

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECTS 80 / 2

463 SCOMM13: JOINT COMM. ON GAS PIPELINE IMPACT 1974-76

The District Court's opinion in the Oklahoma Corporation Commission case was affirmed on appeal to the Supreme Court without opinion. However, Mr. Justice Rehnquist, joined by Justices Stewart and Powell, dissented solely on the grounds that the Oklahoma Commission was not a "person" which could be sued under Section 20 of the Natural Gas Act.

"I do think the convoluted statutory construction of the District Court withstands analysis. The Federal Power Commission is given statutory authority to sue any 'person,' defined in the Act to include an 'individual' or a 'corporation'. While use of the word 'include' would in some circumstances permit suits against 'persons' who could not fairly be classified as either 'individuals' or 'corporations', the term hardly can be said to cover an agency with corporate characteristics which is nevertheless specifically excluded from the definition of 'corporation'". 415 U.S. at 967.

In a footnote, Justice Rehnquist noted that an examination of the use of the term "person" in other sections of the Act clearly indicates that regulatory agencies were not intended to fall within that definition. Among the sections he noted as examples in which "person" clearly could not be defined to include a state regulatory agency was the definition of "natural gas company".

"Furthermore, in the same section, 'natural gas company' is defined to mean a 'person engaged in the transportation of natural gas in interstate commerce of such gas for resale.' (emphasis added) Obviously, inclusion of a state regulatory body within the definition of 'person' in that section would be meaningless." 415 U.S. at 967.

Justice Rehnquist also noted that under Section 19 of the Act any "person, State, municipality, or State commission" aggrieved by the Commission order may apply for a rehearing. He reasoned that if States, State commissions, or municipalities were included within the term "person" the specific inclusion of those terms in Section 19 would be superfluous.

8. Again, while the issue is not free of doubt, it is arguable that the State may, in its capacity as the owner of natural gas, retain State-owned gas for instate use through appropriate leasing provisions. As previously noted, the general rule is that a State may not restrict or interfere with the sale of gas in interstate commerce. Pennsylvania v. West Virginia, 262 U.S. 553 (1923); Oklahoma v. Kansas Natural Gas Company, 221 U.S. 229 (1911); and Northern Natural Gas Company v. State Corporation Commission of Kansas, 372 U.S. 84 (1963).

The Federal courts have invalidated: (1) state attempts to regulate the price of gas sold in interstate commerce, whether directly, FPC v. The Corporation Commission of Oklahoma, 362 F.Supp. 522 (W.D. Okla.), aff'd 415 U.S. 961 (1974), Cities Service Gas Company v. State Corporation Commission, 355 U.S. 391 (1958), Natural Gas Pipeline of America v. Panna Corp., 340 U.S. 44 (1955); or indirectly Northern Natural Gas Co. v. State Corporation Commission of Kansas, 372 U.S. 84 (1963); (2) attempts to require an interstate pipeline company to make sales or connections

for sales within a state where no FPC certification has been granted, Illinois Natural Gas Co. v. Central Illinois Public Service Co., et al., 314 U.S. 498 (1942); (3) attempts to require state approval for the transfer of facilities by companies subject to the jurisdiction of the Federal Power Commission, Cabot Corp., et al. v. Public Service Commission of West Virginia, 332 F.Supp. 370 (S.D. West Virginia 1971); (4) efforts by municipalities to preclude construction of interstate pipeline facilities through the use of zoning ordinances, Transco Gas Pipeline Corp. v. Borough of Milltown, 93 F.Supp. 287 (D.N.J. 1950); New York State Natural Gas Corp. v. Town of Elma, 182 F.Supp. 1 (W.D.N.Y. 1960) and (5) orders requiring interstate pipeline companies to take ratably from all wells connected to its systems in a field, Northern Natural Gas Co. v. State Corporation Commission of Kansas, 372 U.S. 84 (1963).

While the above-cited cases would most certainly prohibit any attempt by the State of Alaska to directly or indirectly restrict interstate access to natural gas produced within the State, it is not clear that Alaska cannot restrict such access with respect to state royalty gas and, perhaps, other gas produced from state leases. The most recent session of the Texas Legislature passed a statute designed to achieve the latter result. V.A.T.S. Article 5382F. The statute made it unlawful for certain state agencies and

officers empowered to execute oil, gas and mineral leases on the various categories of state lands, to execute any such leases which did not contain provisions that none of the natural gas or casinghead gas produced from the mineral estate could be sold or contracted for sale for ultimate use outside the State of Texas unless and until the Texas Railroad Commission found that such gas was not needed for certain designated purposes within the State. Although the statute clearly affects and restricts interstate access to natural gas produced in Texas, it is not clear that the restriction is constitutionally invalid. As discussed below, the nature of state activity in executing oil, gas and mineral leases is proprietary, not governmental. In Foster-Fountain Packing Co. v. Haydel, 278 U.S. 1 (1928) the Court held unconstitutional a Louisiana statute which would have prohibited interstate shipment of shrimp from which the head and hulls had ^{not} been removed but would have allowed such shipment after the shrimp had been hulled and de-headed. The purpose of the Act was to cause a shift in the shrimp processing industry from Mississippi to Louisiana. The Court had no trouble concluding that the statute violated the commerce clause of the Constitution.

" . . . Interstate commerce includes more than transportation; it embraces all of the component parts of commercial intercourse among States. And a state statute that operates directly to burden any of its essential elements is invalid. Dahnke-Walker Company v. Bondurant, 257 U.S. 282, 290. Shefer v. Farmer's Grain Co., supra, 199. A State

is without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the state. Penna. v. West Virginia, 262 U.S. 553, 596. Oklahoma v. Kansas Nat. Gas Co., 221 U.S. 229, 255." 278 U.S. at 10-11.

The Court indicated, however, that on the basis of cases such as Geer v. Connecticut, 161 U.S. 519 which holds that a state owns and has a right to control all of the game and fish within its boundaries, Louisiana could have retained all of the shrimp for consumption and use within the state.

". . .As the representative of its people, the State might have retained the shrimp for consumption and use therein. But, in direct opposition to conservation for intrastate use, this act permits all parts of the shrimp to be shipped and sold outside of the state." 278 U.S. at 13.

In a separate concurring opinion Mr. Justice Reynolds stated "

"Manifestly, Louisiana has full power absolutely to forbid interstate shipments of shrimp taken within her territory. These crustaceans belong to her and she may appropriate them for the exclusive use and benefit of citizens. If the state should conclude that the best interests of her people require all shrimp to be canned or manufactured therein before becoming part of interstate commerce, nothing in the Federal Constitution would prevent appropriate action to that end. This would not interfere with any right guaranteed to an outsider. How wildlife may be utilized in order to advantage her own citizens is for the producing State to determine." 278 U.S. at 15.

In an earlier case, the Court had concluded that the state of New Jersey could constitutionally prohibit the transportation of water outside the State. Hudson Water Co. v. McCord, 209 U.S. 340 (1908). The stated purpose of the Act was to

preserve New Jersey's fresh water for the benefit of New Jersey citizens. The Court upheld the statute on the theory that the state, on behalf of its people, owned rights to all of the water in question and could prohibit its interstate transportation.

While these cases certainly do not suggest that States may regulate interstate access to natural gas in general, they may suggest that the more limited control of access to those minerals which are actually owned by the State may be a permissible form of state action. An argument can be made that a State, as owner of the minerals, has as much right to develop and dispose of those minerals, whether in intrastate or interstate commerce as does an individual. That a state may choose to develop its resources by leasing them to others, need not necessarily destroy its right to dictate their disposal, particularly, where the state has retained such a right in the leases themselves.

The Courts have consistently held that governmental bodies in dealing with their lands have essentially the same latitude as similarly situated individuals. For example in United States v. General Petroleum Corporation, 73 F.Supp. 225 (S.D.Cal., 1946) a case involving the right of the Secretary of Interior to establish the minimum value for royalty gas (the lease so permitted in certain circumstances), the Court stated:

"In resolving the foregoing issue it must be remembered that the government's role is taken to be no different from that of any private lessor

or proprietor, for while the Kettleman Hills lands involved are public mineral lands, and as such until their disposition are under supervision and control of Congress, the government as to such lands acts in a proprietary capacity, and treats with them in the same way as does a private landowner. Regardless of the type of lease Congress might authorize, a lease executed in accordance with what it has authorized becomes a private contractual matter and is to be interpreted according to the general rules of law respecting contracts between individuals. And regardless of what Congress has authorized, unless the authorized provision is mandatory, it may not be 'read in' if the Secretary omitted to include it." 73 F.Supp. at 234 (footnote omitted).

In determining the validity of the Texas Relinquishment Act of 1925, V.A.T.S. Art. 5367 et seq., the Supreme Court of Texas noted that

"A sale or lease by the state is subject to the same rules of law that are applied to ordinary business or commercial leases." Greene v. Robison, 8 S.W.2d 655, 662 (Tex. S.Ct. 1928)

The reported cases where State "embargo" actions were held invalid all dealt with situations in which the State was attempting to regulate the manner in which its citizens or citizens of other States may carry on transactions in interstate commerce. Insofar as the recent Texas statute (V.A.T.S. Article 538v) purports to restrict only the disposition of gas from State-owned lands, and to do so only in the context of newly-executed lease agreements, it may be distinguishable. While it cannot be said with assurance that the Act is valid, there is at least a chance that it would be upheld.

9. The State may, for valid conservation reasons,
protect oil and gas deposits from physical waste by pre-
scribing reasonable regulations governing production. The
State of Alaska may have primary interest in conservation
legislation with respect to regulations which would require
the reinjection of all or a portion of, natural gas in order
to maintain proper reservoir pressure. This issue will be
of principal importance if it develops that the failure to
reinject a sufficient portion of gas to maintain reservoir
pressure will cause a loss of gas drive in the reservoir and
a resulting loss of oil reserves otherwise recoverable.

Under the traditional principles of law discussed
earlier, it would appear that the State of Alaska can, by
regulation, require the recycle of gas in order to prevent
waste. In this regard, the very early proration statutes
and/or regulatory orders had as their basic purpose the
prevention of waste due to loss of reservoir pressure, as
may be seen from the description in Champlin Refining Co.
v. Corporation Commission of Oklahoma, supra:

"Crude oil and natural gas occur together or
in close proximity to each other, and the gas in a
pool moves the contents toward the point of least
resistance. When wells are drilled into a pool
the oil and gas move from place to place. If some
of the wells are permitted to produce a greater
proportion of their capacity than others, drainage
occurs from the less active to the more active.
There is a heavy gas pressure in the Oklahoma City
field. Where proportional taking from the wells
in flush pools is not enforced, operators who do

not have physical or market outlets are forced to produce to capacity in order to prevent drainage to others having adequate outlets. In Oklahoma prior to the passage of the Act, large quantities of oil produced in excess of transportation facilities or demand therefor were stored in surface tanks, and by reason of seepage, rain, fire and evaporation enormous waste occurred. Uncontrolled flow of flush or semi-flush wells for any considerable period exhausts an excessive amount of pressure, wastefully uses the gas and greatly lessens ultimate recovery. Appropriate utilization of gas energy is especially important in the Oklahoma City field where, because of the great depth of the wells, the cost of artificially recovering the oil would be very high." Id., p. 228.

Also see, Bandini Petroleum Co. v. Superior Court, 284 U.S.

8 (1931); Brown v. Humble Oil & Refining Co., 126 Tex. 296,

83 S.W.2d 935, motion for reh. overr'd, 126 Tex. 314, 87

S.W.2d 1069 (1935); Henderson Co. v. Thompson, supra;

Ohio Oil Co. v. Indiana, 177 U.S. 190 (1900); Commonwealth v.

Trent, 117 Ky. 34, 77 S.W. 390 (1903); Shannon v. Shaffer

Oil & Refining Co., 51 F.2d 878 (10th Cir. 1931).

The subject of gas recycle is generally regarded as indistinguishable from other secondary recovery operations such as waterflooding. See e.g., Williams & Meyers, supra § 204.5; Methvin, Secondary Recovery Operations: Rights of the Non-Joiner, 42 Tex. L.Rev. 364 (1963-64).

Williams & Meyers note that fluid injection is generally regulated by the states and may not be undertaken without approval of the appropriate state regulatory agency, and quote as an illustration Rule 701 of the North Dakota

Industrial Commission:

"Permit for Injection of Gas, Air or Water

"Where correlative rights of all operators are protected and waste will not occur:

"(a) The injection of gas or air or water into any reservoir for the purpose of maintaining reservoir pressure, for secondary recovery operations or for water disposal, shall be permitted only by order of the Commission after notice and hearing. Orders approving the application will not be made within 15 days of the filing of the application unless the written consent of all persons entitled to notice is filed with the Commission within such time. . . ." Id., pp. 58-59.

