3/29/11 Update: Alaska Stand Alone Gas Pipeline

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Alaska Stand Alone Gas Pipeline/***ASAP***

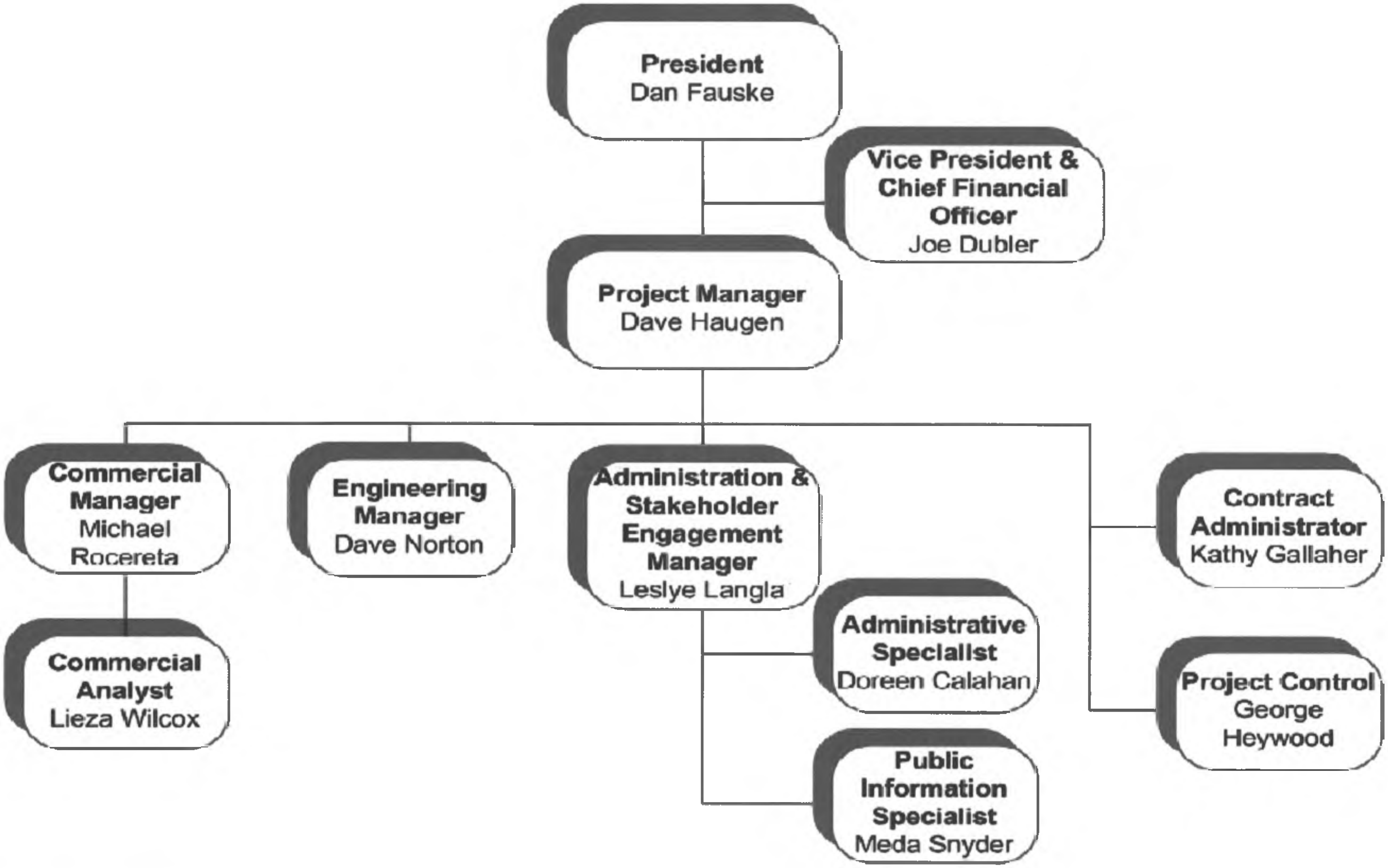
March 29, 2011

ALASKA GASLINE DEVELOPMENT CORP.
GAS FOR ALASKANS

Tel. 907-277-4488 | Fax. 907-277-4484 | www.gasline.us.com

Joint In-State Gasline Development Team

AGDC Project Staff Organization



Project Management/Engineering

ACTIVITY	CONTRACTOR
Project Management	Hawk Consultants LLC
Engineering Services	Michael Baker Jr., Inc.
Legal Services	Birch Horton Bittner & Cherot
Project Pacing and Review	Independent Project Analysis (IPA)
Facilities Peer Review	WorleyParsons

Environmental/Regulatory

ACTIVITY	CONTRACTOR
Environmental Services	ASRC Energy Services (AES)
Third Party EIS	Cardno ENTRIX
Regulatory Advisor	Stoel Rives LLC

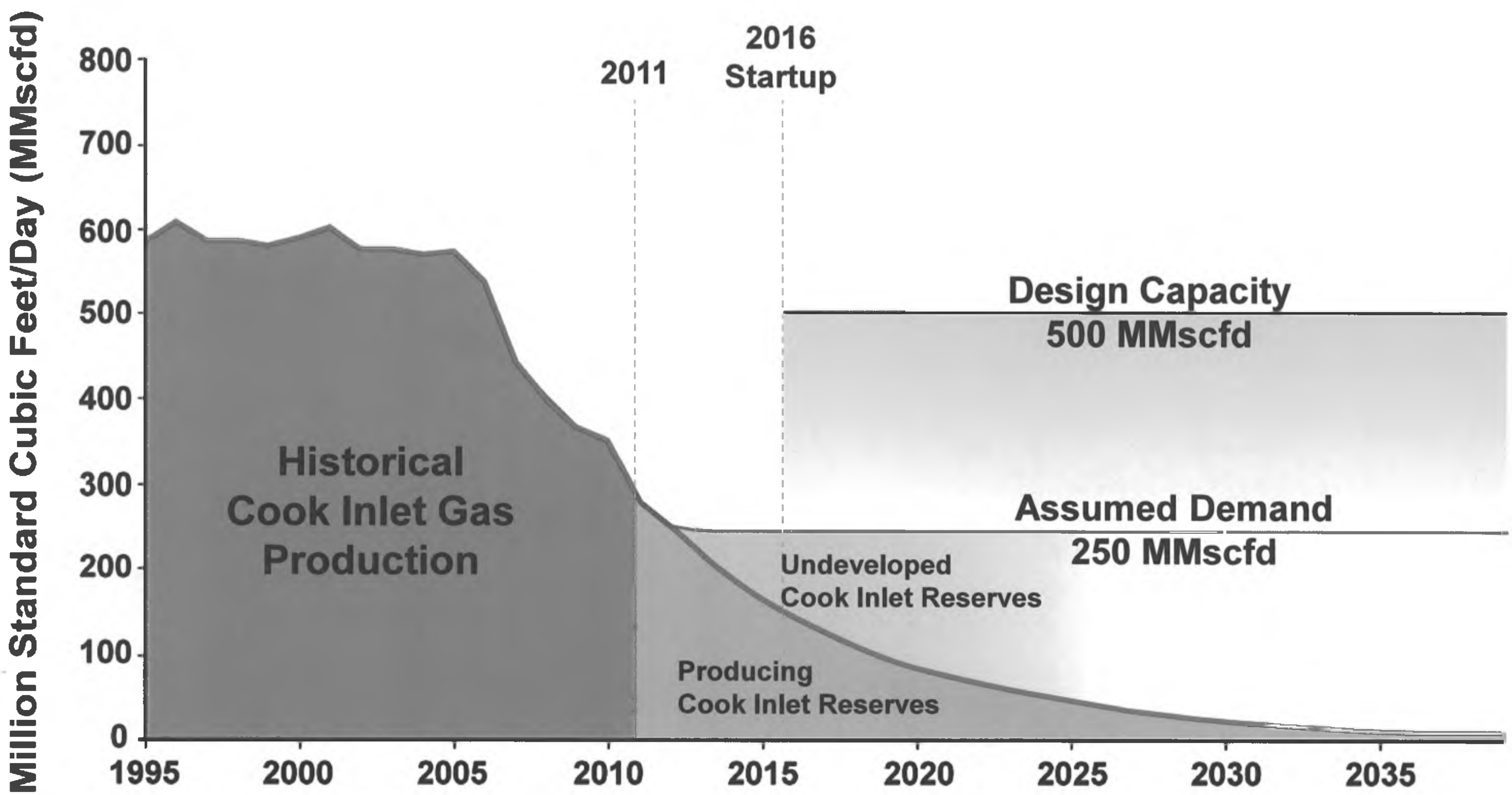
Financial

ACTIVITY	CONTRACTOR
Financial Advisor	Citigroup/Ramirez
Tariff Modeling	Black and Veatch
ECONOMIC/MARKET STUDIES:	
Gas to Liquids	Hatch Associates Consultants, Inc.
Liquefied Natural Gas	Science Applications International Corporation (SAIC)
Natural Gas Liquids	R.W. Beck Inc.

