

# A guide to Alaska natural gas projects

Ideas for moving Prudhoe Bay's natural gas bounty off Alaska's North Slope are as plentiful as cottonwood seed in the June air.

Some are modest: Truck small amounts of gas to Fairbanks consumers.

Some are epic: Pipe massive amounts to a Southcentral Alaska liquefied natural gas plant for LNG shipments to Asia – the most expensive North American private-sector construction project ever.

Some are pinned to visions of an Alaska energy utopia, where gas for local use is plentiful and relatively cheap, the oil and gas industry develops new fields by the dozen, the state treasury overflows with wealth, and new industries sprout from the earth like wild lupine.

Some are backed by tens or even hundreds of millions of state dollars to help design, engineer and otherwise prepare for construction. These include the big producer-led LNG project, a much more modest state-led pipeline to Southcentral Alaska and the Fairbanks trucked-LNG project.

Some are little more than a concept looking to catch on.

The great North Slope oil discoveries of the 1960s and 1970s also found an estimated 35 trillion cubic feet of natural gas – almost one and a half times the entire volume of U.S. production in 2012. The U.S. Geological Survey estimates an additional 221 trillion cubic feet await discovery in Alaska's Arctic, onshore and offshore. If

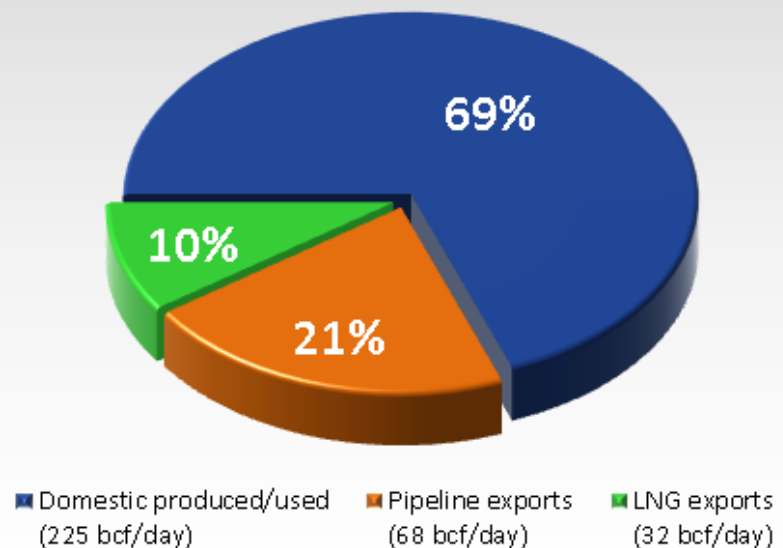
only an economically viable way could be found to move the gas to consumers.

Below we summarize several proposals – big and small – for transporting natural gas from Alaska's North Slope.

## LNG export project

This would involve an approximately 800-mile mostly buried pipeline from the Prudhoe Bay field on Alaska's North Slope to Southcentral Alaska, possibly Valdez, possibly Nikiski, or somewhere else along Cook Inlet or Prince William Sound. At the port, a plant would chill the gas to minus 260 degrees to create liquefied natural gas, or LNG, a compressed form of the gas that can be shipped on insulated tankers to markets worldwide.

2012 worldwide gas production, exports



Source: BP

The 42-inch-diameter pipeline under consideration by the major North Slope producers would carry 3 billion to 3.5 billion cubic feet of natural gas per day. Alaskans would use some of this gas, and running the pipeline and LNG plant would consume some. The plant would make 15 million to 18 million metric tons a year of LNG, the equivalent of 2 billion to 2.4 billion cubic feet a day of gas. That would place it among the world's largest LNG plants.

Project Information	
<b>Sponsors:</b>	ExxonMobil/BP/ConocoPhillips/TransCanada
<b>Estimated cost:</b>	\$45 billion to \$65 billion (2012 dollars)
<b>Route:</b>	Parallel the trans-Alaska oil pipeline from Prudhoe Bay to the Fairbanks area. The route then could continue parallel to the oil pipeline to Valdez or possibly head to Nikiski or somewhere else in Cook Inlet. A large-scale gas liquefaction plant would be built at the tidewater location.
<b>Gas for Alaskans:</b>	The oil companies/TransCanada project would provide at least five points in Alaska from which spur pipelines could be built.
<b>Status:</b>	The oil companies/TransCanada are assessing the viability of an LNG export project.

