

# Geothermal Ground Source Heat Pump at Alexandra District Energy Utility System

**IDEA 2018, Vancouver**  
Monday June 11, 2018

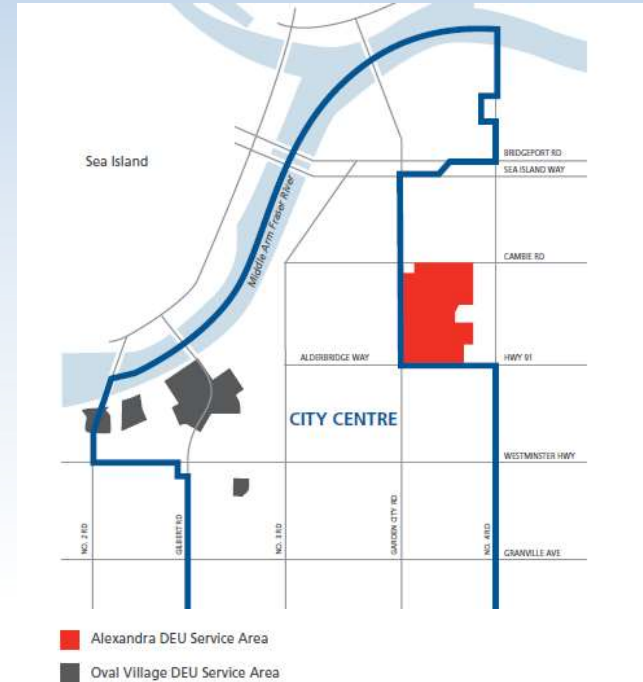
**Presented By:**  
Constantino Retes, P.Eng  
Lulu Island Energy Company



