Siemens Energy – AESO Tech Session 1

Innovative Emissions-Free Waste Heat to Power

DCG Investment Jeopardized by AESO 2018 Tariff

Siemens sCO_2 Waste Heat Recovery Technology
Project Overview

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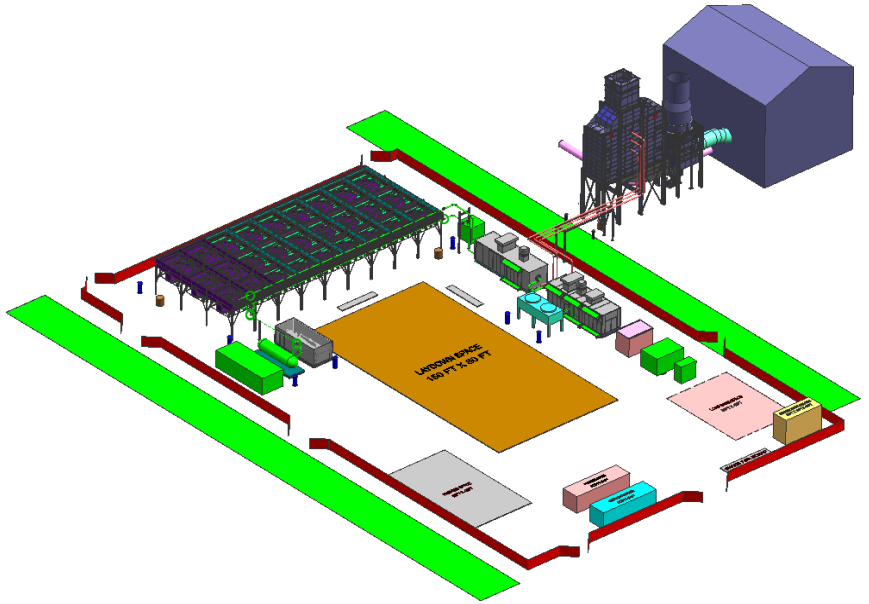
Project – The First of its Kind Commercial Installation

- **Partnering with TC Energy** on Pilot Project at Compressor Station in Alberta
- Innovative clean energy technology converting waste heat from gas turbine exhaust into **emission-free power (9MWe)**
- Partially funded by **Emissions Reduction Alberta (ERA)**
- Targeting **first in the world commercial scale supercritical CO_2 (sCO_2)** waste heat recovery installation, as pilot for future deployment in Alberta
- TC Energy goals: **Enhance facility efficiency**, reduce greenhouse gas (GHG) emissions
- Siemens objectives: Introduce new technology solution that makes fossil energy greener; CO_2-neutral power supply; **Develop sCO_2 expertise and supply chain in Alberta market**

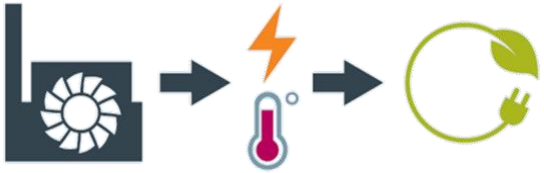
Technology – Innovative Clean Energy Conversion

- Closed-loop power cycle based on proven Rankine / Brayton Cycle principle
- Working fluid is Carbon Dioxide (CO_2) operating in supercritical region where advantages of liquid and gas are simultaneously leveraged
- **Zero water requirements**; small footprint / no new land disturbances
- **Safe, stable, non-flammable, non-toxic, benign,** and readily available working fluid

TC Energy – Compressor Station in Alberta



Convert waste heat into emissions-free power; improve plant efficiency and generate carbon offsets.