An order by the North Dakota Commission permitting water injection despite the objection of certain owners in the unit was sustained by the Supreme Court of North Dakota, where the Court held that the parties who refuse to join into a voluntary unitization and pressure maintenance program should not be allowed to frustrate legitimate conservation efforts. Syverson v. North Dakota State Industrial Commission, 111 N.W.2d 128 (N.D. Sup. Ct. 1961); accord, Arnstad v. North Dakota State Industrial Commission, 122 N.W.2d 857 (N.D. Sup. Ct. 1963). The Syverson case was among the cases quoted with approval by the Supreme Court of Texas in affirming orders of the Railroad Commission of Texas which likewise approved a

permit for waterflooding over the objection of a lease owner who objected to the order. Railroad Commission v. Manziel, 361 S.W.2d 560, 570 (Tex.Sup.Ct. 1962):

"These authorities, in principle, support our view that it was the purpose of the Legislature in adopting our conservation laws that in any oil or gas field the Commission should have power, even the duty, to prevent undue drainage of oil across lease lines. The Commission has two primary duties in the administration and control of our oil and gas industry. It must look to each field as a whole to determine what is necessary to prevent waste while at the same time countering this consideration with a view toward allowing each operator to recover his fair share of the oil in place beneath his land. In carrying out these duties, there has devolved upon the Commission the power to promulgate rules, orders and regulations that control the industry, and such are issued pursuant to the police power of the state, and that power may invade the right of the owner of the land to the oil in place under his land as long as it is based on some justifying occasion, and is not exercised in an unreasonable or arbitrary manner. See: Brown v. Humble Oil and Refining Co., 126 Tex. 269, 83 S.W.2d 935, 87 S.W.2d 1069, 99 A.L.R. 1107, 101 A.L.R. 1393 (1935).

"The rules of ownership are of prime importance, but in this consideration the rights of one do not exceed the rights of another. As to oil and gas, the surface proprietors within the field have the coequal right to take from the common source of supply. It follows from the nature of oil and gas that the use by one of his power to seek to convert a part of the common reservoir to actual possession may result in an undue portion being attributed to one of the possessors of the right to the detriment of the other. Hence, it is within the Commission's power to protect the vested rights of all the collective owners, by securing a just distribution, and to reach the like end by preventing waste.

"There is no dispute as to the necessity of injecting larger amounts of water into the reservoir to prevent waste in the field, ..." Id., pp. 571-572.

The Railroad Commission's orders in Manziel were issued pursuant to its powers under Articles 6029 and 6008b Tex.Civ.Stat. The former provides the Commission the power to make and enforce rules to prevent waste, and the latter specifically authorizes the Commission to approve voluntary unitization and secondary recovery operations:

"Article 6029: The Commission shall make and enforce rules, regulations or orders for the conservation of crude petroleum oil and natural gas and to prevent the waste thereof, including rules, regulations or orders for the following purposes:"

"Article 6008b, § 1: Subject to approval of the Railroad Commission of Texas * * * persons owning or controlling production, leases, royalties, or other interests in separate properties in the same oil field, gas field, or oil and gas field, may voluntarily enter into and perform agreements for the following purposes:

"(A) To establish pooled units necessary to effect secondary recovery operations for oil or gas, including those known as cycling, recycling, repressuring, water flooding, and pressure maintenance and to establish and operate cooperative facilities necessary for said secondary operations; . . . "

As stated above, gas recycle is generally indistinguishable in theory from other secondary recovery operations, and the Manziel case appears to be one of the few cases to address the question of whether the state may order the undertaking of secondary recovery in order to prevent waste.

961 (1945) is worthy of mention. The facts of the case are summarized by the Supreme Court of Texas as follows:

"The Bammel Field was classed primarily as a gas field, and covered about 3200 acres. The Bammel Field was practically all under lease to Harrell in 1939, when he applied to the Railroad Commission for a permit to install a recycling plant. Under authority from that body, the operations were begun by drilling production wells around the periphery of the field and two injection wells in the center. The gas was taken from the production wells through the recycling plant, where the liquid hydrocarbons were extracted; then the dry gas was pumped back into the producing sand through the injection wells. The recycling plant had a capacity of thirty-five million cubic feet of gas per day, but because of an unavoidable loss of two million cubic feet per day, only thirty-three million cubic feet were reinjected into the reservoir. This continuous process had the effect of pushing the wet gas from the center of the field toward the

edges where it could be produced and processed, the purpose being to extract practically all of the valuable liquids from the gas and leave only dry gas in the reservoir, with the only drop in pressure being that entailed by the daily loss of two million cubic feet of the gas. Harrell intended to forego producing the dry gas for light and fuel purposes until the recycling process had progressed to a point where it would no longer be economically feasible. In fact, the reinjected dry gas fingered out unevenly into the wet gas area, and a certain amount of blending of the wet and dry gas took place.

"In October of 1941 leases belonging to Harrell on approximately four per cent of the field lapsed, and Corzelius acquired control of this acreage. He drilled one well thereon and began production in January of 1942, supplying gas to two distributing corporations owned by him, through a pipe line from the well to Houston. This was the first time that any permanent withdrawals had been made from the field to supply a light and fuel market, and to the time of trial it was the only outlet to a market. The average daily market demand amounted to four or five million cubic feet. By a relatively simple process, Corzelius extracted a portion of the liquids from the gas he produced before delivering it to the pipe line. This process did not recover as great a percentage of the liquids as did the recycling process.

"Harrell applied to the Railroad Commission for an order prohibiting permanent withdrawals from the field until the conclusion of the recycling process; and in the alternative he asked that withdrawals be prorated. Upon a hearing the Commission found that production up to twenty million cubic feet daily would entail no appreciable waste. Therefore withdrawals up to that amount were authorized. This order was extended from time to time. After several futile attempts to obtain mandatory relief from the Supreme Court (see Harrell v. Thompson, 140 Tex. 1, 165 S.W.2d 81), Harrell filed this suit in the form of an appeal from the above-mentioned order and the various extensions thereof." Id., p. 970.

On appeal the Court of Civil Appeals enjoined Corzelius from further production. Following that decision the Commission

effectively mooted the issue by vacating its earlier order and issuing a new order regarding production of gas in Bammel Field. Thus, the order complained of was no longer effective and no one appealed from the subsequent order, which included, inter alia, the following requirement:

"(4) That all gas produced 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 as provided by Article 6008, Revised Civil Statutes of Texas, as amended. Provided, however, that not more than 20,000,000, cubic feet per day of the allowed production from the same Bammel Field shall be utilized for light and fuel and other lawful purposes." Id., p. 971.

Despite the fact that the case was moot, the Supreme Court ruled that the Court of Appeals had erred, reversed the Court of Civil Appeals' decision, and dismissed the case, so as not to leave any doubt as to whether the Commission could regulate production in Bammel Field.

In sum, there are a number of cases which extend the states' power to enact conservation laws and regulations to secondary recovery operations, including gas recycle. These cases are premised on the well established principle that a state may exercise its police powers to prevent the physical waste of oil and gas. It is therefore arguable that the State of Alaska can require the reinjection of all gas so long as it can be shown that such action is necessary to prevent waste of oil in the reservoir. This is clearly the implication of Henderson Co. v. Thompson, 300 U.S. 258

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.

(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, § 106 (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.

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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. claims

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. Corzeliuss v. Harrell, 186 S.W.2d 961, 971 (Tex. 1945).

SCOMM

#13:6

EXXON COMPANY, U.S.A.
POST OFFICE BOX 440 • ANCHORAGE, ALASKA 99510

PRODUCTION DEPARTMENT

December 9, 1975

Joint Gas Pipeline Impact Committee
Alaska State Legislature
425 G Street, Suite 750
Anchorage, Alaska 99501

Attention: Mr. Eric Eckholm

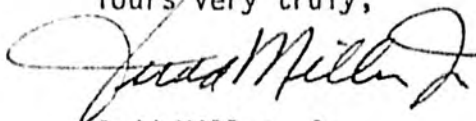
Gentlemen:

There are enclosed for the Committees information the responses of Exxon Company, U.S.A., to the questions submitted with your letter of November 19, 1975.

We did not receive the questions until November 24, 1975, and as you have been advised, the time required in preparing answers prevented us from delivering the answers by the December 8 date.

I plan to make a statement in behalf of our company during the hearing on December 10, 1975.

Yours very truly,



Judd Miller, Jr.
Division Manager

CC's to: Committee Members

QUESTIONS CONCERNING THE PRUDHOE BAY
NATURAL GAS RESERVOIR
AND RELATED MATERIALS

(REQUESTED BY ALASKA STATE LEGISLATURE JOINT GAS
PIPELINE IMPACT COMMITTEE - RECEIVED 11/24/75)

QUESTION: 1. (a) What discount rate does your firm use in evaluating field development investment of the sort envisaged in the Prudhoe Bay Area?

ANSWER: The overall evaluation of any new investment must consider the "cost of capital", the risk, the changing levels and mix of investments, inflationary pressures, future prices, taxes and other governmental and regulatory constraints. The "cost of capital" not only varies between companies in an industry, but also varies for a particular company, such as Exxon, as a function of the changing business environment. An investor is not only interested in the past and present return made by a corporation, but more particularly on the prospects for a level of future return which will reward his risk in an investment.

It has been widely recognized by several financial institutions, energy companies, and government agencies, that the private sector's capital requirements for petroleum investments over the 1970-1985 period will be three to four times the amount required in the last 15 years. In 1974, or more than a year ago, the Chase Manhattan Bank, in its paper, "The Profit Situation", stated the following:

"...In the United States alone, the petroleum industry's financial needs will exceed half a trillion dollars.

Raising that much money will represent an enormous task .. Part of it can be borrowed but at least three-fourths will have to be generated internally from profits and capital recovery. Nearly half must be obtained from profits alone and, profits will have to grow much faster than in the past. The rate of return on invested capital will need to range between 15 and 20 percent."

Also, in early 1975, Ezra Solomon has testified in connection with the FPC hearing on Docket No. RM 75-14 as follows:

...Thus my conclusion on the rate of return question is that the appropriate rate for new investment dedicated to expanding our oil and gas production capacity should now lie in the range of 17-18 percent a year on DCF after-tax basis."

The above quoted returns reflect averages, for the industry and the wide range of investment decisions. Therefore, it is clear that a specific discount rate is a constantly changing target and clearly subject to many variables that range within a band of expectations. However, it is obvious that the 10 percent before-tax rate used in the Aerospace report is clearly inadequate and inappropriate for economic evaluation of any petroleum industry investments in Alaska.

It is essential to realize that the returns quoted above are on total expenditures, and not incremental investments such as development costs of Prudhoe. When only the incremental development costs are used, the acceptable rate of return must be much higher, especially since the exploration costs which are neglected occur many years before the project is brought on stream. As an example, Exxon has been exploring in Alaska since the 1950's, has drilled many dry holes, but has generated no revenue to date. The profit on the Prudhoe Bay venture must bear some of the earlier failures and the long delays before any cash flow is generated.

It is also important to realize that the return for a particular investment opportunity must be adjusted for the specific degree of risk involved. Operating experience in a remote, Arctic environment is very limited and consideration must be given to the probability that costs could be considerably higher than forecast. In this instance, there is also uncertainty in produce prices, investment and operating costs, and taxes.

Consideration of these factors leads to the conclusion that the rate of return at Prudhoe Bay must be substantially higher than the return required on average investments. This is necessary to recoup exploration costs, both past, present and future, and to yield earnings sufficient to attract the capital required to conduct an active exploration program in a high risk environment such as Alaska.

Therefore, in summary, consideration in investment considerations must include the following:

- (1) The overall cost of capital to the individual corporation, considering its overall investment mix, capital structure, long-term debt, and the need for an adequate return by the corporate investor.
- (2) The Prudhoe Bay project involves an abnormal amount of uncertainty and risk.
- (3) Any analysis of only the Prudhoe Bay development costs as opposed to total cost, requires a higher return to justify the total venture.

QUESTION: 1 (B) If more than one rate is used, indicate the reasons and the circumstances appropriate to each rate.

ANSWER: As noted in 1(A), projects judged to have substantial risk require higher returns to offset the risk and justify the investment.

QUESTION: 2. (A) Are there any circumstances under which a requirement to reinject all gas produced could lead to a reduction in the rate of oil recovery, or in the ultimate recovery?

ANSWER: Exxon's reservoir performance studies, which are based on "reasonably expected circumstances", show that produced gas can be reinjected without causing a reduction in the rate of oil recovery or in ultimate oil recovery.

QUESTION: 2. (b) If so, explain those conditions and estimate the amount of reduction.

ANSWER: Based on our current knowledge of the reservoir, and expected reservoir performance, this question is not applicable - see response to Question 2.(A).

QUESTION: 2.(C) Are there circumstances under which the reinjection of gas could be more costly than production of gas for sale?

ANSWER: Reinjection is an expensive and unnecessary step where gas markets are available. When gas is reinjected, it must be produced a second time and the added gas injection and gas producing costs are substantially higher than the cost of producing the gas directly to sale.

