts to ship their raw natural gas to other states, eliminating the opportunity to create new and additional revenues through the establishment of petrochemical industries. This phenomenon is well recognized in Alaska. Since territorial days, the belief that in-state processing of Alaska's natural resources motivated the leaders to fight for processing of fish, timber and now oil and natural gas.

Alaska seems designed to perfection for such applications. There is not only an abundance of natural gas, there are great quantities of fresh water and a climate that attracts capital intensive industries, requiring few, but highly paid, employees.

This paper was written after several months of study and interviews. Its purposes are to explore the feasibility of the current Northwest Pipeline project, analyze the actual benefits that can accrue from the development of the North Slope gas resource and to outline what is necessary to make a petrochemical industry a reality in Alaska.

Gas Pipeline Study Committee
Commonwealth North
March 1980

I. PROJECT HISTORY

The origins of the current project trace back to 1966 when the State of Alaska sold leases for oil exploration on state land on the Arctic Slope of Alaska. This sale led to the 1967 discovery of the Prudhoe Bay oil field, the largest oil reserve on the North American continent. In the excitement over oil, many Americans have never realized that a significant added feature of this particular field is the enormous quantity of natural gas contained in the reservoir.

In the excitement over North Slope oil, many Americans did not realize the significance of the enormous reservoir of natural gas.

Best estimates are that approximately 27 trillion cubic feet of recoverable gas are contained in the Prudhoe Bay field alone. Large additional quantities of gas are expected to be discovered in the Beaufort Sea, Arctic Wildlife Range and Naval Petroleum Reserve fields, all of which are either on or immediately off-shore of the North Slope of Alaska.

Following the planning for the trans-Alaska oil pipeline, three gas pipeline projects were actively promoted. One project, the Arctic Gas Pipeline, was backed by the Prudhoe Bay oil producers. They proposed to construct a gas pipeline running along the edge of the Arctic Ocean to the MacKenzie River country in the Northwest Territory and from there across Canada to the Midwest. A second project, designed by El Paso Natural Gas Company and widely supported by the Alaskan people, proposed a pipeline roughly parallel to the trans-Alaska oil line ending at a tidewater location near Valdez. This project involved the liquification of the natural gas and transportation by LNG tankers to California.

A third proposal was presented by Northwest Pipeline Company and consisted of a natural gas pipeline roughly paralleling the trans-Alaska pipeline from Prudhoe Bay to Fairbanks. From that point the line would basically follow the

Alaska Highway through Canada, eventually re-entering the United States at the Alberta border.

In 1977, President Jimmy Carter issued a Decision in which he selected the Northwest Pipeline proposal.

In October, 1976, President Gerald Ford signed into law the Alaska Natural Gas Transportation Act (ANGTA). This Act superseded the Federal Power Commission's normal procedures and called for the FPC to make a recommendation on the Alaska gas pipeline route directly to the President. In September 1977, President Jimmy Carter issued a Decision, as required by ANGTA, and an accompanying report in which he selected the Northwest Pipeline proposal as the designated means by which Alaska gas would be transported. While the Decision described the facility requirements for the pipeline as those that had been submitted by Northwest Pipeline, it did not specify an operating pressure, an issue which was later to become a subject of controversy.

II. MAJOR PROJECT PARTICIPANTS

The participants are generally grouped as follows:

A. The Major Producers

Exxon, ARCO, Sohio, and the State of Alaska are the original owners of the gas. The oil company producers have entered into sales contracts with various gas distribution companies in the south 48.

B. The Gas Buyers

The producers share of the Prudhoe Bay gas has been committed to the following gas transmission companies:

Columbia Natural Gas	Sohio (2/3)
Northern Natural Gas	Sohio (1/3)

Pacific Interstate Transmission	ARCO	(33%)
Panhandle Eastern	ARCO	(20%)
United Gas Pipeline	ARCO	(15%)
Texas Gas Transmission	ARCO	(12%)
Trans Western Pipeline	ARCO	(10%)
Texas Eastern Transmission, Co.	ARCO	(10%)
Northern Natural Gas	Exxon	(1/3)
Michigan Wisconsin Gas	Exxon	(1/3)
Pacific Gas and Electric	Exxon	(1/3)

C. The Northwest Pipeline Consortium

The Northwest Alaska Pipeline Company consortium is owned by seven partners, American Natural Alaska, Northern Natural Gas, Panhandle Eastern Pipeline, United Gas Pipeline, Pacific Lighting and Northwest Energy. The Canadian portion will be the responsibility of Foothills Petroleum, Ltd, who will act as operator for several Canadian consortiums which include West Coast Transmission, Alaska Gas Transmission, Trans-Canada, Pan Alberta, Consolidated Natural Gas, Alberta Natural Gas, and Alberta Gas Trunkline.

D. State of Alaska

Several officials and departments of the executive branch of state government share jurisdiction over various aspects of the pipeline project. The Governor, through the Department of Natural Resources, has primary responsibility for representing the natural resource interests for the state. The Department of Natural Resources coordinates the activities of mineral and energy management as well as oil and gas conservation. The Department of Commerce coordinates the activities of power and energy development, economic development, the Pipeline Commission and the power authority. The Department of Environmental Conservation

is responsible for approval of permits related to development projects.

The State legislature, primarily through the Joint Gas Pipeline Committee, has assumed a major role in developing a state position regarding the gas pipeline and gas development issues.

The Mayors Task Force has advocated forcefully for the development of an in-state petrochemical industry.

The Royalty Oil and Gas Board, created by the legislature in 1972 and appointed by the Governor, has taken the lead in advocating the development of a petrochemical industry using the gas liquids from Prudhoe Bay.

The State Pipeline Coordinator, appointed by the Governor, is responsible for coordinating gas pipeline construction issues.

The Mayors Task Force is an ad-hoc committee consisting of the mayors from the North Star (Fairbanks) Borough, North Slope Borough, Matanuska-Susitna Borough, Kenai Borough and the Municipality of Anchorage. The Mayors Task Force has advocated forcefully for the development of an in-state petrochemical processing industry and has studied the issue of the location of a conditioning plant for the pipeline.

E. The Federal Government

The Federal Energy Regulatory Commission (FERC) has primary responsibility for representing the interests of the Federal Government in the project. In addition, the President has appointed a federal inspector for the gas line and given him wide-ranging authority to resolve bureaucratic problems that might delay the project. The Department of Energy has also become involved as a facilitator to aid the state in getting a commitment for the producers' gas liquids in return for state financial participation in the pipeline project.

F. The National Energy Board and Canadian Pipeline Office

The NEB is the Canadian equivalent of the FERC except that it has broader powers. Since the Canadian constitution grants greater autonomy to the provinces than the U.S. Constitution provides the states, a great emphasis is placed by the NEB on interprovincial regulatory matters.

