



Yukon Energy Charrette

Natural Gas

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Fekete Associates Inc.*



Current Cost of Diesel Supply

Load	Fuel Consumption (litre/hr)	Yukon Diesel Cost ⁽¹⁾ (\$/litre)	Cost/kwh (\$/kwh)	Electrical Efficiency (%)
50%	151.1	1.26	0.38	33.3
75%	210.3	1.26	0.35	35.9
100%	271.6	1.26	0.34	37.0

Example case of a 1 MW diesel driven generator

(1) YEC is not required to pay the 7.2¢ tax on diesel used for electrical generation.

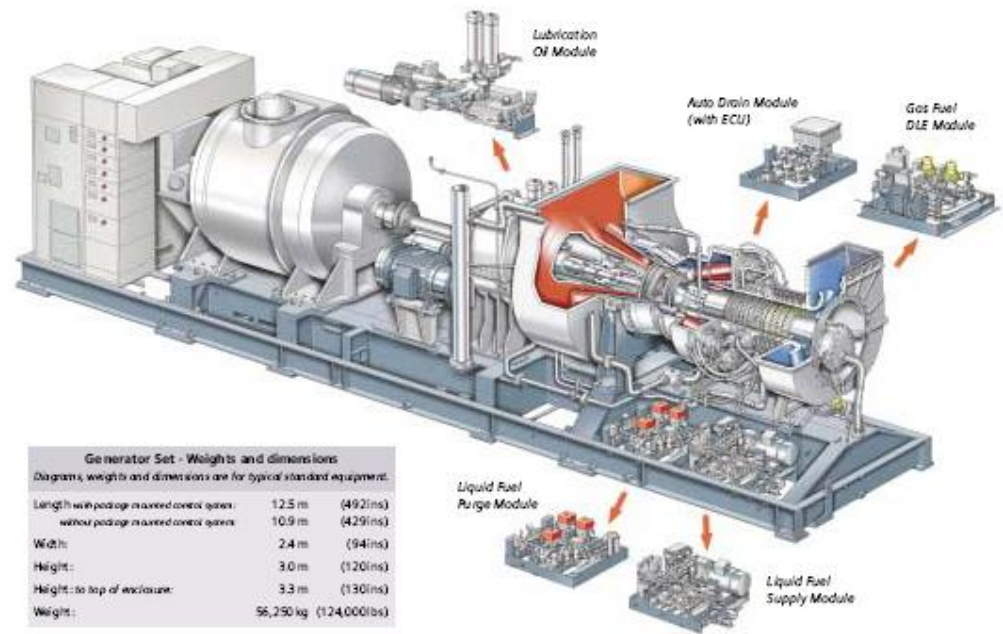
Sources: Caterpillar Engines (www.catelectricpowerinfo.com)
Yukon Energy (www.yukonenergy.ca)

Natural Gas Engines

GE Energy Jenbacher J624 GS 4MW
Reciprocating (< 5 MW)