### Sponsors

Three separate groups are discussing such an LNG export project.

- 1) ExxonMobil, ConocoPhillips and BP, the main North Slope producers, plus pipeline company TransCanada, in March 2012 said they are considering a project to export LNG to Asia, where the gas currently can fetch a much higher price than in North America. They are in the early stages of considering this option.

Two of the sponsors – ExxonMobil and TransCanada – in 2010 proposed to build a 48-inch buried pipeline to Valdez, with someone else constructing and operating an LNG plant there. They found insufficient customer interest at that time to pursue the project. But the global LNG market has changed since then, and they have taken up the new LNG effort with ConocoPhillips and BP.

- 2) A Japanese company called Resources Energy Inc. is proposing an LNG plant in Southcentral Alaska that could start up in 2019 or 2020 and eventually produce 15 million to 20 million metric tons a year. The company was formed in late 2011 by Japan's Hyogo Prefecture, a regional government, as well as other business interests and several

small Japanese utilities affected by that nation's nuclear power plant shutdowns following an earthquake and tsunami that year.

REI said it completed feasibility studies in spring 2013 that cost \$10 million to \$20 million and verified its concept will work for supplying lower-cost LNG to Japanese utilities. REI would rely on others to produce the natural gas and build a pipeline from the North Slope to its plant. REI said it is working to find investors in its idea.

- 3) The Alaska Gasline Port Authority has proposed a government-owned Valdez LNG project. The port authority was formed in the late 1990s and is a joint venture of the Fairbanks North Star Borough and Valdez, two local governments along the pipeline route.

In 2013, the U.S. Department of Energy dismissed the port authority's application to export about 19 million metric tons of LNG annually from Valdez. In its letter, the department said the port authority had no natural gas under contract, no pipeline and no leased or committed site for an LNG plant. The port authority then issued a press release saying: "We will continue to work with the Department of Energy on our export license application to satisfy the issues raised in its letter."

### Estimated cost

\$45 billion to more than \$65 billion (2012 dollars) for the producer-led project.

ExxonMobil, ConocoPhillips, BP and TransCanada say their cost estimate would cover a pipeline from the Point Thomson gas field to Prudhoe Bay, a massive gas treatment plant at Prudhoe Bay, the roughly 800-mile pipeline to tidewater and compressor stations along the way, a liquefaction plant at a Southcentral Alaska site to be determined, LNG storage tanks and a tanker terminal.

REI estimates the cost of its LNG plant and shipping terminal at \$20 billion to \$24 billion. Including a North Slope gas treatment plant and pipeline would bring total development costs to \$38 billion to \$45 billion, REI says, though it would prefer that someone else take the lead on those pieces.

The port authority has no recent cost estimates for its concept.



Source: SCLNG

**A coastal Alaska LNG-export plant could look something like this illustration, provided by the South Central LNG project sponsors: ExxonMobil, BP, ConocoPhillips and TransCanada.**

## Gas for Alaskans

The pipeline concept pursued by the oil producers and TransCanada would provide at least five points from which spur lines could be built to provide gas to Alaskans. This project involves only providing gas-takeoff points, not building the spur lines or local distribution pipelines, which would be up to the state, utilities or private companies.

REI says gas could be taken for local use, but it does not propose any in-state distribution role for itself.

The Alaska Gasline Port Authority says under its proposal gas could be taken from the pipeline at Fairbanks and that a spur line from Glennallen could provide gas to Southcentral Alaska.

## Status

The North Slope producers and TransCanada are studying the commercial feasibility and preliminary design. TransCanada, on behalf of the project sponsors, conducted a non-binding solicitation of interest Aug. 31 through Sept. 14, 2012, among producers, shippers, buyers and others in a possible LNG export project as well as a pipeline to North

American markets. TransCanada said it received interest from potential shippers and “major players from a broad range of industry sectors and geographic locations,” including North America and Asia. It did not disclose further details.

Under terms of the state's Alaska Gasline Inducement Act license issued to TransCanada in 2008 and later amended, the state will reimburse the effort for 90 percent of early development work on the new LNG option. The state has not given the venture a deadline for filing to obtain government permits and other approvals for the LNG project.

The four companies said they expect to have spent \$80 million to \$100 million on the LNG effort from spring 2012 to the end of

2013. Their limited 2013 field season includes work on the northern half of the proposed pipeline route to improve their data on fisheries, stream hydrology, water resources, wetlands mapping and other information they would need to apply for project permits. The team has volumes of other route information gathered in earlier, unsuccessful gas line efforts by the same sponsors.