III. DESIGN CONSIDERATIONS

As conceived by Northwest Pipeline and the oil company producers, the project would transport all of the gas from the North Slope to the Alaska-Canada border through a 48 inch, 1260 psig (pounds per square inch, guage) pipeline. In Canada, the pipeline would be expanded to a 56 inch, 1080 psig pipeline, capable of carrying substantially increased amounts of gas. The additional gas would probably come from a proposed pipeline extending from the Canadian Arctic Coast down the Dempster Highway to Whitehorse, Yukon Territory. The interface between the Alaska portion and the Canadian portion would probably be located in Whitehorse.

The Canadian portion would traverse the Yukon and part of British Columbia to the southern part of Alberta where it would connect with a "pre-built" portion, consisting of two legs into the United States in the Montana-North Dakota area. The pre-built portion would be a separate project, constructed prior to the Northwest Alaska portion in order to transport Alberta gas across the border to the United States.

The Northwest project does not provide for the extraction of gas liquids in Alaska for petrochemical feedstocks.

The project as conceived does not provide for the extraction or processing of gas

liquids in Alaska for use as feedstocks for petrochemicals.(1) However, the Canadian Province of Alberta has developed a worldscale petrochemical complex. Canadian interests are eyeing the ethane feedstocks that could be recovered from the Northwest Pipeline to feed the existing and/or future Alberta natural gas liquids industry.

IV. THE PROMISE OF IN-STATE PETROCHEMICAL INDUSTRY

Natural gas is recovered from the oil reservoir either in association with the oil or from gas reservoirs. After the raw oil/gas mixture is brought to the surface, it is put through a gathering and treatment process which separates the oil, gas and water. The separated raw gas contains many different types of molecules, including carbon dioxide, water vapor, and the hydrocarbons of methane, and heavier molecules such as ethane, propane, butane and pentanes. The latter four are the premier feedstocks of the petrochemical industry.

A major consideration in the technical design of the pipeline is the content of carbon dioxide and water in the raw gas since carbon dioxide and water combine to form a highly corrosive mixture which accelerates deterioration of the pipeline and ancillary equipment.

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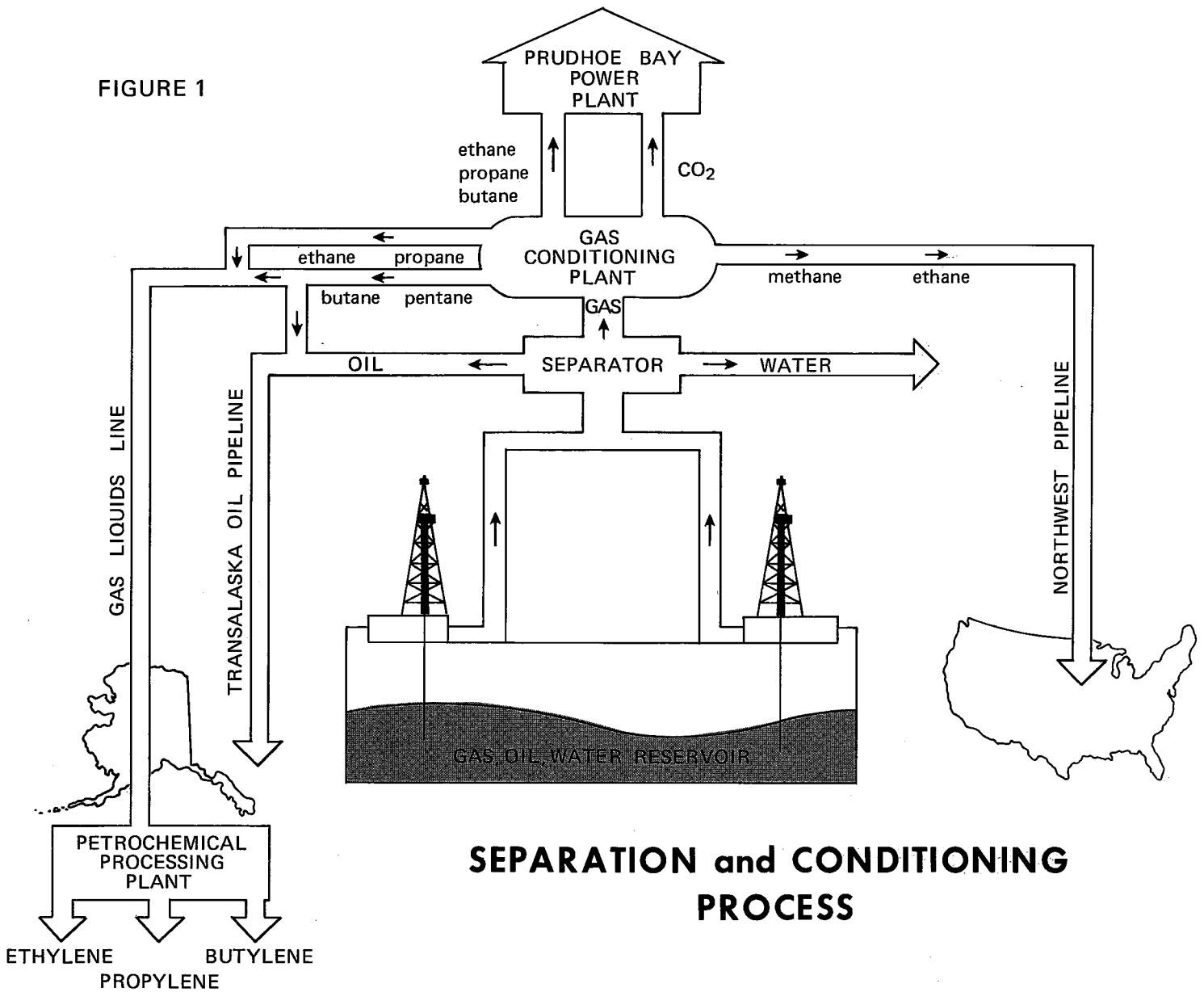
(1) Alaska Governor Jay Hammond, speaking for a groundswell of public opinion, has told the federal government that there will definitely be no Alaska financial participation in the gas line unless the state is able to develop a petrochemical industry using the Prudhoe Bay gas liquids. (Anchorage Daily News, November 6, 1979)

After leaving the separation process, the gas passes through a gas conditioning plant. The gas conditioning plant separates the many different types of hydrocarbon molecules of gas into individual vapor and liquid components. The design criteria used in the gas conditioning plant influence the amount of gas liquids that are produced.

FIGURE 1



SEPARATION and CONDITIONING PROCESS

The heavier gas liquids are normally transported in a separate pipeline or with crude oil to a refinery. The lighter gas liquids may be transported to a petrochemical complex in a separate pipeline or used as fuel. Carbon dioxide is removed and the vapor and the lighter hydrocarbons (what we think of when we refer to natural gas) are normally transported through a pipeline for use as a fuel for homes and industries.