State and Federal Agency Contracts

ACTIVITY	CONTRACTOR
Federal BLM	Federal Lands Right-of-Way
Alaska Department of Natural Resources	State Pipeline Coordinator's Office: Right-of-Way Lease
Alaska Department of Natural Resources	Cook Inlet Gas Report
Alaska Department of Environmental Conservation	Air Quality Permitting
Alaska Railroad Corporation	Right-of-Way, Crossing & Materials

Cook Inlet Gas Production vs.
Alaska Stand Alone Gas Pipeline Capacity

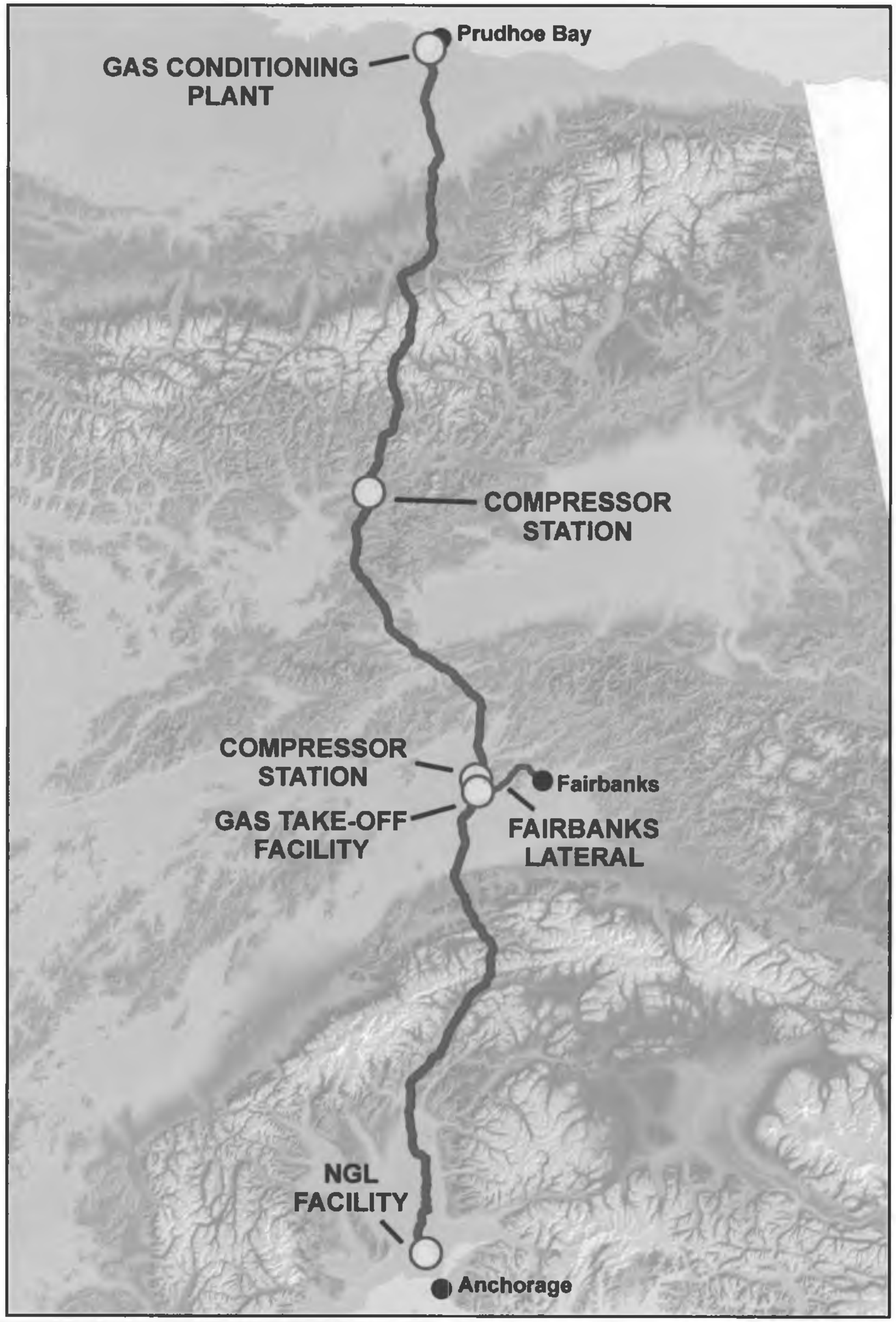


Project Features

- Design Capacity: 500 MMscfd (with NGLs)
- Mainline Pipeline
- Fairbanks Lateral
- Gas Conditioning Facility
- Two Compressor Stations
- NGL Extraction Plant
- Gas Take-off Facility/NGL Straddle Plant

