

Gas / Electric Options for Gathering & Treatment of Natural Gas

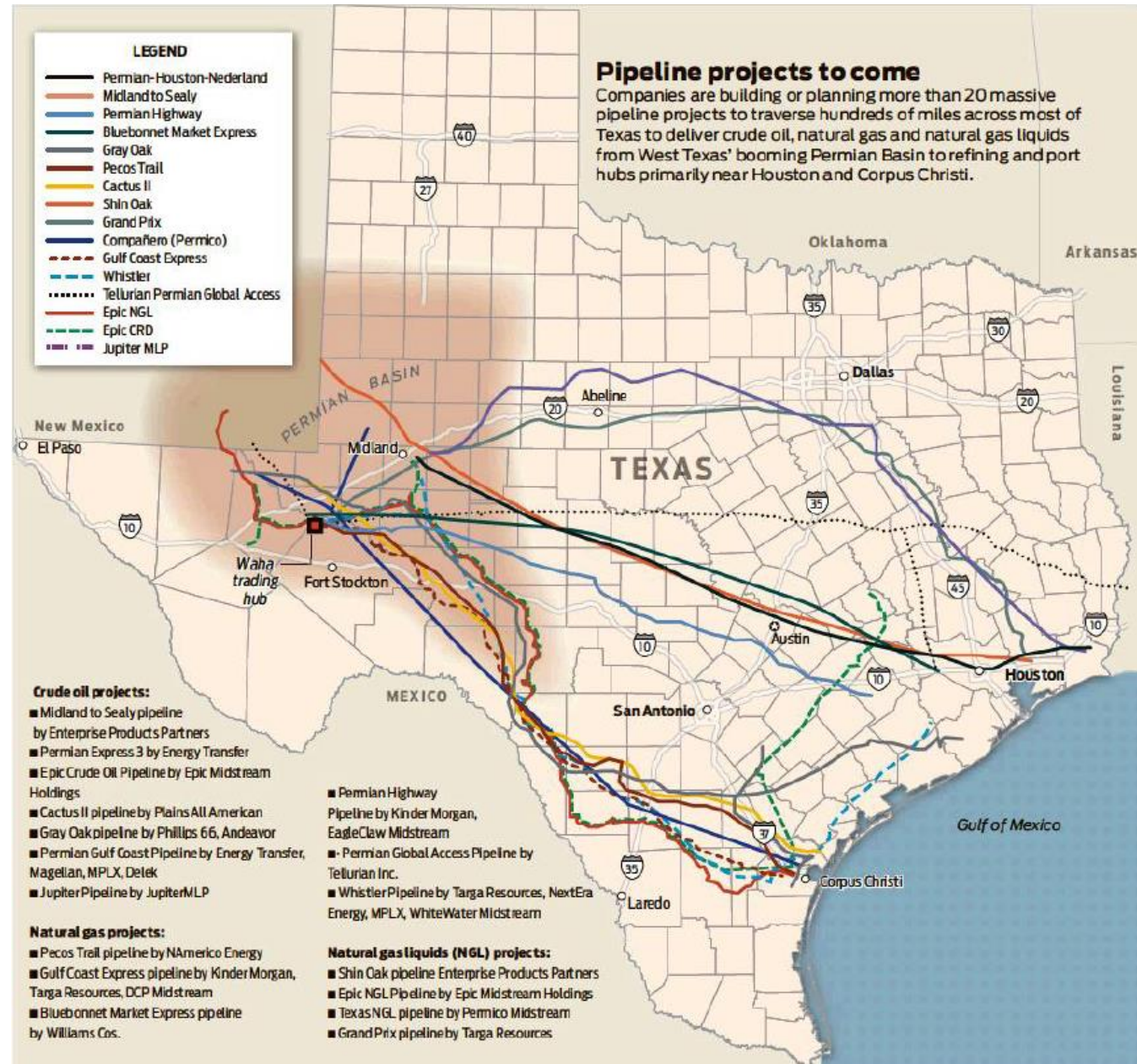
January 7th, 2018

Everything is bigger in Texas?

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What's going on in Texas?.....