The pipeline quality gas, in the vapor state, exits from the gas conditioning plant after having water vapor and carbon dioxide removed and the hydrocarbon dew point(1) and pressure controlled to prevent gas liquids from condensing in the pipeline during transport to market. Figure 1 shows a schematic of this process. If the gas is not transported to market, the gas conditioning plant is replaced by a gas liquids "stripping" plant and the gas vapor is reinjected into the reservoir.

At Prudhoe Bay, 180,000 barrels per day can be recovered and transported as liquids.

At Prudhoe Bay, it is estimated that 180,000 barrels per day can be recovered and transported as liquids.(2) Ethane, by far the largest component, is partially removed by the carbon dioxide removal operation although not separated as a segregated stream. Therefore, depending

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(1) The dew point is the temperature at which a vapor will condense to a liquid. A common example is the condensation of water on the outside of a cold glass of water.

(2) Some estimates put the figure as low as 100,000, others are as high as 250,000 barrels per day. Variables which effect these estimates include the total daily rate of raw gas and the cryogenic temperature design of the gas conditioning process. The low estimate is based on 2.8 billion cubic feet per day of raw gas and a -150°F temperature in the gas conditioning process which would recover about 70% of the ethane from the gas stream. A -30°F design temperature would drop the ethane liquid yield to 20% with the remaining 80% remaining as a vapor in the gas pipeline.

on the design of the gas conditioning plant, the ethane can either be left in a vapor state and transported with the methane to market, or recovered as a liquid by the gas conditioning plant in order to utilize it as a petrochemical feedstock.

After the gas liquids reach a petrochemical plant, they are processed through a high pressure, high temperature cracker which turns the ethane, propane and butane into petrochemical building blocks of ethylene, propylene and butylene. These products are then piped into a production facility from which a host of modern fiber and plastic products can be manufactured.

The Prudhoe Bay field is capable of producing 2.8 billion cubic feet of raw gas per day. The volume of natural gas to be transported in the Northwest pipeline is approximately 2 billion cubic feet per day. One-eighth of this amount, totaling approximately 250 million cubic feet per day, belongs to the state as Alaska's royalty share. According to a conditioning plant study conducted for the producers by the Parsons Company, 2.8 billion standard cubic feet per day of raw gas could yield the following products in a gas conditioning plant:

Component	% of Total	Volume (MMSCF/D)	Minimum Liquids Available[1] BBLS/Day
methane -	74.1	2076	
ethane -	6.5	181	24,713
propane -	3.5	97	57,556
butanes -	1.7	46	20,354
pentanes+ -	1.1	31	4,194
carbon dioxide -	12.6	353	
other -	0.5	16	
	100.00%	2800	106,817

[1] Bonner and Moore Report, November 1, 1979, page C-3

Several studies have been made regarding the potential for a petrochemical industry in Alaska. In particular, the Houston-based consulting firm of Bonner and Moore has been involved over the past two years in feasibility studies for the Oil and Gas Royalty Board. The Bonner and Moore report estimated that appropriate gas conditioning plant design would yield up to 100,000 barrels per day of ethane and 82,000 barrels per day of propane, butane and pentanes.(2)

An additional study by the New York consulting firm, Chem Systems, Inc., was presented at a public meeting of the Royalty Board on October 5, 1979. This report indicates that "the petrochemical markets in the Pacific Rim area are sufficient to support a major complex in Alaska at present and probably a second complex in the late 1980's."

Markets in the Pacific Rim will support a major petrochemical complex in Alaska.

A critical review of the Bonner and Moore study was conducted by Connie C. Barlow of Arlon Tussing and Associates in January 1980. This report questioned some of the Bonner and Moore estimates regarding pricing of Prudhoe Bay gas liquid feedstocks.

Recently, the Joint Gas Pipeline Committee of the Alaska state legislature has further confirmed a high degree of interest from several large, world scale, petrochemical producers.

The primary reason for the competitive situation in Alaska is the large quantity of the resource, the reliable supply and the competitive price of feedstocks. In order to compete in this market, a world-scale plant must be constructed.

A world-scale ethylene plant produces at least one billion pounds of ethylene per year from 26,000 barrels per day of

(2) Bonner and Moore Report, November 1, 1979, Pages 3-9.

ethane. Thus, the potential 100,000 barrels per day of ethane that could be produced from the North Slope, given optimum gas conditioning plant design, would indicate an eventual capacity to support at least three world scale ethylene plants. The gas liquids not required for feedstocks to a petrochemical industry can be sold as liquified petroleum gas (LPG) in Pacific Rim markets.

Given optimum gas conditioning plant design, at least three world scale ethylene plants could be supported.

The Bonner and Moore studies indicate that the 180,000 barrels per day of gas liquids could be transported from Prudhoe Bay to a tidewater petrochemical complex in a separate 18 inch pipeline. The pipeline cost could be justified if it carried at least 106,000 barrels per day. Therefore, the Bonner and Moore study used this lower figure to show the threshold potential for petrochemical development.

The state's share of the 180,000 barrels of liquids would be approximately 22,000 barrels per day. The State's one-eighth share of the methane gas stream could be exchanged on an equivalent BTU basis for approximately 100,000 barrels per day of producers' gas liquids. The additional quantities necessary will have to be acquired by the state from the producers to justify the expense of constructing a separate gas liquids pipeline.

V. ANALYSIS OF ISSUES

A. The Viability of the Northwest Pipeline Construction Project

At the present time, Northwest Pipeline Company faces several major problems, which some observers predict will be

Northwest Pipeline faces problems which may be insurmountable.

insurmountable. In addition to the current turmoil in Canadian national politics, unresolved Canadian Native claims and provincial taxing policies, the most critical challenge is financing. Major financing cannot be committed until detailed engineering design has progressed to a point where an accurate pro forma cost analysis on the project can be made. And yet the detailed engineering is estimated to be at least one year behind schedule.

John McMillian has stated that government financing is not required.

Northwest Pipeline officials have consistently given optimistic and frequently changing estimates of the complexity, time and magnitude of the issues involved in the project. In particular, Northwest Pipeline Company President John McMillian has compounded the confusion by making conflicting statements regarding the role of the State of Alaska in the project. He has publicly stated that government financing is not required to make the project viable and yet has also said that the project cannot be built without the financial participation of the State of Alaska.

Since the financing issue has not progressed on schedule, it has become increasingly clear that the project will not move ahead further until financing commitments are made. Since neither Northwest nor the state is able to finance the project on its own, the only apparent sources of financing for the project are as follows:

1. Major oil companies
2. Life insurance companies
3. The federal government

The project will not move ahead further until financing commitments are made.