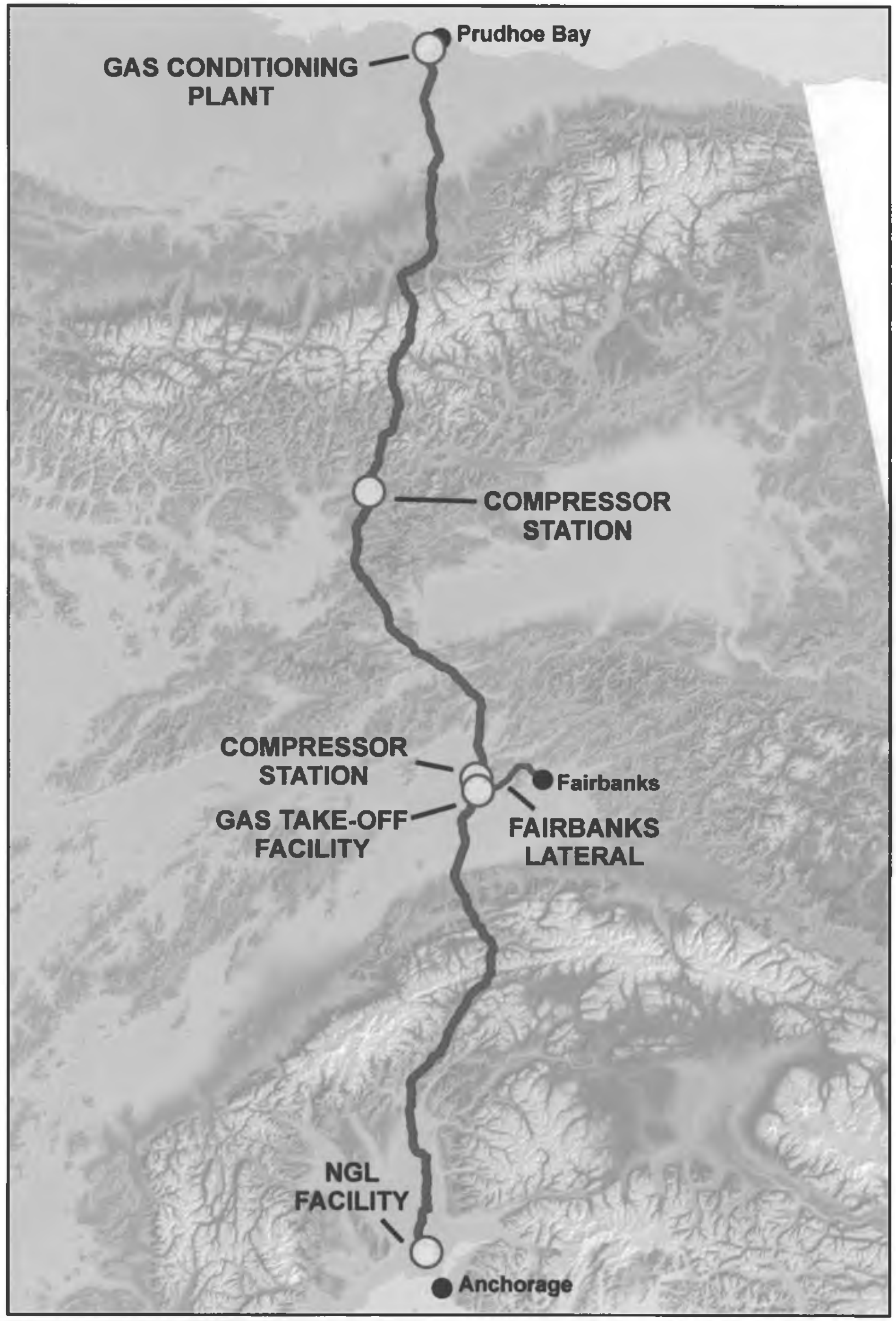
Pipeline

- Mainline:
  - 737 miles long
  - 24-inch-diameter
  - 2,500 psi maximum operating pressure
- Fairbanks Lateral:
  - 35 miles long
  - 12-inch-diameter
  - Tie-in with mainline at MP 458



Other Project Facilities

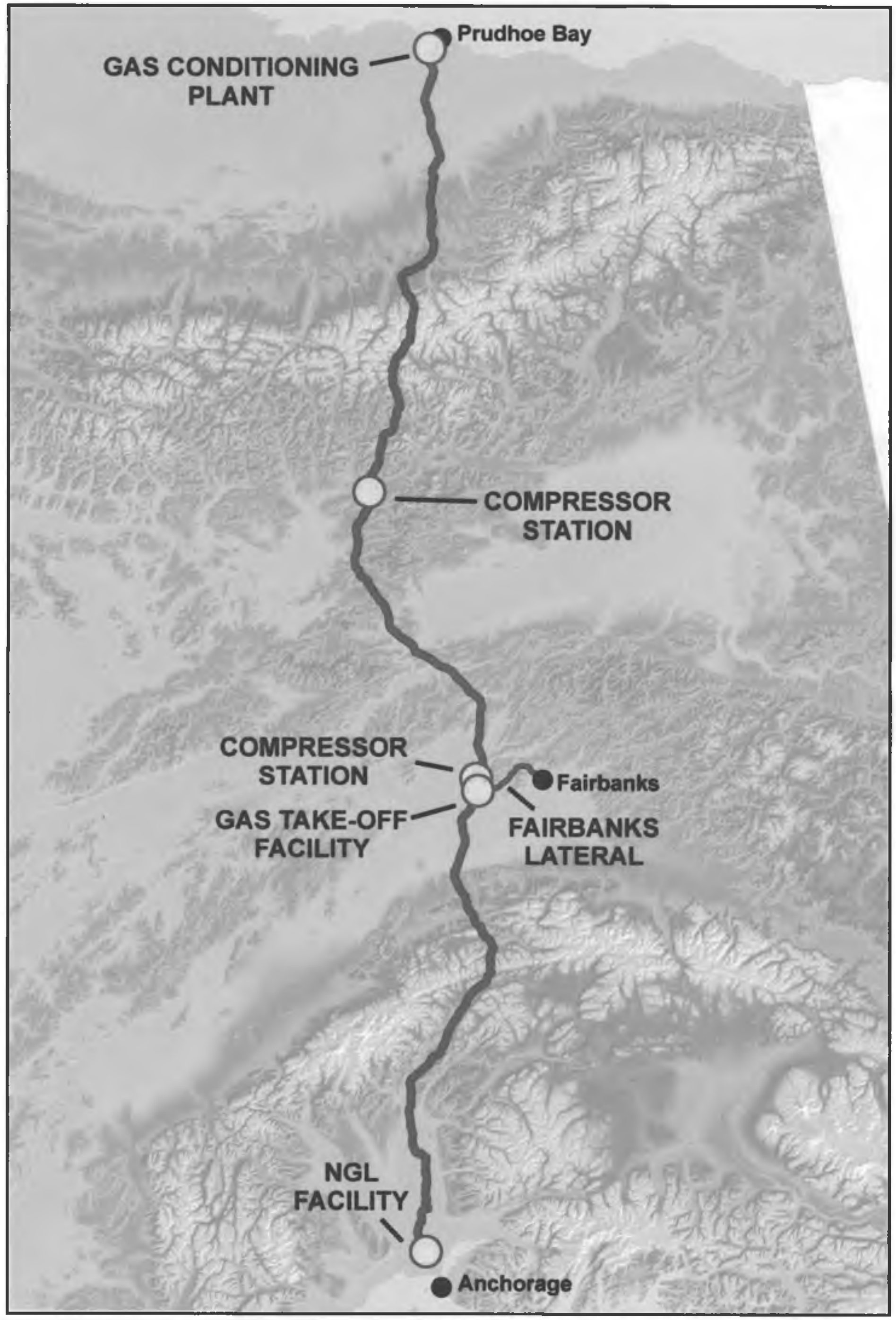
- Gas Conditioning Plant
  - At Prudhoe Bay
  - Remove carbon dioxide, hydrogen sulfide, and other impurities from the gas
- Two Compressor Stations
  - Gas-turbine-driven centrifugal compressors.
  - Gas-turbine-driven electric power generators



Other Permanent Facilities

- Gas take-off facility/NGL straddle plant
  - Gas for Fairbanks
  - Remove NGLs to provide dry gas for Fairbanks
  - Reinject NGLs into mainline
- NGL extraction plant
  - Remove NGLs for sale

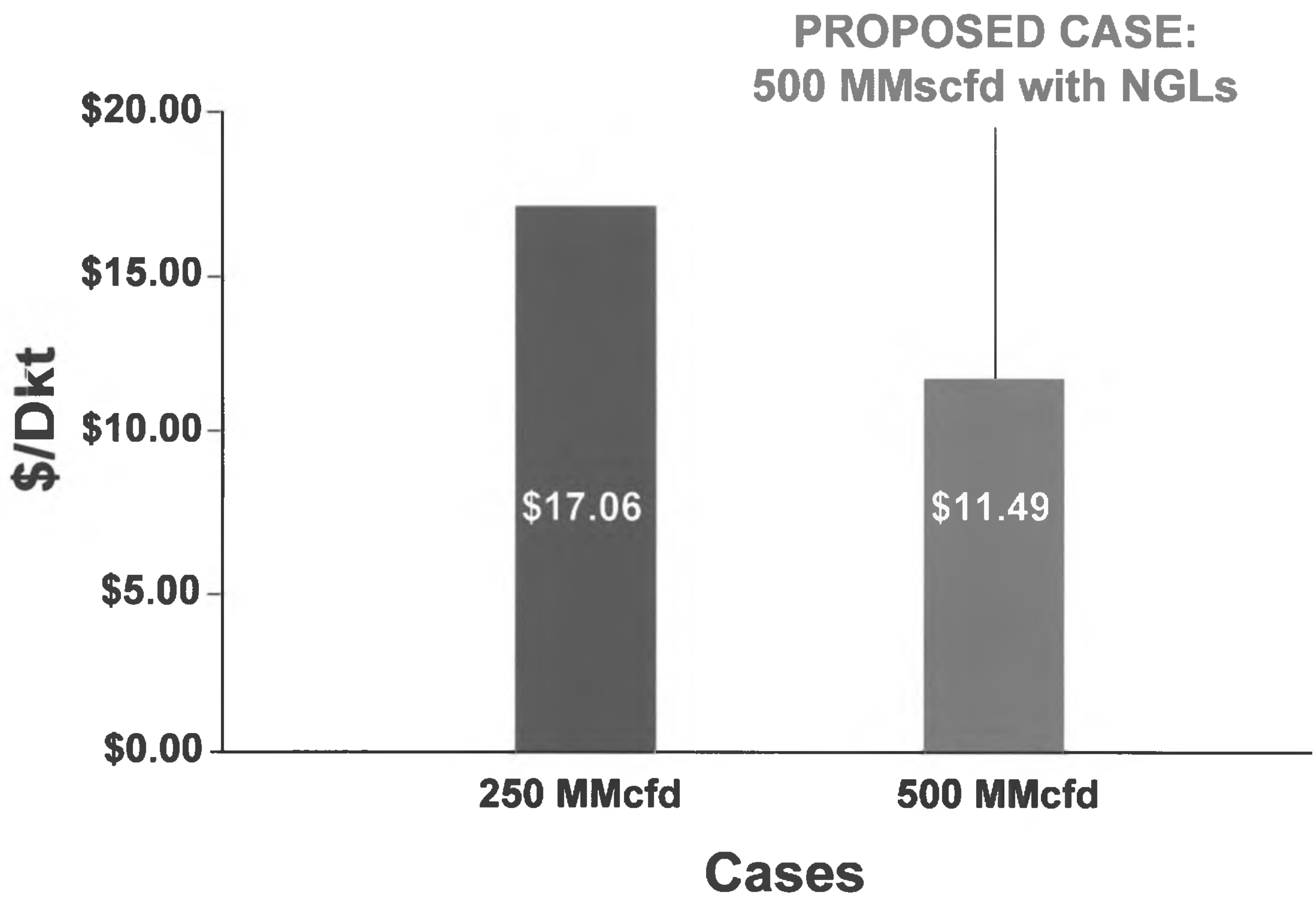
NOTE: Natural gas liquids (NGLs) include ethane, propane, and butane