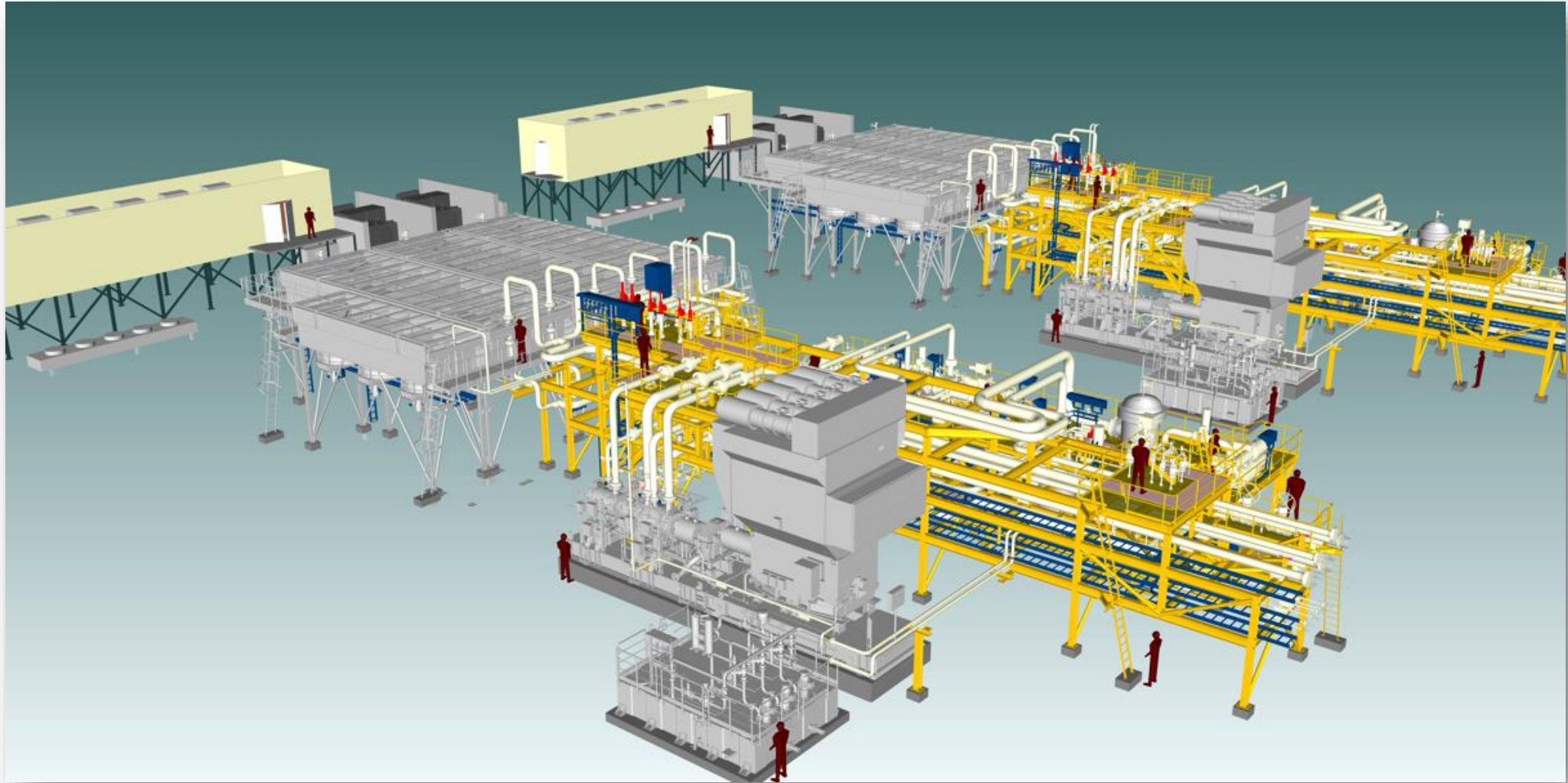
A Typical Installation

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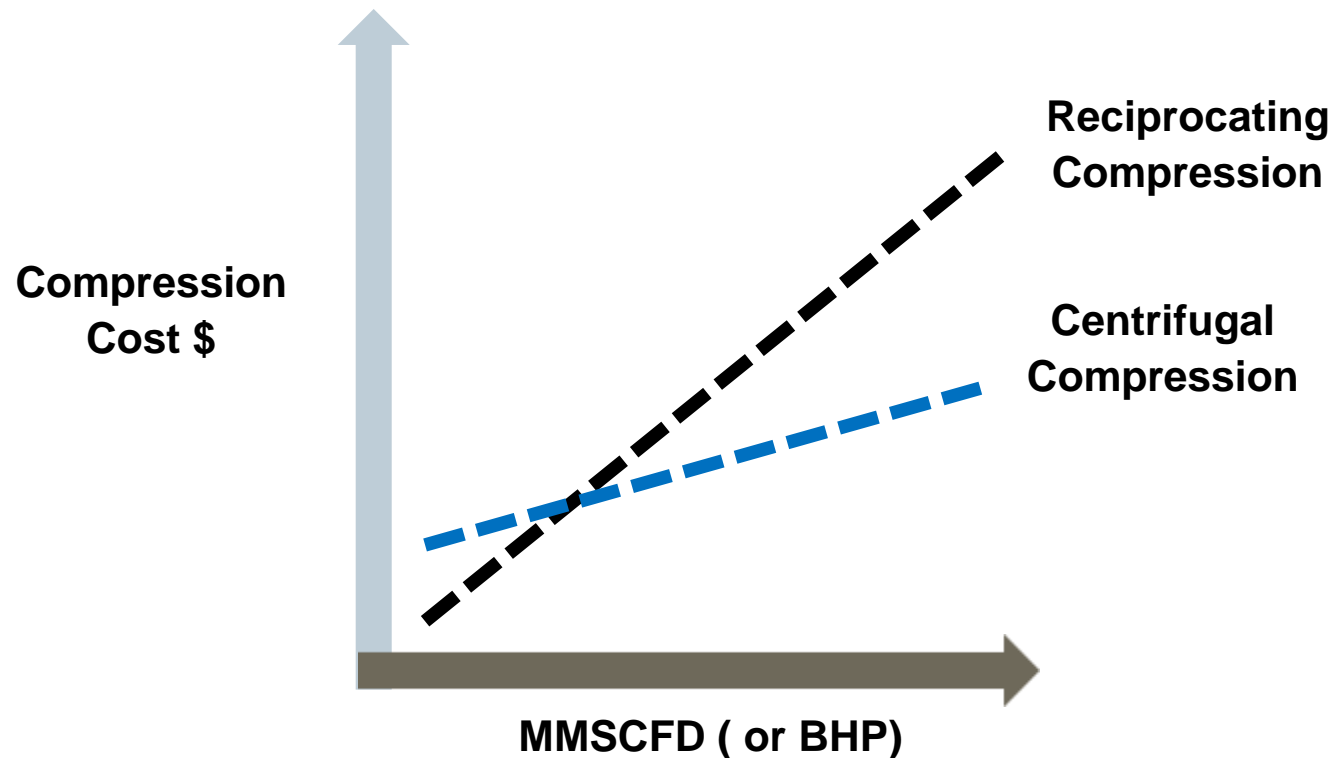
The Future Installation

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Capital Cost Comparison

Centrifugal compressors offer economies of scale with larger gas gathering and gas treatment facilities



With a centrifugal solution, the larger the plant, the less the \$/MMSCFD capital cost.

A detailed example

CAPEX		High Speed Recip	Centrifugal
	Plant Flow, MMSCFD	500	500
	Flow per Compressor, MMSCFD	58	125
	Qty Units Req'd	9	4
	CAPEX per Unit	\$ 2,750,000	\$ 4,250,000
	CAPEX for Compression	\$ 24,750,000	\$ 17,000,000
	Balance Of Plant Equipment per Train	Included in CAPEX	\$ 3,875,000
	Total BOP	Included in CAPEX	\$ 15,500,000
	I&C Cost per Train includes all EPC Costs	\$ 4,250,000	\$ 4,500,000
	Total I&C	\$ 38,250,000	\$ 18,000,000
	CAPEX Phase 1	\$ 63,000,000	\$ 50,500,000
	*Does not includes spare units		

MAINTENANCE COSTS		High Speed Recip	Centrifugal
	Compressor Power - Each Unit	6478	15149
	Number of Units	9	4
	\$ / per Year / per horsepower Compressor and Motor	\$ 19.05	1.91
	Total Yearly Compressor and Motor Maint Cost	\$ 1,110,653	\$ 115,738
	Discount Rate	5%	5%
	Years	20	20
	NPV of MAINTEX	(\$13,841,193)	(\$1,442,356)
	MAINTEX Delta	\$	12,398,837

TOTAL PLANT LIFE CYCLE COST	\$ 76,841,193	\$ 51,942,356
SAVINGS FOR CENTRIFUGAL CONFIGURATION	\$	24,898,837

Centrifugal vs Recips

Reduced Life Cycle Costs

- Centrifugal compression doesn't require a standby, resulting in lower CAPEX solution than reciprocating
- Significant savings in the site installation costs including foundations, piping, wiring etc, due to lesser number of units

Highest Reliability & Flexibility

- Centrifugal compressors are in essence maintenance free machinery, multi billion dollar facilities use these compressors with no installed spares.
- Turbo-compressors have considerable flow flexibility, when discharge pressure is reduced, surplus power can be used to increase flow.