Modular Package - Generator Set

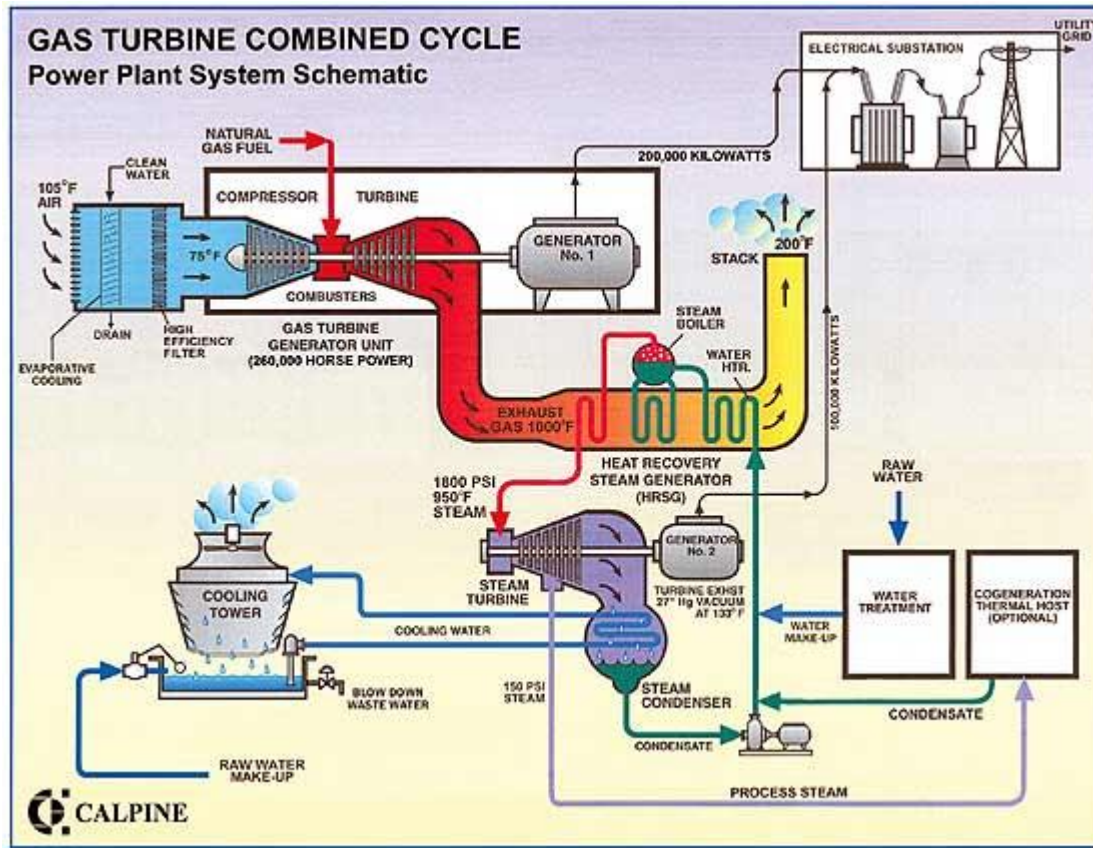


Siemens SGT-200 6.75MW
Turbine (5+ MW)

Efficiency – Single Cycle

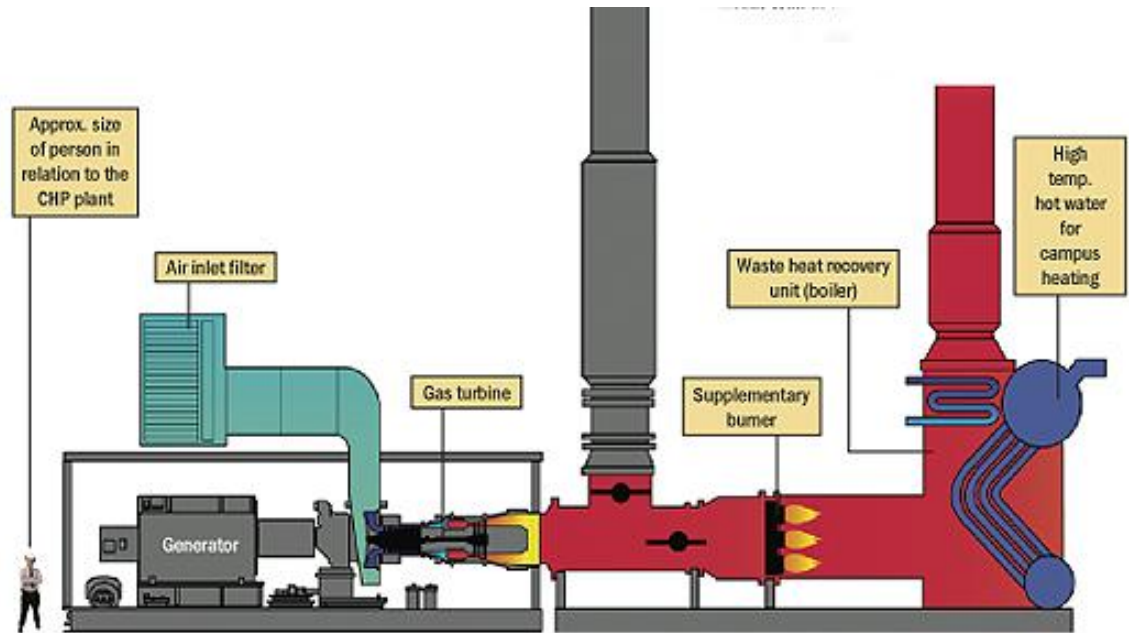
Manufacturer	Model	Type	Electrical Output MW	Electrical Efficiency %
GE energy	J208 GS	reciprocating	0.34 MW	35.8%
CATERPILLAR	DM5496	reciprocating	1.31 MW	34.8%
GE Energy	J624	reciprocating	4.40 MW	46.5%
GE Energy	GE10-2	Turbine	11.98 MW	33.3%
Siemens	SGT-200	Turbine	6.75 MW	31.0%
Rolls-Royce	501-KB5S	Turbine	3.89 MW	29.0%