QUESTION: 3. (A) The Aerospace study states (p. 3-30) that gas compression for reinjection will require 5 percent of the gas as fuel. Is this a reasonable estimate?

ANSWER: The fuel estimate of 5 percent of the gas compressed for reinjection is reasonable. However, additional fuel will be required for oil and gas production.

It should be pointed out that our answer to this and all subsequent questions related to the Aerospace and Gruy studies are based upon a cursory review of those studies. A more detailed review of the studies with those who performed the study is needed to be sure we understand the study.

QUESTION: 3. (B) How does this compare with the field consumption of gas to be expected under the assumption of maximum production for sale?

ANSWER: The gas at Prudhoe Bay will ultimately be sold. The question is really one of timing. Fuel associated with gas sales should be comparable regardless of timing. If gas sales are delayed, additional fuel will be required for reinjection and production the second time. Gruy's study would indicate the additional fuel required for gas injected is 5 percent of 5.9 Tcf or 295 Bcf of gas. We believe this figure is understated because our studies indicate the produced and reinjected gas would exceed the 5.9 Tcf estimated by Gruy.

Fuel requirements for oil production are highly uncertain because they are dependent on final reservoir management plans. These plans will be updated and improved upon as the field is produced and production behavior is

observed and evaluated. nevertheless, - fuel will be required for oil production whether gas sales are early or late.

QUESTION: 3. (C) Neglecting the gas used as compression fuel, is there any reason why all the reinjected gas could not eventually be recovered?

ANSWER: The recovery of gas reserves will depend upon the abandonment pressure which will be affected by the economic environment. A percentage of the reinjected gas or its equivalent will be recovered.

QUESTION: 3. (D) Assuming that all gas was reinjected, at what point do you estimate the total quantity of gas reinjected would equal the total recoverable gas reserves contained in the reservoir?

ANSWER: We are not sure we understand the question. If no outside gas is injected, the injected gas will come from the recoverable reserve and will never exceed that available. Based on reasonable assumptions of producing conditions, we believe that the total volume of gas reinjected will not equal the total recoverable gas reserves contained in the reservoir prior to depletion of the oil reserves.

QUESTION: 3. (E) Would this quantity (less that consumed in reinjection) actually be recoverable at that point? If more or less, why?

ANSWER: As noted in 3 (B), a percentage of the injected volumes or its equivalent will be recoverable dependent upon the economic abandonment pressure for the field.

QUESTION: 4. (A) Are the cost figures used in the H. J. Gruy model (Aerospace, p. 3-23 and Gruy, p. 10) reasonable?

ANSWER: The cost parameters summarized on p. 3-23 are expressed in 1975 dollars and on that basis are reasonable. However, inflation will substantially affect actual costs and should be taken into consideration. For example, during 1974 drill bits increased 29%, pumps 43%, tubular steel 52%, and certain other items such as valves and fittings were up over 100% in cost. Furthermore, additional capital expenditures which are not listed on p. 3-23 nor p.10 will be required. Those include expenditures for water injection, gas processing, artificial lift, gathering systems, and other lease facilities.

QUESTION: 4. (B) Aerospace (p. 3-22) indicates that the quantity dependent costs are in addition to the costs of water treatment plants, but no cost figures are provided for such plants. Apparently, there are similar additional capital costs associated with gas processing, to control the water and hydrocarbon dew points, and to remove carbon dioxide (Aerospace Report, p. 3-8). Please explain the relative costs of these activities, and any other related activity necessary to prepare the gas for sale, so that the committee can have a general idea of why the costs of producing the gas for sale are higher than the costs of production for reinjection.

ANSWER: Our research indicates Gruy's study included about \$4.5 billion (1975\$) in capital expenditures for water injection wells and facilities, gas sales treating, gathering facilities, and other lease and service facilities. Gas sales treating facilities were estimated to cost \$550 MM by Gruy. Exxon's estimate (1975\$) for the gas sales treating facility is comparable to Gruy's.

When costs for sales compression and additional electrical power to support gas sales are added, Exxon's estimate of gas sales facility

costs is increased to \$800 MM (1975 dollars). These sales investments will ultimately be required whether gas is sold early or delayed. The cost to produce the gas to early sales is less than the costs to reinject the gas and produce it a second time. This subject is discussed further in our answer to question 8. (B).

QUESTION: 5. (A) Have you entered into any agreements for the sale of your share of the Prudhoe Bay gas which would require you to produce the gas even if the price obtainable for it was very low?

ANSWER: No. We have not entered into a gas contract; however, we have entered into agreements which grant certain purchasers the right to negotiate for Exxon's gas reserves. These agreements have been made a matter of public record with the Federal Power Commission and the California Public Utility Commission.

Exxon has entered into two agreements involving minor uses of gas for field facility fuel; however, no gas value has been agreed to. These agreements are expected to be superseded by the Unit.

QUESTION 5. (B) What minimum price, if any, is mentioned in any gas sale or option agreement covering North Slope gas to which your firm is a party?

ANSWER: None. A minimum price concept is included in the agreements referenced in the answer to 5 (A) above.

QUESTION: 6. (A) What will become of the heavier hydrocarbons contained in the gas stream (ethane and heavier) if the gas is reinjected?

ANSWER: In the absence of a gas sale, the produced gas will be processed through gas/liquid separation equipment and the liquids will be

commingled with the crude and transported to market.

QUESTION: 6. (B) If it is sold?

ANSWER: When Prudhoe Bay gas is sold, it will be necessary to reduce the water vapor and hydrocarbon dew points of the gas to the extent required by gas pipeline quality specifications. The hydrocarbon liquids removed from the gas stream will either be transported through the oil pipeline and sold, consumed as field fuel or re-injected into reservoir.

QUESTION: 6. (c) To what extent, if any, has your firm committed itself to the sale of these heavier hydrocarbons?

ANSWER: No commitments have been made.

QUESTION: 7. (A) Will the proceeds of the production of oil and gas be shared by the producers on the basis of original oil and gas in place?

ANSWER: The proceeds of the production of oil and gas will not be shared by the Prudhoe Bay owners. Instead, each owner will take-in-kind and dispose of separately, their share of the production. The proper basis for sharing oil and gas production is currently being negotiated.

QUESTION: 7. (B) If not, then how?

ANSWER: See explanation above.

QUESTION 7. (c) If, as is indicated in Gruy, the production of gas for sale

results in a loss of oil, what principle will govern the appointment of this loss among the field's several owners:

ANSWER: None. Once the oil and gas allocation factors referenced in response to question 7 (A) have been established, they will apply to the produced volumes.

Again, we do not like the use of the word "loss". Early gas sales is clearly the most optimum way to produce Prudhoe Bay. Gruy's estimated "loss" associated with early gas sales is a highly uncertain "loss" which, in our view, can be reduced, if not eliminated, by good reservoir management practices. Furthermore, the "loss", if it occurs, is small when compared to the benefits in present value income and other factors which would be associated with early gas sales including a higher condensate reserves, less fuel associated with reinjection of gas, less fuel and higher operating costs associated with producing the gas a second time, and lower costs associated with the reduced operating

QUESTION: 8 (A) The Aerospace study indicates that the future field development costs of gas production for sale exceed the costs of field development under a 100 percent reinjection assumption by a substantial amount. (Aerospace, p. 19 indicates a difference of \$3.8 billion.) Does your firm generally believe this to be a realistic prediction?

ANSWER: The Gruy study is limited to production over a 23-year period and compares costs for early gas sales with costs for no gas sales where all excess gas is reinjected. As previously pointed out, we have not had a chance to study the Gruy report in the detail we would like, however, we believe the \$3.8 billion cost increment associated with early gas sales is approximately correct for the assumptions made. Again, we must emphasize this expenditure is expressed in 1975\$ and will be substantially less than the ultimate expenditure required.

QUESTION: 8 (B) If so, please explain the reasons for this \$3.8 billion difference; if not, why?

ANSWER: To make the two cases comparable, the gas must be sold under the delayed gas sales case. This would require adding expenditures for gas treating and processing, central compression, additional electrical power, and other lease and service facilities required to handle the sales gas. Additional operating costs must be added to cover production of the gas, the extended life of the field, and the costs of fuel associated with producing and selling the gas. Addition of those factors to the Gruy "no gas sales" case would make that case more expensive than the early sales case. When the present value loss of deferring the income from gas sales and the associated condensate and plant liquids is included as additional cost to defer gas sales, deferral is clearly an uneconomic option which should not be seriously considered.

QUESTION: 9 (A) Pages 3-37 of the Aerospace report indicate that the total costs of producing the gas, considering the lost oil production (at \$9/barrel) and the actual field development costs, under maximum pressure maintenance, would be \$7.251 billion. Is this a reasonable figure? If not, what would be a reasonable estimate?

ANSWER: The \$7.2 billion (1975\$) number is comprised of the \$3.8 billion cost increment previously discussed and \$3.4 billion due to the approximately 400 MM barrel difference in oil recovery reported by Gruy. As previously discussed, this "loss" is uncertain and we believe it can be reduced or eliminated. Other than this difference, our quick examination of the Gruy study leads us to believe it is approximately correct.

QUESTION: 9. (B) The Aerospace report indicates that, assuming a \$9/barrel price for oil and a 10 percent discount rate, the cost of gas production will be \$47/Mcf (sic 47¢/Mcf) (Aerospace, p. 3-38, 3-30). Is this a reasonable figure? If not, what would be a reasonable figure?

ANSWER: We cannot endorse the calculation and cost estimate for several reasons. The discount rate which was used is clearly too low, the calculation did not include all costs, and the costs were expressed in 1975\$. The calculation was based upon a before-income-tax evaluation. Income taxes are a heavy burden to industry and add to the cost of the gas. Furthermore, the costs did not include appropriate exploration expenditures.

Industry makes many unsuccessful exploration expenditures to achieve one successful discovery and its profits on that discovery must carry its failures. The analysis of costs cannot be restricted to a small area of operations. Most of the larger companies operate throughout the United States, and their success in one part of the U.S. must carry failures in other parts. To arrive at the proper costs for a specific reserve and an acceptable return for a particular project is an exercise in futility as witness the FPC's experience. The only reasonable approach is to base gas values on deregulated free market gas pricing policies.

QUESTION: 10 (A) Would your firm be willing to develop the field for gas production (for sale) if the expected revenue from the gas sales were less than the cost of its production? (In other words, are there any circumstances under which your firm would go ahead with development for gas sales even if the present net worth of the field (or your part of it) were to be reduced thereby?)

ANSWER: Exxon cannot undertake projects which do not provide a profit and a reasonable return on investment. Therefore, we would not enter into a venture in which the revenue was less than the cost and which did not yield a reasonable present net worth. Furthermore, any government or other entity which forces expenditures on unprofitable investments is inefficiently utilizing its resources.

QUESTION: (10)(B) Are there any circumstances under which the production of natural gas could be subsidized by the production of oil?

ANSWER: It is our view that both oil and gas owners have the right to produce and realize current income from their reserves, and that the oil and gas can be optimally produced simultaneously in the Prudhoe Bay Field. In view of the large energy potential of the oil and gas, we further believe that with proper free market price incentives, each resource stands alone on its own economic merit and that there is no need for one to subsidize the other.

QUESTION: 10 (C) Are there circumstances under which a firm could be compelled to produce the gas even though such production did not make economic sense?

ANSWER: No.

QUESTION: 11. The Aerospace study seems to indicate that the maximum gas production from the Prudhoe Bay reservoir sustainable for any substantial period of time, without undue loss or oil recovery, is about 2.5 Bcf/day. Some pipeline feasibility calculations seem to be predicated on a higher rate of production. Is the Aerospace estimate realistic?

ANSWER: We have on a number of occasions stated, as have other Prudhoe Bay producers, that in our opinion a gas production rate from Prudhoe Bay of between 2 and 2.5 Bcf/

day is reasonable based on current reservoir knowledge and predicted performance. With additional reservoir performance data and after partial depletion of the oil reserves, the gas sale rate might be substantially increased above the 2.5 Bcf/day.

QUESTION: 11 (B) If not, what is a realistic estimate?

ANSWER: See response to question 11. (A).

STATE OF ALASKA

DEPARTMENT OF LAW

OFFICE OF THE ATTORNEY GENERAL

JAY S. HAMMOND, Governor

POUCH K — STATE CAPITOL
JUNEAU 99801

April 2, 1975

MEMORANDUM

TO: The Honorable Jay S. Hammond
Governor

FROM: Avrum M. Gross 
Attorney General

RE: Recommendation of Gas Pipeline
Task Force

On December 2, immediately after assuming office, you appointed me to chair a task force to review the State's posture concerning alternative transportation systems for North Slope gas. The task force was composed of the Commissioners of Environmental Conservation, Fish and Game, Revenue, Economic Development, Community and Regional Affairs, Commerce, Natural Resources and Highways, as well as the Director of the Division of Policy Development and Planning. At times Lieutenant Governor Thomas has participated with us in our deliberations and, of course, you have from time to time sat in on the sessions as we evaluated information made available to us.