The federal government has made it clear that they will not provide financial assistance to the project other than the FERC "return on equity" decision, which granted Northwest a 17.5% return on equity investment. The life insurance industry is limited by corporate statute in their ability to invest in high risk projects, unless some other entity

guarantees cost overruns. The major oil companies, who are the owners of the gas, have the financial strength necessary to underwrite the project. However, they are restricted from participation by the Clayton Anti-trust Act. Recently, the producer companies have expressed strong interest in becoming involved in the project. Exxon made a proposal in November, 1979 which was rejected by Energy Secretary Charles Duncan. But given the magnitude of the financing necessary and the alternatives available, it appears certain that the producer companies must assume some sort of role in the financial and construction responsibilities of the project in order to insure its success.

The producer companies must assume some financial and construction responsibilities to insure the project's success.

B. Financing

Northwest Pipeline Company currently estimates that the total cost of the project will be $15 billion. Of that total, $6 billion will be spent on the Alaska portion, the Canadian leg will cost $6 billion, and the south 48 construction $3 billion. Some estimates are higher. Exxon, in their proposal to the Department of Energy, forecasted a cost of $10 billion for the American segments alone.

More recent cost estimates, however, appear to be as follows:

$7 billion -	Alaska section
6 billion -	Canadian Section
3 billion -	South Portion
3.5 billion -	Gas conditioning
4 billion -	Field Development
$23.5 billion	total

Northwest Pipeline Company has consistently advocated that someone else be responsible for backstop and cost overrun guarantees. In a speech to the Commonwealth North membership on

October 5, 1979, McMillian stated that Northwest Pipeline's financial participation will consist of 25% equity position in the project with the remaining 75% of project costs coming from debt financing, primarily from the insurance and banking industry.

The producers are unwilling to participate financially if they do not have an equity position and effective management control.

He indicated that the producers' participation would be limited to providing cost overrun guarantees to the debt servicers. However, the producers have consistently stated their unwillingness to participate financially in any project in which they do not have an equity position as well as having effective management control.

In that same speech, McMillian indicated that he had been in discussion with European investors and had obtained preliminary commitments from German sources for up to $1 billion in equity participation based on a commitment to use German made products on the pipeline.

McMillian welcomes the state building a gas liquids line.

When asked about the possibility of the State of Alaska participating in a separate gas liquids pipeline, he said, "We would welcome the state building a gas liquids line. It won't effect the volumes of gas that we expect to transmit through our pipeline."

Given the vagaries of financing and detailed engineering and design of the project, it is very clear that the cost and schedule of the project will be jeopardized by any decision which changes the preliminary design of the project. In particular, any change in the pressure or the location of the conditioning plant would substantially alter the current project design.

It is also very clear that regardless of what Northwest Pipeline's public statements are, the project will require state financial participation in the pipeline itself in order to assist Northwest in gaining financial commitments from other sources. Recent

Department of Energy activities verify this position.

The Governor has long advocated that the state should become a financial participant in the project. Thus far, the legislature has been unwilling to support direct state financial participation. Furthermore, the use of tax exempt bonds has not yet cleared a critical hurdle in the U.S. Congress and the state cannot sell tax exempt revenue bonds as a means of aiding Northwest Pipeline Company financing unless the state is the legal owner of the pipeline.

With regard to state general obligation (GO) bonds, a recent opinion by the state bond counsel indicates that a serious constitutional problem will inhibit the state from using GO bonds for equity participation in the gas pipeline. The constitution requires that a project must constitute an asset of relatively permanent value and the issuer of the bonds must retain some legal interest in the project. The opinion makes it clear that the benefits of pipeline construction and operation are not sufficient legal grounds to render the use of GO bonds constitutional.

The bond counsel concludes that investment of state GO bonds could probably meet the physical requisites of the capital improvements restriction on such bonds. However, they add that the financing "must be accompanied by some form of interest in the pipeline. Clearly the interest would have to be equivalent in value to the amount of bond proceeds devoted to its acquisition and not be an equity in Northwest Pipeline Company securities."

Federal financial assistance will mean government control of the construction and rate of return.

Federal participation is unlikely to occur unless Northwest publicly concedes that it cannot finance the line privately and the Congress reverses its previous clearly stated position opposing federal

financing. The reasons that Northwest does not want federal financing appear to be:

1. Federal financial assistance creates a situation where the federal government will control the construction and rate of return on the project.

2. Northwest, by requesting federal help, would in effect be saying that the project had failed and have to assume responsibility for the failure.

A further danger to the State of Alaska in federal participation lies in the possible revocation of any use by the state of a royalty share of the natural gas reserves. Should the federal government decide to participate financially, it is possible that the state would not be able to retain the exemption given it in Section 13B of the Alaska Natural Gas Transportation Act of 1976 whereby it gained the option to take its royalty gas in kind, a concession given to no other state. From a practical standpoint, this exemption may not provide any advantage since the state could not utilize its share independently. The real danger is that once the royalty gas is committed to the interstate market, the instate use of the resource would be permanently precluded by federal law and regulatory agencies.

Once the royalty gas is committed to the interstate market, in-state use would be permanently precluded.

C. Development of the Petrochemical Industry

The analysis of the issues indicates that the development of the petrochemical industry may not depend on the construction of the Northwest Pipeline project. It has been shown through several studies, that an 18 inch chilled gas pipeline could carry the gas liquids that would be produced at Prudhoe Bay. The State of Alaska could provide incentives for the construction and operation of a separate gas liquids pipeline. In order to effect this, the

A petrochemical industry does not depend on the success of the Northwest Pipeline project.

state must be prepared to enter into negotiations and provide some incentives to the producers in order to acquire all of the gas liquids.

The state has never clearly enunciated a policy regarding the development of a petrochemical industry.

The State has available to it many incentive opportunities which can meet the needs of the producers as well as the interest of the state in developing a petrochemical industry. However, the state has never clearly enunciated a policy regarding the development of a petrochemical industry. In fact, the state, through its past administrative and legislative actions, has indicated a de facto policy which discourages investment and development by the oil and gas industry in Alaska. Since the 1969 lease sale at Prudhoe Bay, the State has increased the rate of income, property and severance taxes on the oil industry twelve times.

These policies have resulted in huge revenue surpluses being accumulated by the State at the expense of discouraging private investment in natural resource development.

Recently a number of Prudhoe Bay leases, which were acquired in 1969 at a cost of $120 million, had to be returned to the state by the oil companies. The companies had requested an extension on the time required for development but the state insisted on an increase in the royalty percentage in return for the extension. The inability of the state to encourage adequate development of these valuable resources is another clear example of counterproductive activity in natural resource development investment.

At the present time, general feasibility studies(1) indicate an optimistic outlook for a gas liquids-petrochemical development in Alaska. The results are so optimistic, in fact, that a detailed

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(1) Bonner and Moore, Nov. 1979.
Chem Systems, Inc., Nov. 1979.