Preliminary Capital Cost Estimates for Pipeline and Facilities

Flow Rate (MMscfd)	Spiked with NGL ($ Billion)
250	$6.9
500	$8.4

Transportation Tariff Comparison (July 2010)

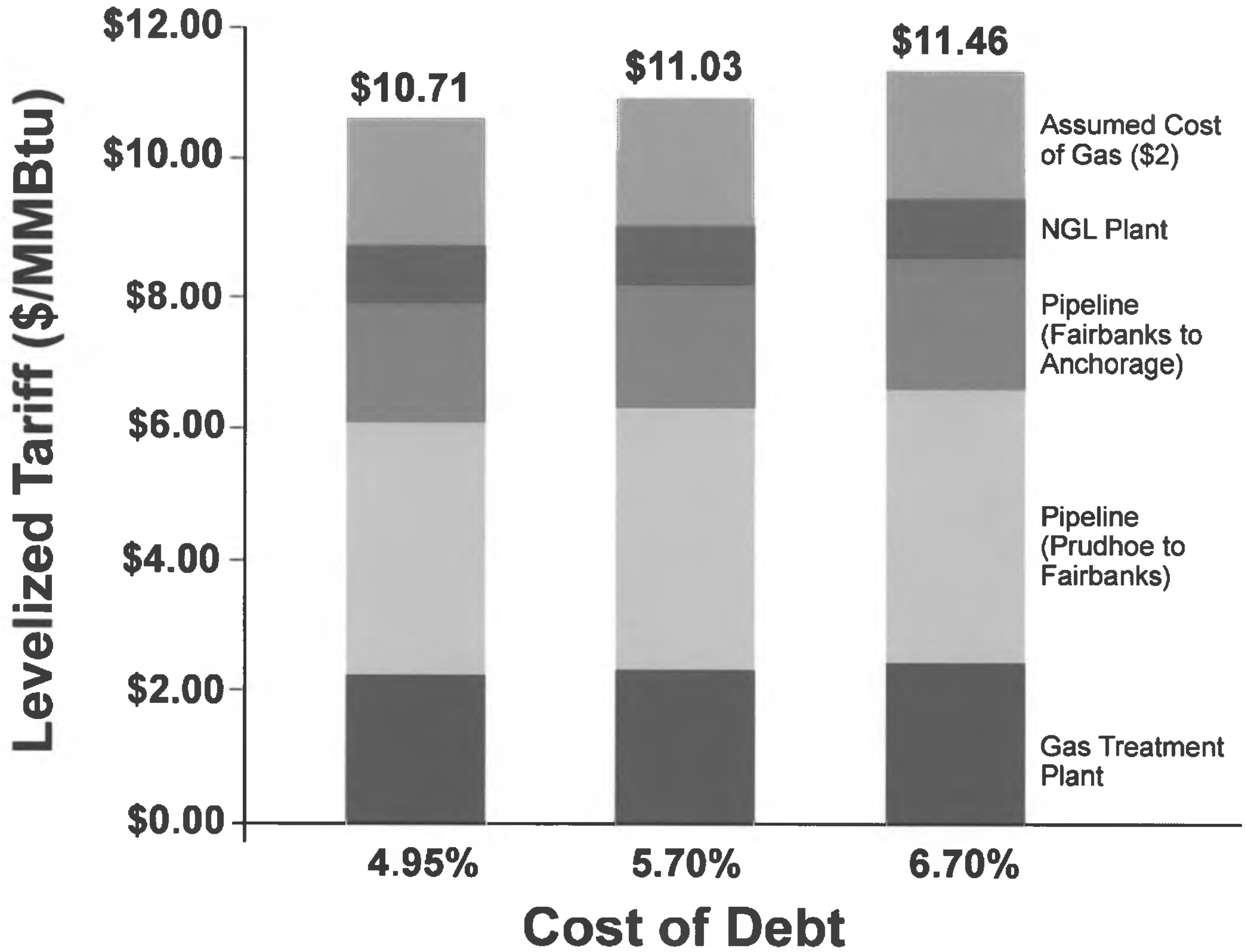


NOTE: All cases include assumed gas supply cost of $2 (negotiable)

Transportation Tariff Comparison (July 2010) ASSUMPTIONS

Debt/Equity	70%/30%
Return on Equity	11.31%
Cost of Debt	6.76%
Capital and O&M Escalation	3%
Contract & Depreciation Life	20 years
Levelized Tariffs	Based on deterministic capital cost estimate

Optimized Tariff (November 2010)



Commercial/Financing Options

- Cost of debt
- Project timeline
- Throughput
- Marketing of liquids
- State equity
- Line-fill contributed by state royalty

Key Commercial Activities

- Evaluate needs of anchor industrial users
- Find interested builder/owner/operators
- Optimize commercial interests and develop financing options

Potential Industrial Users

- Natural Gas Liquids (NGL) Export
  - Market study underway
- Gas to Liquids (GTL) Export
  - Market study in progress
- Liquefied Natural Gas (LNG) Export
  - Nikiski plant license extended 2 years
  - Market study underway
- Fertilizer Production
  - Agrium Nikiski plant shut down

Natural Gas Liquids (NGL) Export

- Extraction/fractionation/storage facility at Port MacKenzie or Nikiski
- Additional pipelines to berths and loading facility
- New commercial studies to determine full-value chain value and market viability by R.W. Beck

NATURAL GAS LIQUIDS (NGL)

When natural gas comes out of the well, it contains other hydrocarbons known as natural gas liquids, or NGLs, which are removed during processing. NGLs are valuable products that include ethane, propane, butane, pentane, and other hydrocarbons. NGLs are sources of energy and serve as raw materials for oil refineries or petrochemical plants.

Gas To Liquids (GTL) Export

- GTL facility either near Fairbanks or at tidewater at Cook Inlet
- Liquids transported to potential markets in Alaska and/or Pacific Rim
- Economic feasibility study underway by Hatch

GAS TO LIQUIDS (GTL)

Gas to liquids, or GTL, refers to a process to convert the components of natural gas into liquids such as diesel fuel, liquid petroleum gas, and naphtha. A gas to liquids refinery is required for this process, which combines the carbon and hydrogen in natural gas molecules to make the synthetic liquid hydrocarbons.

Liquefied Natural Gas (LNG) Export

- Current 2-train plant not fully loaded (240 MMscfd inlet cap) but operating under favorable sales contracts
- Depending on LNG viability, third train may be required to anchor throughput
- New full-value chain and market study underway from SAIC

LIQUEFIED NATURAL GAS (LNG)

Liquefied natural gas, or LNG, is produced by cooling natural gas to about -260°F so that it becomes a liquid that takes up about 600 times less volume than the gas. LNG can be shipped in special tank trucks or ocean-going tankers to terminals, where it is returned to a gas and sent through pipelines to consumers.

The LNG facility in Kenai is the country's oldest active LNG marine terminal (43 years of production).

