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FISCAL NOTE

REQUEST:

Revision Date: N/A
Title: Railbelt Gasline Project

Agency Affected: AK. Power Auth.; OMB
BRU: _____

Sponsor: Fahrenkamp/Uening
Requestor: Sen. LARSEN/COMMERCE

Components: CIP-Feasibility Studies

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING						

CAPITAL *		500.0	0	0	0	0
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REVENUE						
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FUNDING: (Thousands of Dollars)


GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL						

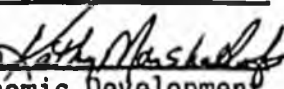
POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS : (Attach a separate page if necessary)

*Estimated Cost of completing feasibility studies required by AS 44.83.185 and licensing for project established by the legislation.

Prepared by: Robert L. LeResche  Phone: 465-3575
Division: Alaska Power Authority Date: 3/17/88

Approved by Commissioner: J. Anthony Smith  Date: 3/17/1988
Agency: Department of Commerce & Economic Development

Distribution (by preparer):

- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)

March 16, 1988

SB 417 & 418 - Sen Fahrenkamp

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- 2) Usibelli Coal Mine, Inc. - John Sims
- 3) Alaska Power Authority - Dick Emmerman (teleconference-Anch)
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March 16, 1988

MEMORANDUM

TO: Representative Sam Cotten

FROM: Ginny Fay *GF* and Gretchen Keiser *GK*
Legislative Analysts

RE: An Analysis of the Wasilla-Fairbanks Gas Pipeline Proposal
Research Request 88.095

You requested this agency to examine the Wasilla-Fairbanks Gas Pipeline proposal made by the ENSTAR Natural Gas Company (ENSTAR). This memorandum presents an analysis of what we believe are the major issues to be considered during your deliberations on the proposed gas pipeline. The information covers a broad array of Railbelt energy issues and, following a summary of findings, is presented in several sections:

- 1) The Gas Pipeline Proposal - the routing, size, and throughput of the proposed gas transmission pipeline; potential communities to be served by distribution systems off the transmission gasline; and cost estimates (page 7).
- 2) Statutory, Regulatory and Contractual Considerations - state and federal right-of-way (ROW) leasing, regulation of gas transmission and distribution, and the timing and conditions of state contracting of the gasline operation (page 9).
- 3) Natural Gas Supply and Demand - the ability of Cook Inlet natural gas to meet projected consumption and the potential demand in Fairbanks based on probable costs of space heating or power plant conversions as well as the likely cost of natural gas in Fairbanks (page 14).
- 4) Use of Natural Gas and its Relationship to other Railbelt Energy Sources - the competing (present and future) sources of energy for power generation in the Railbelt, demand-side alternatives for residential and commercial space heating, and alternative markets for fuels displaced by natural gas consumption (page 29).

- 5) The Proposed Gasline's Relationship to North Slope Gas - the compatibility (with respect to timing and engineering) of the proposed gasline with the Trans-Alaska Gas System (TAGS) project and the potential for coupling the pipeline projects to export North Slope gas from Cook Inlet (page 40).
- 6) Employment Impacts - estimates of construction and permanent jobs created by the proposed gasline and estimated employment under alternative expenditures of available state funds (page 46).
- 7) Environmental Effects - the environmental impacts of gasline construction and natural gas use on the air quality and groundwater in the Fairbanks area (page 48).

SUMMARY OF FINDINGS

- A state ROW lease for the proposed gasline would require common carrier status and would designate the location of connections for the interchange of gas with other common carriers and the delivery of gas to any purchaser. These requirements also apply to the state ROW lease currently pending for TAGS.
- Alaska Public Utilities Commission (APUC) certificates would be required prior to operation of the main transmission gasline (assuming the state contracts for pipeline operation) as well as community gas distribution systems. Contrary to ENSTAR's suggestion, it is questionable whether gas could be sold in Fairbanks at the same price as in the southern Railbelt. Statutory provisions prohibit unreasonable preferences to any of a public utility's customers. In addition, fixed costs per household may be higher than anticipated by ENSTAR.
- If the state chose to contract for the gasline operation, prudence suggests that a final contract be in place before construction commences. Furthermore, the state may want gas utilities to obtain advance approvals from the APUC before construction, as is common, if not required, practice among private companies building transmission and distribution gaslines. In addition, there are a number of issues the state might anticipate in order to ensure maximum utilization of the gasline, including: specifying who pays for future connections, compressor stations and upgrades; accessibility of Cook Inlet gas supplies via ENSTAR's Beluga and Kenai gaslines; and assurance that upgrading the existing gas pipeline system would occur when needed in order to prevent bottlenecks in gas shipments north or south.

- Known gas reserves in Cook Inlet are sufficient to supply current end uses for approximately 20 years. Adding Fairbanks gas consumption would probably shave less than one year off the estimated 20-year supply. Best guesses of additional, undiscovered gas resources that would be recoverable from Cook Inlet extend the period during which Cook Inlet gas supplies would be sufficient to meet projected demand for another nine to 22 years.
- This agency estimates that, beginning in 1994, the Fairbanks area annual natural gas consumption would be approximately 4.8 billion cubic feet (BCF). Our estimate is 44 percent of ENSTAR's 10.9 BCF annual gas consumption projection.
- The proposed gas distribution system would potentially serve about 49 percent of the homes in the Fairbanks area. ENSTAR predicts that 90 percent of these potential residential customers will convert to natural gas for space heating. We estimate that a maximum of 80 percent of potential residential customers served by the distribution system, or 41 percent of all homes in the Fairbanks area, would change their heating systems under an aggressive conversion program.
- ENSTAR estimates that 95 percent of both large and small commercial buildings would convert to natural gas for space heating as soon as gas became available. We believe this overestimates commercial conversion. Fairbanks Municipal Utility System (FMUS) plans to extend its hot water space heating system in the downtown commercial district. We estimate that the actual commercial conversion level will be lower than ENSTAR's projections by about 50 percent.
- ENSTAR estimates that electrical power generating facilities would use about 5.8 BCF of gas annually. We estimate annual gas consumption for power generation at 1.1 BCF. Neither of these estimates includes power generation by the military in the Fairbanks area because federal regulations prevent them from converting their coal-fired generating facilities to natural gas. The major problem with ENSTAR's estimate is that it was made before the Anchorage-Fairbanks intertie was completed and does not account for the resulting large decrease in diesel-fired generation in the Fairbanks area. Golden Valley Electric Association (GVEA) would continue to use coal-fired facilities for baseload, purchase power over the electrical intertie, and use natural gas to supplement these other sources of power. FMUS recently decided to sign a ten-year coal contract and does not plan to convert their coal units to natural gas. Similarly, the University does not plan to convert their coal-fired units.

The effect of partial natural gas conversion on electricity prices in Fairbanks would be a reduction of about one-tenth of a cent per kilowatt hour, or \$500,000 in energy savings for all electricity consumed annually.

If the project were 100 percent bond financed, the debt repayment would add about \$3.10/thousand cubic feet (MCF) for a total gas price of about \$7.00/MCF for residential space heating customers. The project is not economically feasible without state financing.

A natural gas pipeline to Fairbanks would provide natural gas primarily for space heating, thereby lowering household energy costs. The total cost of the proposed gasline project is \$220 million. The project would serve approximately 9,325 homes and result in annual fuel savings of \$129 per household, or about \$1.5 million for all households. In contrast, the cost to weatherize all unweatherized homes (about 22,300) potentially served by the gas pipeline at \$2,300 per home would be \$51.3 million; annual fuel savings per household would be about \$345, or about \$8.4 million total. Weatherization would cost the state one-quarter as much as the proposed gasline, affect about 2.5 times as many homes, and reduce annual fuel costs by six times as much as the gasline.

An important consideration regarding the proposed natural gas pipeline is the effect state funding has on the feasibility of privately financed projects. The Usibelli cogeneration facility as now planned would be a privately financed, 100 to 150 megawatt (MW) coal-fired plant used to dry coal for export. Approximately 85 percent of the plant's annual energy output would be available for Railbelt energy needs. In addition to the Usibelli project, other projects including municipal waste pellet projects in Fairbanks and Anchorage, could be affected.

We estimate that natural gas would displace about 21 million gallons (496,000 barrels) of fuel products consumed annually in the Fairbanks area. MAPCO, which refines the No. 4 turbine fuel used for power generation in the Fairbanks area, is unlikely to find a new market for the turbine fuel displaced by power plant conversions to natural gas. The displacement of diesel heating fuels (No. 1 and 2) from the Fairbanks market will likely affect all three refiners currently marketing these products in Fairbanks. Competition from MAPCO and Petro Star (North Pole refiners) for the remaining diesel fuel sales in Fairbanks would likely bump Tesoro (a Nikiski refiner) out of the local market.

With respect to developing new markets, Petro Star appears to be the most vulnerable because virtually all its diesel fuels are currently sold locally and the company lacks experience and facilities in other markets. Tesoro is likely to export displaced fuels out of state--along with surplus diesel fuels due to the shrinking commercial jet fuel market serving foreign airlines. During the last two years, MAPCO has acquired distribution facilities in Anchorage and Nenana and has been positioning itself to more vigorously move its refined products out of the Railbelt. This strategy--in addition to current experimentation with a different military jet fuel product in order to increase sales to the military in Alaska--could alleviate the surplus of diesel fuel products MAPCO would experience once natural gas reaches the Fairbanks market.

At some point in the future, competition for dwindling Cook Inlet gas supplies will likely push prices upward, ultimately encouraging some users to look elsewhere for natural gas. When North Slope gas might be used by Southcentral consumers is uncertain, but would depend on: 1) the success of future exploration in Cook Inlet; 2) pipeline access; 3) the price of North Slope gas in Railbelt markets; and 4) the price and feasibility of alternative energy sources for space heating and power generation in the Railbelt.

Initially, the proposed Wasilla-Fairbanks gasline would rely upon Cook Inlet gas supplies, making the timing of the gasline independent of the TAGS project. We estimate that delivery of North Slope gas to the Railbelt customers is not likely to occur until after the turn of the century. Yukon Pacific, sponsor of the TAGS, predicts that by the time North Slope gas is needed in the Railbelt, the TAGS will likely be operating at maximum capacity to meet export demand.

The design differences (size, maximum pressure and throughput, and gas temperature) between the Wasilla-Fairbanks gasline and the TAGS would not present technical obstacles preventing a connection between the two pipelines. A number of modifications would be necessary, including: 1) installing a regulator station in Fairbanks, 2) upgrading compression on the northern segment of the TAGS, 3) adding compressor stations along the Wasilla-Fairbanks gasline, and 4) providing some capability for gas storage in the Railbelt to accommodate periodic shutdown of the TAGS. While upfront costs might not be prohibitive, the use of gas as fuel for the compressor stations represents a significant ongoing expense.

There appear to be significant problems with a suggestion that the state build a Wasilla-Fairbanks gasline large enough to accommodate North Slope gas throughput for export from Cook Inlet (thereby shaving hundreds of miles off a rerouted TAGS project) while ensuring intrastate deliveries to Railbelt consumers. Major cost differences exist between the two proposed gaslines, and the state would need considerably more money than the \$228 million available in the Railbelt Energy Fund. Following considerable study, Yukon Pacific concluded that Valdez is preferable as a terminus for the TAGS project.

If the state wants to provide gas to Fairbanks while at the same time enhance the exportability of North Slope gas, state support for the TAGS project and state financing of the necessary facilities for TAGS gas deliveries at Fairbanks may be the best approach. Under this scenario, new gas turbines in Fairbanks (when new electrical capacity is needed in the Railbelt) could provide power to Anchorage via the intertie. A gasline delivering North Slope gas to southern Railbelt customers might also be feasible some time after the year 2000.

Construction of the gas pipeline would require about 700 workers for about 15 months. Construction of the Fairbanks area distribution system would require 200 workers during three summer construction seasons. We do not believe that operation of the gas distribution system would result in a net gain in employment to the Fairbanks economy. The weatherization alternative would create about 260 full-time jobs for a one-year period. Construction of the Usibelli plant would require 300 workers. In addition, it would add approximately 175 jobs for the life of the project.

The route selected for construction of the gasline from Wasilla to Fairbanks would provide the best construction conditions with the least environmental impacts. To the extent that natural gas would replace coal, wood, or fuel oil for space heating and electrical power generation, there would be an improvement in air quality. The burning of natural gas, however, would increase water vapor emissions which could increase ice fog. The net effect on air quality would probably be positive.

THE GAS PIPELINE PROPOSAL

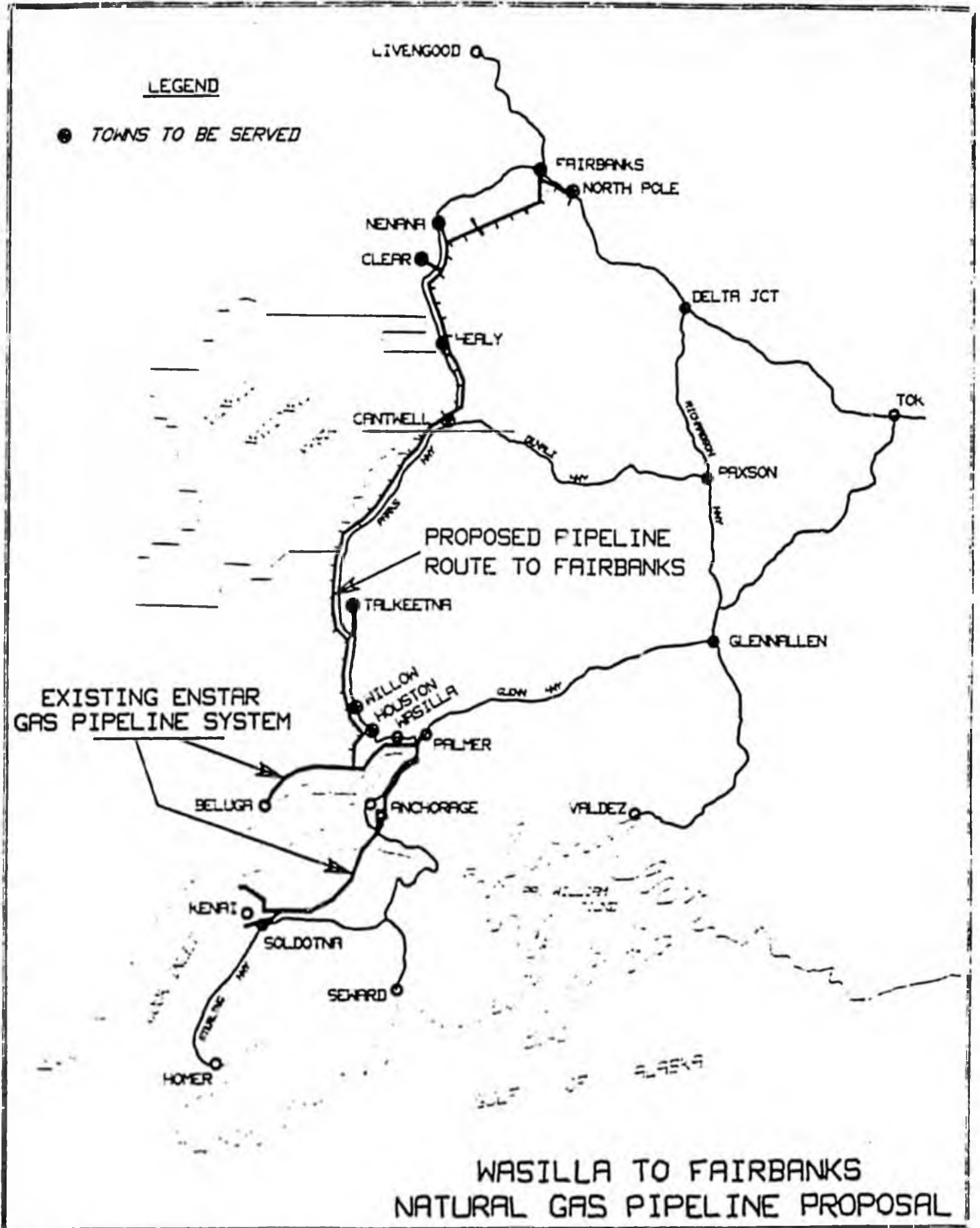
The ENSTAR proposal consists of a gas transmission pipeline from the vicinity of Wasilla to Fairbanks, with a gas distribution system to serve residences, businesses and electric utilities in the Fairbanks-North Pole area. Near Wasilla, the gas pipeline would be connected to ENSTAR's existing Beluga gasline, thereby providing access to natural gas from the Beluga field on the west side of Cook Inlet. The proposal specifies a 305-mile route that generally parallels the Parks Highway or Anchorage-Fairbanks intertie for all but about 60 miles (Figure 1). Additional Railbelt communities in the vicinity of the proposed gasline route include: Houston, Willow, Talkeetna, Cantwell, Healy, Anderson and Nenana. The uninsulated, steel pipeline would be buried along most of the route, with the exception of a few aerial crossings, most notably at the Nenana River and Hurricane Gulch.