Combined Cycle Schematic



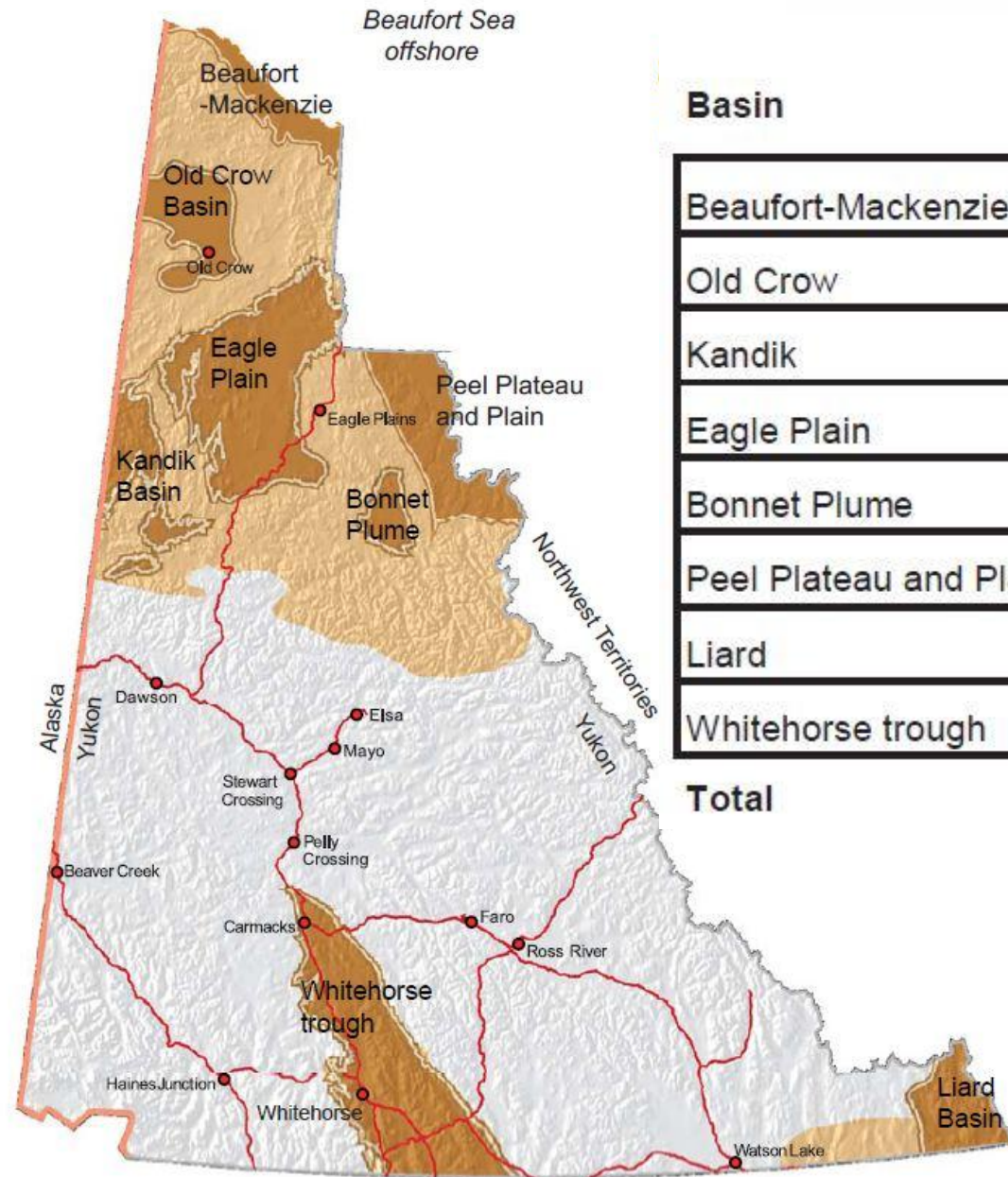
Total thermal efficiency ~ 55%

University of Calgary 12 MW Co-gen

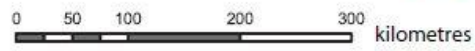


Manufacturer	Model	Type	Electrical Output MW	Electrical Efficiency %	Total Efficiency %
Siemens	SGT-400	Turbine	12.9	35%	80%

