Geothermal Ground Source Heat Pump at Alexandra District Energy Utility System

IDEA 2018, Vancouver
Monday June 11, 2018

Presented By:
Constantino Retes, P.Eng
Lulu Island Energy Company
BACKGROUND
Lulu Island Energy Company & the City of Richmond

- Lulu Island Energy Company (LIEC) is a wholly owned municipal corporation, established to operate district energy utility systems in the City of Richmond.

- LIEC currently owns and operates two district energy systems:
  - The Alexandra DEU
  - The Oval Village DEU

- Long term, LIEC is planning to implement a DE system throughout the whole City Centre area.
ADEU - Overview

- First district energy system built by the City of Richmond
- City partnered with a developer to service two residential buildings (2010)
- Located in the Alexandra West Cambie neighborhood - Aircraft Noise Bylaw
- DE identified as key strategy – LIEC and Service Area Bylaw created
ADEU – Service Area Bylaw

- Mandates connection for all new developments in service area
- Buildings required to use 70% of the heating, cooling and DHW from ADEU
- ADEU regulated by Richmond’s City Council (not BCUC)
- Rates are updated every year and voted by council
ADEU – Expansion

Phase 3 Expansion - 2014
• Additional geo-exchange field and peaking capacity (2014-2020)
  – Heating: 6 MW
  – Cooling: 8 MW

Phase 4 Expansion - 2015
• ASHP system for commercial customers:
  – Heating: 3 MW
  – Cooling: 2 MW
ADEU - Today

- Connected buildings: 9
- Connected residential units: 1456
- Connected non-residential area: 314,000 ft²
- Connected gross floor area: 1,678,000 ft²
- Total length of pipe: 3.4 km

- Heating capacity: 6 MW + 3 MW (ASHP)
- Cooling capacity: 8 MW + 2 MW (ASHP)
ADEU SYSTEM
How it works:

• Uses earth as a heat source (winter) or a heat sink (summer)
• A water source heat pump is used to further raise/lower temperatures

Benefits:

• Provides both heating and cooling
• Low carbon energy source
• High efficiency (COP)
• Minimal maintenance required
Geothermal Ground Source Heat Pump at ADEU
ADEU - Energy Centre

- Located inside the West Cambie Neighborhood Park
- Houses the geo-exchange field and distribution system pumps
- Provides additional peaking/backup capacity through boilers and cooling towers
- System monitored remotely through a SCADA system
ADEU - Distribution Piping

- Two-pipe distribution system
- Transfers energy from the geo fields to the customer's buildings
- Combines customer’s loads providing diversity benefit
- No additional insulation required
- More than 3.4 km of HDPE 22” mains and 8-12” service lines
ADEU - Energy Transfer Stations

• Interconnection between the DEU and the connected buildings

• ETS Components:
  – Heat exchanger
  – Energy meter
  – Controller
  – Measurement instruments
  – Isolation and control valves
  – Pipe, fittings and strainers
SmartREIT– Satellite Energy Plant

- Services the Central at Garden City shopping mall
- Designed to meet commercial loads at competitive rates
- Uses Air Source Heat Pump technology with modular units
- Connected to the main ADEU geo-exchange energy system
ADEU – What’s Next

• ADEU full build-out projections (2020-2025):
  – Floor area: 4.5M ft²
  – Buildings: 15 +

• Target: > 70% energy from low carbon sources

• Two additional geo fields required: > 10,000 m²
Learned Lessons

- Plan for future expansion
- Take control over ETS design, construction and commissioning
- Get involved in the building’s mechanical system design and commissioning
- Avoid in-building backup/ supplementary energy sources
Awards and Recognition

- ADEU has won several awards for its leadership and focus on sustainability and innovation:
  - Energy Globe – National Award – 2013
  - APEGBC – Sustainability Award - 2014
  - Canadian Geoexchange Coalition – Excellence Award – 2014
  - IDEA – System of the Year Award – 2016
Thank You

Questions?

Presented By:
Constantino Retes, P.Eng
Lulu Island Energy Company