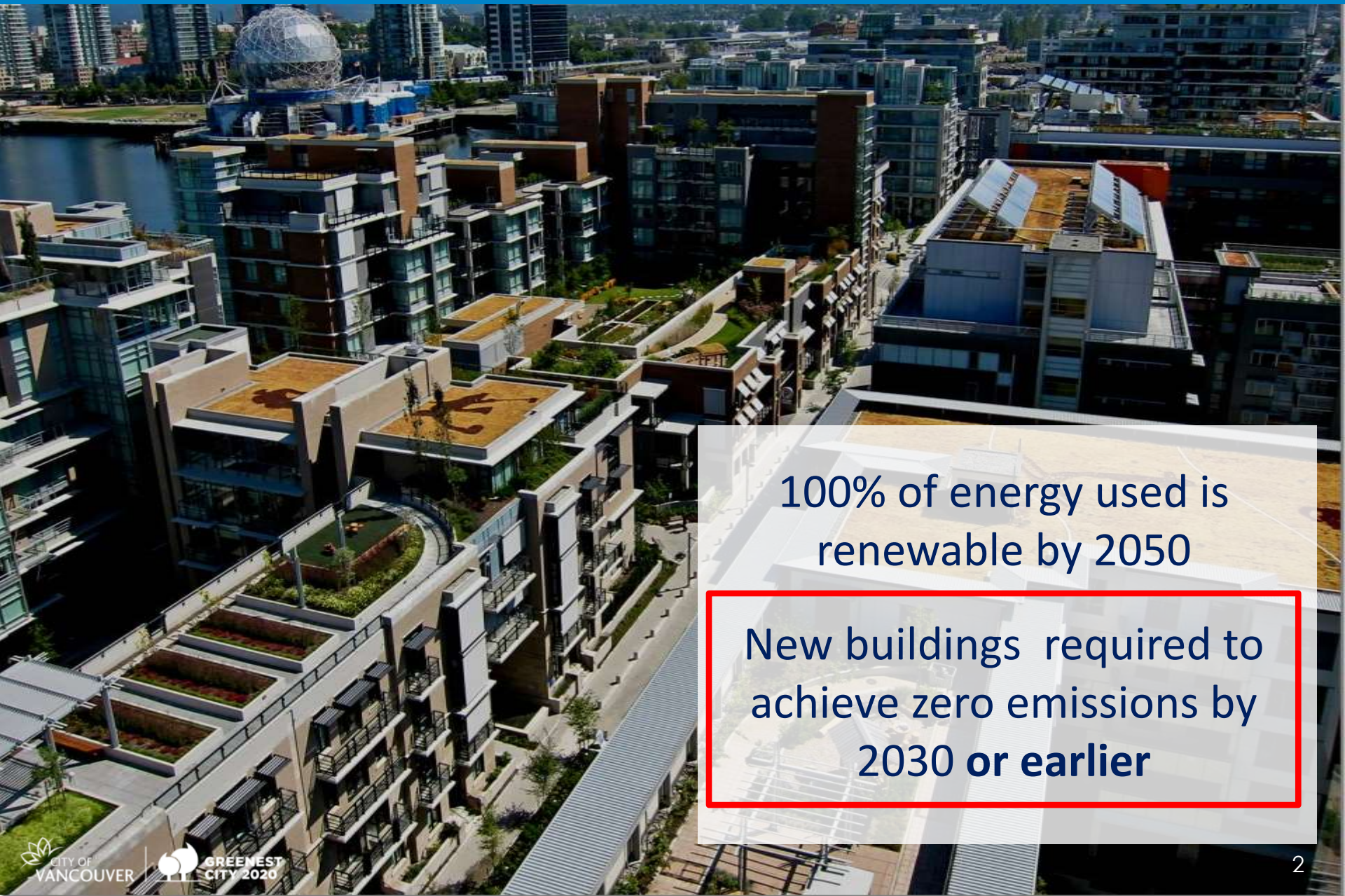
Expansion of the False Creek Neighbourhood Energy Utility ("NEU")

IDEA Conference Workshop
June 11, 2018

CITY OF VANCOUVER | GREENEST CITY

Renewable City Strategy – Approved in 2015



100% of energy used is renewable by 2050

New buildings required to achieve zero emissions by 2030 **or earlier**

Zero Emissions Building Plan – Approved in 2016

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High Performance Building

- GHG limit achieved by minimizing heat loss
- Enables simple heating system design

Low Carbon Energy System

- GHG limit achieved by combining efficiency with low carbon energy supply
- Uses advanced technologies

False Creek NEU Overview

(Operational Since 2010)