Onshore Resource Potential

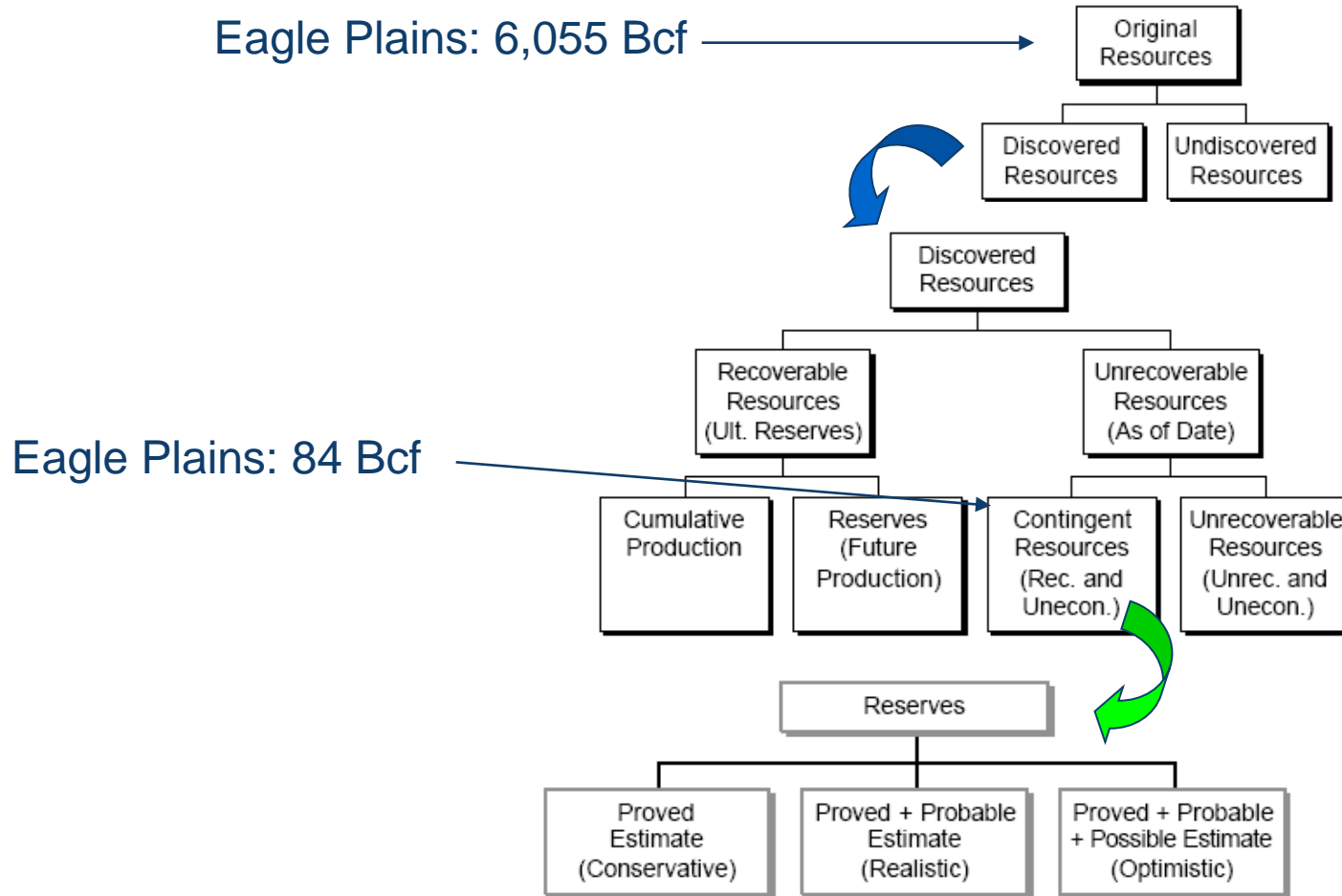


Basin	Gas (Bcf)	Oil (MMbbls)
Beaufort-Mackenzie	1008.1	216.7
Old Crow	1149.7	0
Kandik	648.9	99.3
Eagle Plain	6055.3	436.7
Bonnet Plume	800.4	0
Peel Plateau and Plain	2915.8	0
Liard	4109.9	0.1
Whitehorse trough	423.4	19.2
Total	17 111.5	772.0



1: 7 000 000

Reserves and Resources



Source: Society of Petroleum Evaluation Engineers

Koteneelee



- Only gas field that has produced in the Yukon.
- Gas flows south to British Columbia.
- Gas discovered to date has been depleted.
- Prospects for future exploration ????

- Currently producing 5,826 MMcf/d of gas from 2 gas.



Whitehorse Trough

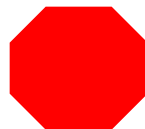
HEY! WHAT'S THAT OUT THE WINDOW?



How Much Gas is Needed?

Yearly Generation (GWh)	Yearly Load Factor (%)	Generator size (MW)
10	90%	1.26
10	50%	2.28
10	25%	4.57
10	10%	11.42
20	90%	2.52
20	50%	4.57
20	25%	9.13
20	10%	22.83
50	90%	6.30
50	50%	11.42
50	25%	22.83
50	10%	57.08

	Simple Cycle	Combined Cycle
Size (MW)	7	57
Hours per day	24	24
Energy output (KWh/d)	168,000	1,368,000
Conversion (MJ per KWh)	3.6	3.6
Energy output: MJ/d	604,800	4,924,800
Efficiency	35%	55%
Fuel Requirement (MJ/d)	1,728,000	8,954,182
Gas Heat Content (MJ/MMcf)	1,050,000	1,050,000
Gas Supply (MMcf/d)	1.65	8.53
Gas Price (\$/Mcf)	7.75	7.75
Fuel Cost (\$/KWh)	0.08	0.05