The problem as you stated it was to make an unbiased, comparative evaluation of the TransAlaskan and Canadian routes for transportation of North Slope gas so as to determine what route would best serve the interests of the State of Alaska. Prior to the formation of the task force, you had publicly stated

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that you favored a Trans-Alaskan route on the basis of information available to you. Upon assuming office, a great deal more information became available, as well as the machinery to do a comprehensive review of the competing projects. You asked that we consider whether or not your support of a Trans-Alaskan pipeline was justified in light of detailed information developed by the task force.

Your prior support of the Trans-Alaskan pipeline was consistent with the position of the previous administration. Upon undertaking a review of the competing projects, we found that a substantial amount of work remained to be done in evaluating the two proposals. The State had intervened in the legal proceedings before the Federal Power Commission and retained counsel in Washington, D.C. to present the State's position, but until this task force embarked upon its efforts the State's position consisted more of enthusiastic support for an Alaskan route for a pipeline than of careful analysis. You advised the task force that whatever position was ultimately adopted by the State, you wanted to be able to rationally support it and defend it before the Federal Power Commission or Congress should that body ultimately take jurisdiction over the matter. Faced with that mandate, the task force has met regularly since December and has increased its work substantially in the last two months so as to be able to make a recommendation to you prior to initiation of the FPC hearings. The prehearing conference for that proceeding will be April 7, so we are pleased to have met the deadline.

Our efforts have been directed to a comprehensive review of material developed in connection with both projects.

That material was made available primarily from the participants, Alaskan Arctic Gas and El Paso Alaska, who were required to develop the data for submission to the FPC. Representatives of both Arctic Gas and El Paso have appeared before the task force and made extensive presentations concerning their plans. The task force has also utilized consultant studies as a source of knowledge.

As a result of our review, it is the recommendation of the task force that you reaffirm support of a Trans-Alaskan transportation system for natural gas from the North Slope. We will in this report outline the basis for our conclusions. We will not include here the backup data on which our conclusions are based, but we have that data compiled for your review when you wish to make such a review.

A. The Nature of the Projects.

There are basically two competing systems for the transportation of North Slope gas to the continental United States. The first is the so-called Canadian route. Under this proposal, which has been made by the Arctic Gas consortium, gas from Prudhoe Bay would be transported by means of a large-diameter pipeline from Prudhoe Bay east across the Canadian border to a point somewhat south of the Mackenzie River Delta. At that point the pipeline carrying Alaskan gas would join with a lateral from the Mackenzie Delta region which would carry Canadian gas. The main line formed by the convergence of these two laterals follows the Mackenzie River Valley south through the Northwest Territories. After leaving the river valley,

this line continues south to Caroline Junction, Alberta. At Caroline Junction, the main 48-inch pipeline diverges into two pipelines; one heads southwest to the Canadian-Idaho border and the other heads southeast to the Canadian-Montana border. New pipelines which are proposed for construction in the Lower 48 would receive the gas at these border points and transport it to markets in Washington, Oregon and California in the case of the western pipeline and to markets in the midwest and east in the case of the eastern lateral. Theoretically, any surplus Canadian gas from the Mackenzie Delta would also be available for distribution in the United States, though the existence of that surplus is somewhat speculative.

The estimated cost of this transportation system is estimated by the consortium to be 8.3 billion dollars, not all of which is allocable to the Alaskan transportation network. The portion of the price which is allocable to the Canadian lateral should not affect the price of the American gas transported by the line.

The alternative to the Trans-Canadian system is a Trans-Alaskan route which handles the gas in a more complicated manner. This proposal, presently advanced by El Paso Alaska, would take the gas by means of a large-diameter 42-inch pipeline from Prudhoe Bay down the existing corridor of the Alyeska Pipeline. On approaching the southern terminus, the line would leave the pipeline corridor and go to Gravina Point on Prince William Sound. The applicant for the Trans-Alaska line intends to build

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at Gravina Point an LNG plant which would reduce the gas to liquefied form. El Paso also proposes to construct a fleet of cryogenic tankers which would then take the liquefied gas to California, where the LNG would be reconverted to its gaseous state. At least initially, all of the North Slope gas delivered to California would be physically consumed on the west coast. This in turn would free gas presently being transported from Texas and New Mexico to the west coast, which could then be made available to markets in the midwest and east via existing distribution systems. If gas deliveries from Alaska increase to the extent that not all of the gas can be consumed in the west, it will be possible to reverse the direction of existing lines. These lines can then be used to transport gas from California eastward to Texas and Louisiana where the gas could be flowed into existing transportation systems and moved to the east and midwest. Although this transportation system is complex, a review of the system by Arctic Gas concludes (somewhat reluctantly) that this system is feasible and, of course, El Paso always has maintained the workability of this approach. This transportation system, including the pipeline, the cryogenic tankers, the LNG plant, the regasification plant, and facilities needed to effectuate displacement is estimated by El Paso in 1973 dollars to be 6.7 billion dollars. An analysis prepared by Arctic Gas critiquing the El Paso project indicates the more realistic figure on the basis of today's dollars would be 8.3 billion dollars, and while that figure may be inaccurate, there is no question but that

the cost of the El Paso proposal is substantially higher than set out in its application. Assuming the El Paso project costs approximately the same as the Arctic Gas project, it will nonetheless be more expensive for the delivery of American gas alone, as the Arctic Gas project will cover transportation of both American and Canadian gas.

Both projects involve the loss of some of the gas in the transportation system itself. The best estimate we have is that the Arctic Gas proposal will involve utilization of approximately nine to ten per cent of the gas for energy in transit. The El Paso loss will be considerably higher--approximately 16 per cent.

B. Criteria for Assessment.

The basic standard we have used in evaluating these two projects is what is best for the interests of the State of Alaska. We have sought to evaluate which route would produce the greatest benefits for the State in the long run. In evaluating those benefits, we have attempted to categorize them in two basic groups, which incidentally is the same basic grouping the FPC will make in its hearing procedure. The first is environmental. We have tried to evaluate the environmental effects of each line so as to consider the impact each will have on the State. Second, we have tried to consider the long-term economic impact of the line. That investigation has involved a study of the alternative effects of the two lines upon such things as royalty payments which would be made to the State, severance taxes, and property taxes. We will outline our general findings in these two areas.

I. ENVIRONMENTAL IMPACT. Unlike the quantitative measurements which can be applied to revenue comparisons, evaluation of environmental impact is a highly subjective process. There was no clear sentiment in the task force that one route or the other was better from an environmental standpoint. Rather, the conclusion was that each proposal had both benefits and detriments. It was the feeling of the group that, while the choice was not clearcut on the basis of a purely environmental comparison, it should be the State's obligation in the forthcoming FPC proceedings to insure that the detriments we have identified be minimized insofar as possible. We will outline the primary benefits and detriments of each route here, though as I have noted, they were not in themselves the basis for the group's recommendation.

(a) Trans-Alaskan Route.

Advantages

1. Without doubt, the most important environmental asset of a Trans-Alaska route is the fact that the gas pipeline could be constructed in an existing transportation corridor, a corridor which has been studied intensively and about which a tremendous amount of environmental information has been gathered. As construction of the Trans-Alaska oil pipeline proceeds, more information regarding construction practices, revegetation, protection of stream crossings, and other important techniques will be developed.

2. Existing facilities, such as the TAPS haul road, construction camps, access roads, existing highway system, spoil disposal sites, material sites and other critically important ancillary needs could be made available for use to

construct the gas pipeline.

3. A Trans-Alaska gas pipeline would parallel many streams along the corridor in the Arctic, instead of transecting them, which means that the total number of stream crossings on the ecologically sensitive North Slope is reduced along this route.

4. There is a dearth of knowledge about the fishery resources of the Arctic, particularly the offshore fisheries. However, the Alaska gas pipeline route parallels the Sagavanirktok River; our knowledge of its fishery resources is much more detailed than any other river on the North Slope. This greater base of knowledge can be drawn on to minimize the adverse impact on the North Slope fishery, if a Trans-Alaska gas pipeline is built.

5. Natural gas is the cleanest available fossil fuel. For this reason, it is in great demand in those areas of the nation which suffer from air pollution problems. An Alaskan route would insure that some day, if the need should arise, Alaskans could use their royalty gas as a low pollution source of energy. An Alaskan route would preserve that option; a Canadian route would not.

Disadvantages

1. An Alaskan route will mean substantial additional development in the State, particularly along an already heavily impacted pipeline route. With this development will

come the accompanying stresses of "boom growth", inflation, more people and possibly a large tidewater development to liquefy the gas for shipment to the Lower 48 states. This latter development could be sizable and may lead to extensive development in an area which is presently pristine.

2. There may be physical, biological and chemical effects from construction and operation of an LNG plant at tidewater. Excess heat from this process would be discharged from the plant and could have an adverse environmental impact. However, we estimate that this impact may be minimal.

3. Secondary development, spurred by the existence of an LNG facility and the availability of natural gas for industrial uses may cause greater environmental problems than the LNG development itself. An associated large petrochemical industry at tidewater would create its own environmental and socio-economic problems.

4. Any new development inevitably means more people and a new LNG facility built in a presently undeveloped area will mean that a new community may have to be constructed, or that existing communities will have to wrestle with significant new growth. Providing the basic services, such as water, sewer, health facilities, schools, etc., may place a severe burden on both State and affected community resources.

5. The environmental hazards of shipping LNG in cryogenic tankers are probably not of sufficient magnitude to be worrisome (especially when compared to shipping crude

come the accompanying stresses of "boom growth", inflation, more people and possibly a large tidewater development to liquefy the gas for shipment to the Lower 48 states. This latter development could be sizable and may lead to extensive development in an area which is presently pristine.

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4. Any new development inevitably means more people and a new LNG facility built in a presently undeveloped area will mean that a new community may have to be constructed, or that existing communities will have to wrestle with significant new growth. Providing the basic services, such as water, sewer, health facilities, schools, etc., may place a severe burden on both State and affected community resources.

5. The environmental hazards of shipping LNG in cryogenic tankers are probably not of sufficient magnitude to be worrisome (especially when compared to shipping crude

oil by tanker), but the safety hazards to the ships and personnel may be substantial.

6. The energy loss, in the liquefaction process, is an environmental liability, especially in an era when energy conservation is needed.

(b) Trans-Canada Route

Advantages

1. Development within Alaska would be minimal if an Alaska-Canada gas pipeline were constructed. The tidewater development of LNG facilities, and tanker movement of the LNG would be eliminated by an overland route from Prudhoe Bay to the midwest. Also, development activity along the Trans-Alaska pipeline corridor would be eliminated.

2. The Alaska-Canada route will cause less problems in Alaska because of the relatively short distance that the pipeline would be within Alaska's borders (from Prudhoe Bay east to the Canadian border). In this sense, however, we are "trading off" Alaskan environmental problems to Canada.

Disadvantages

1. Any viable Alaska-Canada route will undoubtedly breach the ecologically fragile Arctic National Wildlife Range. This range, which is under consideration as a wilderness area, is the last remaining area of the Arctic Coastal Plain in Alaska and perhaps in the North American Continent which is not presently committed to development. An Alaska-Canada pipeline through this area would undoubtedly be the first in a long line of petroleum-related developments in the Range.

Therefore, a decision to route the gas pipeline through the Range may, in effect, be a decision to commit the last untouched wilderness area on Alaska's North Slope to full-scale oil and gas development.

2. A gas pipeline running east to the Canadian border from Prudhoe Bay transects many north-south Arctic streams and may have a serious environmental impact on the North Slope's fish resources. As the pipeline is refrigerated below the freezing point of water, its presence under streams and rivers may impact on natural freezing and thawing processes. Winter survival of fish populations, which in the Arctic is directly tied to adequate supplies of water, may be jeopardized by localized and downstream effects that would be created by a pipeline buried under streams and rivers. In addition, siltation caused by the construction process and stream bed disturbances could have major impact on aquatic habitat.

3. Advocates of an Alaska-Canada pipeline state that snow and ice roads would be used to support construction activities, which would avoid the need to build a permanent access-haul road network. However, there are substantial environmental problems associated with ice road construction. Heavy construction vehicles, rumbling over ice and snow roads, can cause damage to the tundra which may lead to serious subsidence, solifluction and erosion problems. As mute testimony to this fact, swaths of dead vegetation remain today in Naval Petroleum Reserve Number 4 more than 20 years after exploration crews

traveled on ice roads searching for oil and gas. Also, there appears to be a very real question regarding the availability of sufficient snow and water to construct snow and ice roads. Precipitation on the Arctic Slope is light, averaging four to eight inches annually. Therefore, snow availability--coupled with the lack of adequate sources of water for artificial snow manufacture--could be a serious factor in limiting construction of snow and ice roads along an Alaska-Canada pipeline route. In any event, maintenance of the line would utilize all-terrain vehicles at any time of year, with subsequent permafrost and tundra degradation.