Tier 1 Project Permits (Major)

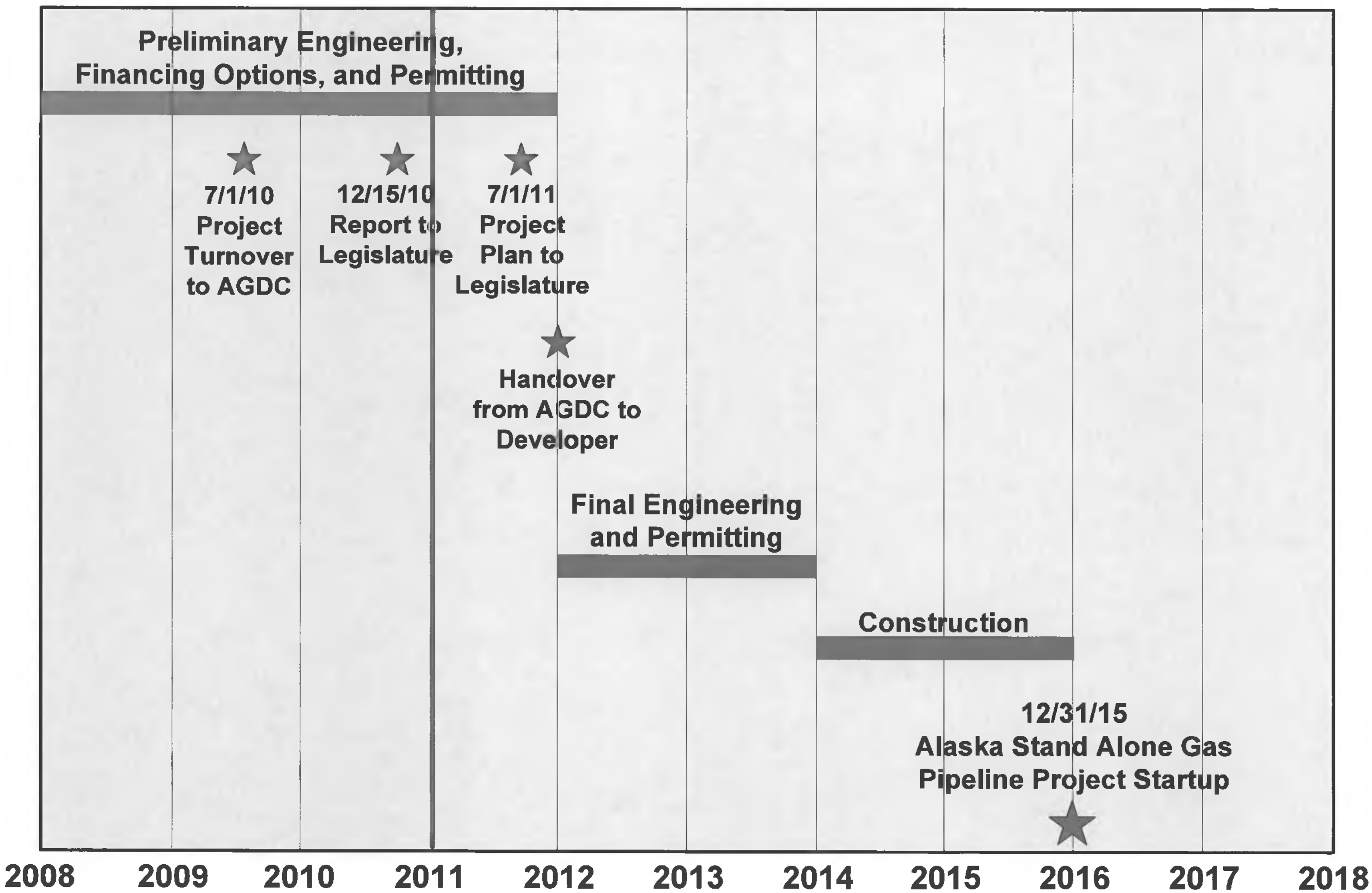
Agency	Permit Type	Submittal	Expected Issuance
BLM	Federal Pipeline Right-of-Way Grant	Nov. 2009; Resubmitted Aug. 2010	Jan. 2012
ADNR	State Pipeline Right-of-Way Lease	Nov. 2009; Resubmitted Aug. 2010	Jan. 2012
USACE	Section 404/Environmental Impact Statement	Nov. 2009; Resubmitted Aug. 2010	Jan. 2012

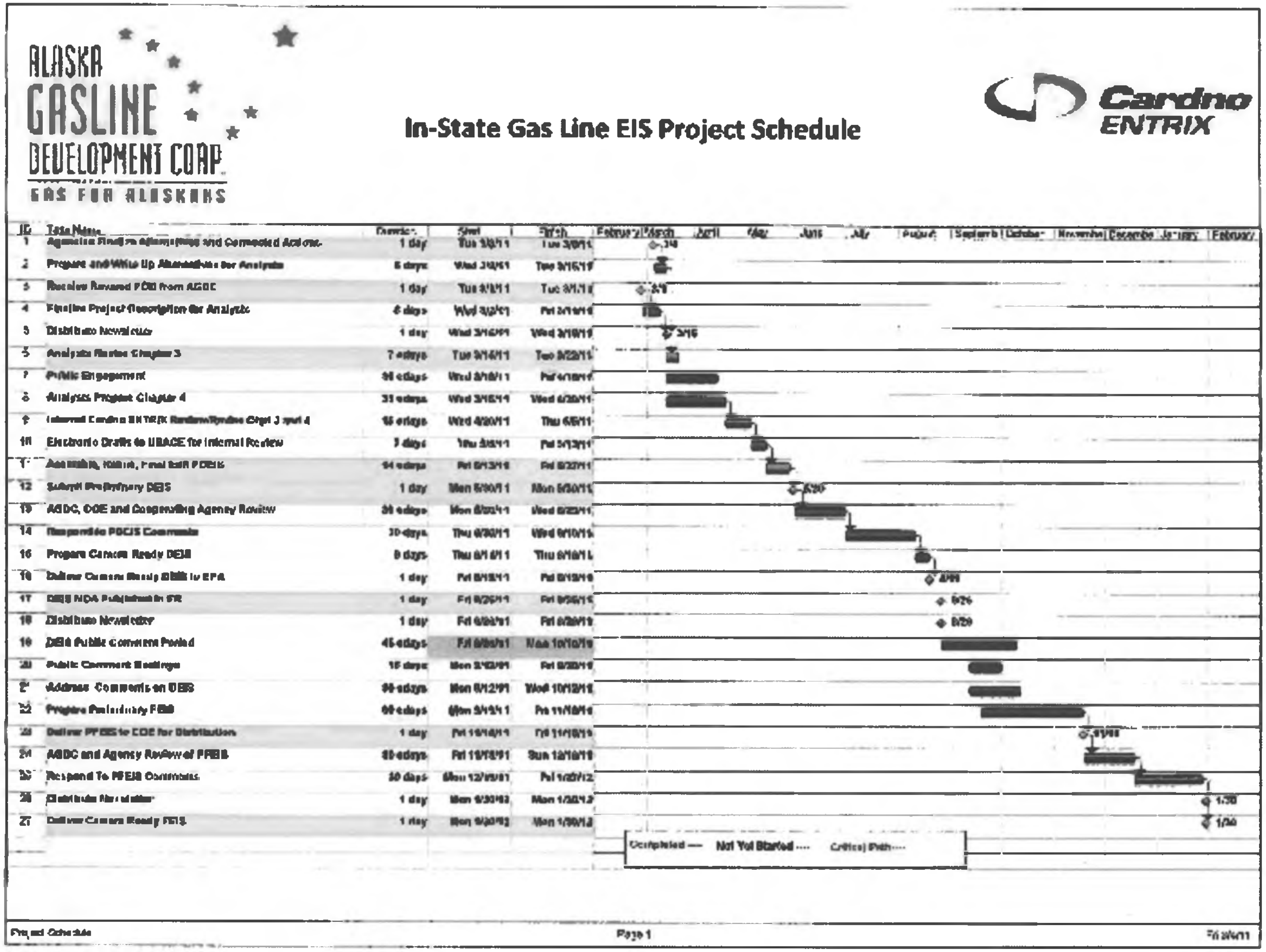
Tier 2 Project Permits (Long Lead Time)

Agency	Permit Type	Submittal	Expected Issuance
ADNR	Coastal Consistency Determination Permit to Appropriate Water Temporary Water Use Permit	April 2011*	Oct. 2011
ADEC	APDES Permit	April 2011*	Oct. 2011
Local	Land Use and/or Zoning Permits	April 2011*	Oct. 2011
USACE	Section 10 Obstruction to Navigable Water Permit	April 2011*	Jan. 2012
USCG	Section 9 Bridge Permit	April 2011*	Jan. 2012
ADF&G	Fish Habitat Protection Permits	April 2011*	Oct. 2012
ADEC	Prevention of Significant Deterioration (PSD)	TBD*	2012

*Based upon available data and agency requirements

Project Schedule

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In-State Gas Line EIS Project Schedule
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Public Engagement
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Most Recent Activity

- Plan of Development published on United States Army Corps of Engineers website at the following link

http://www.asapeis.com/ProjectDocuments.aspx

Thank You!