The risks associated with delaying this marketing effort are enormous.

feasibility prospectus should be developed as soon as possible. This prospectus would become the vehicle for marketing the opportunities that can be offered to major world scale petrochemical companies. The risks associated with delaying this marketing effort are enormous. Should the state not have a firmly committed gas liquids-petrochemical project under way at the time the Northwest Pipeline project begins, the state may lose the opportunity to develop a petrochemical industry using the Prudhoe Bay gas liquids.

The construction cycle schedule for a petrochemical project is approximately the same as that of the Northwest Pipeline project. The Northwest Pipeline project will be built based on anticipated gas and BTU throughput factors. Therefore, it is imperative that the State have a firm plan under way regarding the amount of liquids (and therefore BTUs) that will be used in an instate processing system. Once the FERC makes a determination on the detail design and the project financing is committed, the State of Alaska will no longer have the ability to influence project design. The interstate market consideration will then dictate where the State's royalty gas is to be transported and therefore how the gas liquids will be used.

The feasibility of developing a viable petrochemical industry can be enhanced if the overall risks can be segregated as follows:

1. Gas conditioning.
2. Gas liquids pipeline.
3. Petrochemical processing plant.

The State of Alaska must conduct detailed feasibility studies and develop marketing strategies to encourage private investment in each phase of the development effort. No single company or consortium can assume overall responsibility for all three phases of the project.

D. Acquisition of the Prudhoe Bay Gas Liquids

It is absolutely essential that the state reassess its role and take the lead to bring about an active development interest in the gas liquids and the petrochemical industry in Alaska. Although the state has made comments in the FERC hearings regarding its interest in the gas liquids, it has not taken material steps toward developing the industry. Actions which the state could take are as follows:

It is absolutely essential that the state take the lead.

1. Secure a contract for the producers' share of the gas liquids.
2. Cause a detailed feasibility prospectus of a gas liquids pipeline to be developed.
3. Actively seek interest and proposals from major petrochemical companies on the basis of being able to provide a guaranteed supply of gas liquids up to 106,000 barrels per day.
4. Take the responsibility to coordinate the pieces of the project and provide incentives to get active proposals from companies with demonstrated ability to construct and operate world scale petrochemical facilities.
5. Determine whether financial participation by the state in the gas conditioning plant will aid the long-term development of a petrochemical industry in Alaska and take the necessary action to determine how the state can interest well known and proven companies who construct and operate gas conditioning plants.

E. Pipeline Size and Pressure

Northwest, in its initial filing and in all subsequent filings and hearings, has consistently advocated a 1260 psig (pounds per square inch guage) line. The state and the producers, however, have consistently advocated a higher pressure line, because it would have the ability

to transport more liquids. Northwest has opposed a higher pressure because they say it will require a higher capital investment and, therefore, will produce a lower return on their investment.

In February 1978, the Natural Energy Board of Canada (NEB) selected a 1,080 psig 56 inch diameter pipeline as the choice for the Canadian segment of the project. This choice of size and pressure by the Canadians narrowed the range of choices available for the Alaskan segment.

On August 6, 1979, the FERC issued its order approving the Alaska segment design specifications and initial system capacity as proposed by Northwest Pipeline Company. The State challenged the FERC ruling in court but lost the case in December 1979. Thus, the project currently proposes a 1260 psig-48 inch diameter line.

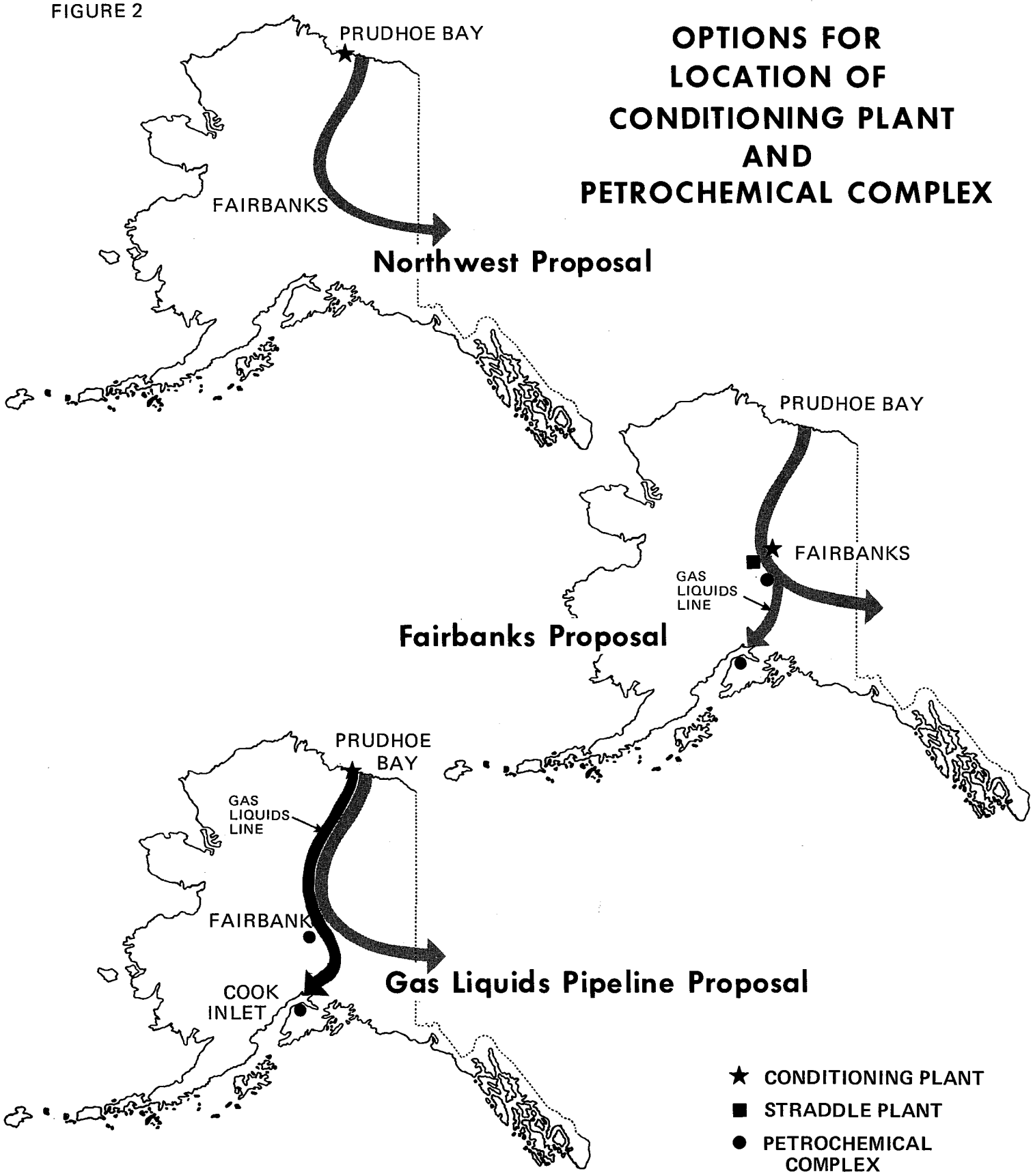
F. The Gas Conditioning Plant

In contrast to Cook Inlet gas which does not require conditioning and enters into the normal methane pipeline as it is recovered, North Slope gas contains a high percentage of CO2 and gas liquids that must be removed by the conditioning plant.