4. Wildlife along an Alaska-Canada route will undoubtedly be adversely impacted by construction of the gas pipeline. A route which knifes through the coastal plain of the Arctic National Wildlife Range would breach untouched caribou calving grounds, would traverse and possibly interfere with the denning area and normal movements of a distinct polar bear population, and encroach upon significant resting and feeding grounds utilized by snow geese in preparation for their nonstop migratory flight to the contiguous United States.

5. The Canadian segment of an Alaska-Canada gas pipeline route would carry a very high environmental price tag, as it would traverse a very fragile area which has been touched only lightly by the machines and hands of man. Environmental impact of an Alaska-Canada gas pipeline does not end at the Yukon border; we Alaskans cannot close our eyes to the very

real environmental problems that would be associated with the Canadian leg of the pipeline route. The route traverses some of the most severe permafrost problem areas on the North American continent. Therefore, when writing the equation for determining the true environmental costs of an Alaska-Canada route, the serious problems in Canada must also be considered.

II. ECONOMIC IMPACT. One factor which has substantially affected our analysis in the economic sphere is concern for the possibility that neither the El Paso nor the Arctic Gas proposals may be completely economically viable. Of course, neither the Arctic Gas consortium nor El Paso have indicated in their applications to the Federal Power Commission that there is any real economic risk in the project. Both applicants have submitted cost data which, on the surface, seems to show that gas can be delivered to United States markets at competitive prices. The difficulty is that we find it hard to accept these estimates as completely reliable in light of both general and Alaskan experience with major construction projects of this magnitude. More than two years before the Trans-Alaska oil pipeline is expected to go on stream, its final system cost is now estimated at more than five times the initially announced figure. Overruns of 50 to 400 per cent are the rule, rather than the exception, in large custom designed and built engineering projects such as electrical generating plants, manufacturing plants pioneering new technology (G. M.-Lordsville), sports stadiums and coliseums (New Orleans, Seattle), airports,

urban transit systems (BART, Washington Metro), etc. Accordingly it is reasonable to regard the applicants' pro forma cost figures as establishing only an order of magnitude and a base for escalation far in excess of the rate of general inflation.

Our review of the information available indicates to us that both projects can be projected at an initial cost of 8-8.5 billion dollars, and taking into account the certainty of continual inflation, the near certainty of delays and other difficulties that will occur before either project can be completed, a more realistic estimate for either project would be at least 10 billion dollars. This last figure might well be qualified by the expression "plus 50 per cent or minus 20 per cent".

The significance of this initial cost is that it will necessarily require that tariffs for the transportation of this gas be high--so high in fact as to make the gas possibly noncompetitive with alternate fuel sources. A detailed accounting analysis of the necessary cash flows would be as futile and misleading as detailed cost estimates in judging the overall project viability. Because of engineering, cost and timing uncertainties, a very general procedure is probably as adequate for our purpose as an intensive critique of the applicants' pro forma income statements. Supposing the \$10 billion investment were to be depreciated at five per cent per year and that the entire investment had to produce a rate of return of 10 per cent, the initial annualized capital costs would be 1.5 billion dollars. Assuming further

that either system would be capable of delivering into the existing natural gas distribution system of the Lower 48 states one quadrillion BTU (quad) per year, the average capital costs at this level of throughput would be \$1.50 per million BTU delivered. Assuming operating costs other than fuel to amount to 10 per cent of the capital costs, a wellhead price of only 25 cents per million BTU would bring the delivered costs at the U.S.-Canadian border or out of a regasification plant on the west coast of the United States, to \$1.90 per million BTU.

The assumptions going into this order of magnitude estimate are, we believe, conservative to moderate, so that \$1.90 probably represents the minimum price at which Alaskan natural gas could conceivably be delivered into the gas distribution system of the Lower 48 states. An informal survey of the opinions of energy specialists not affiliated with the applicants produced a range of cost estimates for transportation alone running from \$1.75 to \$2.50 for gas transported by an overland pipeline through Canada and \$2.00 to \$3.00 for a system that combined a pipeline across Alaska with LNG tankers to the west coast. The implications of these possible economic forecasts are enormous for the State. If the market price of the gas delivered in United States markets is nearly equivalent to the transportation cost alone, the State's royalty and share from severance taxes will be minimal. This is because both royalty and severance tax are based on a percentage of wellhead value, and wellhead value will roughly equal the difference between the market value of the gas and its transportation

cost. If gas is "deregulated", the equality will be precise. If wellhead price is set by the FPC (as is the current practice), the difference will be minimal since we cannot conceive of the FPC setting a wellhead price that would require the gas to be sold at a loss. If the gas can only be sold at a price of, say, \$2.50/Mcf, and it costs \$2.50/Mcf to get that gas to the market, there is simply going to be no wellhead value left upon which to assess royalties and taxes.

I am sure that our conclusions concerning possible lack of wellhead value must seem confusing, in light of the publicly expressed concerns of a national gas shortage, but if an evaluation is done of the nature of that "shortage", the problem becomes fairly clear. Gas has two basic markets in the United States, a "premium" market and a "nonpremium" market. The premium use of gas is for residential, commercial, and special industrial uses. While the price of premium gas is presently low because it is regulated by the FPC, there is no question but that on a free market the gas could be sold for high prices, perhaps in the neighborhood of \$3.00 per Mcf. The nonpremium use of gas is industrial and as boiler fuel. In this market, the maximum price which is paid for gas is about \$2.00 per Mcf. The significance of these two markets is that there are different competing products in each. In the premium market, gas competes with middle-distillate fuel oil. In the nonpremium market, gas competes with heavy fuel oil or coal.

The regulatory practices of the U. S. Government have created an unusual situation in regard to the prices at which

"premium" and "nonpremium" gas are sold. Interstate sales of gas are regulated by the FPC, while intrastate sales are not. Since interstate regulation has been on the basis of artificially low wellhead prices, much gas in the United States is used in the same state in which it is produced. There is a shortage in the "premium" market because companies cannot sell gas there advantageously--they can derive higher prices for nonpremium industrial use in the state of production.

If transportation costs for Alaskan gas are excessive, that gas is not going to be able to compete adequately with alternative sources of industrial fuel. The gas could compete on the premium market if conditions stay as they are today, since there is a real shortage in the premium market, and customers will buy the gas at even a high market price. The shortage in the premium market, however, is limited, and in and by itself could not justify the construction of a transportation system of the magnitude proposed. Moreover, if gas is deregulated or if end-use restrictions are placed on the use of natural gas, we can expect to see gas supplies quickly reallocated, with the result that the "shortage" in the premium market will rapidly dissipate. Companies will then direct their gas supplies to those markets where gas could be sold for higher rates than in nonpremium sales, leaving the nonpremium market to use heavy oil and coal. We have some doubts that Alaskan gas would be able to compete against gas from other sources in the premium

market if such a reallocation occurs. The primary competitor in the nonpremium market is oil and coal and the indications to the task force are that in the future Alaska gas will not be able to be delivered to the continental United States for prices competitive with those fuel options.

This issue is, of course, more complex than I have set out here, but suffice it to say that the task force has some concerns about the ability of either project to deliver gas competitively without government subsidy and with the result of a positive wellhead value. If the wellhead value is zero or very small, our royalties from the gas will be very slight and our severance taxes, which are based on wellhead value, will also be minimized. We find this to be a significant feature in our analysis since it has led us to conclude that if we are to derive any significant economic benefit from this developed Alaskan resource, it may well have to be through direct use of the gas ourselves.

That direct use can come in several ways. First, the gas may be made available in Alaska for the "premium" uses I previously discussed, though such a use will only involve a small percentage of the State's royalty share. For instance, the State's royalty share will be approximately 280 MMcf/d from production of 2.25 bcf/d. Even if we developed a natural gas market in the state equal to that which presently exists in Anchorage, it would only use approximately an additional 55.7 MMcf/d.

The real possible benefits for Alaska's gas seem to lie in the development of cheap sources of fuel for possible

industrial use in the state. . That industrial use can occur either in the interior or along the coast, where the gas is delivered. The cost of the transportation of such gas in Alaska will be substantially less than the cost of delivering the gas to the continental United States, meaning that we will have a source of cheap fuel here for industries that seek to use it. There are several possibilities which need not be discussed in detail here. Petrochemicals is one form of industrial use which has been discussed previously, and other possibilities exist, such as the Klukwan Iron Ore project in Southeastern Alaska.

Unless we have a Trans-Alaska line, there is no satisfactory way to transport Alaskan gas for Alaskan use. We have considered the possibility of constructing pipelines from Prudhoe Bay to points in Alaska, assuming that a Trans-Canadian route were used to transport most of the gas to continental United States markets. Our conclusion has been that a transportation system just for Alaska's royalty share is not economically feasible. The cost of construction of such a system simply cannot be amortized without resulting in an extremely high cost of gas. Accordingly, it is clearly in the State's best interest in obtaining a maximum return from its North Slope gas to keep that gas in the state for use here, and since we can only do that with a Trans-Alaskan line, it is in the State's interest to support such a route.

To this point our analysis has been based on economic projections which indicate a minimal wellhead value for Alaskan

gas from Prudhoe Bay. It is, of course, entirely possible that our predictions are overly pessimistic and that in the end we will see a reasonable or even substantial wellhead value for the gas. If that is the case, the direct use of Alaska's royalty gas in the state will not be the only benefit derived from the resource, but it will still be a prime benefit. If the wellhead price turns out to be more than we have anticipated, the State will derive royalty and severance taxes based on the wellhead price from both the Arctic Gas and the El Paso proposed systems. The task force does not anticipate that, if the project turns out to be successful, there would be a substantial difference in wellhead price between the Arctic Gas and the El Paso proposals, though there is some indication that a higher wellhead price might be derived under the Arctic Gas proposal. That possibility derives from the fact that the Arctic Gas and El Paso proposals are about the same cost, but the Arctic Gas system would carry a somewhat greater volume of gas, reducing unit transportation cost. However, as we note below, other direct taxes imposed by the State of Alaska on a Trans-Alaskan project would more than compensate for the difference between the two proposals. Moreover, the benefits which would accrue from Alaskan use of Prudhoe Bay gas are sufficiently substantial in and by themselves to outweigh what we anticipate to be a small difference in possible wellhead value, and local use has the added benefit of providing real value to the gas in the event that the economic model we have described is proven correct.

A Trans-Alaska line will also result in revenue from a number of other sources than the gas itself. The property

tax on the Trans-Alaska project would, in the view of the Department of Revenue, produce \$68 million more per year than a route through Canada. Under our current gas severance tax law, the wellhead price with a Trans-Canada pipeline would have to be 58.21 cents higher than the Trans-Alaska project to offset in royalty and severance tax payments this substantial difference in property tax. As previously noted, we have concern about the existence of any significant wellhead value after deduction of transportation costs and, accordingly, this comparison is important in evaluating the projects. If the current proposed law was passed providing for a 10 per cent severance tax on wellhead value, then the wellhead differential necessary to make the total revenues from both projects equal is 43.8 cents.

Adding to the direct revenue benefits of a Trans-Alaska line would be the corporate and personal income tax revenues that would accrue to the State. Although difficult to estimate, approximately \$42 million more tax revenue is expected during construction of the Trans-Alaska line.

These tax revenues are not, of course, without corresponding burden. Both projects will create substantial demands on State services. It is going to be crucial that we insure a source of revenue to meet those burdens. Property and income taxes provide such a source, even if the economic concerns expressed earlier are valid.

C. A Recommended State Position.

The task force believes that the State in its own best interest should advocate the construction of a Trans-Alaskan

route for the transportation of North Slope gas. This support, however, should be given in full recognition of the fact that it is the State's interest which is being promoted rather than that of a particular company or consortium building a route. We do not recommend that the State necessarily support El Paso Alaska in the construction of a Trans-Alaskan route. To do that would be to wed ourselves to the El Paso proposal and it is not necessarily to our benefit to do so.

We believe it is in the State's interest to support the Trans-Alaskan route but to insist that if that route is approved by the FPC stipulations be contained to insure the promotion of Alaska's interest. First, we must work to insure that the pipeline is certified as a common carrier. Without a detailed discussion of this point, legal doctrines require that common carrier status be obtained in order to insure that Alaska's gas be available at the terminus of the pipeline for Alaskan use. There is some authority that suggests that once gas is commingled in an interstate pipeline it may not be removed without FPC consent. We should make it a prime point in our position to insure that that consent is obtained.