PROPANE PRODUCTION, TRANSPORTATION AND UTILIZATION IN RURAL AND URBAN ALASKA

PREPARED FOR
ALASKA NATURAL GAS DEVELOPMENT AUTHORITY

BY PAUL FUHS
DECEMBER 2010

PROPANE PRODUCTION, TRANSPORTATION AND UTILIZATION IN RURAL AND URBAN ALASKA

ALASKA NATURAL GAS DEVELOPMENT AUTHORITY

PRINCIPAL FINDINGS:

This report considers and analyzes a number of transportation and technical issues related to potential large scale use of propane produced on the North Slope and consumed in rural and urban Alaska. The overall conclusion of this investigation is that it is feasible to transport and utilize large quantities of propane and save consumers money, if the product can be purchased and produced at a reasonable price on the North Slope, ideally below $1 per gallon.

The access point at which propane can be extracted from gas processing facilities on the North Slope has a dramatic effect on the price of producing propane. Negotiations are currently underway between ANGDA staff and the Prudhoe Bay Unit operator's group to gain access to the most favorable access point.

Transportation costs are reduced substantially when bulk shipping methods are used. As the recent Northern Economics report points out, propane use is expected to ramp up over the years as it is shown to produce cost savings to consumers. Once a tipping point is reached to justify bulk shipping, the additional transportation savings are substantial.

Propane can be used as a fuel for generating electricity and the maintenance profile for propane generators is much lower than diesel generators. In recent years the State of Alaska has focused on alternative electrical generation strategies. Propane generation of electricity should also be considered in the mix of alternatives. However, even if advances can be made in reducing electrical generation costs, there will still be a strong need for home heating and cooking fuel which could be even more important to reducing household energy costs than electricity.

According to the Alaska Energy Authority, In Western rural Alaska, households can spend as much as four times as much on home heating than they do for electricity. In Fairbanks, households spend twice as much on home heating as they do on electricity. In Southcentral Alaska, households spend about as much on home heating as they do for electricity. (for detailed data see Propane Residential Use section below.)

Even when any of the proposed gasline projects are completed there will still be a need for propane for home heating in urban areas where the housing densities are not high enough to justify the extension of local distribution systems.

The primary purpose of the ANGDA propane project is to provide an alternative energy source which results in cost savings to residential and business consumers in Alaska.

PROPANE PRODUCTION COSTS

According to the ANGDA North Slope propane acquisition team, there are several points of entry on the North Slope where propane can be extracted. The points at which propane is at its highest concentration in the gas processing facility are the points that will require the least amount of gas processing and result in the lowest priced propane. The ANGDA team is in the process of negotiating these agreements with the North Slope producers. NANA/Worley Parsons and CH2MHILL are on contract to provide costs estimates for the various scenarios. Since the negotiations with the producers have not been concluded, it is not possible to forecast a price for propane at the gate on the North Slope. This paper focuses on the transportation, storage and other costs associated with using propane. These costs would be added to the purchase/production cost of propane on the North Slope to estimate ultimate delivered costs.

If any of the proposed gasline proposals moves forward, propane can also be extracted anywhere along the line through a straddle plant which removes the desired gases for consumer use or value added processing and then puts the remainder back into the gasline. This would be similar to the operation of the Flint Hills refinery with the Trans Alaska Pipeline. The propane extraction facilities on the North Slope are designed so that they can be relocated if desired.

PRICING ISSUES COMPARED TO DIESEL FUEL

Propane starts with a thermal disadvantage to diesel fuel in that it contains one third less heating value compared to diesel. So to be competitive with diesel at $6/gallon, propane would have to be sold at $4/gallon. This will affect storage also in that you must store 50% more propane than diesel to create an equal amount of BTU's. If you required 2000 barrels of diesel storage, you would have to have 3000 barrels of propane storage. However, there are other advantages to using propane that mitigate this thermal disadvantage and they are discussed later in this report.

PRICING ISSUES RELATED TO COMPETITION

It appears that if ANGDA can obtain agreements to access propane at the most favorable offtake point on the North Slope, propane can be delivered at a very favorable price. What are the assurances that savings in producing and transporting propane would be ultimately passed on to consumers? There are several factors which could affect this outcome.

First, in the urban areas such as Fairbanks and in rural areas where there are competing suppliers, this unregulated competition should result in savings to consumers while providing a reasonable level of profit for the distributors.

In areas where there is no competition, it is more difficult to ensure that cost savings will be passed on to consumers. In these areas local entities have taken steps to achieve savings, primarily through consolidated purchase of fuel through a regulated utility, such as an electric utility. Most of these are non profit cooperatives that exist to provide the lowest cost of energy to their customers. In addition, most of them are regulated by the Regulatory Commission of Alaska which ensures that consumers will receive the lowest energy prices. Some of the larger rural electric utilities have even considered establishing their own fuel shipping operations.

At the AFN convention last year, there were several references made to forming a fuel purchasing coop to create more competitive conditions in these remote areas. This could also contribute to competition by combining the demand from many villages and then going out to bid for the service.

However, there are also issues of local distribution which could affect these savings. Although it has not received much publicity, in many cases, village fuel distribution is owned by the village native corporation or by the municipality or tribe. Fuel sales are one of their only sources of income and they are responsible for some of the high prices we have seen. While storage and distribution costs range from $0.25 to $1.00 per gallon, in many cases the local markups are from $2 to $4 per gallon. These are tough decisions to make when the viability of these organizations may hang on highly marked up fuel sales.

Propane could also be competitive when applied to a portion of the demand of a community, for instance, a school or new HUD housing development. In that case micro generators could provide the electricity and also provide waste heat for home heating, or refrigeration for community freezers. However, the impact on local utilities must be carefully weighed. If a school representing 1/3 of local electrical demand went off the local grid and generated its own power with propane, the local utility would lose 1/3 of its market and the remaining fixed costs they have would have to be spread among the remaining customers, increasing the energy costs to residential and business users.

In a recent development the Alaska Village Electric Coop (AVEC) which aggregates demand and makes bulk purchases of fuel for many villages in Western Alaska, has proposed to begin shipping its own fuel through its subsidiary Vitus Marine. This could provide a transportation service dedicated to its customers for all forms of fuel. In discussions with AVEC and Vitus Marine, they are interested in exploring shipping and utilizing propane for electrical generation and home use if the purchase price of propane at the Yukon River bridge or Nenana would result in savings to the utility and its customers.

The issue of competition and savings to customers will have to continue to be addressed as ANGDA proceeds with this project.

POTENTIAL USES OF PROPANE

RURAL RESIDENTIAL PROPANE USE

Propane is already in use in many residences in rural Alaska primarily for home cooking and some water heating. As previously stated, home heating costs far exceed electricity costs in Western Alaska by a factor of up to 4 to 1. If the delivered price of propane is competitive, it could be a practical alternative to diesel for home heating.

Alaska Energy Authority Regional Energy Cost Comparisons, August 2008
Average household energy costs by use category

Anchorage	Fairbanks
$1,371 Electricity	$1,912 Electricity
$1,086 Heating	$4,027 Heating
$5,726 Transportation	$3,521 Transportation
$8,182 Total Energy	$9,461 Total Energy
12.2% Percent of income	15.3% Percent of income
Southeast Alaska	Rural Alaska
$1,374 Electricity	$1,843 Electricity
$1,704 Heating	$7,715 Heating
$2,291 Transportation	$2,282 Transportation
$5,368 Total Energy	$11,840 Total Energy
8.5% Percent of income	20.2% Percent of income

The cost of converting a home to propane would be approximately $3,000, including a space heater with flush mount exhaust, an on demand water heater and a 250 gallon buried fuel tank which should last for about a month depending on the season.