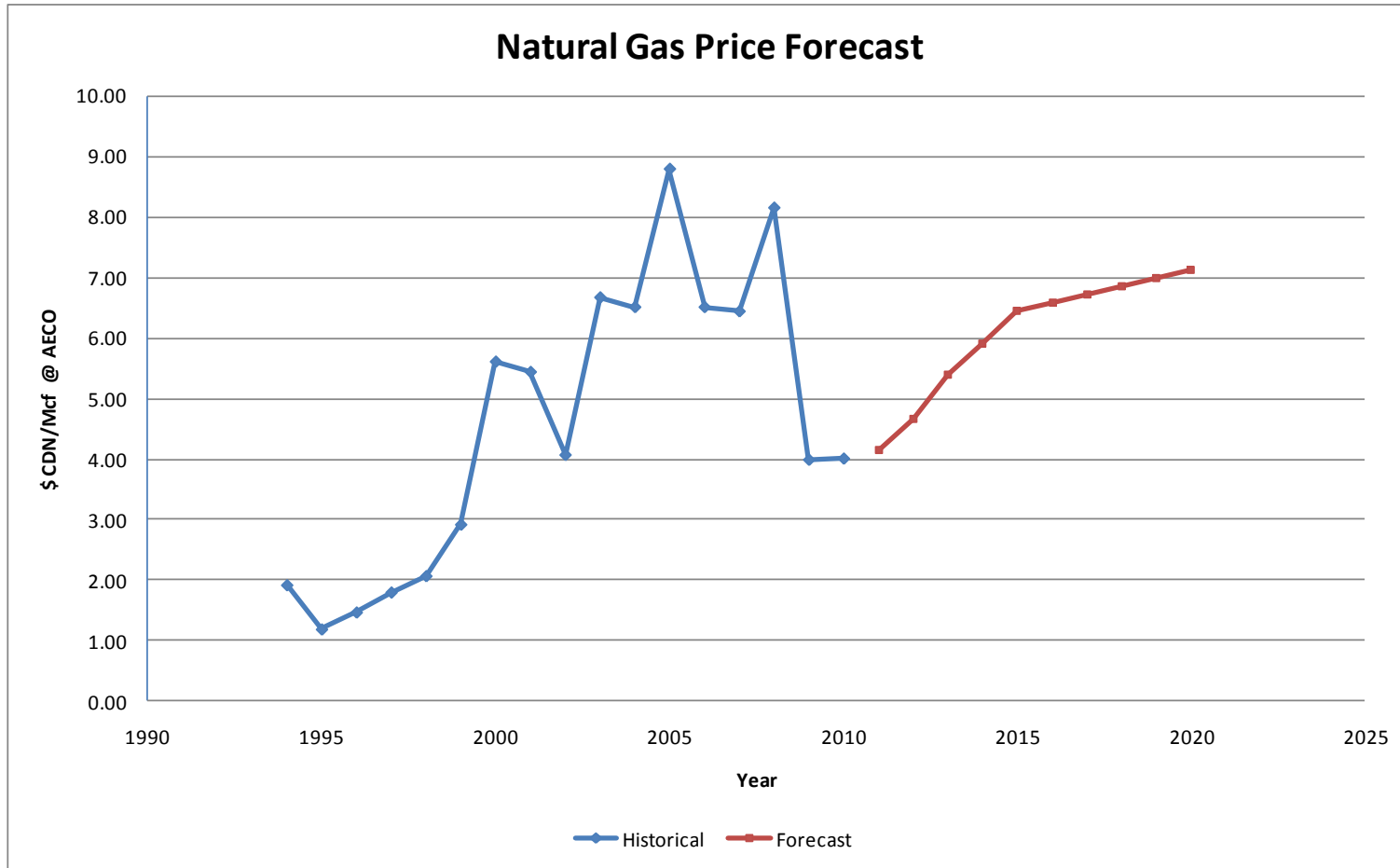
Understand the price assumptions!

Includes only fuel (gas) cost.