El Paso has not spent the time or the money to evaluate the environmental impact of its line in the same manner as has been forthcoming from Arctic Gas. Relying primarily on the pipeline corridor studies already completed, El Paso suggests that in essence the problem has already been resolved by those studies. That, unfortunately, is an oversimplification. First,

it is unclear whether or not the gas and oil pipelines can in all instances be laid side by side within the same corridor, and it is possible that in certain instances the pipeline will have to be laid outside the existing corridor, creating environmental problems which have not been studied by El Paso. The State should be in a position to press for a route which most efficiently establishes a system compatible with the surrounding environment. Very little review has been done by El Paso of the environmental problems created when its proposed pipeline route leaves the corridor and goes to the Alaskan coast. Again, the State should not feel itself wedded to any position or presentation made by El Paso but should be in a position in the FPC proceedings to vigorously criticize and, if necessary, advocate alternatives. Finally, the financial capacity of El Paso to construct the proposed project is limited. El Paso frankly concedes that if it is granted a certificate, it expects to be joined by other companies and what we may well see is a new consortium created, composed of many of the same parties that presently are in the Arctic Gas consortium. The State should do everything to insure that adequate financial backing is obtained for this project and that the project is, insofar as it can be made so, economically feasible. It is in the State's interests to do so because if the project ultimately becomes subsidized we can reasonably expect that the State will be forced to bear a portion of that subsidy, either through pre-emption of its taxing power or through imposition of other federal controls.

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While we have recommended to you that the State support a Trans-Alaskan route, we believe that we must also advise you that there is a great deal of impetus and political pressure tending toward an adoption of the Canadian route by either the FPC or the Congress. Midwestern and eastern states see it in their interest to have North Slope gas come directly to their markets through a pipeline, and when the decision is made we can expect that this large segment of the United States populace will not be ignored. Moreover, there is evidence that the Arctic Gas proposal will use less of the gas itself in the transportation system, which will recommend the system to a national constituency. Finally, as we have noted earlier, the Arctic Gas proposal appears to be cheaper in terms of the construction necessary for the transportation of Alaskan gas. Faced with two marginal economic proposals, the FPC or the Congress may well opt for the one which at least is cheaper on its face, since that would reduce costs to consumers.

We mention these factors because we believe that, while Alaska should promote a Trans-Alaskan route, it should never lose sight of the fact that the Arctic Gas proposal has a substantial chance of ultimately prevailing. Accordingly we believe our position should be not only to promote the Trans-Alaskan route, but actively to criticize the Arctic Gas proposal in an effort to insure that if it is ultimately adopted it will be the best route possible for Alaska. For instance, the Arctic Gas proposal right now is for a line through the Arctic Wildlife

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Range. It is the feeling of the task force that it is not in the State's interest to promote intrusion and development of that Range and that the State should attempt to insure that routes are developed for the Arctic Gas proposal (if it is accepted) which will avoid incursions into the Range. Arctic Gas has indicated that if they obtain the certificate which, in their view, will give them eminent domain powers for a pipeline across State lands, they will nonetheless negotiate with the State for such a route. We would expect to do so, but at the same time we should make every effort before the FPC or the Congress to insure that the basic corridor for the route is sound.

We will be meeting with our attorneys in Washington, D.C. over the weekend to discuss how we best can present Alaska's case before the FPC. On April 7 I will participate in the prehearing conference, at which point we will indicate to the hearing officer what basic alignment we will take in the proceeding. I will, of course, await your instruction before advising Washington counsel of that course of action.

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CONCLUSIONS

The statements and testimony from communities and knowledgeable individuals have led to the following conclusions relative to the impact of pipeline construction. They are drawn with the aim of placing in perspective the possible courses of action which may be open to the Legislature and which are discussed later in this Summary.

1. The communities found it difficult, in most cases, to determine what effects pipeline construction would have on their areas. Most did not have the staff to do research or make employment and population projections. The communities had very little information on the specific plans for the pipeline at a date early enough to be helpful.

2. The early impact will be in the areas of law enforcement, recreation, unemployment, drugs, alcohol and welfare. These matters will increase the operational costs of local governments, but will not increase the potential for additional revenue. These problems will be associated with a transient population and with pipeline workers looking for recreation.

3. The more permanent population will place demands on schools, public facilities, housing, utilities and government services which, in some communities, will be difficult to meet. Although revenue to the local governments will rise, there will be an over-all lag in revenue, especially in property taxation. Some categories of State shared revenues will rise in proportion to population increases. Where a sales tax is in effect, an increase should be felt almost at once.

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4. Increased population will accelerate the need for many public improvements, often necessitating substantial financing at a date earlier than normal. In some cases, this presents the community with the problem of meeting higher maintenance costs and debt service payments while raising a question in the minds of community leaders as to whether required substantial tax increases can be sufficient. Without assistance, this may be the case in many communities.

5. Population increases will occur in most Alaskan cities, and in general, the impact will be in proportion to the increase. However, the relative severity of the impact on any community will be more related to the percentage of population increase rather than the number of persons arriving in any given community.

6. Some government leaders are concerned that public improvements made to meet demands during construction may lead to over-building with a resultant debt-burden existing in a community long after construction is completed. In nearly every case, the Committee's conclusion is that the cities will not decrease substantially in population after construction is completed.

7. Even with a lag in revenue receipts, findings show that by 1977, most community revenues will have reflected the population increase and further impact aid, per se, should not be required.

8. The agencies of the State Government will have an important role in meeting many of the problems associated with the pipeline construction, both in the organized communities, the unincorporated communities and in the unorganized borough.

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The effectiveness of these agencies will depend upon the money available to them and the direction given by the Administration. The Committee or the Legislature should review whatever plans are drawn to determine their adequacy.

9. Some communities are deficient in certain facilities or utilities and include funding of these deficiencies as related to pipeline impact. Even though there may be a real deficiency, the total demand for financing must be considered along with the amount needed only to meet the impact.

10. Some communities desire to provide improvements which are in excess of the need due to impact alone. In these cases, the impact portion should be isolated and the additional funds needed should be considered separately (see Appendices C & D).

11. There are capital-improvement projects being accelerated because of pipeline construction, but which will be needed regardless of the pipeline within a reasonable period of time under normal growth conditions. Aid made available should be designed to help the community during the interim period only.

Communities which are required to make capital improvements many years in advance of normal requirements may need a higher degree of immediate help, but not beyond the point where local revenues are created to support debt service.

12. Inflationary pressures will be a factor in operational costs of local government. It is believed that this factor need not be considered except for the first year of the impact. (See Appendices C & D).

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The following observations and suggestions for consideration are offered to reflect, as nearly as possible, the composite concern expressed in committee meetings, as well as in hearings and interviews with community leaders and citizens of the various impact areas:

1. Numerous city officials have suggested that increases in State Revenue Sharing would provide the aid so badly needed by the local governments. Administratively, this would be a simple solution, assuming that a general increase in the various categorical formulae used in revenue sharing would provide the amounts of aid necessary in individual cases.

This method was tested against the net needs of the five communities requesting the largest amounts of aid and found successful, if any general formula is to apply. The per-capita needs for operational aid range from about \$15 per-capita in the larger communities to over \$250 per-capita in the smaller ones.

Categorical grants might be made to the communities in response to formal applications, but this would not provide a total solution covering all communities.

Therefore, the first suggestion is an attempt to formalize grants for operational impact aid on a population percentage increase basis.

As stated earlier, the percentage increase in population is more significant to the community than an increase in actual numbers. Therefore, a formula based upon the percentage increase can be devised to provide for operational impact grants which

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apply to all communities affected by population increases.

Assume, for example, that a 12% increase in population would warrant a \$20 per-capita grant. Then, a 150% population increase would require a \$250 per-capita grant. In order to coordinate the situation of the boroughs with service districts, the Committee feels that grants should be broken down by percentage as follows: 50% for general government, 17% police, 17% fire, and 16% roads.

2. The revenue sharing grants for operational impact costs should be formally requested by the cities, with supporting evidence of need.

3. The Committee has found that per-capita impact costs will drop in 1975 and again in 1976. Any assistance programs should be reviewed for 1975 applications to determine the need, and if it exists, to establish a new per-capita grant formula.

4. Caution should be exercised in making substantial allowance for inflation.

5. Aid for capital improvement programs undertaken on an accelerated basis by the community, and which, under normal growth conditions, would be needed by 1976, 1977 or 1978, could be in the form of a State loan or bond-guarantee program. Such a program should be available to all cities and would enable the smaller communities, which may not be able to sell bonds, to obtain debt financing. A bond-guarantee should assure the smaller communities lower interest rates.

6. In cases where capital improvements are ~~not~~ required to meet impact needs, but under normal conditions would not be

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needed for, perhaps, five years or more, the State could undertake a program to finance a portion of the debt service, or interest, for a period of time.

7. In those cases where debt limitation on general obligation bonds makes it impossible to sell bonds for a capital improvement necessary to meet the impact needs, the State should consider a grant program, if an urgent need can be shown.

8. In those cases where funds are urgently needed by a municipal water utility and the earnings potential is such that the required debt coverage cannot be maintained, the State could establish a loan program, at a reasonable interest rate, to cover the interim period until bonds can either be sold or utility rates increased to improve the earnings.

9. Legislation similar to Senate Bill 235 (an Act creating the Alaska State Electric and Telephone Authority) should make available a loan program for municipal and cooperative electric and telephone systems when other financial sources are unavailable.

10. The State should establish a stronger program to make housing loans or purchase available mortgages if normal financing sources are not available.

11. No doubt, much of the impact of pipeline construction will fall in the areas of responsibility of the various State Departments. Funds should be provided for health services and health nurses; State Operated Schools; police; the Department of Highways for maintenance in the impacted areas; airports and airstrip construction and maintenance; various training programs;

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environmental health law enforcement; protection of fish and game along pipeline route; expansion of the Motor Vehicle Division; review of voter registration capability; review of the Court System in impacted communities, and the prosecution of crimes.

The Committee suggests isolation of impact requirements of State Departments in order to prevent permanent build-up of departmental structures.

12. Impact on district and borough schools varies greatly. The per-student requirements range from over \$450 to over \$900. Since the Foundation Program and the other State contribution programs are quite intricate, a formula based on a per-student ratio and on the percentage increase of students should be devised for each of the communities needing school operational funds.

13. Some school districts will be requesting funds for new construction or for temporary classrooms. Consideration should be given to double-shifting until the population trend is fully established. If there is a clear need for more classrooms, temporary quarters should be provided until the growth pattern is clear.

14. Special action should be taken, either legislatively or administratively, to protect fish and game along the pipeline route.

15. Non-critical construction projects should be delayed until pipeline construction reaches its peak and begins to taper off.

16. The Alaska State Legislature should authorize, if appropriate and necessary, the University of Alaska to lease University land for temporary housing in areas where private land is not available.

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17. The Alaska State Legislature should consider the formation of a special agency or task force to investigate and make recommendations to the Administration and the Legislature concerning the availability of federal funds relating to pipeline construction. In light of the urgent needs in various areas of the State, the Committee recognizes that any such agency will need emergency authority. The Committee also feels that such an agency should be composed of members of the Administration and the Legislature or their appointees.

Finally, the Committee concludes that, in general, a case by case approach to the solution of impact problems would best serve to cope with the broad variety of local stresses bound to occur in varying degrees during the pipeline construction period. Suggested legislation to accomplish this approach is offered in "An Act creating the Pipeline Impact Agency" and its companion measure establishing a "Pipeline Impact Fund."

PIPELINE IMPACT
Brief Summary

Several communities more severely affected by pipeline construction will see population increases ranging from 20% up to 150%. Accelerated growth in these proportions places a great burden upon both the State and local governments to provide both the extraordinary operational costs and necessary public improvements to accommodate the increased population.

The State is planning to aid the communities in absorbing part of the additional operational costs incurred, but will be unable to provide any substantial aid in the field of capital improvements because of declining reserves and the prospect of a negative-balance reserve account before substantial revenues accrue to the State from oil production.

In the public improvement categories are schools, streets, sewers and sewage treatment plants, water and other utilities, recreational areas and facilities, libraries, expanded dock facilities, fire and police quarters, and communication facilities, which must be financed and built ahead of schedule, in some cases as much as five or six years.

It is believed that the pipeline construction project is a national interest and that the crash nature of its' construction may be considered as a national effort.

Under the circumstances described above, we want to explore the Federal programs that might be available to assist the heavily impacted communities to prepare for the population boom.

Specifically, the following is a partial list of projects that will be needed by communities and estimated costs involved.

Schools	\$10,000,000
Electrical Utilities	14,000,000

Public Buildings & Facilities	\$10,000,000
Recreational Facilities	4,000,000
Roads & Drainage	2,000,000
Fire-fighting Facilities	1,000,000
Telephone Utility	1,500,000
Water Facilities	25,000,000
Sewer & Treatment Plants	5,000,000
Libraries	1,000,000
Waste Disposal	120,000
Air Quality Control	25,000
Total	<u>\$73,600,000+</u>

A complete assessment of the needs have not been made, but the above represents the needs of the communities most heavily affected by population expansion. It is expected that several other communities that have not been studied, including Juneau, will experience substantial population increases.

It should be noted that several of the cities have already made substantial investments to prepare for the impact. For example, Fairbanks has expended or encumbered over \$27,000,000 since 1969 on public facilities and utilities.