As previously mentioned, a very efficient use of propane could be in a small housing development in which propane is used to generate electricity through a micro generator, the waste heat is used to heat homes, and waste heat is also used to provide refrigeration for a community freezer to keep subsistence foods. If this system were installed by the local utility, it would not detract from covering their fixed cost of operating the utility.

URBAN RESIDENTIAL PROPANE USE

When a gasline is eventually built, it will connect many Alaskan communities to gas that have never been connected before. However, as we have seen in Southcentral Alaska, there are still many residents who cannot connect to gas because they live in areas that are not dense enough to justify the extension of local distribution pipelines. It is estimated that in Fairbanks, about 20,000 residents would be connected to a local gas grid. The remaining 60,000 residents could use propane for home heating and cooking.

PROPANE USE BY ELECTRIC UTILITIES

Propane is a good fuel for electrical generation. It burns clean and the maintenance on propane turbines is a fraction of diesel generators. Diesel generator maintenance has been a persistent problem in rural Alaska. In addition, it appears that propane generators may be a more appropriate fit with the wind generation systems being deployed throughout rural Alaska. When large diesel generators are required to keep running to maintain maximum load when the wind generators are only partially meeting the need, the benefits of wind power are diminished. An array of smaller propane turbines could respond to fluctuating wind energy by switching entire units off.

Diesel engines can also be retrofitted by installing an input orifice on the intake manifold to inject propane in a mixture of up to 25% with diesel fuel without further modifications to the unit. The unit then burns cleaner due to the higher combustion achieved with the addition of the propane.

The bottom line for electrical utilities will be the delivered price of propane compared to diesel. Electrical prices in rural Alaska are already so high that a savings will have to be shown to entice utilities to convert to propane.

PROPANE USE BY MINES

Propane could be an attractive fuel for mines to use in electrical generation. The reduced emissions can help them achieve their air quality requirements. Propane generators also operate on a much lower maintenance schedule than diesel generators. As previously mentioned, existing diesel generators can be retrofitted to use up to 25% propane. The Donlin Creek mine is installing generators that can burn diesel, methane or propane.

The amount of fuel anticipated to be used in these mines is very large indicating that a pipeline may be the most efficient way to move propane. In fact, Nova Gold is proposing a gasline from Beluga to Crooked Creek to fuel its generators. If a propane solution can be shown to be a cost effective alternative, this mine and any others including the prospect at Livengood have said they would consider it. Delivered price will once again be crucial.

PROPANE AS A TRANSPORTATION FUEL

Propane has been used as a transportation fuel for many years. Roush Clean Tech has recently placed two Ford F250 trucks into service on Dalton Highway and North Slope operations. Over this winter they have performed very well. Using propane as a fuel is an alternative to the required use of ultra low sulfur diesel on the North Slope. If propane can be produced for a reasonable price in Alaska, it could be an alternative to gasoline and diesel fuel. It may also help communities reduce violations of the Clean Air Act.

BULK PROPANE TRANSPORTATION METHODS WITHIN ALASKA

RIVERINE MARINE TRANSPORTATION OF PROPANE

Self contained tanks: Propane is currently delivered in 100# to 1000 gallon tanks using existing barge and off loading equipment. The cost of shipping in 100# weights is listed below.

Representative prices for 100# weights to communities on the Yukon River.

These quotes were obtained from local barge shipping companies. These rates represent one time per 100# rates. If a regular trade is established and regular bulk shipments are made, these prices are traditionally lowered by 20% for long term customers.

Trucking costs to Nenana:

$.50 per gallon based on either a single bulk tank of 10,000 gallons or two 20 foot ISO's. These limits are consistent with weight restrictions on the Dalton Highway.

Marine component shipping rates including bulk rate reductions of 20%:

Nenana to Tanana - $11.34/100# = $.81/gallon minus 20% = $.64/gallon

Nenana to Galena - $14.00/100# = $1.00/gallon minus 20% = $.80/gallon

Nenana to Marshall - $24.26/100# = $1.75/gallon minus 20% = $1.40/gallon

Nenana to St Marys - $27.50/100# = $1.96/gallon minus 20% = $1.57/gallon

To obtain the total transportation cost add the $.50/gallon cost of trucking to Nenana.

It would be even more economical to utilize 20 foot ISO propane containers which can hold 5000 gallons of propane. These containers are post flats and can be stacked with other consumer goods on a barge. However, given the tank weight and product, these ISO's would weigh 30,000 pounds. Most villages do not have the equipment available locally to move items of this weight so the barge carrier would have to carry that equipment on board, for instance a Cat 988 loader (or equivalent) to move the tanks into the community.

An advantage of large, self contained tanks is that there is no local tank storage required. As demand ramps up, more containers can be supplied to accommodate the demand. 20 foot ISO containers cost in the range of $50,000.00 each used, or $65,000.00 each new.

A disadvantage of self contained tanks is that the cost of shipping the tanks themselves puts costs on the delivery system that does not produce any energy. Whether it is a 100# tank or a 2o foot ISO, the tank weight is approximately 30% of the total weight. Shippers charge by the pound so 30% of the cost of shipping the propane is the tank shipping cost. Then the container must be shipped back empty to be refilled. The carriers we contacted had an empty tank haul back rate of 50% of the shipping rate, resulting in an additional 15% charge on the total shipping weight, so this means that combined, 45% of the costs of shipping propane are tank shipping costs. How this compares to permanent local storage and bulk shipments of propane is discussed in the STORAGE ISSUES section below.

BULK RIVERINE TRANSPORTATION OF PROPANE

Bulk shipments of propane could result in substantial savings in transportation costs. Two scenarios are: dedicated bulk shipment of 20 foot ISO's deck loaded on top of a diesel delivery barge and a dedicated pressurized propane barge that would deliver in bulk to permanent onshore storage tanks.

While the resources were not available for this study at this time to do a detailed analysis of the costs of these shipments, I was able to obtain enough information from shippers to describe how the system would work and provide some preliminary numbers. Barge companies were reluctant to provide proprietary information so an independent analyis would need to be done.

The bulk shipment of 20 foot ISO's would be most efficient in conjunction with deilivery of diesel fuel. These barges would pick up diesel from distribution hubs like Bethel or take on loads from ocean going barges (the more common source) and then proceed up river to make deliveries of diesel. Following delivery of their most up river destination, they would proceed to the Yukon river bridge to take on a full deck load of 20 foot ISO's. To use the design of the Vitus Marine barges as an example, they would be able to carry 48 loaded ISO's of propane on one barge and 60 on the other. At 5,000 gallons of propane per ISO this translates into a total of 240,000 gallons and 300,000 gallons respectively.

They would then deliver these ISO's going down the river and pick up the empties on their way back up river making diesel deliveries. This would provide for maximum utilization of equipment and the lowest shipping costs. Although these loading operations could be accomplished with current conditions at the Yukon River crossing, they would be more efficient if mooring dolphins or an open cell sheet pile dock were installed at an estimated cost of $2-3 million. Loading at the Yukon River would also reduce trucking costs to $.35/gallon due to reduced mileage.

Propane could also be delivered in a pressurized tank barge and loaded to permanent onshore tanks through a discharge hose as is currently done with diesel fuel. Such a truck based operation was conducted in the 1990's with diesel being delivered by truck from the Flint Hills refinery in Fairbanks and then loaded to the barge at the Yukon River crossing via a floating hose. This service was discontinued due to refinery pricing issues, but it did show feasibility from an operations standpoint. Again, construction of a basic barge landing structure and storage tanks at the Yukon River crossing would improve the efficiency of the operation.

Offloading propane at communities would be accomplished by connecting discharge lines from the barge to headers on shore and then pumped to storage. Barge operators saw this as no different than discharging diesel.