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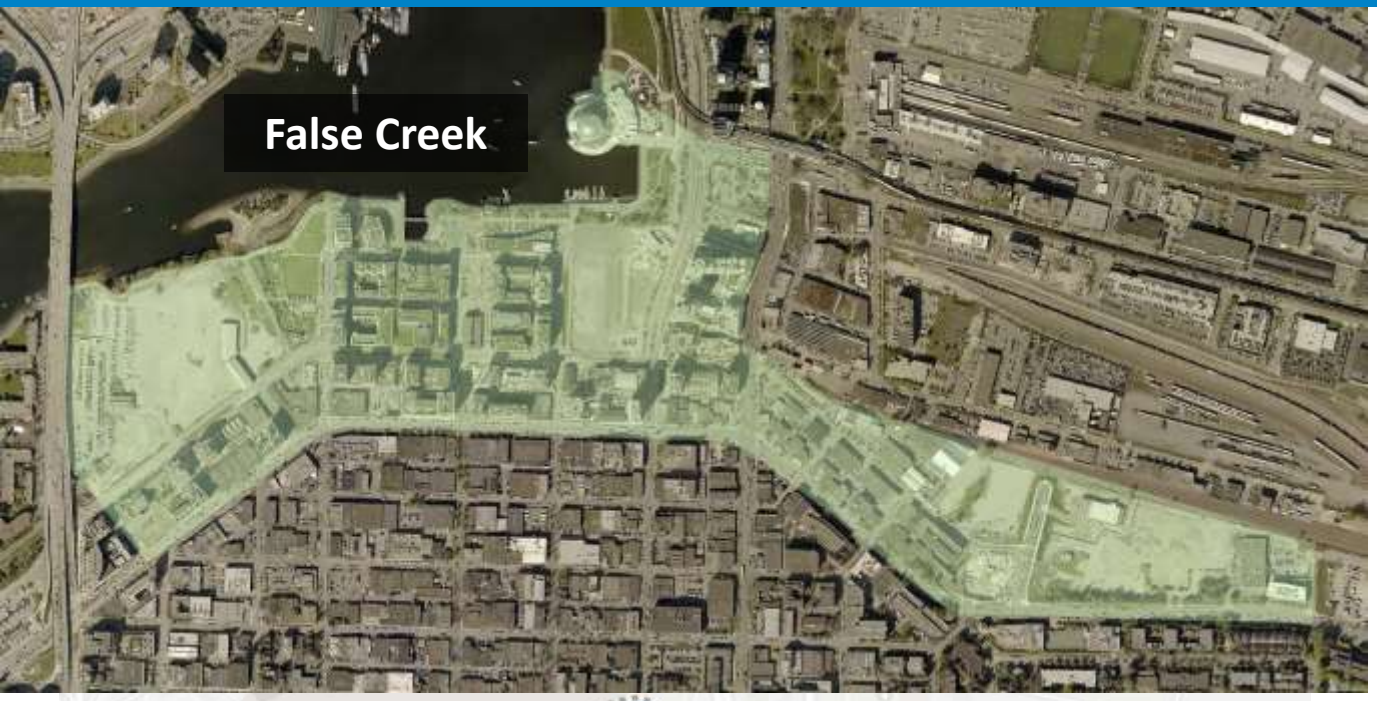
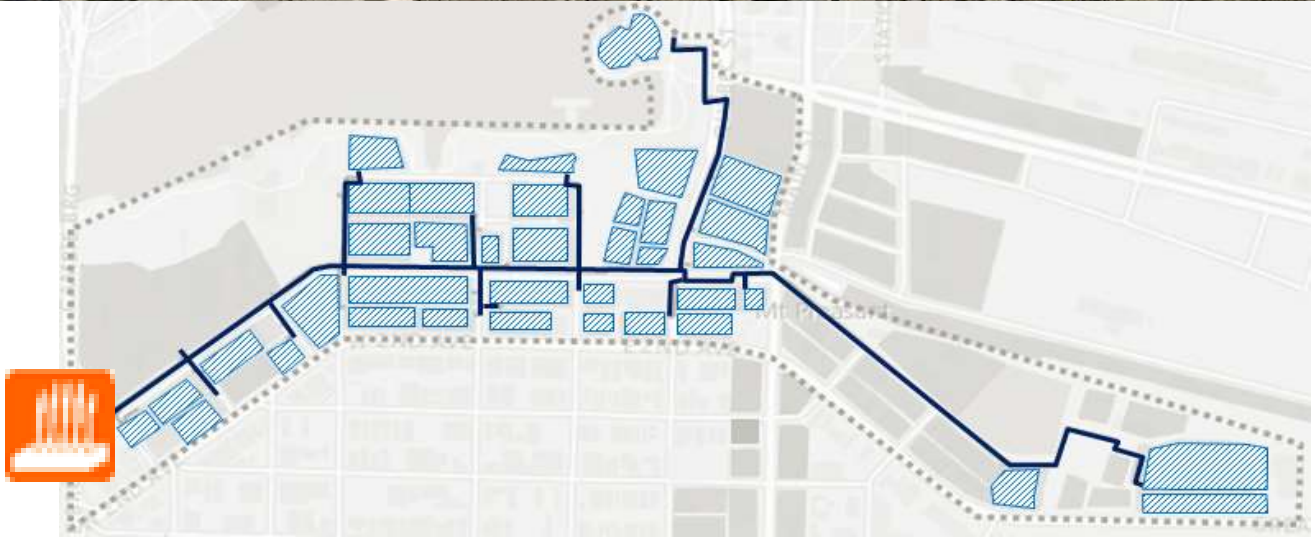
- Supplies thermal energy for space heat & hot water
- Owned & operated by the City, with independent oversight by Expert Panel
- 70% of energy from renewable sources (waste heat recovered from sewage + bio-methane)
- Financially self-sustaining, delivering cost-effective renewable energy