The 20-inch pipeline, initially constructed without compressor stations, could transport up to 200 million cubic feet of natural gas per day (MMCF/day)--considered by proponents to be adequate to meet demand in the Fairbanks areas in the foreseeable future.¹ At maximum design pressure (1,440 psi, with compressor stations south of Fairbanks, between Healy and Cantwell, and between Talkeetna and Willow) the proposed gasline would be capable of throughput up to about 400 MMCF/day.² ENSTAR suggests that at some time in the future, after a North Slope gasline has been built, the gas flow through the proposed Wasilla-Fairbanks pipeline could be reversed, thereby making abundant North Slope gas available for Southcentral customers.

¹As a frame of reference, the Department of Natural Resources estimates the natural gas consumption for space heating and power generation in the Anchorage area at 65 BCF in 1987, or roughly 178 MMCF/day on average.

²Ronald Page, Vice President - Operations, ENSTAR Natural Gas Company, personal communication, February 26, 1988.

FIGURE 1



Source: ENSTAR National Gas Company

The proposal calls for state funding of the \$185 million pipeline between Wasilla and Fairbanks from the Railbelt Energy Fund (which has a current balance of about \$228 million).³ Under the proposed state financing, Fairbanks customers would pay only operation and maintenance costs of the gasline. A low-interest, long-term loan is suggested by ENSTAR as a financing alternative. The \$35 million distribution system in the Fairbanks - North Pole area would be privately financed. If the state pays for construction of the gasline, ENSTAR suggests that it would be possible to provide gas to Fairbanks customers at the same rates as those ENSTAR charges to Southcentral customers, subject to approval by the Alaska Public Utilities Commission.

STATUTORY, REGULATORY AND CONTRACTUAL CONSIDERATIONS

This section discusses the statutory and regulatory environment under which the proposed Wasilla-Fairbanks gasline would proceed. In addition, we present a number of issues which appear to have a bearing on a contractual arrangement that the state might establish with a private entity to operate and maintain the proposed gasline.

Right-Of-Way Leases

The Alaska Power Authority (APA), acting on behalf of the state, would be required to obtain ROW leases from both the state and federal governments in order to construct the gasline on public lands. Under the state's ROW Leasing Act (AS 38.35), the Department of Natural Resources (DNR) would impose several major conditions on the lease issued proposed gasline project, including:

- 1) a common carrier status which means that it will transport, without discrimination, any natural gas delivered to it [AS 38.35.120(a)(1)];
- 2) the interchange of natural gas with other common carriers and the provision of connections and facilities for interchange when the necessity exists [AS 38.35.120(a)(2)];

³The \$185 million cost estimate--about \$607,000 per mile--includes engineering, permitting, construction, materials, inspection and administration expenses. In comparison, ENSTAR's 20-inch diameter Beluga gasline cost about \$54 million in 1984--or roughly \$529,000 per mile.

- 3) provision of connections, as determined by the APUC, to the pipeline for the purpose of delivering natural gas to persons contracting for the purchase of gas transported by the pipeline [AS 38.35.120(a)(5)];
- 4) provision of connections and interchange facilities at state expenses at such places the state considers necessary in order to take a portion of its royalty natural gas [AS 38.35.120(a)(6)];
- 5) provision for abandonment of the pipeline in accordance with terms of the lease likely to include payment for removal (AS 38.35.030); and
- 6) other reasonable provisions and conditions required by the public interest [AS 38.35.120(c)].

The DNR would likely waive annual rental fees unless the state chose to contract operation and maintenance to a private entity which would benefit under the contractual arrangement. However, the APA would be required to reimburse other state agencies for costs incurred in processing the ROW application and monitoring the pipeline construction on the right-of-way.

Under the Mineral Leasing Act of 1920, the federal government would also require the state to obtain a ROW lease from the Bureau of Land Management (BLM). The ROW lease application would trigger the National Environmental Policy Act (NEPA) requirements, including the state's preparation of an environmental impact statement. The entire ROW and NEPA process would probably take 18 to 24 months to complete. The ROW lease would likely contain environmental and technical stipulations, similar in nature to those in the federal ROW lease issued for the Trans-Alaska Pipeline System. Any routing through Denali National Park would trigger an additional, major federal review process under the Alaska National Interests Lands Conservation Act, which is a primary reason that the proposed Wasilla-Fairbanks gasline route steers east of the park boundaries.

Gas Transmission and Distribution Regulation

The state's Pipeline Act requires a pipeline carrier to obtain a certificate of public convenience and necessity from the APUC prior to the construction of pipeline facilities or the transportation of oil or gas (AS 42.06.240). In a case where the state constructs the gasline but intends to lease its operation and maintenance to a private entity, the leasee--as a pipeline carrier with interest in the state-owned gasline--would be subject to APUC jurisdiction under AS 42.06 and would be required to obtain a certificate before transporting the gas. Provided the applicant is found to be able and willing to perform the transmission service proposed, the APUC would issue the certificate, including terms and conditions with respect to standards of service and facilities, discrimination in service and rates, and abandonment.

Prior to operation of a gas distribution system, a public utility is also required to obtain a certificate of public convenience and necessity from the APUC. A gas distribution utility is subject to the provisions of AS 42.05. If the APUC receives competing applications for certificates to serve the same area, it has the authority to select the best application or to take appropriate actions to eliminate competition that is not in the public interest, including the delineation of service area boundaries to preclude the duplication of facilities (AS 42.05.221).

As noted in their proposal, ENSTAR suggests that it would be possible for ENSTAR to provide gas to Fairbanks at the same rates as in the Matanuska - Susitna Valley, Anchorage and Kenai Peninsula. A uniform, or postage stamp, rate throughout the Railbelt may be questionable, given transmission and distribution costs to serve Fairbanks. According to AS 42.05.391, a public utility may not grant an unreasonable preference or advantage to any of its customers (e.g., Fairbanks customers) or subject customers to an unreasonable prejudice or disadvantage (e.g., Southcentral customers). In addition, any uniform rate shall, upon complaint, be reviewed by the APUC and set aside if shown to be unreasonable.⁴

⁴A uniform rate for ENSTAR's entire service area was approved by the APUC when ENSTAR expanded into the Matanuska-Susitna Valley in the mid-1980s. Following extensive review, ENSTAR convinced the APUC that Beluga and Kenai gas supplies were essentially comingled and that ENSTAR's system should be treated as a single service area with a postage stamp rate.

Contractual Arrangement for Operation and Maintenance of the Gasline

During this analysis, a number of issues surfaced which warrant consideration if the state were to contract with a private entity for the operation and maintenance of the Wasilla-Fairbanks gasline. These issues are summarized below:

- 1) In order to ensure timely startup of the gasline once construction is completed, it appears prudent for the state to have a final contract in hand before construction commences. Prudence also suggests that APUC certificates of public convenience and necessity for transmission and distribution of the gas be issued prior to construction. It is a common, if not required, practice for private companies to obtain advance approvals from regulatory commissions prior to construction of new transmission and distribution systems.⁵
- 2) The APUC treats gas transmission and gas distribution as two separate activities, subject to separate applications for certificates of public convenience and necessity. The entity desiring to operate the transmission gasline may or may not be the same entity seeking approval for the operation of gas distribution systems in Fairbanks and other communities along the gasline route. The APUC has the authority to select (from competing applications) the arrangement which best meets the public interest. Senate Bill 417, as presently written, creates some confusion with respect to the above discussion: 1) based on APUC regulation of gas transmission services, it appears that the APA would have to contract operation of the gasline with a gas transmission utility, not a "qualified gas distribution utility" as stated in SB 417; and 2) the adoption of regulations by the APA for the selection of an entity to operate the gasline, as specified in SB 417, appears to infringe upon the existing regulatory jurisdiction of the APUC.

⁵Susan Knowles, Chair of the APUC, noted that ENSTAR obtained the necessary certificates before construction of its Beluga gasline and distribution system in the Mat-Su Valley.

- 3) Typically, state ROW leases address the abandonment of the gas pipeline, specifically spelling out who will pay for its removal when operations cease. If the state intends to have its contractor, who would presumably enjoy the benefits of a long-term arrangement, pay for the removal of the gasline, it would be prudent to have this specified in the state ROW lease issued by the DNR.
- 4) A number of issues will affect utilization of the gasline in the future. The state might want to address the following issues in a contract it establishes for the operation and maintenance of the gasline:
 - a) Who would pay for the connection and necessary facilities in order to bring North Slope gas south through the Wasilla-Fairbanks pipeline?
 - b) Who would pay for compressor stations on the Wasilla-Fairbanks pipeline in order to increase throughput beyond 200 MMCF/day?
 - c) What assurance, if any, can the state negotiate in order to ensure that the Wasilla-Fairbanks gasline operator has broad access to Cook Inlet gas supplies (from willing producers) via ENSTAR's existing Beluga and Kenai gaslines--particularly if ENSTAR is not selected as the proposed gasline operator?⁶
 - d) What conditions could be placed on ENSTAR if they were selected as gasline operator to ensure that upgrading of its existing Southcentral pipeline system would occur, as needed, in order to prevent bottlenecks in gas shipments north from Cook Inlet fields and, in the more distant future, gas shipments south from a connection with a North Slope gasline?

⁶The ENSTAR Beluga and Kenai gaslines are not currently operated under a common carrier status. It is arguable whether the APUC can require common carrier status; apparently, some private parties are investigating the possibility at this time.

State Requirements on the Trans-Alaska Gas System

The Trans-Alaska Gas System--a proposed gasline for the delivery of North Slope gas to Valdez for liquefaction and shipment via liquefied natural gas (LNG) tankers to Asian markets--is subject to the same ROW lease requirements that could be imposed on the Wasilla-Fairbanks gasline. Specifically, the state ROW lease for TAGS, currently under review by the DNR, can require that the project sponsor (i.e., Yukon Pacific Corporation) provide connections along the TAGS route [AS 38.35.120(a)(5)]. At this time, the APUC could designate the locations-- particularly in the Fairbanks area--where Yukon Pacific would include special fittings that would reduce the cost and timing of future connections for the removal of gas from the TAGS.

The state's ROW lease would also require TAGS to operate as a common carrier gas pipeline. Even though the TAGS project is billed as an export-only gasline at this time, the project sponsor intends to apply to the APUC for a certificate of public convenience and necessity prior to construction, based on its interpretation of APUC jurisdiction over common carrier pipelines.⁷ Although preliminary tariff information would be filed with APUC at the time of application, rates would not be approved until intra-state deliveries of gas occur. As an export pipeline, the TAGS project must obtain an export license from the U.S. Department of Energy's Economic Regulatory Administration (application filed in December 1987), but the pipeline would not be subject to federal rate regulation.

NATURAL GAS SUPPLY AND DEMAND

Supply and Demand for Cook Inlet Natural Gas

Current estimates indicate that about 4.2 trillion cubic feet (TCF) of proven ("known") recoverable gas reserves exist in the Cook Inlet area.⁸ The DNR estimates of additional, undiscovered gas resources in Cook Inlet range up to 6.8 TCF, with a 50 percent probability that about two TCF of undiscovered gas is recoverable. The U.S. Geological Survey (USGS) presents higher estimates of undiscovered gas, with about five TCF likely to be economically recoverable.

⁷Jeff Lowenfels, Birch, Horton and Bictner, counsel to Yukon Pacific, personal communication, March 9, 1988.

⁸Department of Natural Resources, Division of Oil and Gas, "Historical and Projected Oil and Gas Consumption," January 1988, p. 8.

Consumption of Cook Inlet natural gas in 1987 is estimated by DNR to total about 194 BCF. Industrial users account for nearly two-thirds of current Railbelt gas consumption, with power generation consuming 20 percent and space heating the remaining 13 percent, as shown in Table 1.

TABLE 1
ESTIMATED COOK INLET NATURAL GAS CONSUMPTION IN 1987

USE CATEGORY	VOLUME	PERCENT OF TOTAL
Industrial	120.7 BCF	63%
Ammonia-Urea	40.4	21
LNG	47.6	25
Petroleum Production and Operation	32.7	17
Power Generation	39.7 BCF	20%
Public Utilities	35.1	18
Military	4.6	2
Space Heating	24.9 BCF	13%
Residential	13.0	7
Commercial	11.9	6
Unaccounted For	8.5 BCF	4%
TOTAL	193.8 BCF	100%

Source: Department of Natural Resource, Historical and Projected Oil and Gas Consumption, January 1988.

The DNR projects Railbelt gas consumption to increase quite slowly during the next 15 years (1988 - 2002).⁹ Based on these projections, we estimate that known gas reserves in Cook Inlet are likely to supply current end uses for approximately 20 years. The additional gas consumption in the Fairbanks area made possible by the proposed Wasilla-Fairbanks gasline is to shave one year off the estimated 20-year estimated supply (Fairbanks gas demand is considered in greater detail later in this section). The above-mentioned "best guess" estimates of additional, undiscovered reserves could supply current end uses (assuming continued slight demand growth and no dramatic changes in Cook Inlet consumption patterns) for another nine years to 2017 (two TCF estimate from DNR) or for another 22 years to 2030 (five TCF estimate from USGS).

However, these overall estimates are somewhat simplistic because they assume that all end users would have equal access to Cook Inlet gas. As Cook Inlet gas supplies dwindle in the future, it is conceivable that certain producers will limit their contractual obligations to other parties in order to supply gas for their own industrial needs. Unocal, for example, may be unwilling to renew an existing ENSTAR contract for gas from the Kenai field when it expires in 1992 because Unocal would want to meet feedstock requirements at its own ammonia-urea plant at Nikiski. Marathon Oil Company, another gas producer on the east side of Cook Inlet, might be capable of accommodating more of ENSTAR's needs. Alternatively, ENSTAR may have to compete with Chugach Electric Association for additional gas contracts with the Beluga gas field producers (ARCO, Shell and Chevron) in the mid-1990s.

At some point in the future, competition for dwindling Cook Inlet gas resources will likely push prices upward, ultimately encouraging some users to look elsewhere for gas supplies. Clearly, the North Slope is a logical source, with estimated recoverable gas reserves of 31,310 BCF.¹⁰ When North Slope gas might be used by Southcentral consumers is uncertain at this time, but depends on: 1) the success of future exploration and production in Cook Inlet; 2) pipeline access to North Slope gas; 3) the price of North Slope gas compared with Cook Inlet gas; and 4) the price and feasibility of alternative Railbelt energy sources for power generation and space heating (i.e., hydroelectric, coal, diesel, municipal waste pellets, wood wastes, and weatherization and other demand-side options).

⁹These projections are based on work done by the Institute of Social and Economic Research (ISER) in 1986. We generally concur with the ISER underlying assumptions, although they may slightly overestimate future consumption, based on the recent "track record" where 1986 and 1987 actual consumption was somewhat lower than ISER projected.

¹⁰Department of Natural Resources, "Historical and Projected Oil and Gas Consumption," p. 8.

Fairbanks Demand for Natural Gas

This agency estimates that, beginning in 1994, the Fairbanks area annual natural gas consumption would be approximately 4.8 BCF. Our estimate is 44 percent of ENSTAR's gas consumption projection. In this agency's estimate, the majority of annual natural gas use would be for space heating with the remainder used for electric power generation, as shown in Table 2.

TABLE 2

ESTIMATED ANNUAL NATURAL GAS CONSUMPTION IN FAIRBANKS

USE CATEGORY	HOUSE RESEARCH	%	ENSTAR	%
Space Heating	3.7 BCF	77%	5.1 BCF	47%
Residential	2.5	52	2.7	25
Commercial	1.2	25	2.4	22
Power Generation	1.1 BCF	23%	5.8 BCF	53%
Public Utilities	1.1	23	5.8	53
Total	4.8 BCF	100%	10.9 BCF	100%

* * *

These estimates are based on the following discussion of natural gas use for space heating and electrical power generation. Our analysis of both space heating and electric power generation conversion rates and subsequent consumption of natural gas uses current prices of natural gas and fuel oil despite the fact that the project would not be completed until about 1993. The feasibility of the proposed pipeline project is dependent on fuel price differentials as opposed to absolute fuel prices. The current price of natural gas in southcentral Alaska and the current Fairbanks-North Pole area fuel oil prices reflect the largest likely differential between these prices. We assume that the real fuel price differential will remain constant. In actuality, the effect of linking natural gas and fuel oil space heating markets in the lower 48 has been the convergence of prices on a BTU basis as a result of price and market competition.¹¹ The effect of assuming a constant price differential is to analyze the project under the most favorable economic scenario.

