

Gasification – FT Subsection of the Energy Task Force Meeting

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Gasification – FT Subsection Proposal: Coal to Liquids Plant (CTL)

Consider installing a multi-fuel gasification unit capable of producing enough syngas to feed a 5000 barrels per day (bbl/d) Fisher Tropsch (FT) synthetic fuel process. Refining process units would be installed downstream of the FT to produce a low pour-point diesel product and naphtha ready for use by local consumers. Waste heat and tail gas from the FT process would be utilized to produce electricity for local sale.

CTL Performance Estimate¹

Coal Feed	3,825 tons/day
Diesel/Jet A Fuel Output	4,280 bbl/day
Naphtha Output	820 bbl/day
Electric Power Output	52 MW

Discussion:

Tasked with reviewing gasification as part of an energy plan for Fairbanks, the group acknowledged the decline and eventual end of North Slope crude oil in the future. This fuel source reduction is expected to continue to escalate the cost of energy for Transportation, Space Heating, and Electricity in the Fairbanks area. Coal is an abundant resource in Alaska that is currently being utilized for electric power production and a limited amount of district space heating. Gasification technology is advancing to the point where gasification processes fed by biomass, refuse, and blended coal will soon be available commercially. The Syngas produced from the gasification process could be used for electric power production and for creating high value liquid fuel products utilizing the established Fischer Tropsch (FT) process. Feasibility studies have shown a combined CTL (Coal to Liquids) plant that includes power generation capabilities can convert low value coal to Diesel fuel, naphtha, and electricity and compete in price with traditional refined products¹.

Selecting a gasifier unit with capabilities of using coal, biomass, and municipal waste as feed allows renewable fuel sources to be included in the Fairbanks energy plan. Seasonal changes in the fuel blend could be accommodated with 100% coal feed as a reserve. Coal reserves in Alaska are extensive with the Usibelli Coal Mine in Healy having proven reserves of 91 million tons². A 5000 bbl/d Fisher Tropsch plant would require 1.4 million tons/year of coal as gasifier feed.

The Fisher Tropsch process coupled with refining capabilities would produce ultra-low sulfur diesel and jet fuel. This new source would provide the Fairbanks area and surrounding communities with heating oil and low sulfur highway diesel fuel using the existing fuel distribution infrastructure. Jet A fuel could be marketed at the local airport or to the DOD for

¹ Wyoming Coal/FT Fuels Economic Viability Study, June 2005, Rentech Inc.

² Alaskan Coal Gasification Feasibility Studies – Healy Coal-to-Liquids Plant, DOE/NETL-2007/1251, July 2007

military use as an alternative fuel. Excess liquid fuel produced could be shipped by truck or rail for distribution across Alaska or exported by barge. Diesel fuels produced using the FT process typically meet or exceed the EPA 2006 Low Sulfur Fuel requirements. Heating oil meeting these standards would reduce the Fairbanks' area emission levels for PM, NO_x, and CO₂. Naphtha product could be exported for further refining, used for gasoline blend stock, or as a fuel supply for existing combined cycle power production. Tail gas from the Fischer Tropsch process would be used as fuel for gas turbine/combined cycle power generation that could be sold to consumers.

Estimates that could impact cost of end product:

- We have assumed a 100% coal feed supply for gasification. The reduced performance and additional handling costs associated with blending biomass fuels are not considered in the financial assessment.
- Performance, capital, and construction cost estimates are based on the Wyoming Coal/FT Fuels Economic Viability study performed in June 2005 employing Rentech technologies.
- Long term maintenance costs for the CTL and process equipment life have not been substantiated.
- A mine-mouth CTL plant location is assumed, no coal transportation costs are included.

Strategies to reduce weaknesses and threats from SWOT analysis

A number of weaknesses and threats were identified as part of the Gasification SWOT analysis. Below are some suggestions for mitigating or eliminating potential issues.

- Include Usibelli in developing the project and obtain a long term commitment on coal pricing and contract terms.
- Select EPC contractor who has previous CTL design and construction experience.
- Don't be short-sighted when comparing initial CTL efficiency upgrades against construction and capital costs.
- Investigate whether existing gasifier and FT installations are "leading edge" technology which can be commercially viable and sustainable in Fairbanks' arctic environment.
- If a gas pipeline is constructed from the North Slope, small communities and villages will still require diesel for heating and electric power generation. The federal government and DOD support development of alternate liquid fuels and could be approached for a long term commitment³.
- If a gas pipeline is constructed from the North Slope, an alternative gas feed supply for the FT would be available. This alternative fuel source could provide an opportunity to negotiate with fuel suppliers for the best value.
- Fairbanks is protected from liquid fuel shortages and fuel price extremes after the Trans-Alaska Pipeline shuts down.
- The specifications for the Wiley gasifier claim the gasifier emits zero carbon dioxide, and combusting of the resulting syngas produces less carbon dioxide than with natural gas.

² Alaskan Coal Gasification Feasibility Studies – Healy Coal-to-Liquids Plant, DOE/NETL-2007/1251, July 2007

³ NMA Mining Week, Volume 13 Issue 32, August 17, 2007

Recommendations for next steps:

- Determine minimum and maximum Fairbanks diesel requirements on a seasonal basis to verify CTL sizing and tank farm requirements.
- Verify Fischer Tropsch product can be refined to produce diesel that meets established specifications for Jet A.
- Research existing commercial gasifier technology that supports multi-fuel feed.
- Consider impact on local refiners and heating oil prices with a new diesel source.
- Define available markets for summer season diesel sales when heating oil demand is reduced.
- Determine CTL plant location considering labor, permitting, construction, fuel transportation, and end product distribution factors. A Fairbanks location would be a central point for utilizing combustible wastes, harvested biomass, or a gas pipeline connection when the gas pipeline is constructed. Fairbanks fuel distribution infrastructure, tank farms, and rail road infrastructure could be utilized to reduce CTL capital costs. The Golden Valley lines to Healy and the Alaska Intertie could be used to export electric power to Anchorage.
- Develop an RFP for getting formal quotes from the gasifier and FT manufacturers to establish current pricing and expected performance guarantees (efficiencies, emissions, capacity, etc.) on the proposed fuel mix