Representative Inland River (Mississippi) Propane Barges
Dimensions, Draft and Capacity

USCG #	261064	262194	282474	271388
Dimension	195'x44'	195'x44'	210'x44'	210'x44'
Draft (ft)	6' 3"	6' 3"	8' 6"	7' 9"
Capacity (gal)	360,738	360,234	425,922	399,378
Pressure (PSI)	250	250	250	250

Source: Targa Midstream Services, LP

There is an established port operation in Nenana that currently ships limited amounts of propane. However, the Yukon river is deeper than the Tanana river out of Nenana and could allow for deeper draft barges for bulk shipments.

In doing basic calculations of bulk shipments by pressurized propane barge from Nenana to Tanana with tug boat and crew charges at $12,000.00 per day, the estimated cost of shipping to Tanana is $.40/gallon, about 2/3 of the cost of shipping via container.

SHIPMENT TO TIDEWATER IN SOUTHCENTRAL ALASKA

Propane can be moved to tidewater in southcentral Alaska through a combination of truck to Fairbanks and then rail to the Port of Anchorage. The railroad rate is $910.00 per 20 foot ISO which calculates to $.18/gallon. This would amount to a total cost of $.63/gallon from the North Slope to Southcentral. From there it could be shipped to other coastal communities by scheduled barge service. This service would be particularly appealing to southern coastal Alaska communities that are not icebound in the winter, since they could receive regular shipments without having to incur the costs of substantial winter storage.

If a gasline is developed to tidewater in southcentral Alaska, propane could be extracted there and loaded directly onto barges for shipment to coastal Alaskan communities. Both southwestern and southeastern communities could be the beneficiaries of this propane distribution network. Although the concentration of propane in the gas stream of a gasline is low, (between 2% and 3%) these gases would have to be separated at tidewater to prepare methane for local distribution or for export, so these costs would be absorbed by the overall operation.

BULK PROPANE MARINE SHIPMENTS FROM THE NORTH SLOPE

While it is technically feasible to ship propane from the North Slope to coastal Alaska, there are a number of issues involved. First, the ocean depths on the North Slope are very shallow and would require the construction of a berthing facility, either ice deflecting dolphins or an open cell sheet pile dock. The cost of these facilities has not been estimated. There is an existing dock but it is extensively used during the short shipping season and it is also currently exempted from the Coast Guard port security requirements. Adding propane operations to the existing facility would change that designation and complicate its operation.

This option is further restrained by a short ice free shipping season typically of 7 to 8 weeks. Additional substantial storage would be required on the North Slope to store sufficient amounts to fill a barge with propane. The most likely customers for such shipments would be the Red Dog Mine or regional fuel hubs like Nome and Bethel.

Tug and Barge equipment would have to be leased since it could not sit idle during the iced in periods. Tugs in this area typically rent for $15,000.00 per day. Barge leasing would be an additional cost.

STORAGE

As previously mentioned, 50% more propane is needed to produce the same energy as diesel. This means that either 50%more storage is needed or that deliveries would have to be made on a more frequent basis. However, propane storage is less costly than diesel storage due to not needing extensive diking and cleanup equipment. Due to this, the cost of propane and diesel storage tanks on an equivalent basis are roughly equal.

Many millions of dollars have been spent rebuilding diesel tank farms in rural Alaska. In our meetings with the Denali Commission, they indicated that if propane can be shown to provide a cost savings and displace the need for diesel tank storage, that they would invest in propane storage. This would equalize the subsidies between diesel and propane.

PROPANE SHIPPING TO KUSKOKWIM RIVER

Shipping to the Kuskokwim river could be accomplished by two methods: 1) coming out of the Yukon River with a bulk propane barge and going South by sea, then upriver to Bethel then transferring to a smaller lighter barge as is currently done with diesel fuel, or 2) constructing a propane pipeline connecting to the Yukon river below St. Mary's and on over to the Kuskokwim (about 60 miles). The Denali Commission is currently contemplating building a road to connect the two rivers at this point which is about 60 miles. The resources were not available to estimate the cost of this pipeline. Some storage would also be required at the terminus of the line on the Kuskokwim River. From there, the same shipping and delivery practices can be employed as those on the Yukon River.

PROPANE VAPORIZATION ISSUES

Propane does not vaporize below -45 degrees. This will require making an arctic grade of propane spiked with ethane or other lighter gas. An alternative may be burying propane storage tanks. A study by the Cold Regions Research Facility in Fairbanks shows that at one foot of burial depth, the temperatures never exceeded -19 degrees. Cold weather would not affect storage or distribution operations but would need to be considered in final storage just before the consumption point.

SECURITY OF ALTERNATIVE SUPPLY

To justify large scale conversion to propane, users will have to be assured that an alternative supply of propane is available should there be a failure of production or other disruption of supply from the North Slope. This alternative is represented by a supply point at Prince Rupert, British Columbia, connected to the Alaska rail system by the Hydrotrain barge system currently operating out of Whittier, Alaska. 10,000 gallon propane rail cars would be barged into Whittier, transferred to the Alaska Railroad and then railed to Nenana. While this supply option would incur an approximately 20% greater cost of service than North Slope propane, it could still serve as a secure supply of propane until North Slope operations could resume.

TRAINING

Training for everyone involved in the transportation and handling of propane will be necessary. Propane is regularly handled in the millions of gallons every day across the US and Alaska. However, it has some characteristics different from diesel that will require training to ensure safe operations. A class for 20 rural fuel handlers was held in Fairbanks last year but this will need to be expanded.

CONCLUSION

All the technical issues listed above can be handled with proper facilities and trained personnel. The costs of diesel remain high, opening the door to a more affordable energy source such as propane. The costs of transporting propane appear to be reasonable and are similar to or less than transporting and storing diesel. The determining factor in cost savings from use of propane in Western Alaska will be the purchase and production costs of propane on the North Slope, ensuring competitive or RCA regulated markets and reaching high enough utilization rates to justify bulk shipping methods.

Contact the Author:

Paul Fuhs
907-351-0407
paulfuhs@earthlink.net

PROPANE PRODUCTION, TRANSPORTATION AND UTILIZATION IN RURAL AND URBAN ALASKA

BY PAUL FUHS
FOR ALASKA NATURAL DEVELOPMENT AUTHORITY

PROPANE PRODUCTION

- ON NORTH SLOPE, COST DEPENDENT ON OFFTAKE LOCATION 2% TO 35% CONCENTRATION
- STRADDLE PLANT AT YUKON RIVER
- AT FAIRBANKS AS PART OF CONDITIONING GAS FOR LOCAL USE
- AT TIDEWATER, AS PART OF CONDITIONING GAS FOR LOCAL USE OR EXPORT

PRICING ISSUES

- PROPANE 2/3 BTU VALUE OF DIESEL
- PROPANE 2.5 TIMES BTU VALUE OF METHANE
- COMPETITION EXISTS BETWEEN DISTRIBUTORS IN MOST MARKETS
- UTILITIES AND COOPS CAN MAKE AGGREGATED PURCHASES TO INCREASE COMPETITION
- LOCAL DISTRIBUTION CAN ADD TO COST

POTENTIAL USES

- RESIDENTIAL HEATING - RURAL ALASKA 4 TIMES AS MUCH SPENT AS ON ELECTRICITY - FBKS TWICE AS MUCH
- URBAN RESIDENTIAL USE EVEN IF GASLINE
- ELECTRIC UTILITIES AS PRIMARY OR SECONDARY FUEL - AND WITH WIND
- USE BY MINES - REGULATORY ISSUES
- TRANSPORTATION FUEL

MARINE TRANSPORTATION OF PROPANE

- TRUCK TO NENANA $0.50 PER GALLON
- 100# weight - $0.64/GAL TO TANANA - $1.57 TO ST. MARYS
- 20' ISO CONTAINER ECONOMY OF SCALE
- BULK TANK BARGE ALSO EFFICIENT $0.40/GAL TO TANANA
- SHIPMENT FROM TIDEWATER TO SOUTHEAST
- DIRECT SHIPMENTS FROM NORTH SLOPE

TECHNICAL ISSUES

- STORAGE - 50% MORE STORAGE THAN DIESEL REQUIRED - DENALI COMMISSION
- VAPORIZATION - ARCTIC GRADE PROPANE - BURIED TANKS
- SECURITY OF ALTERNATIVE SUPPLY - PRINCE RUPERT BC BY RAIL
- TRAINING