¹¹American Gas Association, "Gas Househeating Survey," 1981 - 1986, Arlington, VA.

SPACE HEATING CONVERSIONS. Based on ENSTAR's aerial photography analysis, the proposed Fairbanks-North Pole distribution system would provide natural gas to approximately 13,100 potential customers. The majority (84 percent) of these would be residential customers. The potential homes to be served constitute about 49 percent of all homes in the Fairbanks area. ENSTAR predicts that 90 percent of these residential customers and 95 percent of commercial customers will have converted to natural gas by the end of the three-year distribution system construction period. These conversion rates are based on ENSTAR's experience in the southern Railbelt and assume that Fairbanks area natural gas prices would be the same as Anchorage prices. We believe, however, that these conversion rates are overestimated and that natural gas in Fairbanks will probably be priced higher than in Anchorage.

Residential. We estimate that a maximum of 80 percent of potential residential customers served by the gas distribution system, or 41 percent of all homes in the Fairbanks area, would change their heating systems under an aggressive conversion program. This estimate is based on an analysis of data collected during the recent Railbelt end-use survey (Table 3).¹² From survey data on major heating fuel groups, we identified customers who have furnaces or heating systems that are readily convertible to natural gas. For each of these groups, we computed cost per BTU, conversion costs, and payback periods (Table 4).

¹²Steve Colt, Karen Foster, and Jack Kruse, "Forecast of Electricity Demand in the Alaska Railbelt Region: 1988 - 2010, Tech. Memo. I: Residential End Use Survey," prepared by the Institute of Social and Economic Research for the Alaska Power Authority, February 1988.

TABLE 3
 SELECTED ELECTRICAL END USES AND HOUSING CONSTRUCTION IN FAIRBANKS

Major Heating Fuel Source	Survey	
	Respondents	Percent of Total
Oil	150	83
Electricity	6	3
Wood	13	7
Other	5	3
Don't Know	6	3
Total	180	100
Fuel Source Used for at Least Some Heating		
Oil	155	86
Electricity	33	18
Wood	51	28
Propane	4	2
City Steam	2	1
Coal	4	2
Kerosene	2	1
Solar Gain	1	1
Other	1	1
Total	253	141
Hot Water Heater Fuel		
Oil	71	39
Electricity	70	39
Wood	1	1
Propane	15	8
Other	3	2
Don't Know	13	7
No Water Heater	7	4
Total	180	100
Electric Hot Water Heaters Only:		
A) Extra Insulation on Water Heater		
Yes	17	24
No	50	71
Don't Know	3	4
Total	70	100
B) Hot Water Reduced to 120 Degrees or Lower		
Yes	36	51
No	20	29
Don't Know	14	20
Total	70	100

TABLE 3 (Continued)
 SELECTED ELECTRICAL END USES AND HOUSING CONSTRUCTION IN FAIRBANKS

Major Heating Fuel Source	Survey	
	Respondents	Percent of Total
C) Showers Fitted With Flow Restrictors		
Yes	23	33
No	44	63
Don't Know	3	4
Total	70	100
Wall Construction		
2 X 4	61	34
2 X 6	61	34
2 X 8	8	4
Logs	20	11
Mobile Home	4	2
Double Wall	8	4
Other	5	3
Don't Know	13	7
Total	180	100
Ceiling Insulation Thickness		
Less than 6 inches	13	7
6 to 10 inches	54	30
11 to 30 inches	46	26
Don't Know	67	38
Total	180	100
Panels of Glass in Windows		
1	29	16
2	106	59
3	44	24
4	0	0
Don't Know	1	1
Total	180	100

Note: Percentages may not total 100% due to rounding.

Source: Steve Colt, Karen Foster, Jack Kruse, "Forecast of Electricity Demand in the Alaska Railbelt Region: 1988 - 2010, Tech. Memo. I: Residential End-Use Survey," Institute of Social and Economic Research for the Alaska Power Authority, February, 1988.

Prepared by the House Research Agency, March 1988 (88095-3).

TABLE 4

COST EFFECTIVENESS AND PAYBACK PERIOD FOR RESIDENTIAL SPACE-HEATING CONVERSION TO NATURAL GAS IN THE FAIRBANKS DISTRIBUTION AREA

Major Heating Fuel	Number Convertible		--Conversion Costs--		-----Fuel Cost-----		--Natural Gas at \$3.06/MCF--			--Natural Gas at \$3.76/MCF--		
	Customers	Customers	Average	Total	Cost/Unit	Annual Cost	Annual Cost	Annual Savings	Payback Period	Annual Cost	Annual Savings	Payback Period
Fuel Oil	9,709	9,117	\$1,100	\$10,028,700	\$0.88	\$1,254	\$823	\$431	2.6	\$1,011	\$243	4.5
			1,100		0.80	1,140	823	317	3.5	\$1,011	129	8.6
Electric	331	10	2,000	20,000	0.076	2,961	823	2,138	0.9	\$1,011	1,950	1.0
Wood	773	62	2,000	124,000	82.50	858	823	35	57.4	\$1,011	(153)	NA
Propane	221	199	300	59,700	1.20	2,489	823	1,666	0.2	\$1,011	1,478	0.2
Total	11,034	9,388	\$6,500	\$10,232,400								

Note: A natural gas price of \$3.06/MCF assumes that the cost of gas in Fairbanks is the same as the current price of gas in Anchorage. However, because it is unlikely that same rates can be charged, the \$3.76/MCF price was also used. This price adds 70 cents per MCF to cover annual debt service payments for the Fairbanks distribution system. This is a more likely price because by statute the APUC probably would not allow Anchorage customers to bear the costs of the Fairbanks system.

Source: ENSTAR Natural Gas Company data on cost of conversion and natural gas and number of potential customers; Institute of Social and Economic Research, "Forecast of Electricity Demand in the Alaska Railbelt Region: 1988 - 2010," prepared for the Alaska Power Authority, March 1988; Fairbanks Community Research Quarterly, Fall 1987, Volume X, No. 3.

Prepared by the House Research Agency, March 1988 (88.095).

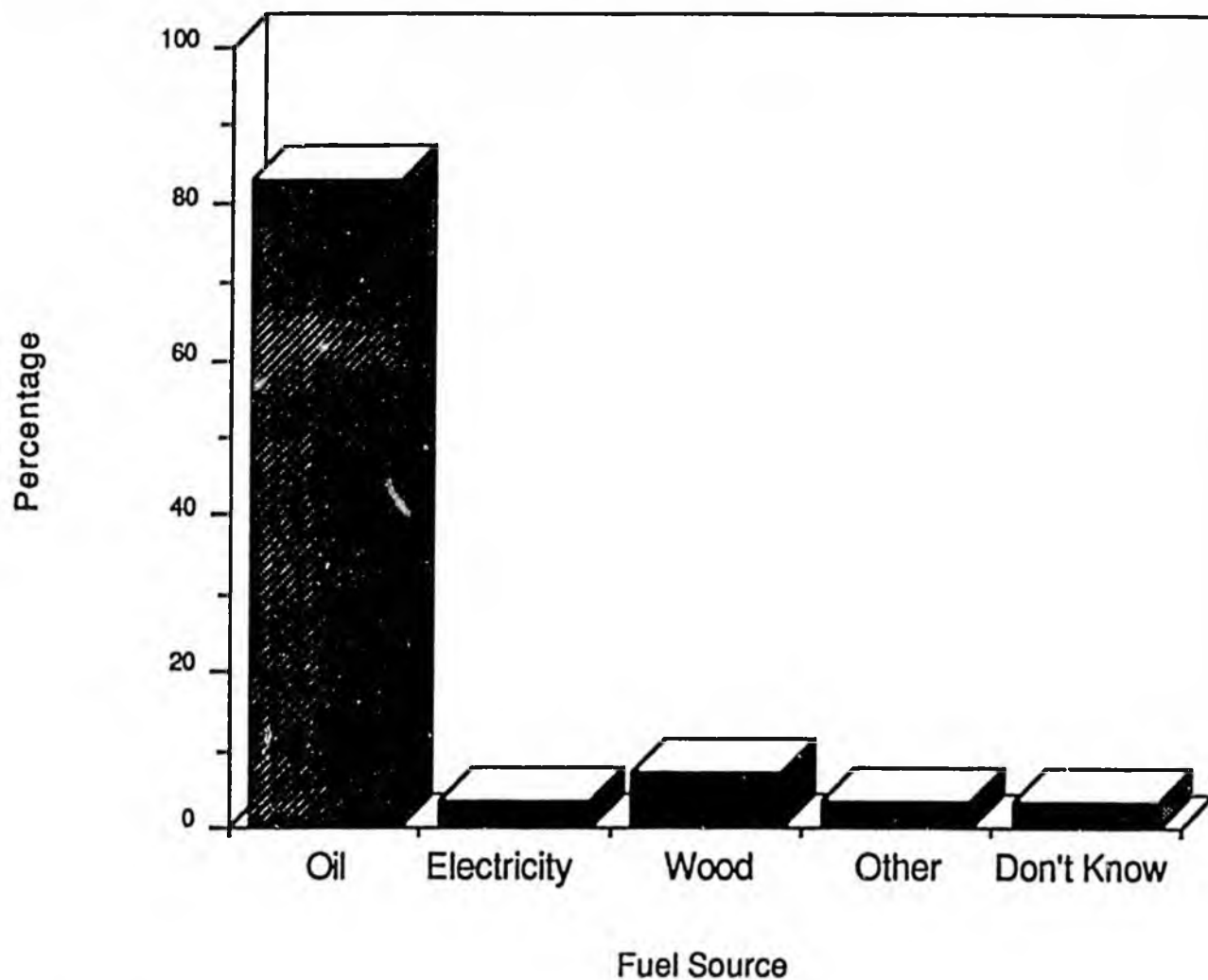
Households heating with propane have the shortest payback period because of the relatively high price of propane and low conversion cost. Houses with electric furnaces have about a one-year payback, which is largely attributable to the high cost of electric heating in the Fairbanks climate. Because households with propane and electric furnace heating systems would see a 100 percent return on their conversion investment in about one year, a high percentage would likely convert to natural gas. Therefore, we have used ENSTAR's 90 percent conversion rate. These households, however, constitute only about two percent of those to be served by the proposed distribution system.

Fuel oil accounts for 86 percent of residential heating systems in the Fairbanks-North Pole area (Table 3, Figure 2). Of the homes with fuel oil, 93 percent have furnaces that are relatively easy to convert. Based on the cost of conversion (\$1,100) and the price of natural gas and fuel oil, the calculated payback period for this subgroup ranges from 2.6 to 8.6 years depending on assumptions about the price of fuels (Table 4). The potential benefits to Fairbanks space heating customers, the return on their heating conversion investment, and the likelihood of residential space heating conversions is greatest when fuel price differentials are relatively large.

ENSTAR assumes that if the state pays for the construction of the gas transmission line, natural gas in Fairbanks can be priced at rates equal to those in the southern Railbelt (currently about \$3.06/MCF for residential customers). As discussed in a prior section, it is questionable whether the APUC would approve a postage stamp rate throughout the Railbelt. It is also questionable whether fuel oil prices in Fairbanks would remain at current levels if natural gas were available. The increase in space heating fuel competition would put downward pressure on fuel oil prices. While any drop in fuel oil prices would be a benefit attributable to the gasline, any fuel oil price reduction would also decrease the incentive to invest in a furnace conversion.¹³ If fewer households convert to natural gas, the fixed costs of the distribution system would be higher per MCF of gas. The ultimate effect would be a reduction in the natural gas and fuel oil price differential.

¹³The shortest payback period (2.6 years) is based on the lowest potential price for natural gas and the current Fairbanks fuel oil price (\$0.88/gallon). The longest payback period (8.6 years) is based on a natural gas price (\$3.76/MCF) that includes debt repayment on the Fairbanks distribution system and a fuel oil price equal to the current, more competitive Anchorage fuel oil price (\$0.80/gallon).

FIGURE 2
Major Heating Fuel Sources in Fairbanks



House Research Agency
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If the state paid for the gas transmission line while the distribution line were privately financed, the most likely residential space heating fuel price differential scenario in Fairbanks would be natural gas priced in the vicinity of \$3.76/MCF (or higher) and the fuel oil priced around Anchorage prices, or \$0.80/gallon. Faced with about four or five years to break even on their conversion investment, it is unlikely that even the subgroup of fuel oil users with the lowest conversion costs would have a 90 percent conversion rate as ENSTAR suggests. National data suggest that a 50 percent conversion rate might be more realistic for a five-year payback period.¹⁴ A gas company-sponsored, aggressive conversion program could push the percentage somewhat higher. Similar to ENSTAR's conclusions, our calculations indicate that homes heated with wood would not convert to gas.

Commercial. ENSTAR estimates that 95 percent of both large and small commercial buildings would be converted to natural gas for space heating as soon as gas became available. ENSTAR's very high conversion rate is based on the likely one-year payback for commercial conversion to natural gas. A portion of this conversion is assumed to occur indirectly via the conversion of the downtown FMUS steam plant to natural gas.¹⁵

We believe this conversion rate is an overestimate for two reasons: 1) FMUS recently decided to sign a ten-year coal contract for their downtown coal facilities and therefore does not intend to convert to natural gas at this time; and 2) when the upgrade of the FMUS downtown coal-fired generators is completed in two years, FMUS plans to extend the hot water space heating system in the downtown commercial district. This is the same area expected to be served by the natural gas distribution system. The expansion of the hot water system will occur prior to the scheduled completion of the gasline. FMUS also believes that the hot water heating system will be competitive with natural gas prices.¹⁶ Although FMUS has completed some pilot projects on the extension of the hot water heating system, they could not provide information on penetration levels at this time. We have estimated that continued use of coal by the steam plant and extension of the hot water system would lower ENSTAR's estimate of commercial natural gas conversions by about 50 percent.

¹⁴Dr. Alan Meirer, Economist, Lawrence Berkeley Laboratory, Berkeley, California, personal communication, March 11, 1988.

¹⁵These coal-fired furnaces provide hot water for the central district heating system. Converting these furnaces to natural gas would have indirectly converted some commercial space heating to natural gas.

¹⁶Virgil Gillespe, Manager, Fairbanks Municipal Utility System, personal communication, March 1988.

POWER PLANT CONVERSIONS. ENSTAR estimates that electrical power generating facilities would use about 5.8 BCF annually (Table 5). These projections are based on the study conducted in 1985 for ENSTAR by Stone and Webster Engineering Corporation. In contrast, the House Research Agency estimates that electrical power generation would use only about 1.1 BCF of gas annually beginning in 1994 (Table 6). As a result of federal regulations, the military installations in the Fairbanks area would be prevented from converting their coal-fired generating facilities to natural gas. Therefore, potential conversions include the Golden Valley electric Association (GVEA), the University of Alaska-Fairbanks utility system (UAF), and the Fairbanks Municipal Utility System (FMUS).

The major problem with ENSTAR's estimate is that it was made before the Anchorage-Fairbanks intertie was completed and does not account for the resulting large decrease in diesel-fired electricity generation in the Fairbanks area. In addition, ENSTAR also includes conversion of FMUS and UAF coal-fired generators. Our lengthy discussions with the University and FMUS indicate that the University intends to convert only one diesel-fired generator used for peaking and supplementing their coal-fired facilities; FMUS currently intends to convert only two diesel-fired generators that are used to supplement their coal-fired baseload generators.¹⁷ ENSTAR's conclusion on GVEA's conversion of the two North Pole diesel-fired generators agrees with this agency's, but we calculate considerably lower annual gas consumption for GVEA.

¹⁷Gerald England, Manager, University of Alaska-Fairbanks utility system, March 1988, and Virgil Gillespe, Manager, Fairbanks Municipal Utility System, March 1988.

TABLE 5
POWER PLANT STUDY

	<u>North Pole (GVEA)</u>	<u>Downtown (MUS)</u>	<u>University</u>	<u>Total</u>
Gas Consumption MMCF/Year	2,859	2,055	928	5,842
Peak Day Demand MMCF/Day	8.98	10.12	3.63	22.73
Operating and Maintenance Cost Savings \$/Year*	\$68,000	\$696,000	\$282,000	\$1,046,000
Conversion Cost	\$1,350,000	\$950,000	\$750,000	\$3,050,000

*Operating and Maintenance savings are in addition to fuel cost differential savings.

Source: ENSTAR Natural Gas Company, February 1988.