Innovative Technology Deployment – No Water Required – 9MW Emissions Free Power in Alberta

Siemens sCO_2 Waste Heat Recovery Technology
Technology Deployment and Impact

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Projected Business Case Benefits in Alberta

25-30 simple cycle gas turbines across ~20 potential sites. GHG emissions offset independently verified

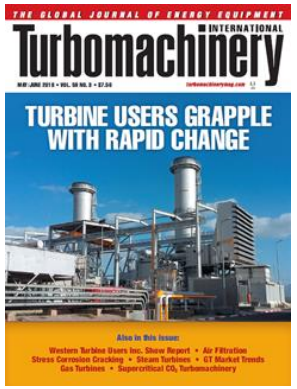
~270 MWe
of recoverable power generation capacity without burning any additional fuels

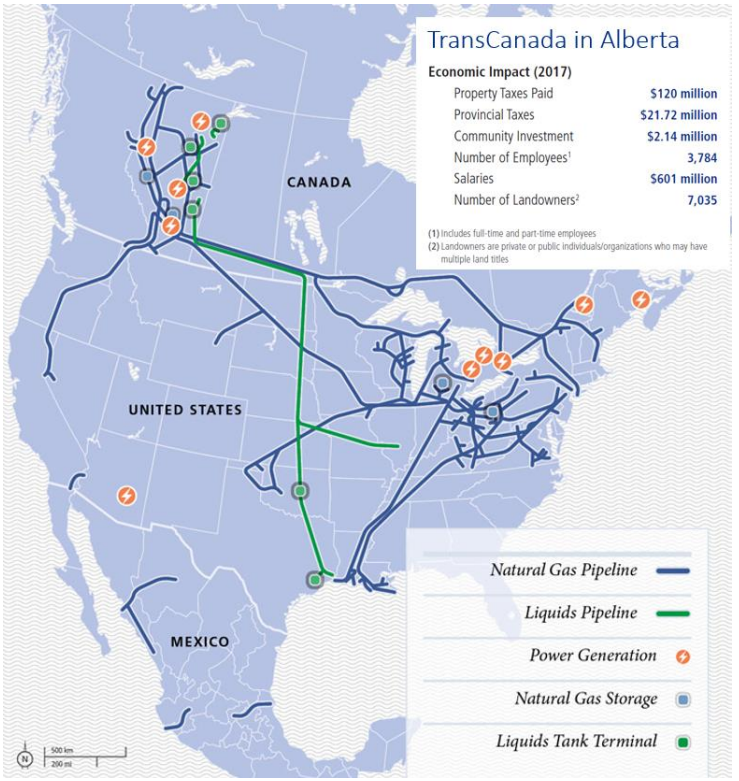
~10% Efficiency Increase
to existing midstream compressor station operating efficiency

Avoids 1,200,000 tons GHG
emissions per year avoided by Waste Heat Recovery power conversion

TC Energy Potential

- TC Energy operates 91,900 km (57,100 miles) of pipeline across Mexico, USA, and Canada. ~50% of installed base in Canada
- Canada: 120+ simple cycle gas turbines, with ~30% fit for current Siemens solution





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Business Case Jeopardized by 2018 Tariff

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Grid Connection Details and 2018 Tariff Impacts to Siemens – TC Energy Pilot Project and Future Deployment

- Fortis is DFO, consultation and HLS started in **Jun '18** - **sufficient capacity at substation at that time**
- $8 MM CAD substation upgrade completed in **Nov '19 to increase load capacity benefiting Fortis distribution system** – upgrade was not required for Siemens Project to connect
- Pilot Project assigned Rate STS: 9.5 MW. Power flow 100% to transmission system (AltaLink) through feeder
- CCD assigned and Fortis **flow through** of previous substation upgrade **costs to Siemens** – **despite project not driving requirements**
- **Potential exists for future fractioning costs**, uncontrolled by project parties due to DFO flow through
- Current estimated CCD assigned to project is ~$2,000,000 CAD, **cost not previously anticipated**

Project Details

- AESO Project: P2293
- Completed High Level Study
- Executing detailed study (Phase 3)
  - Requested ISD: July 1, 2021*
  - COD: November 1, 2021*

*Pending ongoing review of commercial viability

Estimated CCD ~ Double Connection Budget
direct unplanned impact to project CAPEX for costs not driven by project requirements

→ ✖ **Discourages investment in capital intensive DCG projects and innovation in emissions-free power generation in Alberta**

Future $???
unknown / unbounded liability for future fraction adjustments not driven by project requirements

→ ✖ **Lacks investor certainty in budget planning and creates unfair cost assignment to DCG**

Seeking relevant, directly attributable, one-time connection cost allocations for projects in Alberta
--- Cost Causation --- Simplicity ---