Assumes nearby gas supply

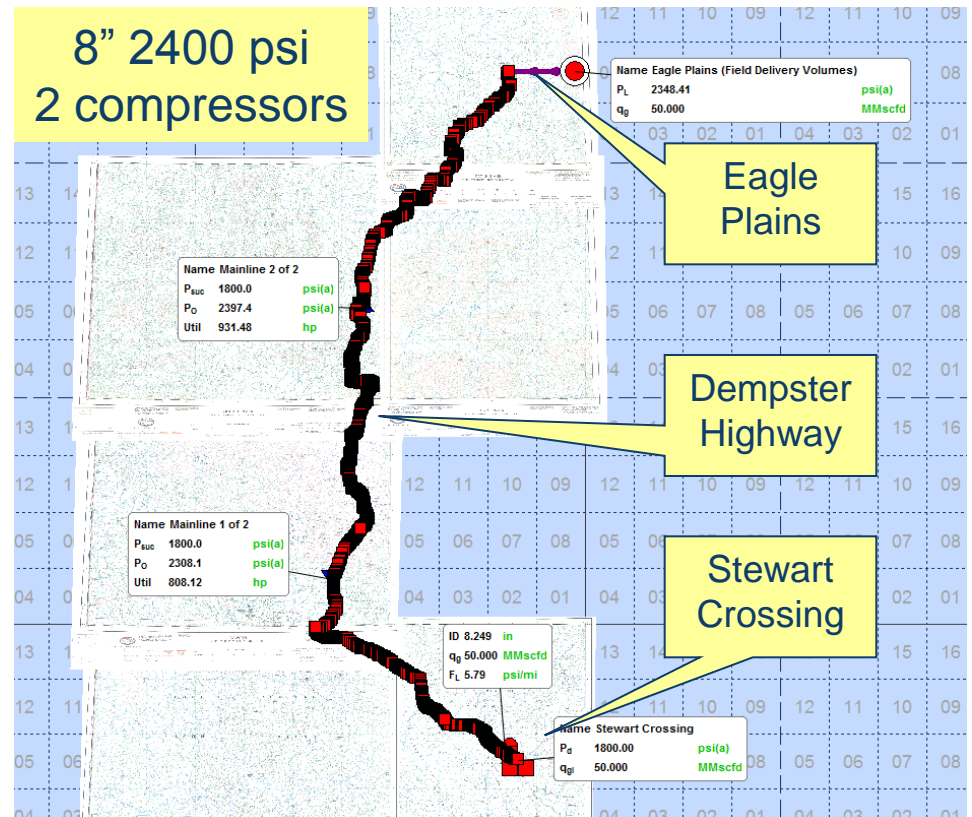
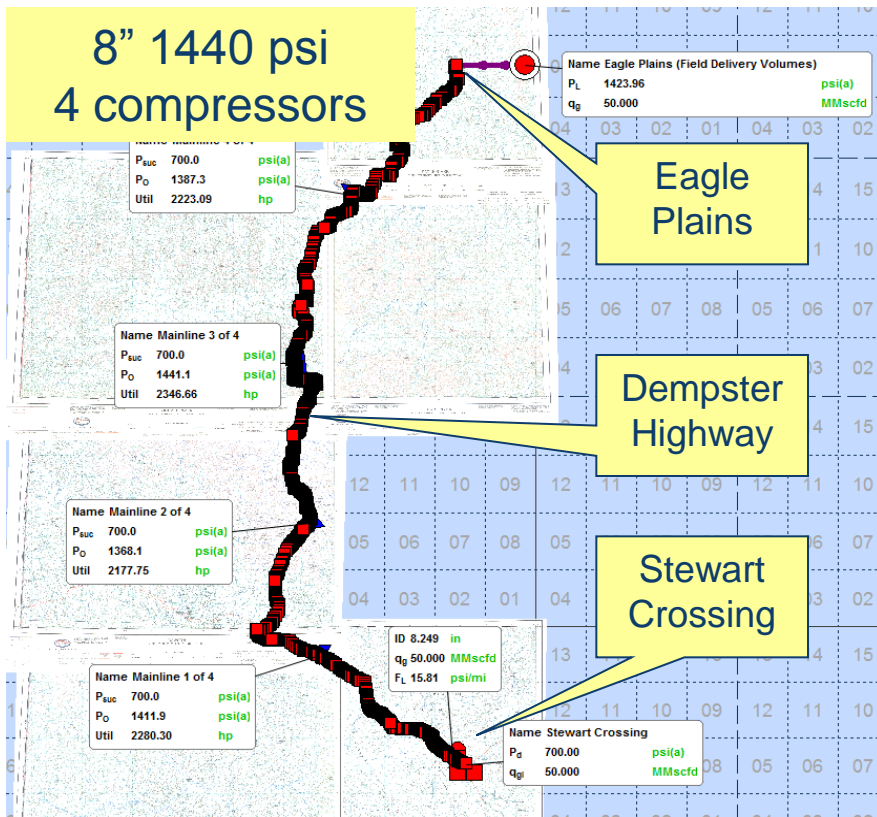
Compressor Cost = ~ \$1000 to \$2000/Kwh