TABLE 6
ELECTRICAL POWER PLANT NATURAL GAS UTILIZATION AND COST SAVINGS FROM
THE PROPOSED WASILLA-FAIRBANKS GASLINE

	GOLDEN VALLEY ELECTRIC ASSOC. NORTH POLE (a)	FAIRBANKS MUNICIPAL UTILITY SYSTEM DOWNTOWN (b)	UNIVERSITY (c)	TOTAL
Gas Consumption MMCF/Year (1994)	963	68	28	1,059
Conversion Cost	\$3,000,000	\$2,000,000	\$75,000	\$5,075,000
Operation and Maintenance Cost Savings \$/Year (d)	68,000	4,760	2,040	74,800
Annual Fuel Savings (e)	830,796	58,800	20,438	910,034
Annual Debt Payment (f)	100,000	67,000	0	167,000
Net Annual Savings	\$798,796	(\$3,440)	\$22,478	\$817,834
Payback Period	3.3	31.5	3.3	5.2

Notes:

- (a) GVEA's gas consumption is based on weather-adjusted generation (including wholesale sales) from 5/87-4/88. This base value is then adjusted to account for demand growth according to GVEA's most recent Power Requirement Study.
- (b) Based on diesel generation for calendar year 1987. The Fairbanks Municipal Utility System (FMUS) expects flat electrical demand growth.
- (c) The University gas consumption is based on annual average diesel consumption for FY 84 - FY 88. The University has experienced a decline in diesel use so this number reflects flat demand growth.
- (d) Operating and maintenance savings are in addition to fuel cost differential savings. O&M savings for Golden Valley (GVEA) are based on ENSTAR data; savings for the Fairbanks and University utilities are based on a kilowatt hour proportion of GVEA's savings.
- (e) Annual fuel savings are based on the price differential between diesel and natural gas. The differential is based on a diesel price of \$0.45/gallon and natural gas price of \$2.41/MMCF.
- (f) Annual debt payments are based on GVEA bonding conversion costs at 9% interest over 30 years; FMUS bonding at 7 percent over 30 years; the University absorbs the cost.

Source: ENSTAR Natural Gas Company data; Mike Kelly, General Manager, Golden Valley Electric Association, March 1988; Virgil Gillespe, General Manager, Fairbanks Municipal Utility System, March 1988; and Gerald England, General Manager, University of Alaska-Fairbanks Utilities Operation, March 1988.

To estimate natural gas consumption for power production, we analyzed recent diesel-fired generation levels since completion of the intertie. Mike Kelly, GVEA General Manager, states that if natural gas were available in Fairbanks at ENSTAR's projected prices, GVEA would continue to use coal-fired facilities for baseload, purchase power over the electrical intertie, and use natural gas to supplement these other sources of power. To estimate GVEA's consumption, we based GVEA's use of natural gas on recent diesel-fired generation levels and incorporated an additional quantity to accommodate GVEA's forecasted demand growth. GVEA's assumption regarding economy energy purchases over the intertie is based on their belief that, together with Anchorage electric utilities, they will be able to contract for an Anchorage gas price which would be lower than ENSTAR's gas price in Fairbanks. To break even, the Anchorage price would have to be five to ten percent lower to account for line losses on the intertie; without compression, the gasline has no corresponding line losses. Because the electric utilities and ENSTAR will both be negotiating with Cook Inlet gas producers about the same time, GVEA's assumption regarding gas prices and economy energy appears reasonable.

Calculation of the University's gas consumption is based on the average annual consumption of diesel fuel to supplement coal-fired generation for the years FY 84 through FY 88. Because the energy consumption at the University has decreased in recent years as a result of its energy conservation program, we have not included additional natural gas quantities to account for demand growth.

Natural gas use at FMUS was calculated using recent diesel generation levels as an indication of future natural gas consumption. FMUS natural gas use entails greater uncertainties, however, than GVEA's or the University's. This is primarily because a portion of FMUS's generators are not currently in use for environmental reasons. Given the conversion of one inoperable diesel-fired unit to natural gas and the upgrade of three coal-fired facilities, the use configuration of FMUS's facilities may change. We have assumed, however, that because the inoperable units are split between coal and diesel fuels, their return to service should not significantly alter the current dispatch system. The most significant reduction in ENSTAR's estimate of FMUS's use results from FMUS's decision to sign a ten-year coal contract and, thus, not convert their coal units to natural gas.

Based on our calculation of annual fuel savings and the cost of conversion, it would be cost-effective for the University and GVEA to convert their diesel-fired generators to natural gas (Table 7). We believe, however, that the high cost of generator conversion would prevent FMUS from switching to gas.¹⁸ We estimate that the effect of conversion on electricity prices in Fairbanks would be a reduction of about one-tenth of a cent per kilowatt hour, or \$500,000 in energy savings for all electricity consumed annually.

ENSTAR estimates that in order to meet their estimated revenue requirements and offer natural gas prices in Fairbanks comparable to Anchorage prices, power plants would have to consume at least two BCF of natural gas annually. Our calculations indicate that this is unlikely. The result is higher gas prices to other users, which would reduce the incentive to convert to gas.

Economic Feasibility of the Project

To determine the economic feasibility of state projects, the APA generally calculates the feasibility of the project as if it were bond financed. If the gas pipeline were 100 percent bond financed at seven percent interest, debt repayment would add about \$1.54/MCF, for a total cost of gas to residential customers of about \$4.80/MCF. Without state financing, the project does not appear to be feasible. The 1985 Stone and Webster Engineering Company analysis of the project (for ENSTAR) probably reached the same conclusion.

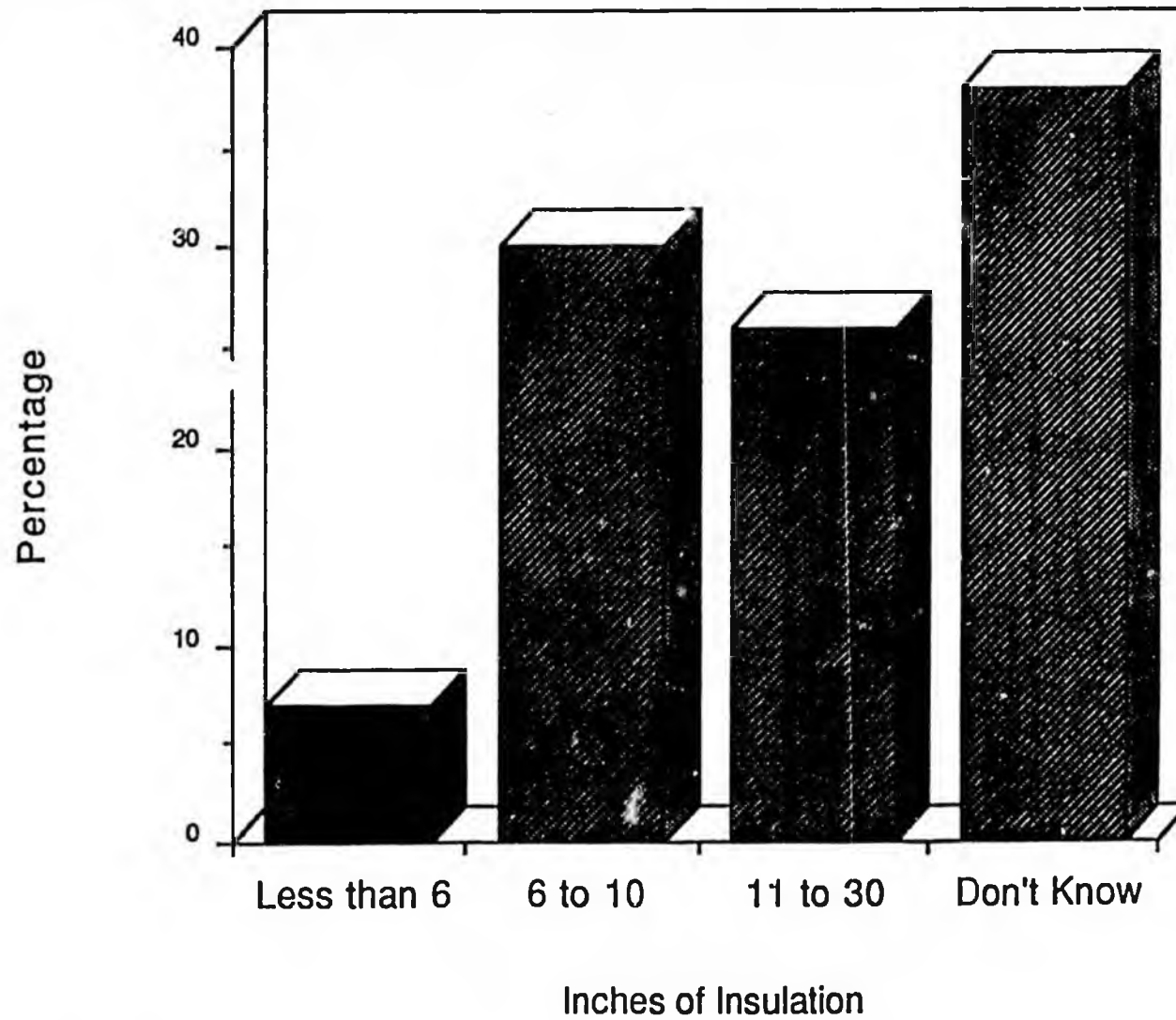
USE OF NATURAL GAS AND ITS RELATIONSHIP TO OTHER RAILBELT ENERGY SOURCES

Residential Weatherization Alternative

A natural gas pipeline to Fairbanks would provide natural gas primarily for space heating, thereby lowering household energy costs. A logical alternative to the construction of the pipeline is improved home weatherization and end-use efficiency. According to Alaska Department of Community and Regional Affairs (DCRA) data, only five percent of the homes in the communities potentially served by the gas pipeline have been weatherized under the federally funded weatherization program (Table 7). Data from the Railbelt end-use survey indicate that there are ample opportunities to improve both residential space-heating and electrical end-use efficiency (Table 3, Figures 3, 4 and 5). This section focuses on the weatherization alternative.

¹⁸The FMUS and GVEA conversion costs are based on preliminary estimates by the General Electric Corporation. The University provided information on their conversion costs.

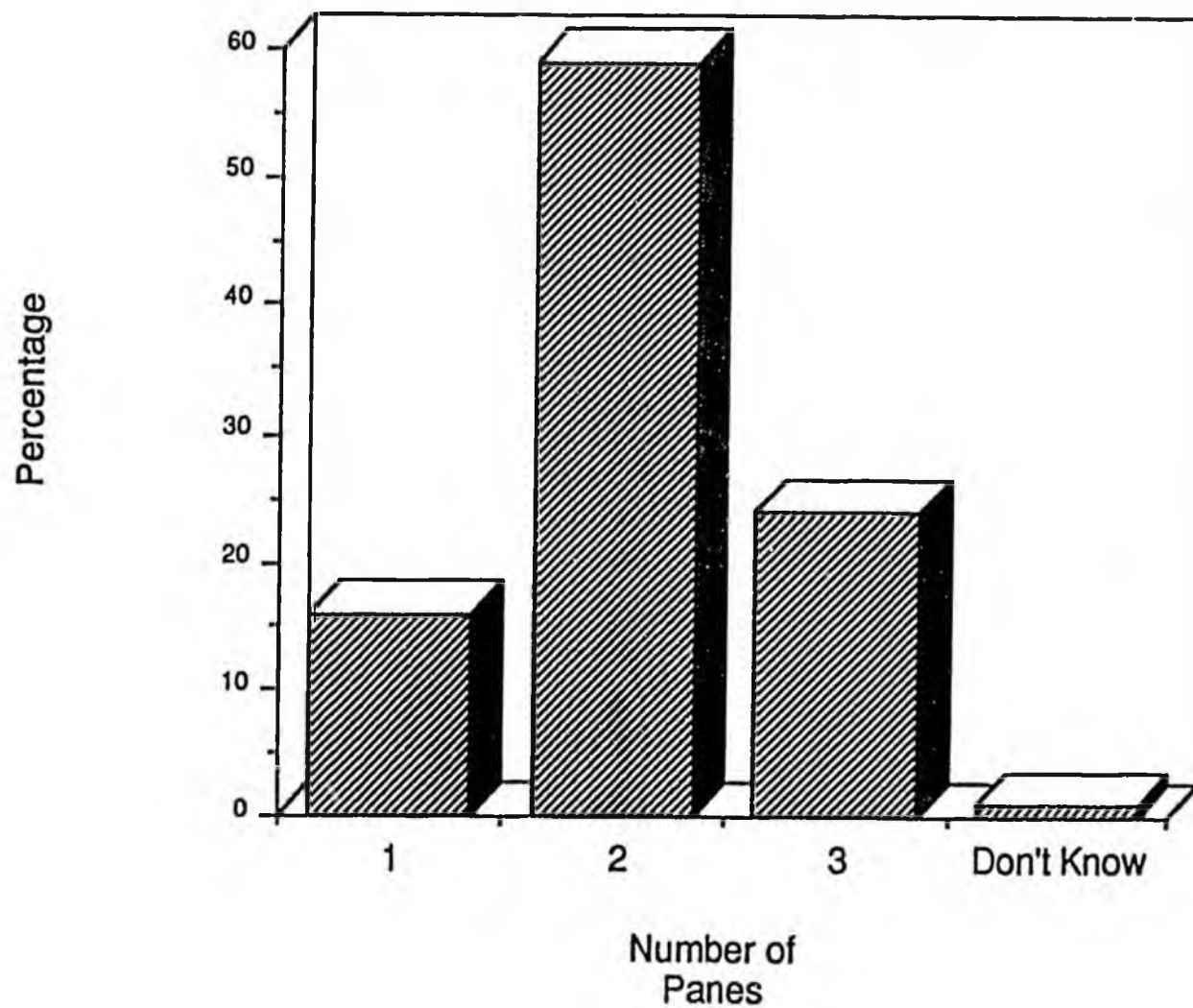
FIGURE 3
Residential Homes Ceiling Insulation, Fairbanks



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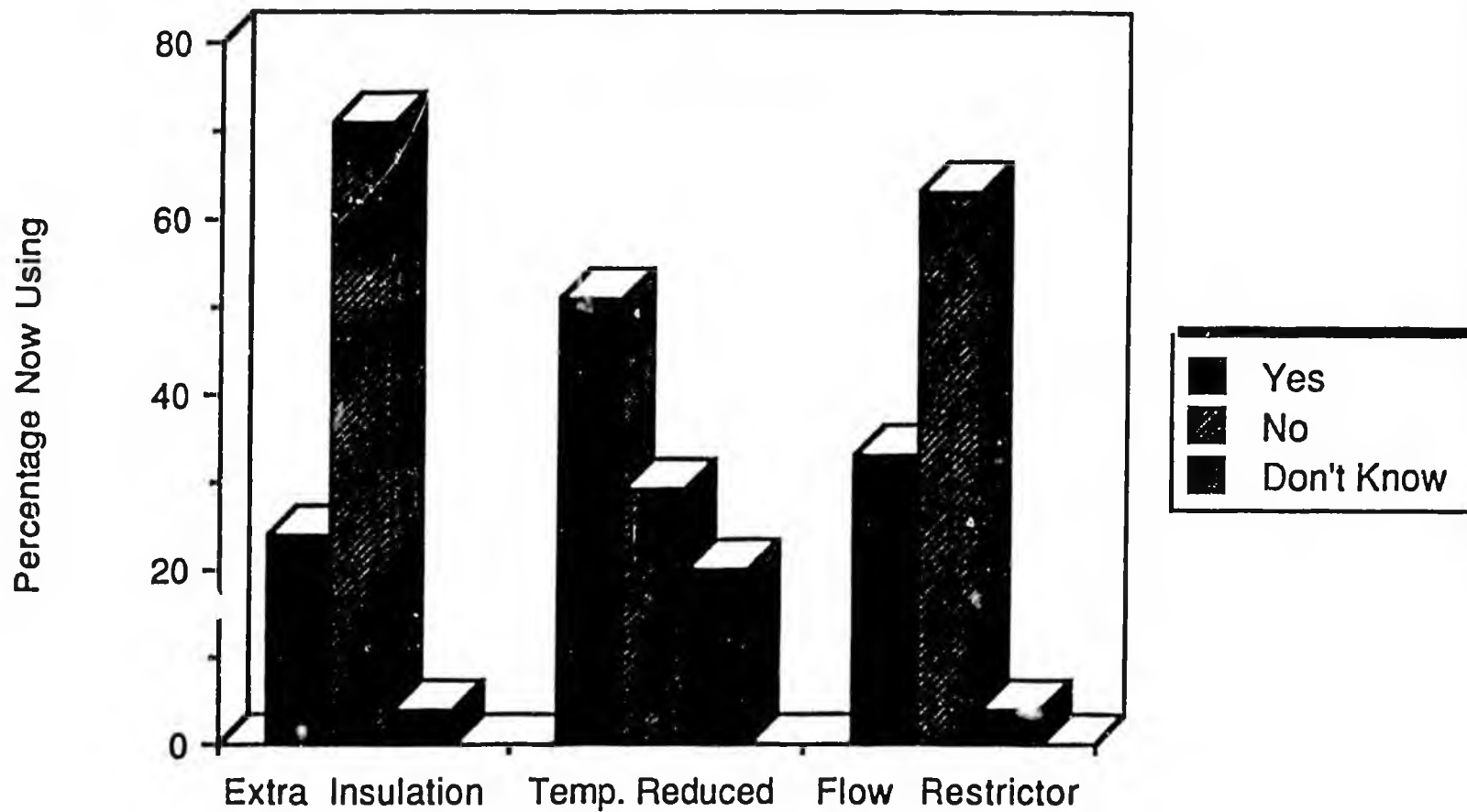
Source: Colt et al., Op. Cit., 1988

FIGURE 4
Panes of Glass in Residential Windows, Fairbanks



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FIGURE 5
**Fairbanks Electric Hot Water Heater
Conservation Measures**



House Research Agency
March 1988

The current weatherization program, funded almost entirely by the federal government and administered by the DCRA, provides \$1,600 per household for caulking, weatherstripping, insulation, insulated doors, and window thermal improvements. The DCRA estimates that this investment per house reduces residential space heating costs by approximately 22 percent. The \$1,600 per house funding level is set by federal regulations. According to the DCRA, a preferable level of funding is \$2,300 per house because the additional funds provide for heating system improvements.¹⁹ The DCRA estimates that a \$2,300 weatherization investment reduces annual heating costs by approximately 30 percent.