# 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 through-out the whole City Centre area



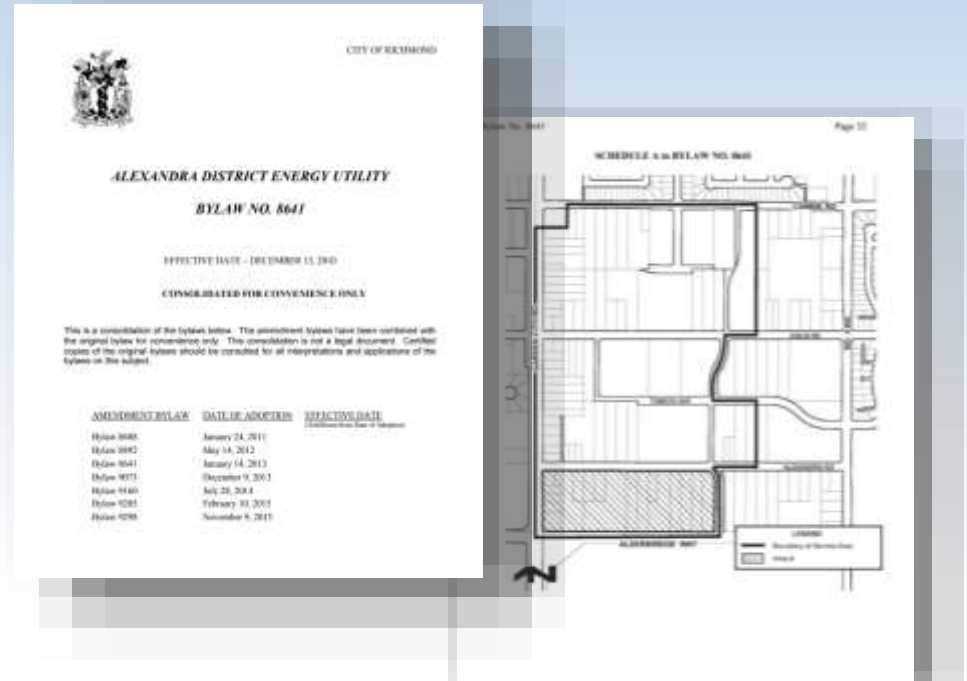
# ADEU - Overview

- 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

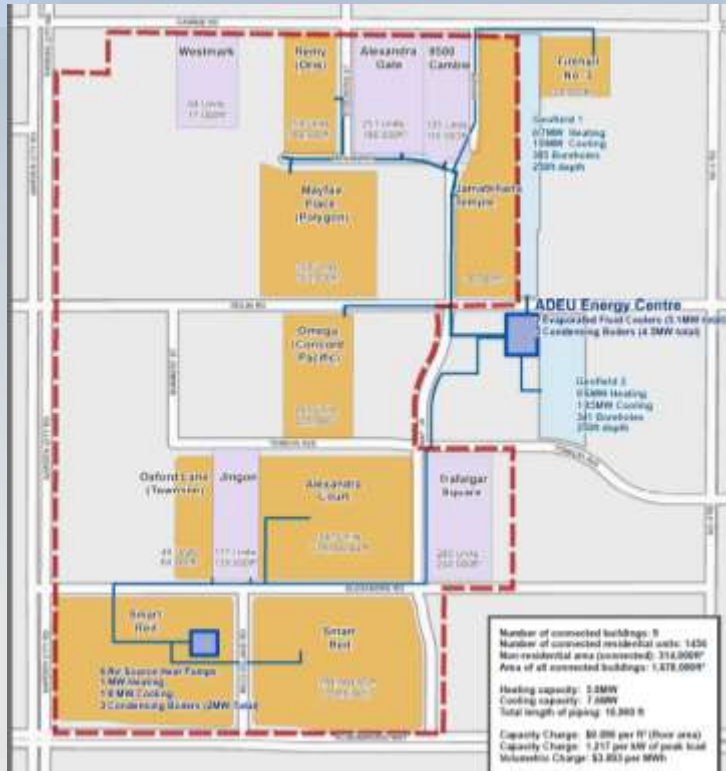


## Phase 4 Expansion - 2015

- 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 ft<sup>2</sup>**
- **Connected gross floor area: 1,678,000 ft<sup>2</sup>**
- **Total length of pipe: 3.4 km**
  
- **Heating capacity: 6 MW + 3 MW (ASHP)**
- **Cooling capacity: 8 MW + 2 MW (ASHP)**

# ADEU SYSTEM



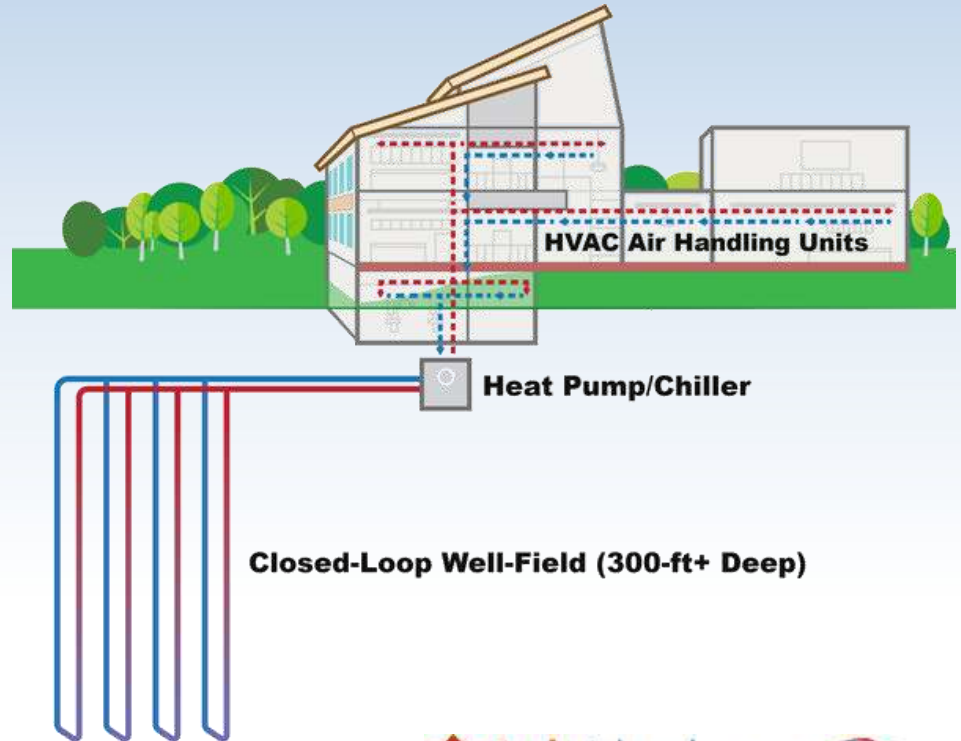
# Geothermal Ground Source Heat Pump Technology – Typical Application

## 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 ft<sup>2</sup>
  - Buildings: 15 +
- Target: > 70% energy from low carbon sources
- Two additional geo fields required: > 10,000 m<sup>2</sup>



# 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



ALEXANDRA COURT



# 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 Georexchange Coalition – Excellence Award – 2014
  - IDEA – System of the Year Award – 2016







**Thank You**

**Questions?**

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