Gas Price Forecast



Source: Fekete Associates Inc.

Eagle Plains to Stewart Crossing



500 km pipeline – 50 MMcf/d ~ 500 MM\$

Need a proper FEED study

What is LNG?

LNG = Liquefied Natural Gas

C1	Methane	93%	Gas	}	Cooled into a liquid
C2	Ethane	2%	Gas		-162 C at atmospheric pressure
C3	Propane	2%	Gas	}	Compressed into a liquid
C4	Butane	2%	Gas/Liquid		~20 psi at atmospheric temperature
C5+	Pentane plus	3%	Liquid		

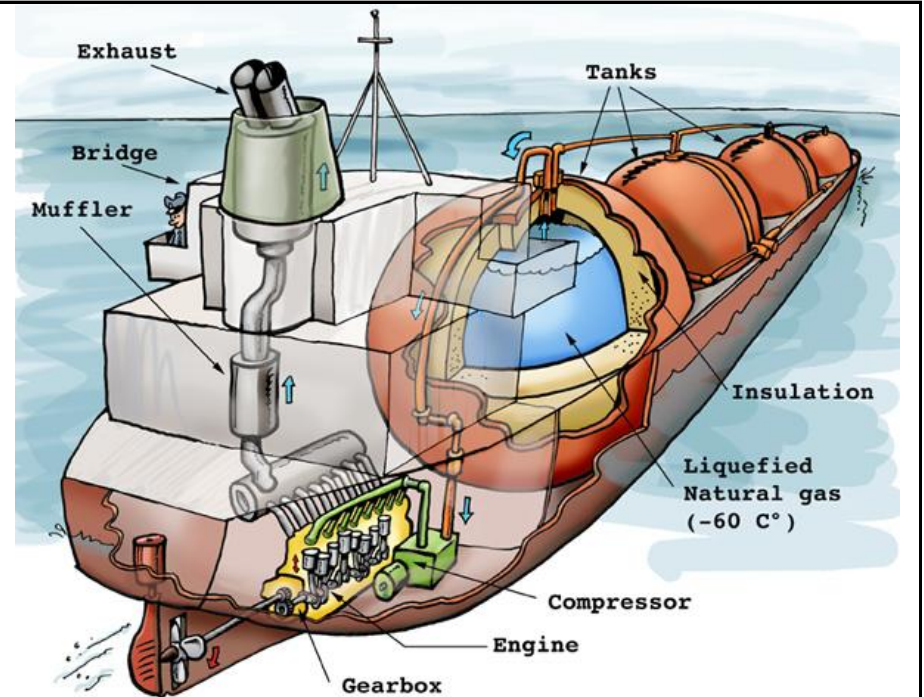
Example composition of natural gas from a well.

May also have small amounts of CO₂.

LNG Option



LNG Truck (56 m³)



LNG Tanker (135,000 m³)

Cooled to -162 degrees C – becomes liquid.

LNG Plant



Fossil Fuel Emission Levels - Pounds per Billion Btu of Energy Input

Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: EIA - Natural Gas Issues and Trends 1998

Natural gas has the lowest CO₂ emissions and pollutants when compared to other fossil fuels.

Thank You....

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