The total cost of the proposed gasline project is \$220 million (\$185 million for the transmission line and \$35 million for the distribution system). The project might serve approximately 9,325 homes in the Fairbanks area. Use of natural gas by these households would result in an estimated annual fuel savings of \$263 per household, or about \$2.5 million for all households (Table 4). This agency estimates that 52 percent of the Fairbanks area natural gas consumption would be for residential space heating. Using this portion of construction costs, we estimate that the cost per household to provide natural gas would be about \$10,300--an equivalent of about 40 years worth of fuel savings.

In contrast, the cost to weatherize all unweatherized homes (about 22,300) in the communities of Fairbanks-North Pole, Anderson/Clear, Nenana, Healy, Cantwell, Talkeetna, Willow, and Houston at the \$2,300 per home level would be \$51.3 million.²⁰ The annual fuel savings per household under the weatherization alternative averages \$345 for all communities; total annual fuel savings would be approximately \$8.4 million (Table 7). For the households in the Fairbanks area that would be served by the proposed pipeline transmission and distribution system, the resulting annual household fuel savings from weatherization would be \$376 (Table 7).

¹⁹This was the level of expenditure per household provided under the weatherization program when the state supplemented federal funding during the mid-1980s. According to Robert Grove, who has weatherized homes in the Fairbanks area during the last ten years, the \$2,300 per house funding level is minimal in the Fairbanks climate.

²⁰The natural gas pipeline proposal does not currently include any costs or plans to distribute natural gas to communities other than Fairbanks, but these communities are along the proposed pipeline right-of-way.

TABLE 7

COST OF THE WEATHERIZATION ALTERNATIVE TO THE WASILLA-FAIRBANKS GASLINE PROPOSAL

COMMUNITY	FY 86 POPULATION	NUMBER OF HOMES WEATHERIZED	NUMBER WEATHERIZED	NUMBER NOT WEATHERIZED	\$/GALLON FUEL OIL	\$/NET BTU	HEATING DEGREE DAYS	TOTAL COST FOR		TOTAL FUEL CONSUMPTION/ HOME PRE-WXED	NET ANNUAL FUEL SAVINGS		TOTAL ANNUAL FUEL SAVINGS		PAYBACK PERIOD (YEARS), WXED
								\$1,600/HOME	\$2,300/HOME		\$1,600*	\$2,300*	\$1,600*	\$2,300*	
Fairbanks	39,151	22,628	999	21,629	\$0.88	\$9.43	14,345	\$34,606,400	\$49,746,700	\$1,254	\$282	\$376	\$6,102,622	\$8,136,830	6.1
Anderson/Clear	566	142	22	120	0.87	9.33	15,300	192,000	276,000	1,322	298	397	35,702	47,602	5.8
Nenana**	544	198	46	152	0.87	9.33	14,539	243,200	349,600	1,257	283	377	42,973	57,297	6.1
Healy	414	150	21	129	0.91	9.76	12,775	206,400	296,700	1,155	260	346	33,519	44,692	6.6
Cantwell	91	51	20	31	0.91	9.76	14,000	49,600	71,300	1,266	285	380	8,827	11,770	6.1
Talkeetna**	2,269	190	87	103	0.76	8.15	11,708	164,800	236,900	884	199	265	20,485	27,313	8.7
Willow	494	100	76	24	0.89	9.54	12,300	38,400	55,200	1,087	245	326	5,872	7,830	7.1
Houston	725	130	4	126	0.89	9.54	11,300	201,600	289,800	999	225	300	28,323	37,764	7.7
TOTAL	44,254	23,589	1,275	22,314	\$0.88	\$9.43	13,283	\$35,702,400	\$51,322,200	\$9,224	\$2,075	\$2,767	\$6,278,323	\$8,371,097	6.1

* Weatherization at \$1,600 assumes a 22.5 percent reduction in fuel costs; weatherization at \$2,300 assumes a 30 percent reduction.

** These communities are not located immediately adjacent to the proposed gas pipeline route. Longer distribution lines would be required to serve these communities.

Source: Fairbanks Community Research Quarterly, Vol. X, No. 3, Fall 1987; Alaska Department of Community and Regional Affairs weatherization program data; House Research Agency survey of community fuel oil distributors, March 1988.

Prepared by the House Research Agency, March 1988 (88.095).

In summary, weatherization would cost one-quarter as much as the proposed gasline, would affect about 2.5 times as many homes, and would provide larger annual fuel savings. In terms of cost recovery, investment in weatherization would be recovered in about seven years versus 40 years for the gasline. If a primary objective of the proposed pipeline project is to reduce the space heating costs to the largest number of households, the weatherization alternative appears vastly superior to the construction of the gas pipeline.

Coal-Fired Power Plants

The Usibelli Coal Mine, Inc. and the City of Nenana are in the engineering and financial analysis phase of constructing separate potential coal-fired electrical generation facilities in the Railbelt. Steve Bainbridge, City Manager, City of Nenana, believes that the Railbelt cannot accommodate two coal-fired facilities in the mid-1990s. Because he believes that the Usibelli project is likely to be more economically feasible than the city project, the City of Nenana is deferring further analysis until more extensive work has been completed on the Usibelli facility. As a result, this section focuses on the Usibelli project. The Usibelli Coal Mine Company has also slowed the pace of analysis until a decision is made on the proposed gasline because the Usibelli group does not believe it can compete with state subsidized natural gas power generation.

The Usibelli cogeneration facility as now planned would be a privately financed, 100 to 150 MW coal-fired plant. The primary use of the plant would be to dry coal. Although Alaska coal has a low sulfur content, its high moisture content--and resulting combustion characteristics--reduces its value in the export market. The planned coal-fired facility would reduce the coal's moisture content and make it more competitive in the world export market. Approximately 85 percent of the plant's annual energy output would be available for Railbelt electrical energy needs. If the facility is financed with private capital, the anticipated wholesale price per kilowatt hour at the "busbar" is \$0.06. Under the current timetable, the project is expected to come on line in the mid-1990s.

The coal-fired cogenerator has a number of attractive aspects, including:

- the increase in coal exports would be a basic sector economic expansion that would increase income and employment in the state for the life of the project;
- being privately financed, it would require no state funding and pass the "market test" of an economically feasible project;
- providing 85 to 125 MW of installed capacity to Railbelt is a relatively small increment of power that would back out approximately nine to twelve BCF of natural gas annually and extend the life of Cook Inlet known gas reserves by about one year;
- if the project were privately financed, the price of electricity would reflect its true cost; and
- the coal combustion technology of the plant would meet stringent air quality standards.

An important consideration regarding the proposed natural gas pipeline is the effect state funding has on the feasibility of privately financed projects. In addition to the Nenana and Usibelli projects, other projects, including municipal waste pellet projects in Fairbanks and Anchorage, could be affected.

The Gasline's Effect on Railbelt Petroleum Product Markets

Based on this agency's analysis of probable space heating and power generation conversions from diesel fuels to natural gas in the Fairbanks area, we estimate that the gasline will annually displace about 21 million gallons (or 496,300 barrels per year), as shown in Table 8.

TABLE 8

ESTIMATED FUEL PRODUCTS ANNUALLY DISPLACED BY THE GASLINE

USE CATEGORY	<u>Diesels No. 1 and 2</u>	<u>No. 4 Turbine Fuel</u>
Space Heating	13.0 million gallons	-0-
Power Generation		
GVEA	-0-	7.1 million gallons
FMUS	495,000 gallons	-0-
UAF	-0-	250,000 gallons
Subtotal	13.5 million gallons (321,300 barrels)	7.4 million gallons (175,000 barrels)
TOTAL	20.9 million gallons (496,300 barrels)	

Note: Most Fairbanks residences that would convert their space heating systems to natural gas presently burn either a blended diesel No. 2 (mixed with diesel No. 1 to lower the pour point temperature) or diesel No. 1 (also called arctic diesel fuel). The FMUS burns diesel No. 2 in its power generators.

* * *

MAPCO's North Pole refinery produces the No. 4 turbine fuel oil currently used by the GVEA and the University. With the exception of possible sales of No. 4 turbine fuel to FMUS once it upgrades some of its power generating units to a dual fuel capability (coal and No. 4 turbine fuel), it does not appear likely that MAPCO will readily find new markets for this product. This heavy end product of the crude oil distillation process would likely be reinjected into the TAPS along with the residual oil MAPCO currently returns to the oil pipeline.

Three in-state refineries (MAPCO and Petro Star at North Pole and Tesoro Alaska Petroleum at Nikiski) produce and sell diesel fuels in the Fairbanks area.²¹ Unlike the lighter diesel No. 1 which can also be refined into commercial jet fuel and, to some extent, into military jet fuel (JP-4), diesel No. 2 is relatively limited with respect to its product versatility. Diesel No. 2 is generally sold for space heating, oil-fired electrical power generation, and as marine diesel. An abundant supply of diesel fuels has existed for several years in the Railbelt, particularly since MAPCO and Tesoro completed refinery expansions and Petro Star commenced operation in 1985. The amount of surplus diesel fuels is anticipated to increase dramatically during the next three years as the foreign airlines, particularly Japan Airlines, phase in more fuel efficient, long-distance airplanes and reduce their commercial fuel purchases at the Anchorage International Airport.

The refiners supplying the Fairbanks market would have to compete more vigorously for the remaining diesel fuel sales and/or develop new markets elsewhere for the 321,000 bbls/year estimated to be displaced from the Fairbanks market by natural gas. The two North Pole refiners would likely be able to further undercut Tesoro's diesel prices (which currently are about six cents/gallon higher to cover pipeline and railroad shipping costs). Wade Rogers, Tesoro's Marketing Manager, indicates that Tesoro's diesel market in Fairbanks would be very vulnerable to this kind of price competition.

With respect to the ability to develop markets for the displaced diesel fuel outside the Fairbanks area, Petro Star appears to be the most vulnerable because it currently sells virtually all of its diesel fuel products in Fairbanks. Steve Lewis, of Petro Star, believes that their company-owned wholesaler (Sourdough Fuel) would be hit hard if state-subsidized natural gas enters the Fairbanks market. Petro Star does not presently have the experience or facilities to more broadly market its products throughout the Railbelt or elsewhere in Alaska.

²¹The fourth in-state refinery, operated by Chevron USA at Nikiski, does not market its diesel No. 2 in Fairbanks.

Tesoro, on the other hand, has expanded markets outside the Railbelt during the past three or four years and has moved diesel products from its tidewater location at Nikiski to Western Alaska, coastal Southcentral communities, and (occasionally) Southeast Alaska. In these markets, Tesoro has had to compete primarily with fuel supplies originating in Puget Sound and, to a lesser extent, southern California. The current Western Alaska fuel market is estimated to be about 80 percent in-state refined products--primarily Tesoro diesel and gasoline products. Wade Rogers, of Tesoro, suggests that the diesel fuels displaced by the gasoline would likely have to be exported--along with surplus diesel fuels as a result of a shrinking commercial jet fuel market serving foreign airlines.

Within the last two years, MAPCO has purchased the Nenana Fuel Company and the Unocal fuel storage facility at the Port of Anchorage in order to expand its distribution system. According to 1987 records of the Alaska Railroad Corporation, all fuel products railed to Nenana for barge transport along the interior river systems originated at MAPCO's North Pole refinery. The newly acquired Port of Anchorage facility will provide storage for gasoline destined for the Anchorage market as well as the various fuel products shipped to Western Alaska.²² With respect to Western Alaska, Tesoro has saturated that market to a large extent and apparently has certain advantages over MAPCO at this time due to its company-owned fuel barges and multi-year contracts with some major consumers. Given its refinery throughput (varying between 75,000 and 85,000 bbls/day), MAPCO is likely to have the largest volume of diesel fuels displaced from the Fairbanks market. The company appears to be positioning itself to more vigorously move fuel products out of the Railbelt--a strategy which could alleviate, to some extent, its surplus of diesel fuels resulting from the Wasilla-Fairbanks gasoline.

At this time, MAPCO is also experimenting with the production of a different military fuel product, JP-8, which is derived from the kerosene (diesel No. 1) fraction. The JP-8 fuel apparently might replace, to a large extent, the various grades of JP-4 and JP-5 currently used by the military in Alaska. The military's JP-4 fuel needs are currently met by in-state refiners. However, the military currently purchases about 600,000 barrels per year of JP-5 fuel out-of-state because Alaska refiners do not produce this fuel product. If MAPCO succeeds in producing the JP-8 fuel, they could potentially expand their military diesel fuel market dramatically and use up a great deal of the estimated diesel fuel surplus they may otherwise face.

²²Buki Wright, Vice President of MAPCO, personal communication, March 9, 1988.

THE PROPOSED GASLINE'S RELATIONSHIP TO NORTH SLOPE GAS

This section examines the compatibility of the proposed gasline with the proposed TAGS project. Three major issues are considered: 1) the relationship between the two projects with respect to project timing; 2) the engineering compatibility of the two pipelines and the modifications likely to be needed in order to deliver gas from TAGS to the Wasilla-Fairbanks gasline; and 3) the sizing of the Wasilla-Fairbanks gasline to accommodate export market throughput and thereby reroute the TAGS project through the Railbelt to tidewater in Cook Inlet.

Timing of the Two Gas Pipeline Proposals

Yukon Pacific estimates a commencement of TAGS construction in 1992-93 in order to enter the Asian market for LNG about 1996. A June 1987 feasibility study (sponsored by Yukon Pacific, ARCO and several Japanese companies) identifies a potential Japanese market for about three to 3.5 million tons of LNG in 1995 and concludes that if TAGS is not operational by 1998, the project risks missing the Japanese market altogether.²³ The project would be economically feasible if Korean and Taiwanese markets for an additional 3.5 to 4 million tons of LNG can be found.²⁴ Production and marketing of about seven million tons of LNG per year would correspond with a TAGS throughput of about 50 percent of maximum design capacity. Although current plans call for maximum throughput upon commencement of operation, it is not uncommon for gaslines to start up with contract sales for about 50 percent of capacity and to increase throughput as markets expand.²⁵

In addition to the above-mentioned feasibility study, securing federal and state permits represents another major activity under Phase I of the TAGS project. At this time, Yukon Pacific has filed for an export license (from the Economic Regulatory Administration) and an export site permit (from the Federal Energy Regulatory Commission). Federal and state ROW lease applications are also pending. Once the federal export approvals are issued

²³Yukon Pacific Corporation, "Update: The Trans-Alaska Gas System," January 12, 1988, p. 1 - 3.

²⁴According to Yukon Pacific, this economic feasibility occurs even under a low oil price of about \$25 in 1995.

²⁵Ken Webb, TAGS Engineer, personal communication, March 10, 1988.

(likely to occur this year), Yukon Pacific will be in a better position to vigorously pursue LNG contracts and project financing. With firm commitments to purchase the project's LNG, design engineering under Phase II would commence.