The location and design of the gas conditioning plant is a critical factor in determining the throughput capacity of the pipeline as well as the ability to recover and transport gas liquids. In most oil and gas developments, the gas conditioning plant is located in close proximity to the gas field due to the need to condition gas as it comes out of the ground prior to transportation. A notable exception to this case is the North Sea where raw gas will be transported through a 2000 psig pipeline to an on-shore conditioning plan.

A raw gas pipeline has to be of sufficiently high pressure to provide for transportation of all of the gas liquids

FIGURE 2


OPTIONS FOR LOCATION OF CONDITIONING PLANT AND PETROCHEMICAL COMPLEX
PRUDHOE BAY
FAIRBANKS
Northwest Proposal
PRUDHOE BAY
FAIRBANKS
GAS LIQUIDS LINE
Fairbanks Proposal
PRUDHOE BAY
GAS LIQUIDS LINE
FAIRBANK
COOK INLET
Gas Liquids Pipeline Proposal
CONDITIONING PLANT
STRADDLE PLANT
PETROCHEMICAL COMPLEX

as well as the methane and CO2. The technology required for a high pressure pipeline carrying raw gas would, as Northwest has stated, change the current conceptual design and cost of the project. Figure 2 shows a conceptual illustration of the three (3) alternative gas conditioning plant configurations. No study has yet been made to determine the cost and benefit differences of these alternatives.

The gas conditioning plant design will have a major impact on the quantity and the product mix of gas liquid extraction.

The need to resolve the gas conditioning plant issue is of paramount importance because of the high cost (estimated $2-3.5 billion) and the long lead time (5 year construction schedule) required to complete this project. The gas conditioning plant issue also relates to the gas liquids issue since the operation of the gas conditioning plant will have a major impact on the quantity and product mix of gas liquid extraction. The gas conditioning plant could serve as the origin of the gas liquid pipeline which would bring the feedstocks to ethylene plants in Fairbanks and tidewater as well as providing products to other petrochemical plants or to an export market.

Therefore, if the state is required to become a financial participant, its interests might best be served through financial participation in the gas conditioning plant. Control of the gas plant design would enable the state to control the liquids extraction decisions.

G. Current Plans for the Gas Liquids

The energy needs to run the gas conditioning plant and the Prudhoe Bay field itself are enormous. At the present time, operating energy needs are being met by a field fuel gas plant located at Prudhoe Bay. This plant produces field fuel for the Prudhoe Bay field and the first four pump stations in the trans-Alaska pipeline.

It is generally agreed that the ethane and a limited quantity of propane and

butane and none of the pentanes could be transported in the Northwest pipeline. The current project design calls for the residual CO2 stream to be "spiked" with ethane, propane or butane and burned as boiler fuel for the field operation. The remaining butane and all of the pentanes will be injected into the already operational trans-Alaska oil pipeline. The remaining ethane will be transported in the methane vapor stream through the gas pipeline.

If the gas liquids are not used for fuel, alternate fuel sources for the project will have to be utilized. The heat and energy required to reduce the temperature for the gas conditioning plant can only be provided by gas or oil if the gas liquids are not used as fuel.

If the gas liquids are not used for fuel on the North Slope, alternate sources will have to be utilized.

VI. FALLBACK POSITION IF THE NORTHWEST PIPELINE PROJECT FAILS

Given the present circumstances, the Northwest Pipeline project is in an uncertain position at best. In order for it to be successful, the producer companies must become financially involved in the project. Furthermore, the detailed engineering may determine that the project is not feasible. Increases in supplies of domestic gas as well as Canadian and Mexican gas may result in a prolonged supply of lower-priced gas in the U.S. which might make the Alaskan gas non-competitive even with the rolled in pricing.

Should this occur, or should the detailed engineering and financing be further delayed to the point that Northwest and the producers abandon the project, the

presidential Decision and congressional approval will become inoperative. In this event, the State must reopen the issue of a trans-Alaska gas pipeline and any other options for moving the natural gas to market.

If the Northwest project fails, the state must reopen the issue of a trans-Alaska pipeline.

The work done by Pipeline Technologists, Flour, and Dames and Moore on behalf of El Paso indicated that the trans-Alaska project would take approximately five years to complete. A liquifaction plant near Valdez was estimated (in 1977) to cost approximately $2 billion and be the long lead time item on the project. The gasification plant in California was calculated to cost $700 million. Recently, as a result of new LNG facilities at Kenai and Indonesia, a gasification facility at Point Conception, California, has moved closer to reality. As originally conceived, and as currently planned, this facility could be expanded to handle the approximately 2.4 million mcf per day of Alaska LNG.

In addition, a significant amount of regulatory hurdles would have to be crossed in order to provide tariff and other considerations necessary to provide for financing of the project.

The construction of the "all-Alaska" gas pipeline would not constitute a significant delay in getting Alaska gas to the south 48.

As the most optimistic schedule estimate for the Northwest project calls for a five year construction trajectory, it appears that the construction of the "All-Alaska" gas pipeline would not constitute a significant delay in getting the Alaska gas to the south 48 market. On this basis, the President and Congress might look favorably on the "All-Alaska" alternative as having an advantage over federal financing of the Northwest project.

VII. CONCLUSIONS

1. No coherent, clearly defined state policy currently exists which guides decisions on the state's role in the pipeline project and development of the petrochemical industry. Such policy decisions as the desirability of in-state processing of natural resources, state taxation and incentive mechanisms, the desirability of developing a major world class petrochemical industry, and the general attitude of the state toward any development project has never been clearly defined by either the Governor or the Legislature.

   The philosophy of Governor Hammond has tended to confuse and discourage investors.

   The philosophy of the Governor regarding the need for environmental acceptability, net revenue gain to the State of Alaska, and approval by the citizens has not been received by industry as a clear statement of policy but rather has tended to confuse and discourage investment.

2. At the present time, neither the President nor Northwest appear committed to any in-state use of the North Slope natural gas resources.

   Neither President Carter nor Northwest appear committed to any in-state use of the North Slope gas.

3. Week to week, month to month, contradictory information continues to surface regarding the viability of the Northwest Pipeline project. A chief cause appears to be Northwest Pipeline Company's tenuous position as the project leader. Three major issues, which are fundamental to the viability of the project, have not been resolved. These are:

   a. When will the detailed project technical design be completed?
   b. Who will finance and build the gas conditioning plant?
   c. Who will finance the pipeline project?