In late 2012, the companies estimated they would need at least three to five more years for a variety of activities in advance of a final investment decision to build the project. These activities include completing design and engineering; obtaining government permits; assessing and confirming the project's commercial viability; and negotiating fiscal terms with Alaska state government. After a decision to build, construction would take five to six years, they estimated.

REI believes it needs to start producing LNG by 2019 or 2020 to get to market before potential competing export projects elsewhere in the world. REI also says it hopes to deliver gas to Japan at under \$10 per million Btu – far below current spot-market prices in Asia. REI says it brings gas buyers to the deal. The CEO in spring

2013 said the next step will involve assembling a coalition of Japanese investors to spend \$50 million to \$100 million on liquefaction plant engineering. To meet the 2019/2020 schedule, REI will need someone else to move quickly on the pipeline and North Slope gas treatment plant.

The port authority continues to tout the LNG export idea in speeches, op-ed columns and interviews.

## Pluses

- Short-term economic boost to Alaska during construction.
- With the right project economics, long-term boost as billions of dollars in revenue flows to the state treasury, the Alaska Permanent Fund and local governments along the pipeline route.
- Southcentral Alaska gets new industry based on LNG exports.
- Outlet for natural gas now stranded on Alaska's North Slope would spur oil and gas exploration.
- Relatively inexpensive gas made available for heating and power generation in the Fairbanks area.
- For Southcentral Alaska, the project likely provides a new, affordable source of natural gas to supplement Cook Inlet's declining supplies.

## Problems

- A very expensive option. High cost makes project risky for lenders that would supply construction financing.
- Federal loan guarantees from 2004 legislation are available only for a pipeline project that delivers gas to the Lower 48, not projects that would export gas. Lack of federal backing would raise borrowing costs.
- Shippers must sign long-term commitments to use the pipeline and liquefaction plant (perhaps 15 or 20 years) and find long-term buyers for the gas in an Asia-Pacific LNG market that other exporters are targeting. Long-term contracts are needed to underpin financing.
- Intense competition among LNG suppliers for Asia customers and prospects of weaker prices due to a buyers' market in the years ahead.

- North Slope producers want state of Alaska to set stable fiscal terms for gas production and the pipeline project. The politics of a fiscal deal could be contentious in Alaska.
- Some Alaskans are frustrated about subsidizing early development costs for an uncertain project.
- Fairbanks-area energy costs remain relatively high until pipeline is running.
- Southcentral Alaska could need supplemental source of natural gas before pipeline is finished.

## Pipeline to Alberta

This proposal was active until 2012; considerable work was completed in the preceding years.

The project conceived an approximately 1,700-mile, 48-inch buried pipeline from the Prudhoe Bay field on Alaska's North Slope to the British Columbia-Alberta border in Canada. From there, the gas could flow to the Lower 48 via an extensive network of existing pipelines.

The gas pipeline would run parallel the trans-Alaska oil pipeline from Prudhoe Bay to Delta Junction, then continue into Canada roughly parallel to the Alaska Highway. The pipeline would move up to 4.5 billion cubic feet of gas per day.

## Estimated cost

\$32 billion to \$41 billion (2009 dollars).

## Sponsor

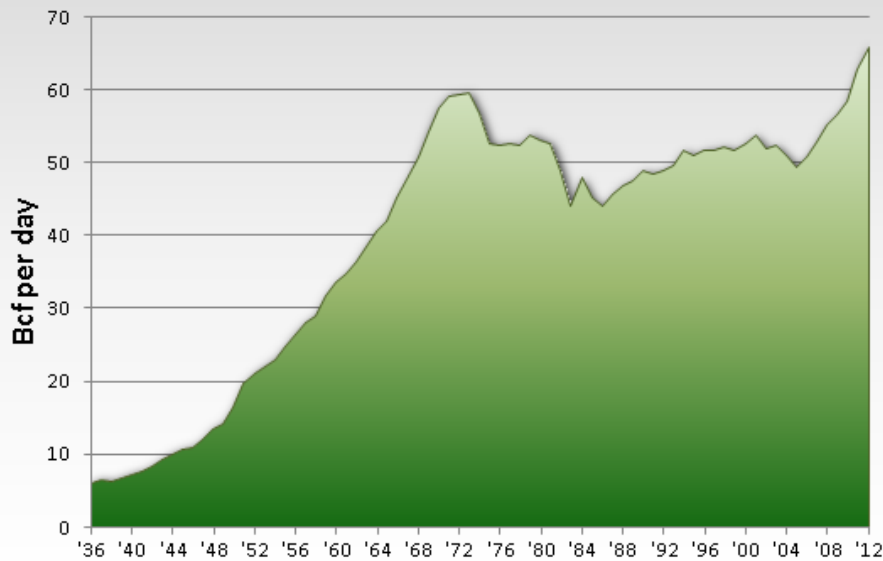
The Alaska Pipeline Project, a partnership of TransCanada and ExxonMobil. The team now is planning the pipeline portion of the North Slope producer-led LNG export project discussed above.