ENSTAR estimates that the Wasilla-Fairbanks gasline would require about 1-1/2 to two years for design and permitting and another 14 to 16 months for construction. Previous information in this memorandum about natural gas conversions in the Fairbanks area assumes gasline transmission and distribution would commence about 1994. Initially, the gasline would rely on Cook Inlet fields for gas to be transported north to Fairbanks. In this respect, the timing of the proposed Wasilla-Fairbanks gasline would be independent of the TAGS project. The time at which flow on the Wasilla-Fairbanks gasline might be reversed and North Slope gas transported to Railbelt consumers is highly speculative because of a number of uncertainties, including:

- 1) the availability of "new" gas from future exploration and production in Cook Inlet;
- 2) future levels of industrial consumption of Cook Inlet gas for LNG and ammonia-urea export;
- 3) the terms of new contracts negotiated between public utilities and Cook Inlet gas producers, as several existing contracts expire in the 1990s;
- 4) the myriad private and public sector decisions regarding alternatives to natural gas for future power generation and space heating in the Railbelt; and
- 5) the cost of North Slope gas in Railbelt markets.

Although there is a great deal of guess work involved, we believe that the delivery of North Slope gas to Railbelt customers is not likely to occur until after the turn of the century.

Approaching the timing of the two proposed gaslines from another perspective, it does not appear that Railbelt demand for natural gas for space heating and power generation (estimated to be roughly 200 MMCF/day in the year 2000) is crucial to the economic feasibility of the TAGS project. Mead Treadwell, of Yukon Pacific, predicts that by the time North Slope gas is needed in the Railbelt, the TAGS will likely be operating at maximum capacity to meet export demand.

Engineering Compatibility of the Proposed Gas Pipelines

The TAGS, as currently designed, would be a 36-inch diameter, chilled, high pressure (up to a maximum of 2,220 psig provided by ten compressor stations along the 800-mile route) gas pipeline capable of about two BCF/day maximum throughput. The Wasilla-Fairbanks gasline would be a 20-inch diameter, uninsulated, high pressure (up to a maximum of 1,440 psig once three compressor stations were added along the 305-mile route) gas pipeline capable of roughly 400 MMCF/day maximum throughput. Based on our discussions with both TAGS and ENSTAR engineers, we conclude that there do not appear to be major technical obstacles which would prevent a connection between the two pipelines.

The state can require--as a condition of its ROW lease for the TAGS--installation of special fittings to provide a future connection between the gaslines. When deliveries of North Slope gas from TAGS to the Railbelt area are warranted, a number of modifications would be necessary, including:

- 1) A regulator station that reduces the pressure of the TAGS gas to the lower pressure of the Wasilla-Fairbanks gasline, with some capability to preheat the chilled TAGS gas as it enters the uninsulated gasline which operates at ambient ground temperature.

- 2) Physical modifications to the TAGS compressor stations north of Fairbanks to provide additional throughput to accommodate the Railbelt deliveries. Additional compression on the north segment of the TAGS would be necessary in order to provide gas at Fairbanks without creating a shortfall in the two BCF throughput transported to Valdez and to minimize a reduction in overall system efficiency. Even the projected 200 MMCF/day gas demand for Railbelt space heating and power generation, which would represent about a ten percent increase in TAGS throughput on the northern segment to Fairbanks, would likely require that some additional equipment be installed at compressor stations north of Fairbanks.²⁶
- 3) The addition of compressor stations along the Wasilla-Fairbanks gasline. Compressors would be necessary to boost throughput to the southern Railbelt above about 200 MMCF/day.
- 4) Some capability for gas storage in the Railbelt gasline network in order to accommodate Railbelt needs during periodic shutdown of the TAGS (estimated to be about 10 days annually under an assumed 97 percent operation target). The Wasilla-Fairbanks gasline itself could act as a storage facility or gas wells for storage of compressed gas in Cook Inlet could be maintained, as is common practice in other states.

We did not attempt to obtain detailed cost estimates for the above modifications. A regulator station in the vicinity of Fairbanks would apparently not be prohibitive in cost, with estimates ranging up to a few million dollars. Multi-million dollar expenditures would be required to add compression along both the TAGS and Wasilla-Fairbanks gaslines. Gas consumed at these compressor stations would be a significant on-going expense. ENSTAR estimates that remote-operated compressor stations could be constructed for \$3 - \$5 million each and that the gas consumed to provide adequate compression would be about two percent of gas throughput (i.e., about \$0.08/MCF if we assume 400 MMCF/day throughput and \$4.00/MCF gas).

²⁶Ken Webb, TAGS engineer, personal communication, March 10, 1988.

Given the proposal for state construction and ownership of the proposed Wasilla-Fairbanks gasline and the potential for contracting its operation to a private entity, there would undoubtedly be considerable discussion and negotiation with respect to who pays for these modifications as they became necessary. As noted earlier in this memorandum, the state might want to specify private financing and construction of these components as a condition of the initial contract. If the contractor financed these additional components, the Railbelt customers would ultimately pay for the modifications to the extent that the APUC considered them prudent expenses.

Sizing the Wasilla-Fairbanks Gasline for North Slope Gas Export as Cook Inlet

It has been suggested that if the state is going to construct a gasline in the Railbelt, it should build the gasline large enough to accommodate North Slope throughput for export markets. Under this scenario, the state could presumably shave hundreds of miles off the length of the TAGS gasline, thereby enhancing the exportability of North Slope gas while at the same time ensuring intrastate deliveries to Railbelt consumers. Based on a brief examination of the issues involved, we believe that there are some significant problems with this suggestion:

- 1) Major cost differences exist between the two proposed gaslines. On a dollar/mile basis, the Wasilla-Fairbanks gasline is estimated to cost about \$607,000 per mile versus about \$6.8 million per mile for the TAGS gasline. The larger diameter, chilled TAGS gasline with several compressor stations represents a significant departure from the proposed Wasilla-Fairbanks gasline. The TAGS is sized for large volume throughput to serve export markets and requires more costly materials (e.g., large-diameter (36") steel pipe and other system components that are disproportionately more expensive than those for a 20" pipeline) as well as a larger work force during construction. If the state wants to construct an export-capacity gasline in the

Railbelt, it appears that considerably more money would be needed than the \$228 million currently available in the Railbelt Energy Fund.

- 2) Yukon Pacific examined the routing of the TAGS through the Railbelt to terminals on both the east and west side of Cook Inlet. While a Prudhoe Bay-Cook Inlet route is possible, Yukon Pacific concluded that a Valdez terminus was preferable for a number of reasons, including:²⁷
 - a) A Cook Inlet route might require a 15-mile subsea pipeline, purchase of relatively expensive land in the Anchorage area, and a long loading line (4,000 feet) to tankers moored offshore because of shallow nearshore water depths.
 - b) A consensus among North Slope producers with respect to the desirability of locating the gas terminal in the general vicinity of the existing oil terminal in Valdez.
 - c) The accessibility of the existing TransAlaska Pipeline System route for the permitting and construction of the TAGS.
 - d) The potential availability of methane and/or ethane feedstock in Valdez for other industrial uses at some time in the future.
- 3) In an attempt to "kill two birds with one stone" through a subsidy of one project to enhance North Slope gas exports and to ensure Railbelt access to abundant gas supplies, the state might support a "compromise" gasline which does not serve either market efficiently. As suggested by Mr. Treadwell of Yukon Pacific, if the state wants to provide gas to Fairbanks while at the same time enhance the exportability of North Slope gas, state support of TAGS and state financing of the necessary facilities for a connection at Fairbanks may be the best approach. Under this scenario, new gas turbines in the Fairbanks area (at some point in the future when new electrical generating capacity is needed) could provide power to the southern Railbelt via the existing or an upgraded Anchorage-Fairbanks Intertie. A Railbelt gasline delivering North Slope gas to Southcentral customers might also be feasible with private financing when needed--some time after the year 2000.

²⁷ Mead Treadwell, Yukon Pacific Corporation, personal communication, March 11, 1988.

In summary, the proposed Wasilla-Fairbanks gasline and the TAGS project appear to be generally compatible with respect to timing and engineering. However, the suggestion for constructing a larger, export-capacity gasline instead of the regional pipeline proposed by ENSTAR raises some questions regarding the differences in project costs, markets and state objectives. State intrusion into private sector decision making with respect to the routing (in the case of TAGS export of gas) and the timing (as in the case of the Usibelli Coal Cogeneration Plant proposal for export of coal, as discussed in the previous section) appears inappropriate, if not counter-productive.

EMPLOYMENT IMPACTS

Gas Pipeline Proposal

Based on ENSTAR's experience building the Beluga gas pipeline, they estimate that at least 75 people would be employed during the permitting and design phase of the Wasilla-Fairbanks pipeline. While there are a number of engineering firms in Alaska with the necessary expertise, the competitive contract award process provides for the possibility that this employment could occur out of state. This preliminary work, which would include the survey, design, and right-of-way acquisition, would require 1-1/2 to two years to complete.

The construction of the pipeline is expected to require a minimum labor force of 700 people during a 14 to 16 month period; this estimate is based on ENSTAR's experience with the construction of the Beluga line. As the pipeline would have essentially no moving parts when complete, operation and maintenance would probably require fewer than six persons.²⁸ The ENSTAR Beluga pipeline was constructed by a joint venture of two construction companies. To ENSTAR's understanding, over 70 percent of the workers on the pipeline were Alaskans.

The construction of the Fairbanks distribution system would take three construction seasons. ENSTAR estimates that at least 200 people would be directly employed on the construction of the steel and plastic system. Construction of the distribution system would occur in the summer months. Because of the seasonal nature of employment, it translates to about 70 full-time, year-round job equivalents. Because of ENSTAR's experience with the Beluga pipeline construction and the reasonableness of these estimates, we have not extensively analyzed any phase of the construction employment figures.

²⁸In the future, when compression would be required to move sufficient quantities of natural gas, operation and maintenance employment would be slightly higher. Compressor stations could be operated by remote control.

ENSTAR estimates that the operation of the local Fairbanks distribution company would require 50 full-time employees. We question, however, whether this would increase Fairbanks employment or merely "shuffle" workers between types of employment. Natural gas in Fairbanks would provide an alternative to diesel fuel. The natural gas distribution system would add employees reading natural gas meters but the diesel fuel distributors would lay off fuel truck drivers. The immediate, direct change in employment levels would result from differences in the labor- or capital-intensive nature of the fuel distribution systems. It is likely that natural gas distribution is less labor intensive because natural gas is "handled" less; the pipeline delivers fuel directly. The net effect could be a reduction in direct employment opportunities.

However, cost savings from natural gas use may stimulate local expenditures, thereby indirectly increasing employment opportunities and offsetting any distribution system employment reductions. Any expenditure of space heating annual savings out of the local community, however, would "leak" these potential indirect employment benefits. If the cost savings from natural gas are sufficient, there is also the potential that its availability could stimulate new economic growth in the basic sector.²⁹ Because natural gas is currently available in the southern Railbelt where energy and other costs are generally lower, most businesses are likely to locate in that area. Any basic sector expansion in Fairbanks that would be attributable to a reduction in energy costs would most likely have to be an opportunity unique to Fairbanks.

Weatherization Alternative

Based on information from Steve Grove, who has the state weatherization contract in the Fairbanks area, approximately 260 year-round full-time construction jobs would be required to weatherize the 22,000 unweatherized homes potentially served by the gas pipeline. These jobs would likely be spread over a two or three year period, e.g., 260 full-time jobs for 6 months over a two year period. This project would utilize locally available labor and building supplies.

²⁹Basic sector industries in Fairbanks include the University, military, mining, and oil refining. The support sector, in contrast, includes retail sales, banking, public utilities and other service providers.

Coal-Fired Power Generation Alternatives

During construction of the Healy project, the Usibelli Coal Mine projects a peak construction work force of about 300 people over a two to three year time period. They state that construction would utilize skills available in Alaska's current work force. Following construction of the cogeneration facility, Usibelli indicates that the project would create approximately 175 year-round jobs as follows:

Mine:	40 (Production and maintenance personnel)
Power Plant:	100 (Management, operators, and maintenance)
Coal Processor:	20 (Operators)
<u>Transportation:</u>	<u>15 (Alaska Railroad and export facilities)</u>
Total:	175

These estimates seem reasonable and, thus, we have not extensively analyzed them. The major difference between jobs generated by the coal drying cogeneration facility and the natural gas pipeline is that the coal facility is a basic sector expansion providing permanent employment opportunities. In addition, because these would be year-round, relatively high paying jobs, the indirect employment effects (or "multiplier" effects) would be greater than seasonal industries such as fishing or construction that tend to attract seasonal nonresident workers.

ENVIRONMENTAL EFFECTS

Pipeline Construction

The route selected for construction of the gasline from Wasilla to Fairbanks would provide the best construction conditions with the least environmental impact. The 305-mile route generally parallels the Parks Highway or Anchorage-Fairbanks intertie for all but about 60 miles. At the sections of the line that would not parallel existing roads, construction would occur in the winter over frozen ground, thus minimizing environmental impacts. Given the information available, it does not appear that construction of the pipeline poses significant environmental problems. The APA has contracted for a more extensive evaluation of the potential environmental impact of the pipeline's construction.

Air Quality

The burning of natural gas does not produce particulates or toxic or noxious by-products. Therefore, to the extent that natural gas replaces coal, wood, or fuel oil for space heating and electrical power generation, there would be an improvement in air quality. Because coal-fired power generating facilities are not currently planned to be converted, air quality improvements in the near term would be primarily from decreased fuel oil combustion. The burning of natural gas, however, would increase water vapor emissions by 17 to 54 percent over those generated by coal or oil combustion. This increased discharge of water vapor could increase ice fog when ambient conditions favor its production.

Analysts at the American Gas Association report that water vapor emissions decrease with increased efficiency of natural gas furnaces. Furnaces are rated by their Annual Fuel Utilization Efficiency (AFUE), a measure of overall seasonal performance. There are five general levels of efficiency depending on the sophistication of the equipment. Gas furnaces manufactured in 1986 had an average AFUE of 74 percent. The national appliance efficiency standard for furnaces will become effective in 1992 and require that all new furnaces have an AFUE of at least 78 percent. However, high-efficiency "condensing" furnaces with AFUE's above 90 percent are now available from virtually all manufacturers.³⁰ To extend the life of Cook Inlet natural gas supplies and alleviate potential ice fog problems in Fairbanks, the state may want to consider establishing a more rigorous gas furnace efficiency standard. Despite the potential ice fog problem, the Alaska Department of Environmental Conservation (DEC) believes that switching to natural gas for space heating would have a net positive effect on air quality in Fairbanks. The DEC can conduct an extensive analysis of air quality effects if requested.³¹

³⁰American Council for an Energy-Efficient Economy, "The Most Energy-Efficient Appliances," 1987 edition, Washington, D.C., p. 18.

³¹Larry Dietrick, Alaska Department of Environmental Conservation, Director, Division of Environmental Quality, personal communication, March 10, 1988.

Groundwater

Another benefit of switching from fuel oil to natural gas for space heating is the potential improvement in groundwater quality. In recent years, it has become increasingly evident in Alaska and nationwide that leaking fuel oil storage tanks are causing serious impacts on groundwater resources. In Fairbanks, the shallow water table magnifies the problem. Unless fuel oil storage tanks are required to be properly emptied and/or removed, however, natural gas conversion would do relatively little to mitigate the problem.

Natural gas conversion of coal electric power generation facilities has been cited as relieving water pollution from run-off at coal storage sites. Based on FMUS's decision to extend their coal contract for 10 years, they will be utilizing a \$3 million state grant to upgrade coal handling and storage facilities. In addition, \$5 million in municipal bond proceeds will be expended to upgrade three coal-fired generators and convert them to coal-diesel dual-fuel generators. Each of these projects will significantly improve environmental quality and lessen any future environmental benefits from converting coal facilities to natural gas.

THE HEALY COGENERATION PROJECT

Usibelli Coal Mine and Brown and Root U.S.A have proposed that a mine-mouth coal-fired power plant and coal drying facility be constructed at Healy. This project can supply inexpensive electrical power (without significant intertie upgrades) throughout the Railbelt well into the next century and will create an entirely new economic activity for Alaska.

PROJECT SUMMARY A state-of-the-art, fluidized bed combustion, coal-fired power plant will be built at Healy with an output capacity of between 100 and 150 MW. The plant would easily meet the stringent air-quality standards applicable to Class 1 airsheds. In addition to the clean and efficient combustion of coal to produce electricity for the Railbelt, the proposed plant would be the primary source of process heat for the coal drying. Thus the power plant would satisfy the requirements under federal law for a cogeneration facility.