Maintenance / Site Personnel Requirement

- Low maintenance requirements eliminate the need for site maintenance and logistics personnel, resulting in further cost savings.

Safety

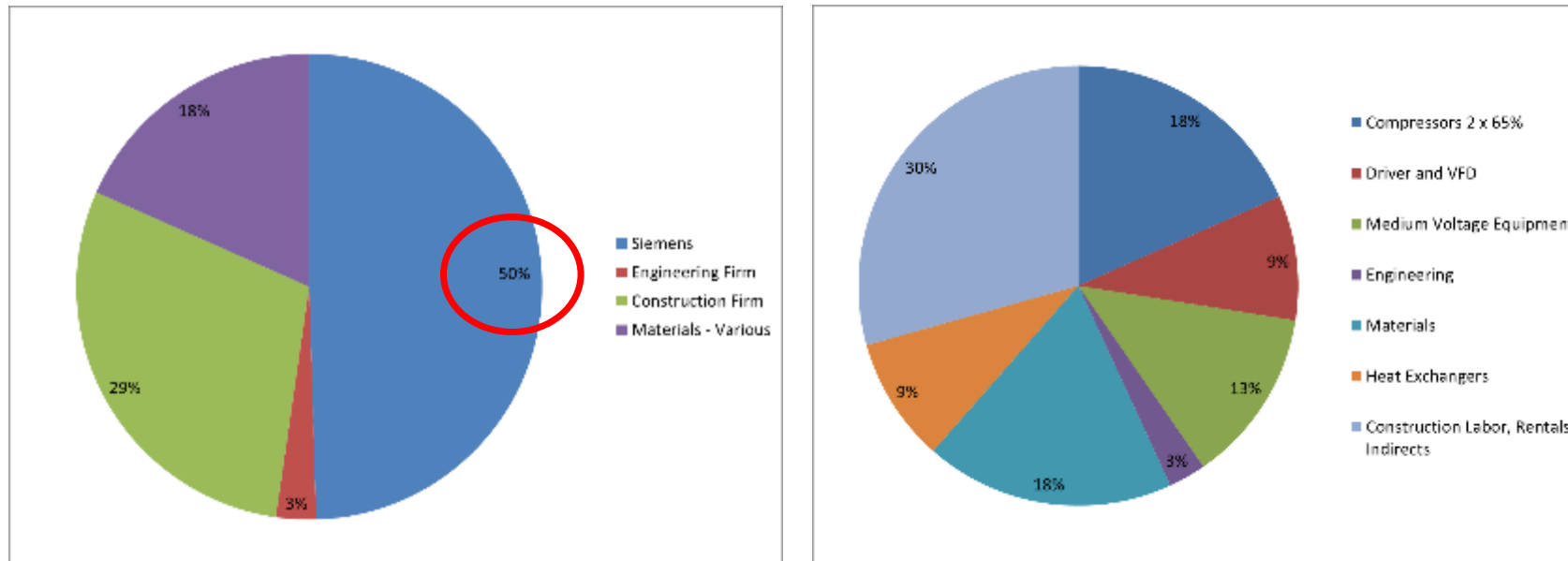
- Centrifugal compressors reduce the HSE exposure risk by +99%, again due to minimal maintenance required compared to a reciprocating solution.
- Gas leakage are significantly higher on the reciprocating compressors, increasing carbon footprint and risk of ignition.

Other Advantages of Centrifugal Compression

Single Source – Some OEMs can provide the compression, drivers, ehouse, switchgear all in a single bundle. In a typical plant that scope is 50%. This offers the resource owner a single point responsibility.

Delivery – With the single point responsibility = streamline project execution, saving time, and reducing schedule risk.