## Status

On hold, as North American shale-gas production has amply supplied the market and deflated prices.

The Alaska Pipeline Project spent more than \$300 million from the project onset through 2011. The sponsor put the project on hold in early 2012. Under the Alaska Gasline Inducement Act, the state is obligated to reimburse TransCanada for up to \$500 million of its pre-construction costs. With TransCanada

## U.S. dry gas production, 1936-2012



Source: U.S. Energy Information Administration

The pipeline would move up to 500 million cubic feet of gas per day. The project also is known as the "bullet line," the in-state line and the Alaska Stand Alone Pipeline, or ASAP.

### Sponsor

Alaska Gasline Development Corp., a state agency the Legislature created in 2010. Some supporters say the state-led effort is a backup if the larger producer-led project stalls. Other supporters see it as the state controlling its energy future, rather than waiting for the major oil and gas producers to act.

and ExxonMobil now considering LNG exports, the remaining balance of state reimbursements is available for eligible costs associated with that project.

In January 2012, the sponsor filed with the Federal Energy Regulatory Commission volumes of data on fish, wildlife, soils, vegetation, cultural sites, air quality and other information that can be used for the environmental impact statement FERC would prepare. Much of that data also could be used for an EIS on the LNG-project pipeline, because some of the route in Alaska would be same as the route for an Alberta line.

## Pipeline to Southcentral

A 737-mile, 36-inch buried pipeline from the Prudhoe Bay field on Alaska's North Slope to the Big Lake area north of Anchorage. From there, the gas could flow to consumers, utilities and other industry via the local distribution pipelines of ENSTAR Natural Gas Co. The pipeline also would supply the Fairbanks area.

The line would parallel the trans-Alaska oil pipeline from Prudhoe Bay to just north of Fairbanks, then continue south to Big Lake, roughly parallel to the Parks Highway.

### Estimated cost

\$5.4 billion to \$10 billion (2012 dollars). Sponsor is using midpoint of \$7.7 billion as a working number.

The cost includes a gas treatment plant at the Prudhoe Bay field to remove propane, butane and other gas liquids as well as water, carbon dioxide and other impurities from the gas, then compress the gas before it enters the pipeline. The cost also includes a separate 35-mile spur line between the main pipeline and Fairbanks.

Project cost does not include a local gas distribution network needed for Fairbanks. The local gas pipeline network already exists in much of Southcentral.

### Gas for Alaskans

Gas for Alaskans was the main idea when the state Legislature funded a feasibility study in 2010.

### Status

The feasibility study issued in July 2011 provided a preliminary plan. In 2013, the Alaska Legislature appropriated about \$355 million to continue design, permitting and commercial work. That's in addition to \$72 million in funding for 2010-2012. The Legislature in 2013 also granted the state gas pipeline corporation unlimited authority to issue bonds to pay for construction, with the restriction that the state is not



legally or morally responsible for the debt. Bond buyers would be repaid from revenue collected from the pipeline's customers, including utilities and large commercial customers.

### Proposed timeline

2013-2015 – Project sponsor sharpens engineering and cost estimate, obtains permits.

Early 2015 – Customers solicited to ship gas on the pipeline, called an “open season.” Customer response will help determine the project’s economic viability.

Early 2016 – Final decision on whether to build project.

2016-2019 – Construction.

Late 2019 – First gas flows to Fairbanks; 2020 gas flows to Southcentral Alaska.

### Pluses

- Short-term economic boost to Alaska during construction of multibillion-dollar project.
- The project could deliver gas to Fairbanks and Southcentral before a larger pipeline to an LNG plant in Southcentral Alaska.
- Assuming the pipeline operates at full capacity and preliminary construction-cost estimates hold true, Alaska's Railbelt consumers could be assured of an affordable gas supply for decades. In Southcentral Alaska, the gas could supplement Cook Inlet supplies used for heating and power generation. Delivering natural gas to Fairbanks could greatly lower that community's high cost of energy.
- The project might help resurrect the Kenai Peninsula LNG plant that exported gas from 1969 through 2012. It then shut down due to a lack of Cook Inlet gas supply.