The coal processing facility would launch an entirely new component of economic activity which would be key to the strong expansion of Alaska's coal mining sector, especially into export markets. Pacific-rim countries have demonstrated extreme reluctance to build plants designed uniquely for Alaska's typically high-moisture, low heat-value, sub-bituminous coal. If most of the moisture is removed from the coal in a facility such as proposed, then the resulting processed fuel can be burned in a wide spectrum of facilities.

EMPLOYMENT IMPACT The project will create a minimum of 175 direct, quality, year-round jobs which would be spread as follows:

Mine:	40 (Production and maintenance)
Power Plant:	100 (Management, operators & maintenance)
Coal Drying:	20 (Operators)
Transportation:	15 (ARR & port)

Total	175

The labor force would also grow through indirect jobs created in the economy at large as a result of the project. During construction the Healy project could employ a peak construction workforce of approximately 300, utilizing skills available in Alaska's present workforce. The power plant is being engineered according to modular design concepts developed by Brown & Root which will greatly reduce field construction time and correspondingly reduce the construction cost.

POWER NEEDS Prior to 1985, the electrical demand over the previous two decades had risen at an annual rate of approximately 9%. The utilities rationalize that demand over the next twenty years may only rise at an annual rate of 1% (C.E.A.). Thus the argument goes there is no need for additional capacity other than Bradley Lake Hydro until well beyond 2000. This is dangerous thinking, which could stymie Alaska's economic growth in the 1990's. It is our position that low cost power from Healy generation will be an important economic stimulus and that there will be healthy growth in the Railbelt economy during the 90's. Aging plants will be retired and new efficient generation will be needed. Remember too, that the Healy plant represents less than 10% addition to the current Railbelt capacity. After all, it was only a year or two ago when we were being persuaded that increments of several hundred megawatts from the aborted Susitna

Project would be needed.

PROJECT COSTS Based upon current engineering estimates, the cost of 150 MW plant at Healy would be \$233 million or \$1552 per installed KW of base load capacity. This compares with approximately \$8000 per installed KW of base load capacity for Bradley Lake. It is anticipated that the capital costs for a plant capable of putting out 500,000 short tons of product annually would be in the range of \$15-20 million. Overall project costs could amount to \$250 million, a figure which would reduce somewhat in the event that the power plant be reduced from 150 MW to 100 MW of rated capacity.

PROJECT FINANCING First cut estimates (based on market rate financing) indicated that power would have to sell at about 6 cents KW/hr at the bus-bar to yield an acceptable rate of return. (Railbelt utilities recently concluded an agreement to purchase power from Bradley Lake Hydroelectric for 6 1/2 cents per KWH.) This estimate can and will be refined downwards while maintaining an adequate rate of return on invested capital.

Enter the Railbelt Energy Fund and the opportunity to assign the principal of the Fund to collateralize a loan which could be made through and by the Alaska Industrial Development and Export Authority (AIDEA) to the Healy project. Under this plan the financial benefits to the project of a lower rate of interest on borrowed capital would be passed through entirely to the customer base - the Railbelt electrical power consumer - in the form of lower unit prices at the bus-bar. The effect of a lower than market or even zero interest rate on this project could be dramatic for the customer - perhaps reducing

the bus-bar cost of electricity to below 4 cents per KW/hr. Under this proposal the corpus of the R.E.F. would not be spent and eventually it could be made available for future projects.

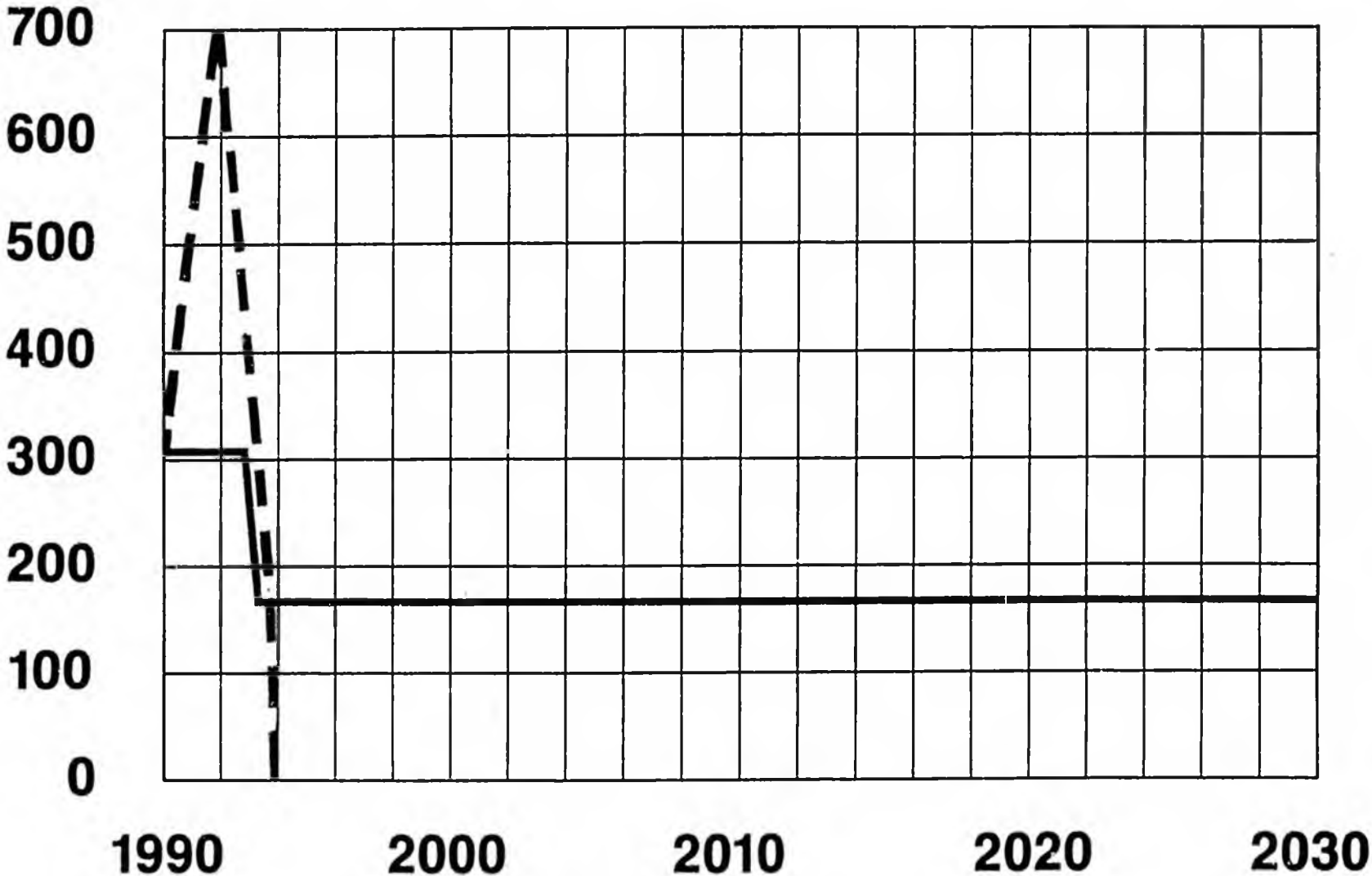
CONSIDER 1) The project is a high-tech innovative state-of-the-art development which would provide both short-term and long-term jobs for Alaskans while utilizing our most abundant energy resource - Coal.

2) Alaska would become a developing force in the energy export market. (Totally in keeping with Governor Cowper's vision of Alaska's economy and role in the future.)

3) This project would, outside the oil industry and Red Dog, be the largest single private sector development project in Alaska.

4) There are ways of utilizing the Railbelt Energy Fund without spending it. One way to put it to work is outlined in this statement.

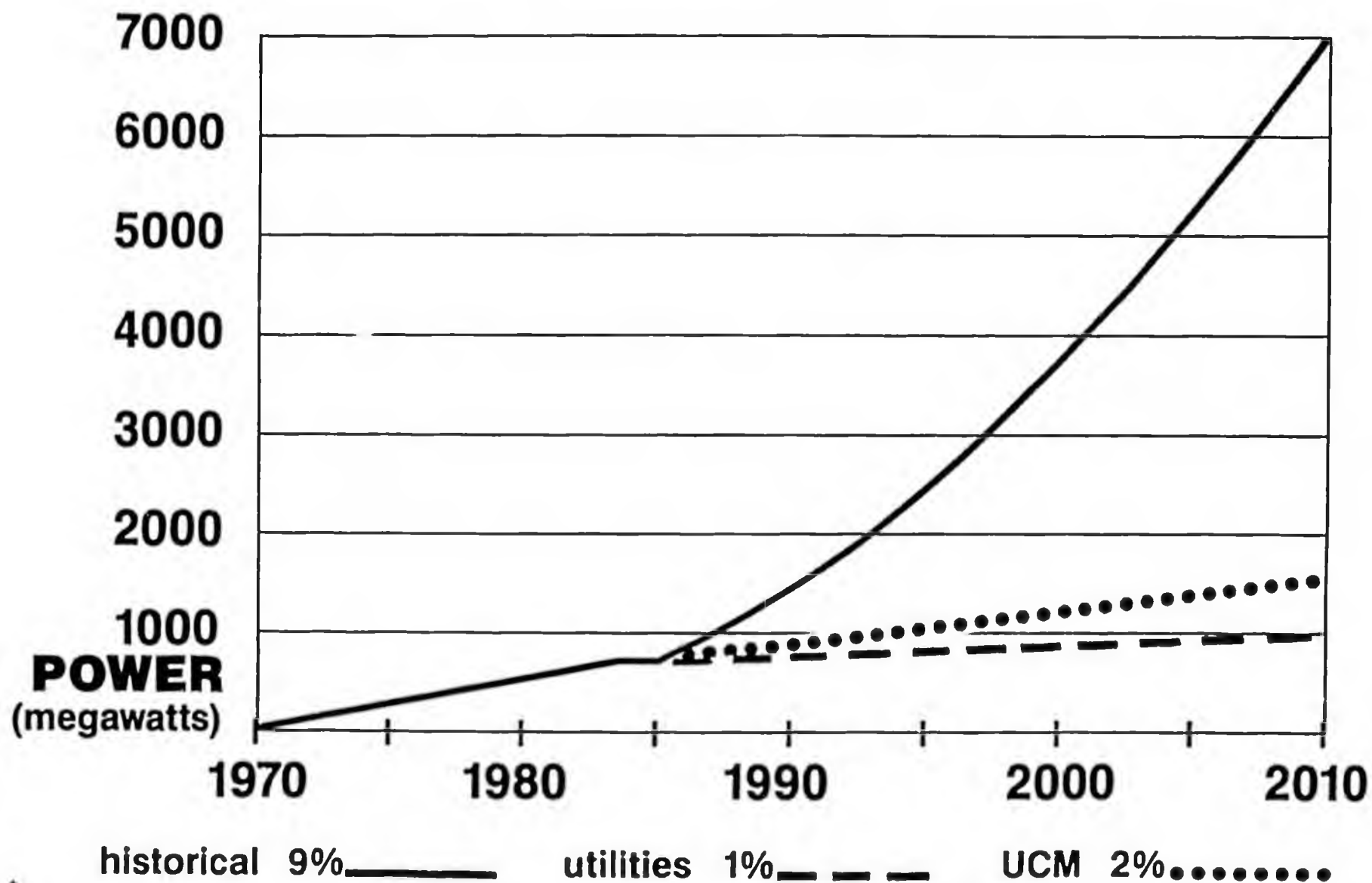
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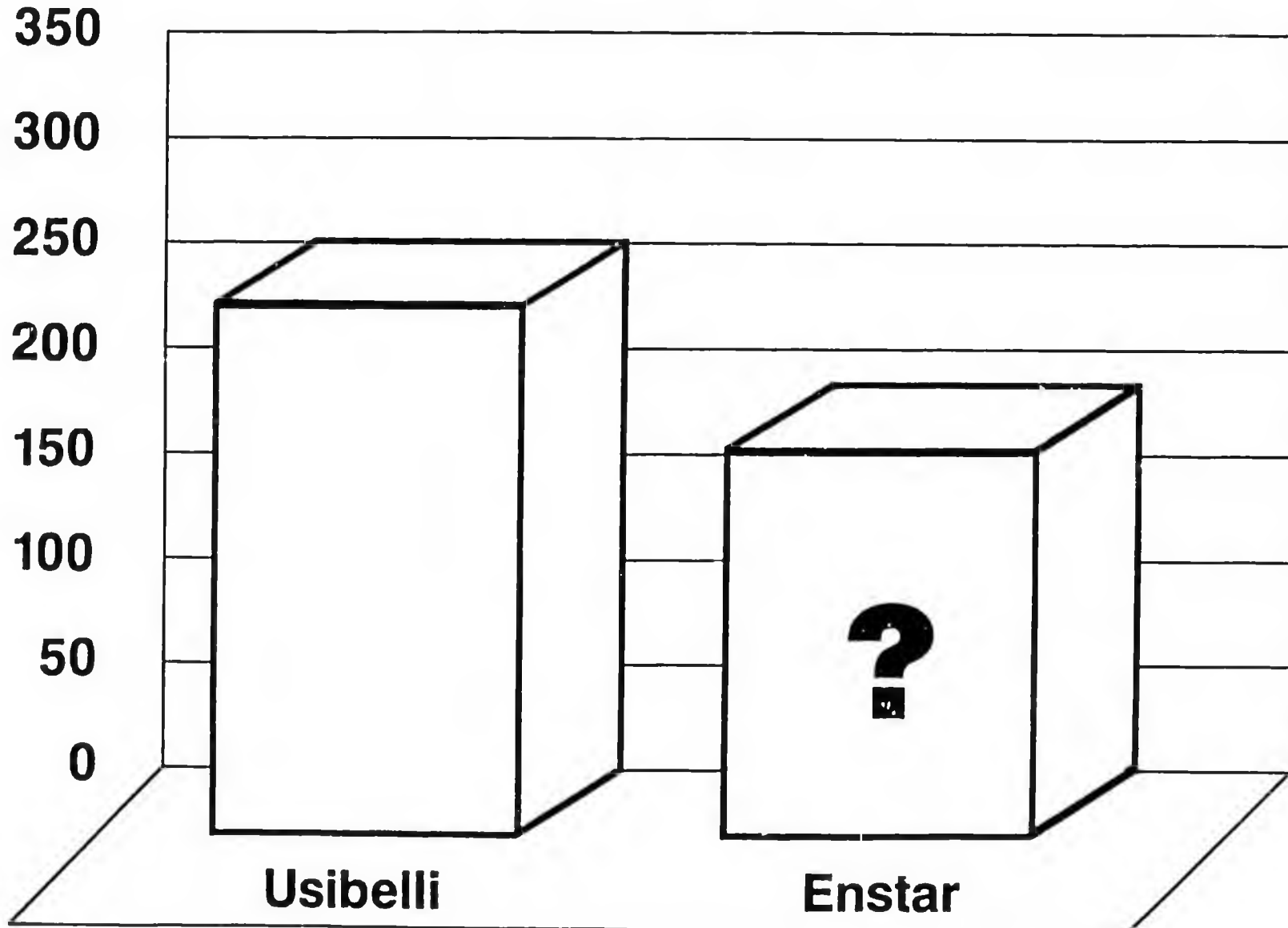
Enstar _ _ _ _