Gas Line Depends On Push

The executive vice president of El Paso Natural Gas Co. said in Anchorage last night that unless his company has some evidence of unqualified, enthusiastic support of all Alaskans, El Paso will be forced to abandon its plans for a trans-Alaska gas pipeline.

The official, George Carameros, who also is vice president of El Paso Alaska, was here for only a day, and met yesterday with the special legislative Pipeline Impact Committee, and members of the Alaska Pipeline Education Committee. He also was the guest of honor at an informal reception last night with Anchorage civic leaders.

Carameros told all that El Paso is faced with a crucial decision on whether to spend another \$30 million, (in addition to the \$2 million already spent) in environmental and engineering studies, preparatory to building a natural gas pipeline from the North Slope to a terminus in Southcentral Alaska.

Arctic Gas Study, which is proposing a trans-Canada gas pipeline to take Prudhoe Bay gas to market, has said it will file applications for its pipeline in January with both the U.S. Federal Power Commission and the Canadian government.

At that time, or within two or three months, El Paso must also file an application.

Carameros said it would cost \$3 million just to file an application with the federal commission and that another \$27 million expenditure would have to be committed for additional work. He said El Paso cannot proceed in this unless there is support in Alaska for the all-Alaska pipeline.

Carameros said he wants firm, complete backing of El Paso's proposal from the governor, the legislature and the people of the state.

He indicated that the state can exercise "moral suasion" in decisions as to who the oil companies on the North Slope sell their gas, and of course, the state has its own royalty gas of which to dispose.

At this meeting with Sen. Ron Rettig's special impact committee, Carameros indicated that El Paso would like to see the legislature adopt a formal resolution at its next

(See Page 2, Col. 3)

El Paso Asks Support

(Continued From Page 1)
session, in January, supporting the trans-Alaska gas pipeline.

The committee's executive secretary, George Sharrock, said the legislators made no commitment. But he said they are sympathetic to the fact that El Paso's project would have more economic benefits to the state than the trans-Canada proposal.

Carameros said the maximum benefit to Alaska would only come with a plan as proposed by El Paso, and not through that proposed by a

consortium of 28 companies, the Arctic Gas Study group.

The trans-Canada plan would pick up Canadian gas from the Mackenzie Delta, for transportation to both Canadian and American markets. Arctic Gas has said the Alaska gas is absolutely essential to a trans-Canada pipeline at this time.

El Paso's plan is to build a pipeline closely paralleling the trans-Alaska crude oil pipeline. A gas liquefaction plant would be built at the gas pipeline's terminus, which has not been decided. Then the

super-chilled liquefied natural gas would be moved to the West Coast by refrigerated supertankers.

"We have completed \$2 million worth of studies which have convinced us that the economics of a trans-Canada pipeline versus a trans-Alaska pipeline are virtually the same — it would cost as much to go either way," Carameros said.

"Furthermore our studies indicate that the plan we propose is economically feasible, providing we can obtain the natural gas supplies necessary to operate the line. But the biggest consideration of all is that the interests of the Alaska people overwhelmingly lie in committing this resource to an all-Alaska pipeline that will reap enormous benefits for the whole state."

Carameros said that despite strong odds in favor of the trans-Alaska gas pipeline, "there has been a passive attitude on the part of Alaskans which we find very difficult to understand."

"If I were in the shoes of the average Alaskan, I would be standing on the rooftop shouting for state support of an all-Alaska route."

Anchorage Daily Times
12/14/73 p. 1

ARCTIC GAS COMPANIES PUSH NATURAL GAS SYSTEM

By BETZI WOODMAN

Earnest persuaders from Arctic Gas Study Groups are working to convince governments, financiers and the general public in the U.S. and Canada that their proposed pipeline is the most efficient and advantageous means of transporting natural gas from the North Slope and Northern Canada's Mackenzie Delta region to all major United States markets.

Until mid-June, wide-ranging feasibility studies were conducted for the 26 participating firms (a major portion of the petroleum and natural gas industries in North America), primarily by the Canadian Arctic Gas Study Company. Then it was announced that the Alaska Arctic Gas Study Company would be activated with an office in Anchorage. Named as president and chief executive was Robert Ward, lieutenant governor under Keith Miller and most recently administrator for the Alaska Power Administration. Colonel Amos "Mo" Mathews, soon-to-be-retired from his position as district engineer for Alaska, Army Corps of Engineers, is executive vice president.

Although both men are highly regarded for their administrative and engineering expertise, respectively, neither has a history of gas pipeline experience. The new office, with from 10 to 20 employees probably

will have loans of gas experts from among the participating firms.

Alaskan Arctic Gas (AAG) will supervise study programs in Alaska, prepare applications (to be filed this year) to state and federal regulatory authorities for approvals to construct and operate the proposed pipeline, and act as liaison with state government officials and Alaskan residents. The Canadian group will continue to function similarly in Canada.

The two companies were organized as service companies on behalf of the mem-

however, they are to be replaced and developed into Alaskan Arctic Gas Pipeline Company and Canadian Arctic Gas Pipeline Company. The latter two organizations will, in their respective countries, actually apply for authorizations; secure the necessary financing; and build, own, and operate the pipeline. (To avoid confusion among the names of four companies, the general reference will be to Arctic Gas.)

Approximately \$34 million has been spent in the past five years studying the economic, engineering, and environmental aspects of the proposed pipeline in both countries. Expenditures are expected to total \$60 million for further studies, regulatory proceedings, and detailed engineering, prior to governmental approvals.

The pipeline will be a contract carrier, officials say, neither buying nor selling gas, but providing transport for shippers of gas who contract for the service on a long-term basis. It will be essentially a utility-type operation with a regulated rate of return.

Proponents of the Arctic Gas pipeline are hard at work drumming up support for the mammoth project estimated to cost \$5.7 billion—and they have their work cut out for them. Pro arguments must be persuasive in the feasibility of the technical aspects of constructing through the Arctic a high-pressure 48-inch line more than two thirds the length of North America.

Advocates must also contend with a number of issues which can complicate procedures as much as or more than the situations which have beset the Trans-Alaskan Pipeline. One immediate concern of Arctic Gas is the proposed El Paso gas pipeline across Alaska from the North Slope to (probably) Seward, where the gas would be liquefied for transport to the west coast. W. P. Wilder, chairman of Canadian Arctic Gas Study Ltd. told government officials of Northwest Territories that delays in approving Arctic's proposals could lead to completion of the El Paso line. "The result would almost certainly be that a pipeline from the Mackenzie Delta would, at the very least, be deferred for a considerable period," Wilder warned. In addition, "exploration for petroleum resources in the North (of Canada) would be severely retarded. Supplies of northern gas would likely be deferred well beyond the point in time that they are required to help meet Canadian needs." Wilder, in fact,



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ber firms. As study companies, the two entities represent a planning phase. Soon,

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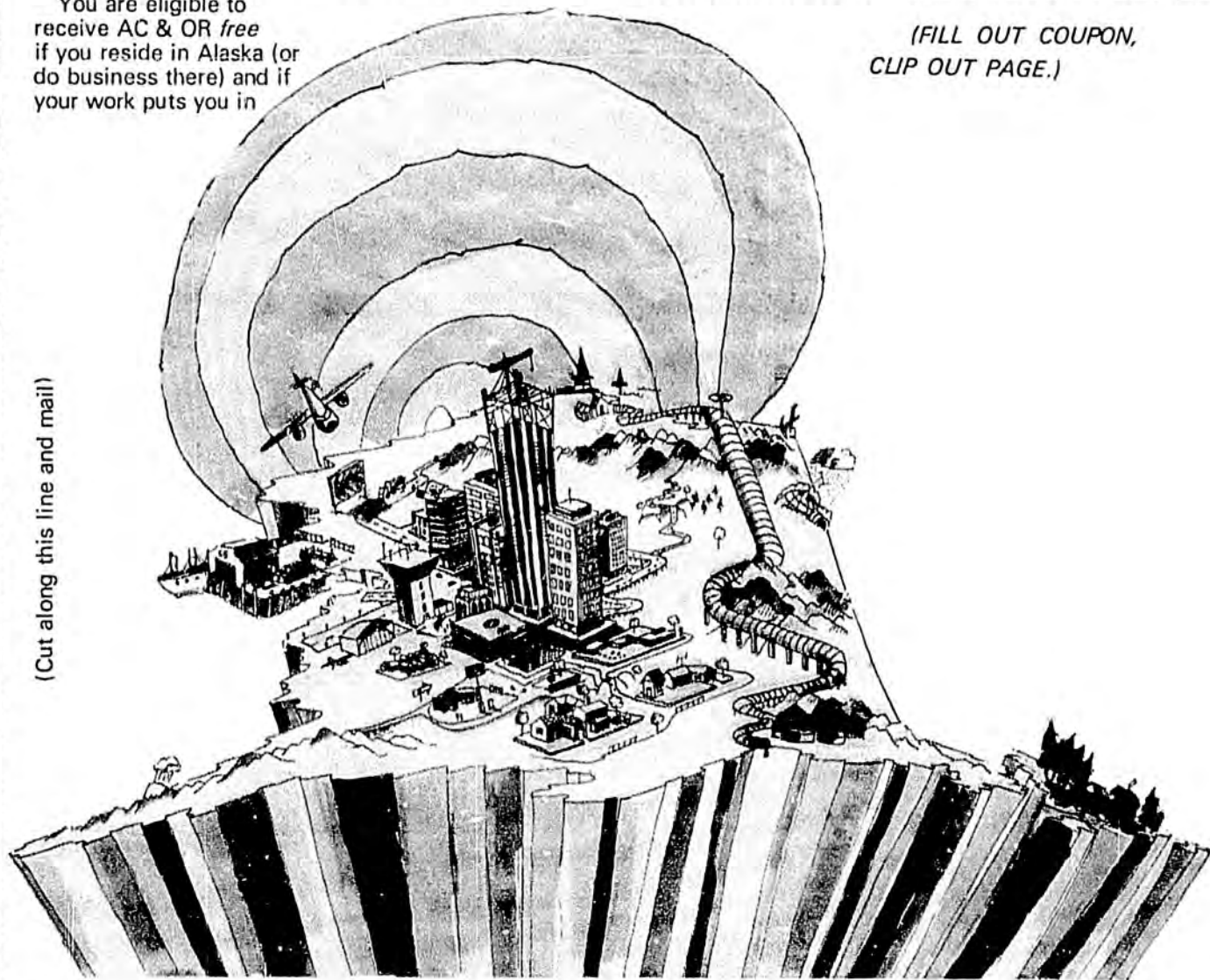
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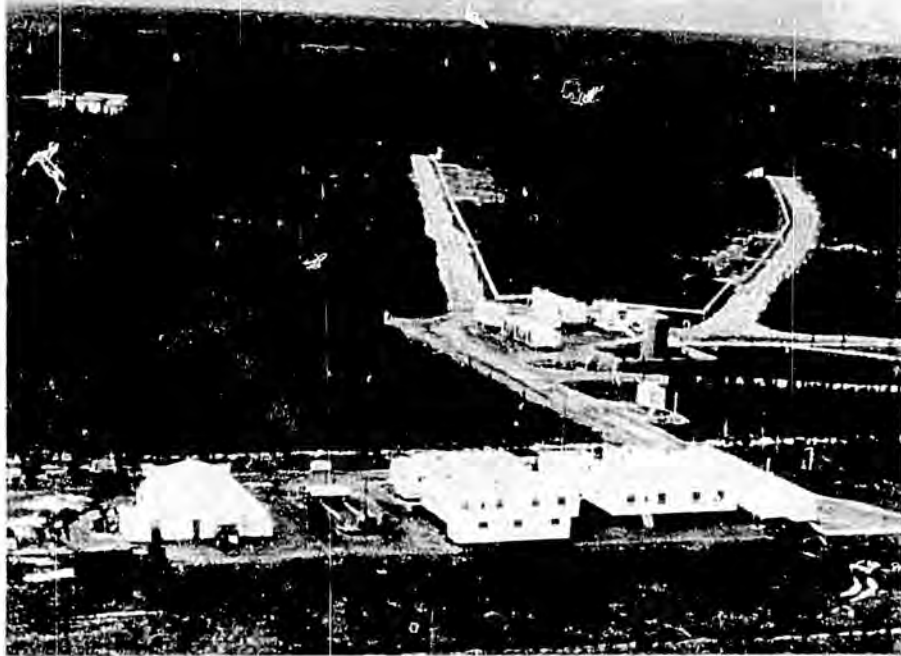
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Aerial view of Arctic Gas' \$3.5 million Arctic test facility at Sans Sault, NWT. Five 500-ft. sections of 48-in. diameter pipe were installed at the test site. Refrigeration and compressor simulated the flow of natural gas through the pipe sections.

has called the possibility of El Paso's success and thus loss of North Slope gas to Arctic Gas "probably the biggest risk facing our project."