Project Information
<b>Sponsor:</b> Alaska Gasline
<b>Estimated cost:</b> \$5.4 billion to
<b>Route:</b> Parallel the trans-Alaska oil pipeline from Prudhoe Bay to just north of Fairbanks, then continue south to Big Lake, roughly parallel to the Parks Highway.
<b>Gas for Alaskans:</b> That is the main purpose of this proposal. Pipeline would supply Fairbanks and Southcentral.
<b>Status:</b> Design, permitting work under way. Decision on building

### Problems

- Requires the state gas line corporation to issue billions of dollars in revenue bonds for construction, and could need direct state funding if the pipeline lacks enough customers to carry the full cost. The state Legislature would need to approve direct financial aid.
- The construction cost estimate is soft until more engineering work is done. A much higher cost than the midpoint \$7.7 billion estimate would alter the project economics.
- Requires major gas shippers to make long-term commitments to use the pipeline.
- The project would produce far less state revenue than a larger pipeline for an LNG export project due to the small volume of gas moved.
- Requires the state to bear all of the pre-construction cost because no private developer will do so.
- The cost of gas to Alaskans would be higher than gas from the larger LNG export project.
- The project would not spark as much Arctic oil and gas exploration as the bigger pipeline.
- The project relies on assumptions about customer demand that must come true to meet the pipeline rates and consumer prices predicted for the project. These include:
  - 1) A major mine, such as the Donlin gold prospect in Western Alaska, will start up by 2019 and contract for a significant volume of gas down the line.
  - 2) A utility or utilities will build a local gas distribution pipeline network in Fairbanks by the time the pipeline from Prudhoe Bay is ready.
  - 3) Cook Inlet gas production will fall to such a point that power plants and the local gas utility in Southcentral Alaska will consume a lot of North Slope gas.
  - 4) A revived liquefied natural gas export plant on the Kenai Peninsula or other large-volume industrial customer(s) will contract for much of the pipeline’s capacity.

## Cook Inlet gas

Out of concern that aging Cook Inlet fields might not produce enough gas for local needs after doing so for nearly 50 years, two Anchorage electric utilities and a gas utility in 2011 jointly began considering the idea of importing liquefied natural gas or compressed natural gas to Southcentral Alaska. Other utilities soon joined the effort. In particular, the utilities were concerned they didn't have enough gas supply under contract for coming years.

Since then, their sense of urgency has eased somewhat as Cook Inlet producers are stepping forward to offer increased gas production to cover the next several years.

Also, in June 2011 the U.S. Geological Survey estimated the Cook Inlet region still holds an estimated 19 trillion cubic feet of natural gas that could be produced using current technology.

That's about double the total Cook Inlet gas production over the past 50 years. But how much of the gas could be produced *profitably* with current technology likely is a much smaller number, possibly as little as 10 percent.

Separately in June 2011, the Alaska Division of Oil and Gas estimated that Cook Inlet alone could continue to profitably supply all of the region's natural gas needs until 2018-2020, at which time supplemental supplies would be needed. The study said the gas industry must continue investing in the Inlet for this prediction to hold.

The state Legislature in recent years has approved incentives to boost Cook Inlet gas exploration and production.

New players include Furie Operating Alaska, which moved a jack-up rig to Cook Inlet and is drilling, Buccaneer Energy, which has a stake in a different jack-up rig partly owned by the state, and Hilcorp, which acquired Chevron and Marathon's holdings in Cook Inlet and boosted development spending for oil and gas production. Hilcorp alone has said it expects to supply local utility gas needs through at least 2017 and has a pending contract to supply one utility into 2018.

In 2010, state lawmakers passed tax credits and other incentives to encourage development of an underground gas storage facility on the Kenai

Peninsula. The goal was to help utilities meet peak winter demand by storing surplus spring-and-summer production. Such a storage site opened in 2012.

## Gas to Fairbanks by truck or pipe

Ideas have been floated for getting North Slope natural gas to the Fairbanks area, where energy costs are much higher than in Southcentral Alaska and only a little natural gas is available, via truck deliveries from a privately owned LNG plant north of Anchorage.