4. Many minor issues have been resolved, mostly those linked to the 1976 Alaska Natural Gas Transportation Act (ANGTA) and the 1977 President's Decision selecting the Northwest route. President Carter is strongly supportive of the Northwest project and is applying pressure through the Federal Energy Regulatory Commission (FERC) and the Federal Pipeline Inspector.

The produces will have to participate financially in order for the Northwest project to succeed.

5. It appears evident that the producers (Exxon, Sohio and ARCO) will have to participate financially in the project in order for it to succeed. At the present time, they have indicated that they will not participate without the following conditions:

   a. Authorization from the Justice Department
   b. An equity position in the project
   c. Effective management control of construction

6. The federal government is strongly advocating that the state make a significant financial commitment to the project. No other state has ever been required to finance a natural resource development project in order to guarantee its success. The producers have the financial and technical capability to ensure the success of the project. State of Alaska financial participation may not be essential if the producers become involved.

No other state has ever been required to finance a natural resource development project in order to guarantee its success.

7. Northwest's strategy is clearly aimed at trying to entice the state into financial participation. The state administration supports financial participation in the project. The legislature has opposed state equity participation.

8. The producers are currently planning to burn the gas liquids as fuel to meet Prudhoe Bay industrial energy

needs. The preliminary size and pressure (48 inch, 1260 psig) design of the Northwest Pipeline reduce the amount of gas liquids that can be transported through the pipeline. The ethane that is transported will increase the BTU value of the gas mixture and will be burned in the interstate market along with the methane.

9. The $2-3.5 billion gas conditioning plant is a critical factor in the design and schedule of the Northwest project. The construction of the plant is the longest leadtime factor on the project. Several significant issues are still unresolved such as who pays for the plant and can the cost be passed on to the consumers?

10. More than adequate justification can be made to move ahead immediately on a feasibility and development project which would launch an instate petrochemical facility. A great deal of interest has been expressed in the use of Alaska's gas liquids by a wide variety of petrochemical companies in the U.S., Japan and Europe. Both the Bonner and Moore and Chem Systems studies indicate a very positive potential for developing a world scale petrochemical industry in Alaska. The major advantages which Alaska can offer are the reliable and abundant source of high quality feed stocks, the proximity to Pacific Rim markets, and a relatively stable wellhead price.

Alaska's advantages: an abundant source of high quality feedstocks, the proximity to Pacific Rim markets, and a relatively stable wellhead price.

11. Should a petrochemical infrastructure not be in place at the time that the gas conditioning plant is finished, then Alaska's royalty gas may be lost forever to the interstate gas market, as once it is committed it is irretrievable by federal law. This means the gas liquids will be burned for fuel on the North Slope. (It is possible that the current project design will

not allow in-state processing of gas liquids.) Alaska must gain control of the producers' share of the liquids in order to maintain a position which will allow maximum flexibility to develop the petrochemical potential.

Alaska must gain control of the producers' share of the liquids.

12. Several important issues still remain to be resolved in Canada including Native land claims and provincial taxation policies. Until the recent upheaval in Canadian national politics, the Canadians appeared to be more on top of the issues involved in the pipeline project. They are even in position to influence policy matters regarding the Alaska portion of the line. Although the Canadians profess not to have any plans to use the ethane portion of the pipeline gas, the ethane transported in the gas line could be recovered and used in the Alberta petrochemical industry. Alberta could replace any ethane it withdraws with an equivalent BTU value of Alberta methane.

The Canadians are in position to influence policy matters regarding the Alaska portion of the line.

13. At the present time, there is no active consideration being given to any pipeline route other than Northwest. Should the Northwest project collapse, an Alaskan gas pipeline to tidewater would once again become a viable alternative. Such a pipeline could be designed to transport both methane and gas liquids.

14. The Point Conception, California LNG terminal will probably be built. Although the initial plant is designed primarily to accept LNG from Cook Inlet and Indonesia, the existence of this facility indicates a commitment toward increasing use of LNG on the West Coast. This would indicate that Prudhoe Bay gas, as well as Cook Inlet gas, could be shipped by LNG tankers to the west coast.

An Alaska gas pipeline to tidewater could be designed to transport both methane and gas liquids.

15. The Mayors Task Force has proved to be a major force supporting economic development. Their attention has been divided between the gas conditioning plant issue and the gas liquids issues. The option of relocating the gas conditioning plant will be possible only if the project is redesigned to accommodate the production and transportation of the gas liquids.

16. The Alaska Corporation Franchise Tax which became law in 1978 has polarized the state and the oil industry and discouraged further private investment in the development of Alaska's oil and gas resources. A complex law suit to test the constitutionality of the law is currently in process. It is evident that the tax structure of the state should be reviewed with the objective of developing a climate which encourages rather than penalizes natural resource development investment.

The tax structure should encourage rather than penalize resource development investment.

VIII. RECOMMENDATIONS

The issues surrounding the Northwest project have been set forth in this paper so that specific recommendations can be made. These recommendations are intended to serve as a framework for a plan of action with the specific goal of helping Alaska take advantage of the great benefits possible from petrochemical development.

A. State Administration

A healthy vital private sector is the greatest benefit that we can pass on to

future generations. However, the ultimate responsibility for use of the natural resources of Alaska rests with the executive branch of state government. The state administration should negotiate directly with producers to acquire their share of the gas liquids and provide encouragement for the petrochemical industry to establish itself within the state. State and local taxation policies should be reviewed to determine their effect on natural resource development.

The state should begin immediately to promote a gas liquids pipeline project.

Since the feasibility of developing a petrochemical industry in Alaska may be independent of the Northwest Pipeline project, the state should develop a strategy to promote the petrochemical development opportunities regardless of the outcome of the Northwest pipeline project. This alternative would require a gas liquids "stripping" plant, rather than a gas conditioning plant.

In the event that the Northwest project fails, the state should be prepared to immediately reactivate the "All-Alaska" pipeline alternative.

Alaska's state administrative agencies dealing with natural resource development and conservation issues have become so numerous, so diffused in their responsibilities, and so spread throughout many departments that the state has been unsuccessful in focusing attention and developing expertise on these issues. These issues are of such great significance to the future development of Alaska that all the responsibilities of these agencies should be placed in one clearly defined agency.

B. Legislation

1. A comprehensive state policy regarding petrochemical and natural resource processing within the state must be developed. Exhibit 2 is a suggested policy resolution which

was approved by the Commonwealth Board of Directors on November 20, 1979

2. Specific legislation is needed to initiate a feasibility study for construction and operation of a gas liquids line, sale of North Slope gas liquids to petrochemical producers and specific direction regarding the role of the state in launching a petrochemical industry must be developed and implementation begun. Petrochemical development feasibility may be enhanced if overall project design risk can be shared by different entities.

3. The timing is ideal for legislation which provides incentives for high risk investment in Alaska.

C. Producer Participation

The participation of the producers in the Northwest Pipeline project may eliminate any requirement for the state to become financially involved. However, state participation should not be rejected out of hand. The determining factor should be whether the long-term development potential of the gas liquids within the state is assured.