Other serious issues with which Arctic Gas must deal include indeterminate and differing energy policies in Canada and the U.S.; differing regulatory procedures (with that of U.S. on the verge of change) by the two governments; environmental and economic impacts; political considerations in both countries which may in some cases be only indirectly related to this particular project; financial backing and methods for public ownership; legal intricacies of product ownership and export; and the already-recognized potential delay in the matter of Canadian aboriginal land claims.

Basic to the whole project, however, is access to the proven gas reserves in both the Mackenzie Delta and the North Slope. Wilder states that two things are required to achieve a delivery rate of more than four billion cubic feet per day and thus make the transportation of Northern gas economically viable: gas resources of both the Slope and the Delta for volume; and access to not only Canadian markets, but an outlet to the much larger U.S. markets.

At this point, the only promise of North Slope gas for the line is through an option held by Columbia Gas Systems with Sohio for gas from the BP operation. Columbia, a participating member of both study groups, is under the crunch to build reserves for their large distribution in seven eastern states. Atlantic Richfield and Exxon, who have most of the gas of Prudhoe through the gas cap, and are also

members of the Arctic Gas Consortium, are not yet committed for their gas transportation.

Before the basic resource of natural gas can be available, however, there must be oil production on the Slope. This, of course, depends on a transportation route for the crude oil — the trans-Alaska oil pipeline. An even further consideration of basics involves the nature of the Prudhoe reservoir and whether the cap gas can be produced without harming the reservoir. The Oil and Gas Conservation Committee has jurisdiction over when the gas will be produced.

To help find answers on which to base such decisions, the state has spent nearly a year on a reservoir simulation project by computer. First basic runs were due in July, but the real crux is not expected until late winter or early spring when all the parameters are defined. Undoubtedly, every company involved on the Slope has taken the prudent step to make its own study. Although a computer will reflect only what program is put into it, it is likely that the oil companies have more information than the state. In any case, judging the results adequately will be a crucial matter.

THE ARCTIC GAS CASE

To back its project, Arctic Gas sets forth a number of advantages besides the overall statement that the route of their gas line represents "the most efficient and advantageous means of providing transportation for large reserves of natural gas to all major U.S. market centers."

Wilder points out that for Canada to re-

main self-sufficient in energy (she is the only industrialized nation in the free world in such a situation), she must be able to develop her vast potential energy resources at an adequate rate. Only a small portion of the potential reserves are presently discovered, developed, and now available for present or future use.

The opportunity exists, Wilder said, to take advantage of the growing U.S. demand for oil and gas imports in such a way to make economically feasible the development and utilization of Canada's Arctic petroleum resources. The scale of development required to economically tap these resources is such that it can be provided only by access to the much larger U.S. markets, he says. "Our proposed Arctic Gas pipeline illustrates this well. At full compressor horsepower, the 48-inch diameter line will be able to deliver gas to Canada and U.S. markets at a rate about one third greater than the present total rate of gas demand in Canada. . . we cannot economically reach our Arctic gas resources without the economics of scale of the big U.S. market."

That market, however, is not all that is needed to make the pipeline economically viable. Also necessary is the U.S. gas supply on the North Slope. It is anticipated that a little more than half the four billion cfd will be from Alaska, the other from Mackenzie Delta. All of the Alaskan gas and a substantial portion of the initial flow of Canadian gas will be destined for U.S. markets. "Without the Alaskan gas, a pipeline from the Mackenzie Delta would require discovery of much more gas in northern Canada to economically justify the pipeline. And it would require export of more Canadian gas to U.S. markets."

Once built, the pipeline capacity could be increased in stages in step with the demand growth by means of incremental looping with additional 48-inch diameter pipe. Thus, after the initial export commitment required to get the system built, "the remaining potential gas reserves in the North (Canada) mainland would be economically available to serve Canadian needs exclusively, if required."

A conservative estimate of the potential gas reserves in northern Canada, excluding the Arctic islands, places the total at 100 trillion cubic feet.

Benefits for Canada, then, will include assurance of adequate gas supplies for Canadian needs; generation of hundreds of millions of dollars in government royalties through production royalty and lease payments, as well as large revenues from various taxes; substantial revenue from the sale of this gas; a dynamic and broad-based stimulation of the Canadian economy and national employment flowing from the activities involved in the development and use of this resource; and generation of earnings to a great number of Canadian investors who are anticipated to be majority owners of the pipeline.

Beyond the construction phase, Arctic

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	623	260E Series A
Flywheel Horsepower	300	300
Power To Empty Wt. Ratio	1:214	1:199
Cubic Inch Displacement	700	844
Heaped Capacity	22 cu. yd.	23 cu. yd.
Width of Cut	10'-4"	10'-6.5"
Transmission Speeds	8	9
Kon Tork Differential	No	Yes

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Gas calculates that operation of the pipeline and export of Canadian gas to the U.S. might result in a contribution to Canada's balance of payment position of \$500 million to \$750 million annually.

Principal benefit to the U.S. would be alleviation of the present critical natural gas shortage, with this line said to be capable of making northern gas supplies available to a much broader (than El Paso's proposal, presumably) area throughout the U.S. from the Pacific coast to the eastern seaboard. With transportation costs to the consuming centers appreciably lower, a maximum wellhead value for the gas would be provided and thus generate revenue to the state.

TECHNICAL

The 26 participating firms in late June agreed on routing of their proposed line for purposes of governmental applications. Precise delineation was not available at AC&O press time and the announcement did not specify the Alaskan portion of the route.

Three routes are being considered from Prudhoe to Canada. One lies east from Prudhoe along the coastal plain, then south up the Mackenzie River valley. This route would cross the Alaska Wildlife Refuge and talks are underway with Department of Interior officials on this matter. Another route skirts the Refuge by crossing the

Brooks Range in Alaska and the Richardson Mountains in the Yukon. The coastal route is shorter, appreciably less costly, would traverse a greater area of potential gas supply and is believed to involve less risk of environmental impact.

The companies are also interested in an offshore route and studies are being conducted by Shell Oil Company off Prudhoe in the Arctic Ocean.

South of the 60th parallel, the line will tie in with existing facilities of Alberta Gas Trunk Line, TransCanada Pipelines and Alberta Natural Gas — all of which can be expanded to handle increased volume.

Depending on final route selection, the proposed pipeline, with full delivery capacity, will embrace up to 3,000 miles of 48-inch diameter pipe and some two million horsepower at about 50 compressor and refrigeration stations. Jet engines of the type used in large aircraft will be installed in compressor stations at approximately 50-mile intervals. They will chill the gas and push it through the pipe.

Design operating pressure is 1,680 psi, requiring X70 pipe with a wall thickness of nearly 3/4 inch. This will be nearly 2 million tons of steel pipe. At full capacity, the line will be able to handle a maximum gas supply of 4.5 billion cfd, traveling at 8 mph with a delivery capacity in excess of 4 billion cfd, the difference accounted for by line fuel.

The unique design feature involves refrigeration of the gas. Throughout the areas of permafrost, roughly north of 60 degrees latitude, the gas will be refrigerated at each compressor station to about 25° F, so that it will be close to soil temperature and below freezing. This chilled gas concept will allow the pipeline to be fully buried the entire length and avoids risk of any intolerable damage to high ice-content permafrost. The surface will be revegetated to provide a thermal insulation for the permafrost and to arrest alluvial erosion. South of the permafrost area, the gas will be chilled to remove the heat of compression.

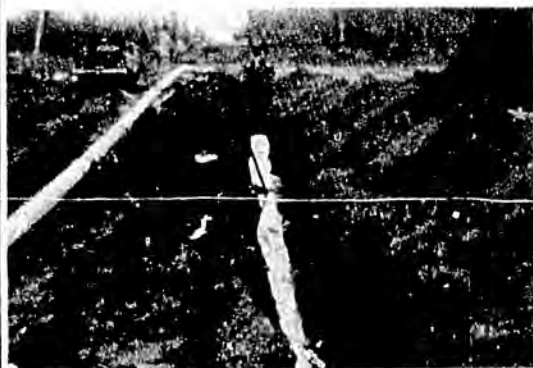
The right-of-way and compressor stations will occupy less than 40 square miles in the 1.5 square-mile Yukon and Northwest Territories. Life of the line is planned for 25 years.

The biggest unknown factor in timing will involve time needed to get government authorization. Allowing 18 months for this from the time of filing, it would be the first part of 1975 before approvals could be anticipated, at the earliest. With luck, this could provide for assembly and delivery of materials during the summer and

TURN TO PAGE 60

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**Next Month —
THE EL PASO STORY**

How to give a mini-business a boost

This year Alaskans will see a boom in small businesses beginning, coinciding with the start of the school year. These small businesses will produce and market a wide range of products, and offer a variety of services. In spite of their basic differences, they will have one thing in common. They will be owned and operated by young people of high school age. It is all part of the nationally-acclaimed Junior Achievement Program, a "learn-by-doing" approach in which students organize and manage their own small-scale businesses.

At Exxon, we are proud to have been able to play a part in introducing Junior Achievement to Alaska. But if Junior Achievement is to continue to be successful, it needs broad community support. That means not only company sponsorship, but individual participation as advisors, and as stockholders, to help give these Mini-businesses a boost.

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Sound equipment was set up at several locations along possible northern pipeline routes being examined by Arctic Gas. The equipment simulates the sounds of pipeline operations, including compressor stations and refrigeration units, to see what impact they have on animals and birds.

CONTINUED FROM PAGE 56
start of construction during the winter of 1975-76.

Construction in the north would be limited to a winter season of about four months. Equipment would move over snow and ice roads to protect the vegetative mat which insulated the permafrost.

With careful planning, it is considered possible to build the northern end of the system as far as the Mackenzie Delta during two winter seasons, 1975-76 and 1976-77. The southern portion could be built during the summer and fall of 1976. This would permit the start of gas flow from the Mackenzie Delta by mid-1977, with extension of the pipeline to the Alaskan North Slope gas during the following winter.

This is considered an optimistic timetable.

The pipelaying will require 9 to 10 mainline construction spreads and two major river crossing crews. The construction spreads in northern Canada would have to complete 60-70 miles each during each winter season, and the prairie spreads would

have to complete about 150 miles each during one fall and summer period.

Construction contract costs, excluding materials and based on unescalated 1972 costs could amount to about \$20 million per construction spread on the prairies and \$30 million to \$50 million per spread for each season in northern Canada. The Alaskan extension, depending on route, will require 8 to 10 construction spreads for a winter season's work, and the contract cost per season is expected to be even higher than in northern Canada. The cost of construction equipment may amount to about \$10 million per spread on the prairies, and in excess of \$15 million for each northern spread. This means that pipeline contractors will be looking at more than \$150 million in equipment to handle this job. In addition to pipelaying, other construction work will include compressor stations, refrigeration stations, maintenance bases, camps, winter snow and ice roads, airports, docks and stockpiling areas.

About eight of the compressor and refrigeration stations would have to be com-

pleted with the pipelaying for the initial start-up of the line; the remaining compressor and refrigerator stations could be completed during the next couple of years to achieve full design capacity.

This construction schedule is dependent upon labor agreements which preclude the risk of work stoppages. Not only is the construction schedule dependent on this, but the entire economic viability could be seriously jeopardized by any extensive work stoppages. A precedent for such labor agreements was set at construction of the large Churchill Falls hydro-electric project. Responsibility for attaining the agreements would rest primarily with the contractors.

In addition to its own technical staff, Arctic Gas employs 30 consultants and research organizations on its wide range of study programs. These include aspects as diverse as metallurgy, soils mechanics, thermodynamics, transportation and logistics, sociology, economics, and wildlife biology, among others.

Principal study programs include pilot test pipelines at Sans Sault and Norman Wells, NWT, and Prudhoe Bay. Chilled and compressed air, used to simulate natural gas flow, has been circulated through 5,000 feet of 48-inch diameter test pipes. In operation for two years, these test facilities demonstrate that fully-buried chilled gas pipelines can be constructed and operated without any permanent damage to the permafrost. This \$7 million program has provided data on stability of gas pipelines in permafrost under various simulated operating conditions: stability of different types of foundations for above-ground structures, effects of a pipeline on various forms of surface cover; drainage problems associated with Arctic pipeline construction; and construction methods, design techniques, material, and equipment for use in an ultimate pipeline system.

FINANCES

As envisioned, the Gas Arctic line will be the largest single project ever to be financed by private capital. Without importing some capital, the company could not raise in Canada the over \$5 billion for the pipeline traversing Canadian lands, except for some 250-300 miles in Alaska. But the company is confident of its ability to secure more than 50 per cent equity, ownership and financial control in Canada. But while there is need to import capital to develop Canada's potential energy supplies, the nation must also generate greater amounts of capital requirements from Canadian savings, according to one Arctic Gas spokesman.

"The growth of the Canadian capital market can provide the opportunity while the problem which confronts the U.S. with its continuing balance of payments position may underline a need to do so. We do not need to discourage foreign investment in our energy sector; we do need to encourage more Canadian investment," said V.L. Horte of Arctic Gas before the Con-



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