Railbelt Power Projections 1988-2010

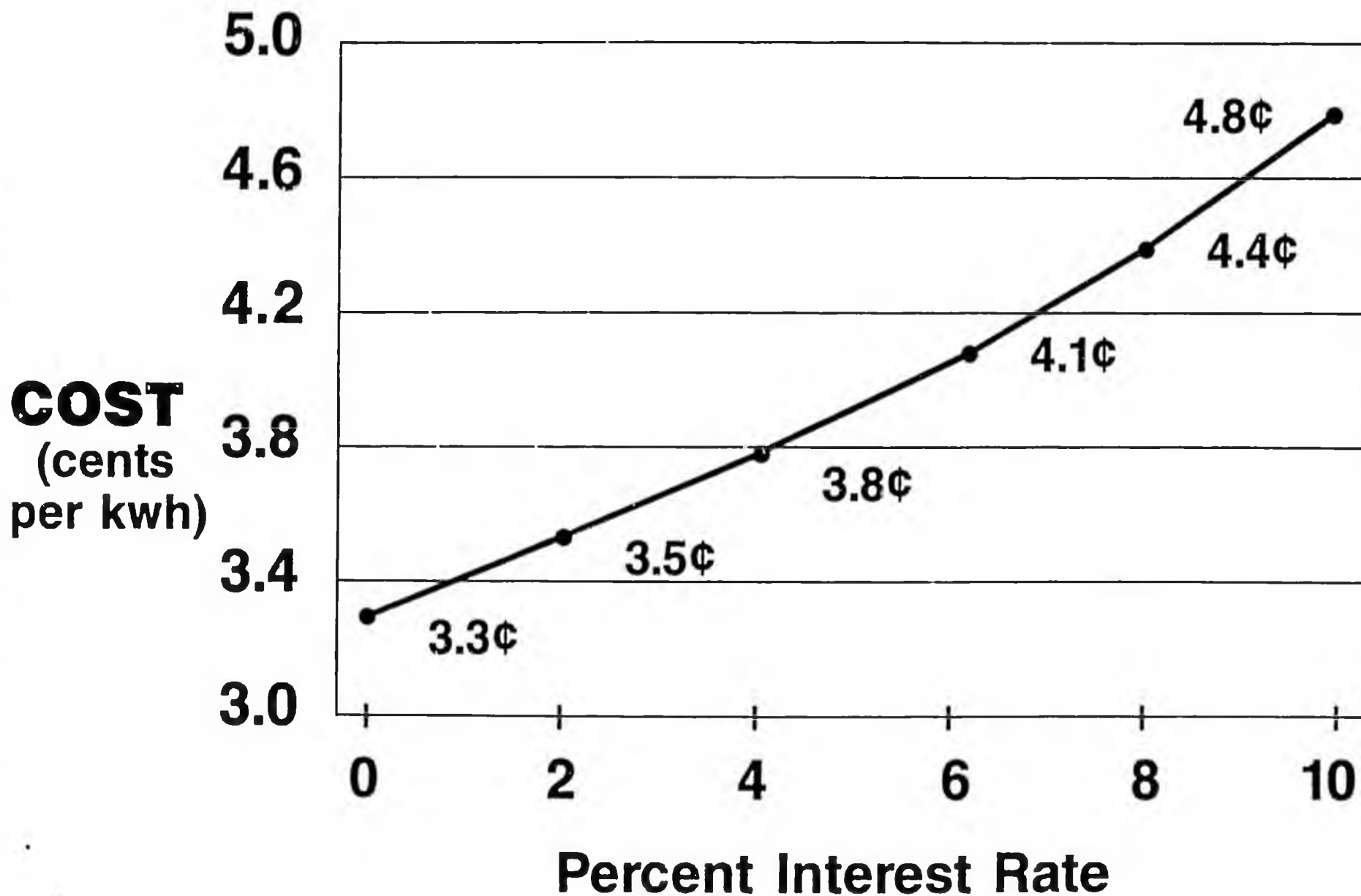


PROJECT COSTS

(in millions)



Power Cost Comparison



BEST PROJECTS FOR THE RAILBELT ENERGY FUND

By Richard F. Barnes

President

ENSTAR Natural Gas Company

It appears that most folks in Southcentral Alaska still believe that the Railbelt Energy Fund should be used as originally intended. That is, to construct energy projects in the Railbelt. The issue of which project or projects produce the most good for the money spent, remains to be decided.

To make a rational choice among competing proposals, it will be useful to decide how to judge and compare. The two best measures are probably those that financially touch the people: what will the project do for energy costs paid by the consumer, and what will it do for jobs? If there are more appropriate criteria, they certainly don't come to mind.

Four projects have been proposed that would require use of the Railbelt Energy Fund for financial feasibility. They include two intertie power transmission lines, a natural gas transmission pipeline, and a coal-fired electric power plant.

But only one project, the natural gas pipeline to Fairbanks, promises to significantly cut the cost of energy to Alaska's consumers. It also happens to be the project that will create the largest number of construction jobs, which are sorely needed in our troubled economy. The second-best proposal is the electric intertie transmission line that would connect the excess generation reserves on the Kenai Peninsula to the grid that serves Anchorage, the Mat-Su Valley, and communities to the north.

ENSTAR Natural Gas Company has proposed state construction of a 285-mile, 20-inch railbelt natural gas pipeline to connect the gas reserves of Cook Inlet with Fairbanks. ENSTAR now serves 79,000 customers from Kenai

to Wasilla, making it the largest public utility in the state. Construction of the state line would make low-cost natural gas available to a distribution system serving about two-thirds of the 70,000 residents of the North Star Borough. ENSTAR estimates that natural gas could be delivered in Fairbanks for about one-half the cost of fuel oil, the most widely used heating fuel in the area. Power plants in Fairbanks could both reduce fuel costs and help clean up air pollution produced in burning heavy oil and coal, by converting to gas.

Pipeline construction would employ 600-700 craft workers for over two years, while another 140 workers would be needed to construct the distribution system for an estimated 2-1/2 construction seasons. Installation and maintenance of gas equipment would provide additional employment opportunities.

The Railbelt Energy Council, made up of electric utility managers and legislators, recommended construction of two electric transmission projects known as interties. The southern intertie, which would move electricity from the Kenai Peninsula to the Anchorage grid, certainly has merit. This project, along with the Fritz Creek line, would make all of the excess electricity produced on the Kenai Peninsula available to the Anchorage grid. When the Bradley Lake hydro project is completed, peak power capability on the peninsula, about 227 megawatts (MW), will far exceed local demand plus transmission capability of the existing intertie to move excess power north. It would be a short-sighted decision to build Bradley Lake and not build the power line needed to bring its 90 MW peaking power to the large population centers of the state. The estimated cost of this project is \$90 million.

The second intertie project proposed by the Railbelt Energy Council would increase the electric transmission capability between Anchorage and Fairbanks. This northern intertie, estimated to cost \$118 million, would increase transfer capability from the existing 70 MW to over 350 MW. While this amount of transfer capability may be needed in the future, present peak demand in Fairbanks is for only about 100 MW. And for the majority of days during the year, the existing 70 MW line carries all of the electricity Fairbanks can use. Until demand for power grows in the interior city, only modest savings would accrue to customers of the Fairbanks electric utilities. If the railbelt natural gas

pipeline were constructed, Fairbanks generation plants could use Cook Inlet gas directly rather than move electricity from Anchorage. The gas pipeline would give virtually all of the benefits of the northern intertie to the electric utilities, while dramatically cutting the cost of heating for residential and commercial customers.

The fourth proposal comes from a joint venture of Usibelli Coal Company and Brown and Root. These two privately owned companies want to use the credit of the Railbelt Energy Fund to collateralize construction of a 100-150 MW coal-fired power plant near Healy. The plant would burn Usibelli's coal to produce power and also produce heat to dry the company's coal, making it more valuable for export sales to the far east. Plant construction would employ about 300 workers at peak, and employ a new work force at the power plant and mine. There are two major problems with the proposal, however. The electric utilities say they see no need for additional power plant construction for perhaps 15 years. There is unused generation capacity up and down the railbelt, already. The second problem is that the power produced by the coal plant would cost twice as much as using natural gas. And that cost would be carried on the back of the rate payers. Usibelli's proposal would require setting aside the entire Railbelt Energy Fund to guarantee the debt of this project. It would be a poor choice to pick a project that has a negative impact on the consumer while preempting construction of superior projects. Public utility regulations require that the benefits of projects such as state-funded pipelines or power lines flow to the consumer. On the other hand, financial benefits that would result at the coal operation would flow to the private owners.

Odds are high that a natural gas pipeline will be built past Fairbanks from the North Slope to either Valdez or the lower-48. When that time comes, the flow of the railbelt gas pipeline could be reversed to make royalty or producer gas available in the southcentral part of the state. This gas could be used to maintain existing chemical and LNG plants or to foster new industrial development. It would also serve as a long-term secure supply of gas for the power plants and domestic users around Cook Inlet.

In the meantime, a combination of projects that would include the southern intertie and the northern railbelt gas pipeline would truly bring value to

this area of the state. It would put people to work all the way from Homer to Fairbanks on energy projects that would last for several years. It would involve most all of the construction crafts, from electrical workers on the power line and Bradley Lake, plumbers and welders on the pipeline, and laborers, operating engineers, teamsters, surveyors and other crafts on all of the projects. And when the projects are finished, there will be immediate cost of living and cost of doing business benefits along the railbelt that will last for many generations in the future. The key is to pick the best projects and move forward. And if you consider the consumer, the gas pipeline project is the best of all.

Prepared by: Administration



CITY OF WASILLA

290 E. HERNING AVE.
WASILLA, ALASKA 99687
PHONE: 373-9050

RESOLUTION NO. WR88-04

A RESOLUTION OF THE CITY OF WASILLA PERTAINING TO USE OF THE RAILBELT ENERGY FUND TO BUILD A NATURAL GAS PIPELINE FROM THE MATANUSKA-SUSITNA VALLEY TO FAIRBANKS.

WHEREAS, the Alaska State Legislature has appropriated \$228 million dollars to increase the availability and reduce the long term cost of energy to cities and communities served by the Alaska Railroad; and

WHEREAS, Cook Inlet producers estimate there is a 30 year supply of known gas reserves which, if delivered to Fairbanks, could reduce heating cost by approximately 50%; and

WHEREAS, Construction of the proposed natural gas line would provide needed economic stimulation and would employ 600-700 craft workers for about two years; and

WHEREAS, the proposal to construct a gas pipeline to meet long term energy needs for railbelt communities has many advantages over construction of an electrical intertie, including the future potential of carrying North Slope natural gas to Cook Inlet.

THEREFORE, BE IT RESOLVED THAT, the Wasilla City Council urges the Governor and the Legislature of the State of Alaska to make the Railbelt Energy Fund available for the purposes of constructing a natural gas pipeline from Cook Inlet to Fairbanks.

I certify that a resolution in substantially the above form was passed by a majority of those voting at a duly called and conducted meeting of the governing body of the City of Wasilla this 14th day of March, 1988.

APPROVED:

JOHN C. STEIN, Mayor

ATTEST:

Erling P. Nelson, C.M.C.
City Clerk

Opinion

• 4—Fairbanks Daily News-Miner, Fairbanks, Alaska

Monday, March 14, 1988

Gas line the best of 4 Railbelt proposals

By RICHARD F. BARNES

It appears that most folks in Southcentral Alaska still believe that the Railbelt Energy Fund should be used as originally intended. That is, to construct energy projects in the Railbelt. The issue of which project or projects produce the most good for the money spent, remains to be decided.

To make a rational choice among competing proposals, it will be useful to decide how to judge and compare. The two best measures are probably those that financially touch the people: What will the project do for energy costs paid by the consumer, and what will it do for jobs?

Four projects have been proposed that would require use of the Railbelt Energy Fund for financial feasibility. They include two intertie power transmission lines, a natural gas transmission pipeline, and a coal-fired electric power plant.

But only one project, the natural gas pipeline to Fairbanks, promises to significantly cut the cost of energy to Alaska's consumers. It also happens to be the project that will create the largest number of construction jobs, which are sorely needed in our troubled economy. The second-best proposal is the

Guest Opinion

electric intertie transmission line that would connect the excess generation reserves on the Kenai Peninsula to the grid that serves Anchorage, the Mat-Su Valley, and communities to the north.

Enstar Natural Gas Co. has proposed state construction of a 285-mile, 20-inch Railbelt natural gas pipeline to connect the gas reserves of Cook Inlet with Fairbanks. Enstar now serves 79,000 customers from Kenai to Wasilla, making it the largest public utility in the state. Construction of the state line would make low-cost natural gas available to a distribution system serving about two-thirds of the 70,000 residents of the North Star Borough. Enstar estimates that natural gas could be delivered in Fairbanks for about one-half the cost of fuel oil, the most widely used heating fuel in the area. Power plants in Fairbanks could both reduce fuel costs and help clean up air pollution produced in burning heavy oil and coal, by converting to gas.

Pipeline construction would employ 600-700 craft workers for over

two years, while another 140 workers would be needed to construct the distribution system for an estimated 2½ construction seasons. Installation and maintenance of gas equipment would provide additional employment opportunities.

The Railbelt Energy Council, made up of electric utility managers and legislators, recommended construction of two electric transmission projects known as interties. The southern intertie, which would move electricity from the Kenai Peninsula to the Anchorage grid, certainly has merit. This project, along with the Fritz Creek line, would make all of the excess electricity produced on the Kenai Peninsula available to the Anchorage grid. When the Bradley Lake hydro project is completed, peak power capability on the peninsula, about 227 megawatts, will far exceed local demand plus transmission capability of the existing intertie to move excess power north. It would be a short-sighted decision to build Bradley Lake and not build the power line needed to bring its 90 MW peaking power to the large population centers of the state. The estimated cost of this project is \$90 million.

The second intertie project proposed by the Railbelt Energy Council

would increase the electric transmission capability between Anchorage and Fairbanks. This northern intertie, estimated to cost \$118 million, would increase transfer capability from the existing 70 MW to over 350 MW. While this amount of transfer capability may be needed in the future, present peak demand in Fairbanks is for only about 100 MW. And for the majority of days during the year, the existing 70 MW line carries all of the electricity Fairbanks can use. Until demand for power grows in the Interior city, only modest savings would accrue to customers of the Fairbanks electric utilities. If the Railbelt natural gas pipeline were constructed, Fairbanks generation plants could use Cook Inlet gas directly rather than move electricity from Anchorage.

The fourth proposal comes from a joint venture of Usibelli Coal Co. and Brown and Root. These two privately owned companies want to use the credit of the Railbelt Energy Fund to collateralize construction of a 100-150 MW coal-fired power plant near Healy. The plant would burn Usibelli's coal to produce power and also produce heat to dry the company's coal, making it more valuable for export sales to the far east. Plant construction

would employ about 300 workers at peak, and employ a new work force at the power plant and mine.

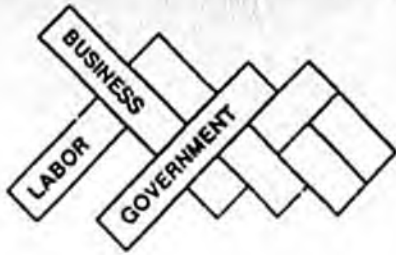
There are two major problems with the proposal, however. The electric utilities say they see no need for additional power plant construction for perhaps 15 years. There is unused generation capability up and down the Railbelt, already. The second problem is that the power produced by the coal plant would cost twice as much as using natural gas. And that cost would be carried on the back of the rate payers.

Odds are high that a natural gas pipeline will be built past Fairbanks from the North Slope to either Valdez or the Lower 48. When that time comes, the flow of the Railbelt gas pipeline could be reversed to make royalty or produce gas available in the south-central part of the state.

In the meantime, a combination of projects that would include the southern intertie and the northern Railbelt gas pipeline would truly bring value to this area of the state.

The key is to pick the best projects and move forward. And if you consider the consumer, the gas pipeline project is the best of all.

Richard F. Barnes is president of Enstar Natural Gas Co.



UNIFIED FAIRBANKS

UNIFIED FAIRBANKS RAILBELT GAS PIPELINE RESOLUTION

WHEREAS, the legislature has established the Railbelt Energy Fund for the purpose of reducing the cost of energy for communities along the railbelt;

WHEREAS, ENSTAR Natural Gas Company has proposed that a State owned, 20" gas pipeline be built from Cook Inlet to Fairbanks for the purpose of transmitting Cook Inlet gas to Fairbanks and other communities along the Railbelt;

WHEREAS, legislation has been introduced in the Alaska State Senate authorizing construction of the gas pipeline;

WHEREAS, the proposed gas pipeline will purportedly deliver natural gas for heating to Fairbanks consumers at approximately one-half of the current heating costs;

WHEREAS, lower fuel costs would reduce the cost of power generation by local utilities;

WHEREAS, natural gas would help alleviate emission problems presently hampering our downtown power plant;

WHEREAS, lower fuel costs would make it more attractive for energy intensive businesses to locate in Fairbanks;

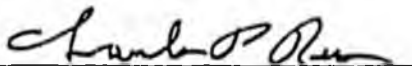
WHEREAS, although some local businesses would be adversely affected by the gas pipeline, lower fuel prices would benefit the community as a whole;

THEREFORE, BE IT RESOLVED that based on currently available information, Unified Fairbanks supports the legislation authorizing the construction of the Railbelt Gas Pipeline contingent on documentation of the projected net benefits to our community.

BE IT FURTHER RESOLVED that Unified Fairbanks also urges the Alaska State Legislature to press for the completion of all Railbelt Energy Fund studies prior to the start of the 1989 legislative session.

This Resolution was passed by Unified Fairbanks on February 24, 1988.

UNIFIED FAIRBANKS


Charles P. Rees, President

CPR:mc:UFMN2:RESOLUTION