### LNG trucked to Fairbanks area

In 2013, the Alaska Legislature approved a \$333 million cash-and-loan package requested by Gov. Sean Parnell for a small North Slope LNG plant as well as storage and distribution infrastructure in the state's Interior. A year earlier, state lawmakers approved \$30 million in tax credits for the LNG storage tanks the Fairbanks area would need to receive trucked deliveries.

With about \$70 million of private money added, the Interior Energy Project, as the state named it, could total \$430 million or so. This total would include building gas distribution pipelines in a limited area of the Fairbanks region; the state estimates expanding the grid could cost an additional \$200 million.

At the center of the funding is the Alaska Industrial Development and Export Authority, a state agency that supports economic development.

AIDEA would use the 2013 \$57.5 million cash appropriation for an equity stake in the LNG plant and perhaps other aspects of the project. AIDEA also is authorized to lend \$125 million at a low interest rate and issue on the open market \$150 million in other low-interest debt to raise money for the project.

#### Project Information

**Sponsor:** Alaska Industrial Development and Export Authority

**Estimated cost:** \$433 million

**Route:** Trucks would transport the LNG down the Dalton Highway from Prudhoe Bay to the Fairbanks area.

**Gas for Alaskans:** This project would bring gas only to the Fairbanks area initially.

**Status:** \$363 million state cash-and-loan package available. AIDEA is soliciting for private investor / operator(s).

The plan is for a private operator or operators to:

- Build the small gas liquefaction plant on the North Slope.
- Own and operate a fleet of LNG delivery trucks running between the plant and Fairbanks. The trucks were not included in the project's cost estimate.
- Build and operate aboveground LNG storage tanks.
- Build and operate "regasification" equipment to warm the gas back into a vapor and feed it into a distribution grid for delivery to residences and businesses around Fairbanks.

The LNG plant would be designed to process up to 9 billion cubic feet of gas a year — averaging 25 million cubic feet a day — slightly more than the forecasted Fairbanks-area demand 10 years after start-up (capacity would be greater than demand to accommodate seasonal swings in demand, AIDEA says).

Potential customers include Golden Valley Electric Association, the Fairbanks-area electrical utility; Flint Hills Resources, owner/operator of a North Pole oil refinery outside Fairbanks; and Fairbanks Natural Gas, the small, privately owned local utility that trucks LNG from Southcentral Alaska and distributes the gas through a limited pipeline network.

AIDEA says that if the project goes ahead, the first LNG could move to Fairbanks by late 2015 or early 2016.

The AIDEA board is reviewing proposals and hopes to decide on a project operator in late 2013.

In anticipation of more gas coming to town, the Fairbanks North Star Borough and the cities of Fairbanks and North Pole in 2012 created the Interior Gas Utility to handle gas distribution to an expanded service area. A potential complicating factor, state

officials say, is that this new municipal utility and the existing private utility, Fairbanks Natural Gas, have competing applications for service in North Pole pending before the state utility commission. The North Pole population is only a little more than 2,000 people, but a Golden Valley power plant and Flint Hills refinery are there.

### Piped natural gas to Fairbanks

Fairbanks Pipeline Co. started in 2010 and is proposing a 514-mile Prudhoe Bay-to-North Pole pipeline to deliver natural gas to Interior Alaska customers. Fairbanks Pipeline is owned by Energia Cura, a Fairbanks energy consulting and service business.

The company said it is targeting Golden Valley Electric, military bases, trans-Alaska pipeline pump stations and mines, as well as Fairbanks Natural Gas, the small local gas utility. It has estimated the 12-inch buried pipeline would cost \$716 million, delivering 52 million cubic feet of gas per day on average.

The route would follow state highways. The Energia owners have funded costs so far. They hope others, including the state, possibly through its Permanent Fund oil-wealth savings account, Alaska Native corporations or other Alaska employers become owners.

*Federal Coordinator Larry Persily contributed to this article.*

Project Information
<b>Sponsor:</b> Fairbanks Pipeline Company (Energia Cura)
<b>Estimated cost:</b> \$716 million
<b>Route:</b> Prudhoe Bay to the Fairbanks area following state highways.
<b>Gas for Alaskans:</b> This project would bring gas to the Fairbanks area, but sponsor says it could be expanded to supply extra gas for Southcentral.
<b>Status:</b> Planning stage

For more information, please visit our website: [www.arcticgas.gov](http://www.arcticgas.gov)

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