The success of a petrochemical industry in Alaska will require the use of most of the gas liquids. Producer cooperation will be required in order to acquire their share of this resource. Any development decisions should accrue to the mutual benefit of the state and the producers.

D. Mayors Task Force

The Mayors Task Force should remain active and become involved in:

1. A natural gas liquids resource utilization analysis including:

   a. Examination of the separate liquids pipeline concept.

b. Risks associated with delay in development of a petrochemical infrastructure and preparation of a preliminary time line plan for petrochemical development.

c. A look at the potential role of the producers and the state in the development of the industry.

The Mayors Task Force should provide a watchdog role over negotiations to acquire the gas liquids.

d. How to provide a watchdog role over federal and state negotiations involving the acquisition of the producers' share of the gas liquids.

2. State financial participation in North Slope gas projects should be examined, including the following options:

a. Study the effect of rescinding the 1978 Corporation Franchise Tax on the producers in exchange for contracts to sell their share of the liquids to the state.

b. Investigate possible state financing of gas conditioning plant with revenue bonds.

c. Reestablish the policy of the state to encourage investments through adequate incentives.

d. Encourage petrochemical development in such a way that regional rivalry is avoided.

e. Define the actions required to launch a gas liquids pipeline project feasibility study. Develop a request for proposals for construction and operation of a liquids pipeline; acquisition of all gas liquids; negotiate sales contracts with petrochemical producer companies; investigate the potential for loan guarantees and other methods of state financing such as the Alaska Industrial Development Authority Bond approach.

IX. A PLAN FOR ACTION

At no time in Alaska's history has the need for active leadership in the promotion of a resource development opportunity been more sorely needed.

Success for development of an Alaskan petrochemical industry will require political leadership. The credibility of the state in promoting this effort will require that all activities reflect a consensus of the political forces in the state.

In order to direct the course toward political action, a petrochemical "czar" should be named, or a small, powerful committee should be formed immediately. This steering committee will serve to oversee and implement the recommendations set forth in this report and ensure that effective efforts are focused on critical issues.

A petrochemical "czar" should be named immediately.

It is our recommendation that the Governor appoint the Lt. Governor to chair a special gas liquids/ petrochemical development steering committee. The committee membership will consist of representatives from each of the following:

The Mayors Task Force
The Alaska Senate
The Alaska House
The Executive Branch

The Commonwealth North Board of Directors should actively promote this report to legislators and provide continuous followup during the 1980 legislative session. The Board should be prepared to assist the steering committee in any way possible as well as maintain constant contact with the state administration. The full development of Alaska's Prudhoe Bay gas resources may have as much or more impact on the state than any other issue including D-2. Whereas the major impact of the D-2 issue may be the

The development of Alaska's gas may have more positive impact on the state than any other resource.

reduction of future opportunities for the state, the gas liquids/petrochemical development will provide immediate and long term benefits to the state and provide a valuable legacy for future generations of Alaskans.

EXHIBIT I

List of Persons and Organizations Interviewed
By Gas Pipeline Study Committee

NAME	ORGANIZATION
John Bennett	Alaska 84, former head of El Paso Alaska
Honorable John Carlson	Mayor, North Star Borough
Honorable Mike Colletta	Alaska Senate
Honorable Don Gilman	Mayor, Kenai Borough
Honorable Avrum Gross	Attorney General, State of Alaska
Honorable Jay Hammond	Governor, State of Alaska
Honorable Ron Larson	Mayor, Matanuska-Susitna Borough
John McMillian	President, Northwest Energy Company
Honorable Bill Miles	Representative, Alaska Legislature
Honorable Terry Miller	Lt. Governor, State of Alaska
Joe Moore	Partner, Bonner and Moore
Glenn Mortimor	Consultant, Chem Systems Inc.
Jack Rhett	Federal Gas Pipeline Inspector
Honorable Mitchell Sharp	Canadian Commissioner, Northern Pipeline Agency
Honorable George Sullivan	Mayor, Municipality of Anchorage
Dale Teel	President, Alaska Gas and Service Company
Morris Thompson	President, Alaska Federation of Natives

EXHIBIT II

Recommended Resolution for the 1980
Alaska Legislature
Approved by the Commonwealth North Board of Directors
November 20, 1979

WHEREAS the State of Alaska firmly supports and encourages responsible development that will strengthen and diversify the economy through the utilization of the human and natural resources of Alaska in an effective manner; and

WHEREAS adoption of a State Economic Development Policy that clearly sets forth the goals of achieving a healthy and growing economy would establish a sound working relationship with industry; and

WHEREAS an economic development policy would establish a basis upon which critical planning decisions could be made and alternatives could be evaluated;

BE IT THEREFORE UNDERSTOOD that the Alaska Legislature adopts the following policy which sets forth the conditions and expectations under which the state will encourage economic development:

(1) offers long term employment opportunities to Alaskans
(2) improves the productivity of the existing economy
(3) contributes to the economy through capital investment
(4) increases energy availability for present and future needs
(5) does not cause a substantial adverse impact on the environment
(6) provides in-state processing of natural resources derived in the state in an amount equal to or greater than the State's royalty share of the resource;

BE IT THEREFORE RESOLVED that the state should undertake activities to attract investment within these criteria to take advantage of the opportunities afforded by Alaska's abundant resources, and use its powers and resources as a catalyst for economic development. The Alaska Legislature therefore ordains that the state should:

(1) identify the many constraints to economic development imposed by the federal, state and local governments and work to eliminate unreasonable constraints as well as resolve the problems created by these constraints;
(2) establish a competitive position with other areas seeking to attract economic development and adopt incentives to attract industry;
(3) provide a stable economic environment through the sale of natural resources owned by the state to those firms which will process Alaska's resources within Alaska.

COMMONWEALTH NORTH GAS PIPELINE STUDY COMMITTEE

1. Millett Keller, Chairman
   Vice-President
   Alaska Pacific Bank

2. Bob Breeze
   Rose and Breeze,
   Attorneys at Law

3. Chuck Champion
   President, NORTEC

4. Paul Crews
   Crews, McGinnis and Hoffman,
   Professional Engineers

5. Mark Fryer
   President,
   Mark Fryer and Associates

6. Max Hodel
   Executive Vice-President,
   Alaska Sales and Service

7. Frank Nyman
   Senior Partner,
   Tryck, Nyman and Hayes,
   Engineering Consultants

8. Robert Retherford
   District Manager
   Retherford and Associates

9. Shelby Stastny
   Partner,
   Arthur Young and Co.

10. Don Wold
    Executive Director,
    Alaska Royalty Oil and Gas Development
    Advisory Board

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As well as providing a forum for national and international speakers, working committees study critical issues facing the state and the nation and prepare well-researched action papers, such as this one.

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