TYPICAL 100 MMSCFD GATHERING PLANT – Motor VFD Drivers

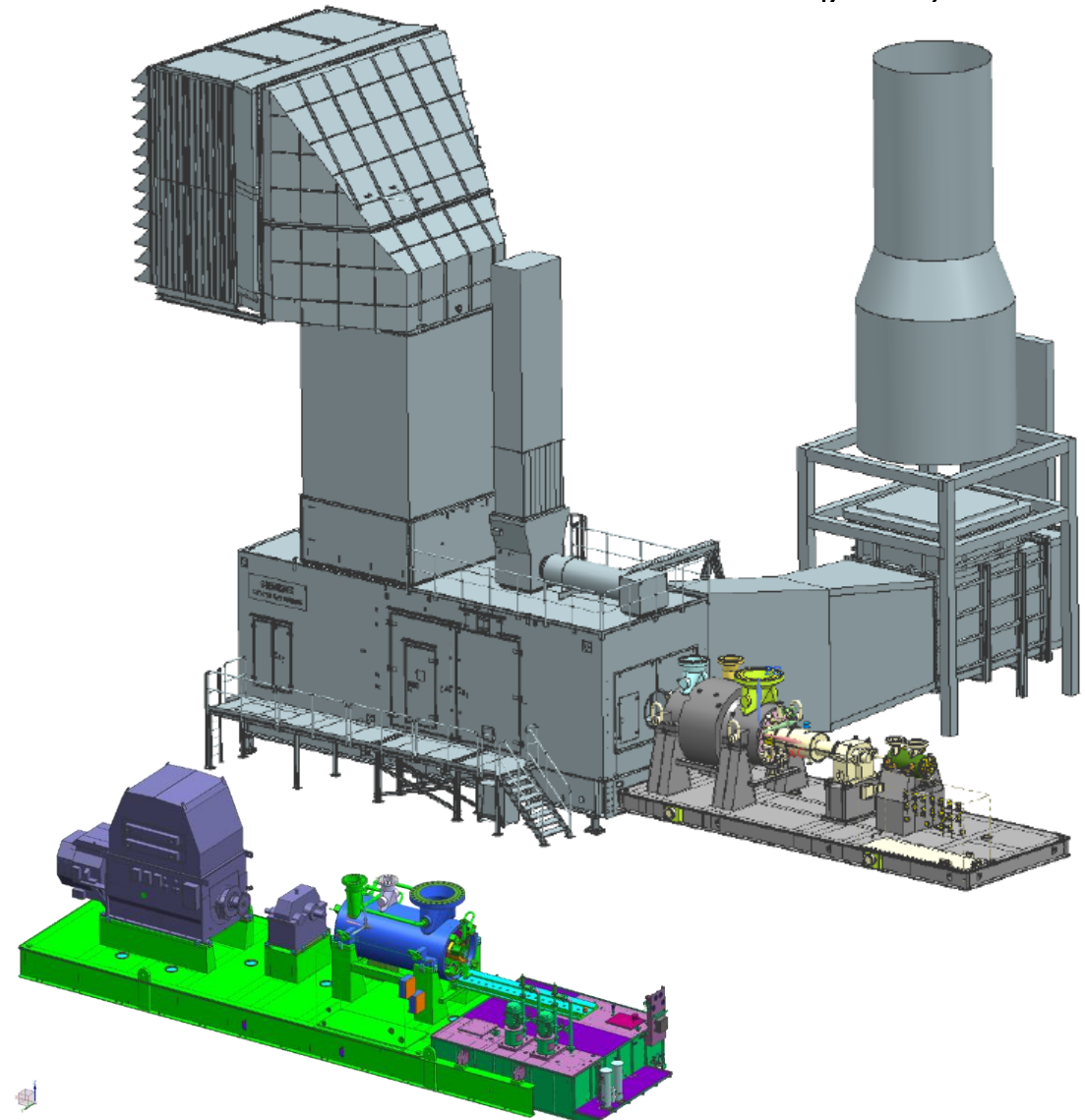


EnCana– Pipestone Central Facility



Project Summary

Project / Country	Alberta, Canada
Customer	Encana
Application	Gas processing plant rated at 200 MMscfd
Technology	1 x SGT-750 gas turbine and Datum compressors. 1 x EMD – D18 Propane compressor train
Start	Nov 2018
Complete	Nov 2019 / EIS 3QTR 2020
Challenge	<ul style="list-style-type: none">Minimize Capex and Opex investment for new facility
Solution	<ul style="list-style-type: none">High efficiency mixed refrigeration solution based on the SGT-750 gas turbine and Datum D18 and D4 compressors.The scope of supply includes a comprehensive long term service agreement adapted to customer needs (5 and 10 years plans under consideration)
Benefits	<ul style="list-style-type: none">High availability and reliability.Low fuel cost due to highest efficiency.Best in class emissions.Waste heat recovery unit to provide supplemental heat to the facility



Thank you!

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