Benefits

- Secures 100% renewable energy outcomes, eliminating the future need for costly and disruptive retrofits to buildings
- Highly resilient, adaptable to wide range of existing and future technologies
- Construction and maintenance cost savings for buildings, and frees up space for green roofs and amenities

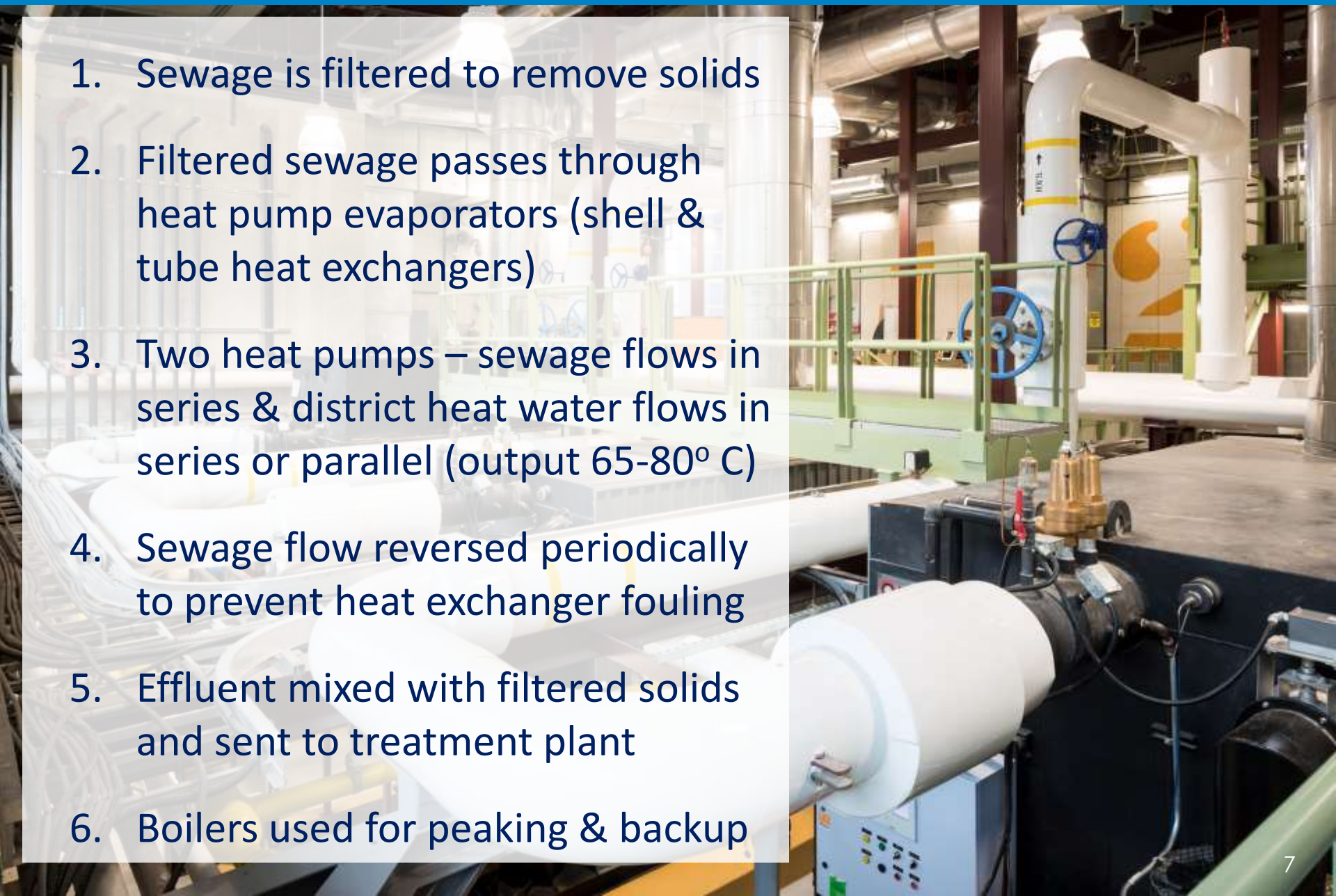
Service Area





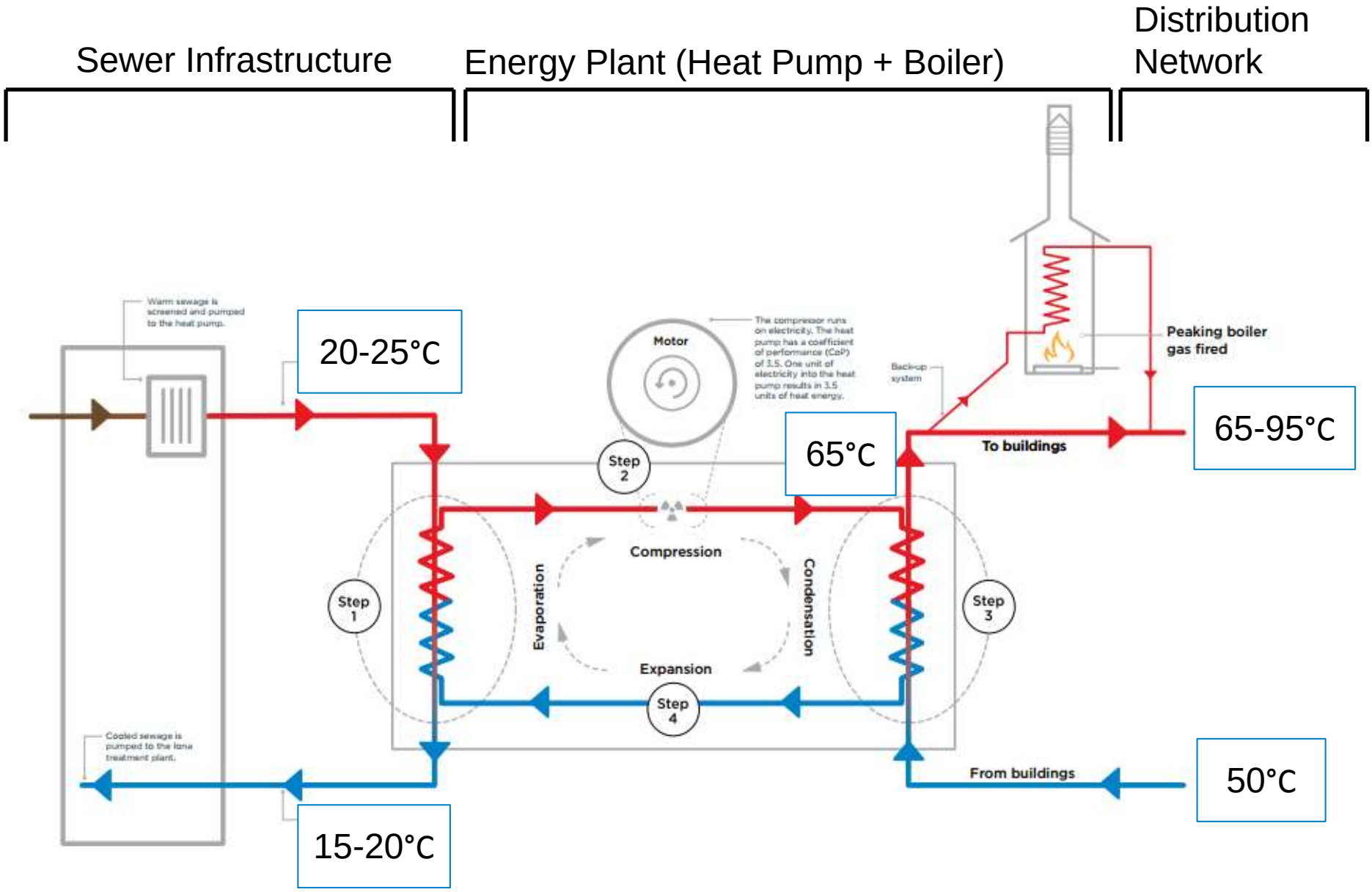
- **32** connected buildings
- **9** buildings in-stream
- Customer base has grown **300%** since 2010
- **5.2M sqft** of connected floor space

Sewage Heat Recovery - How it Works

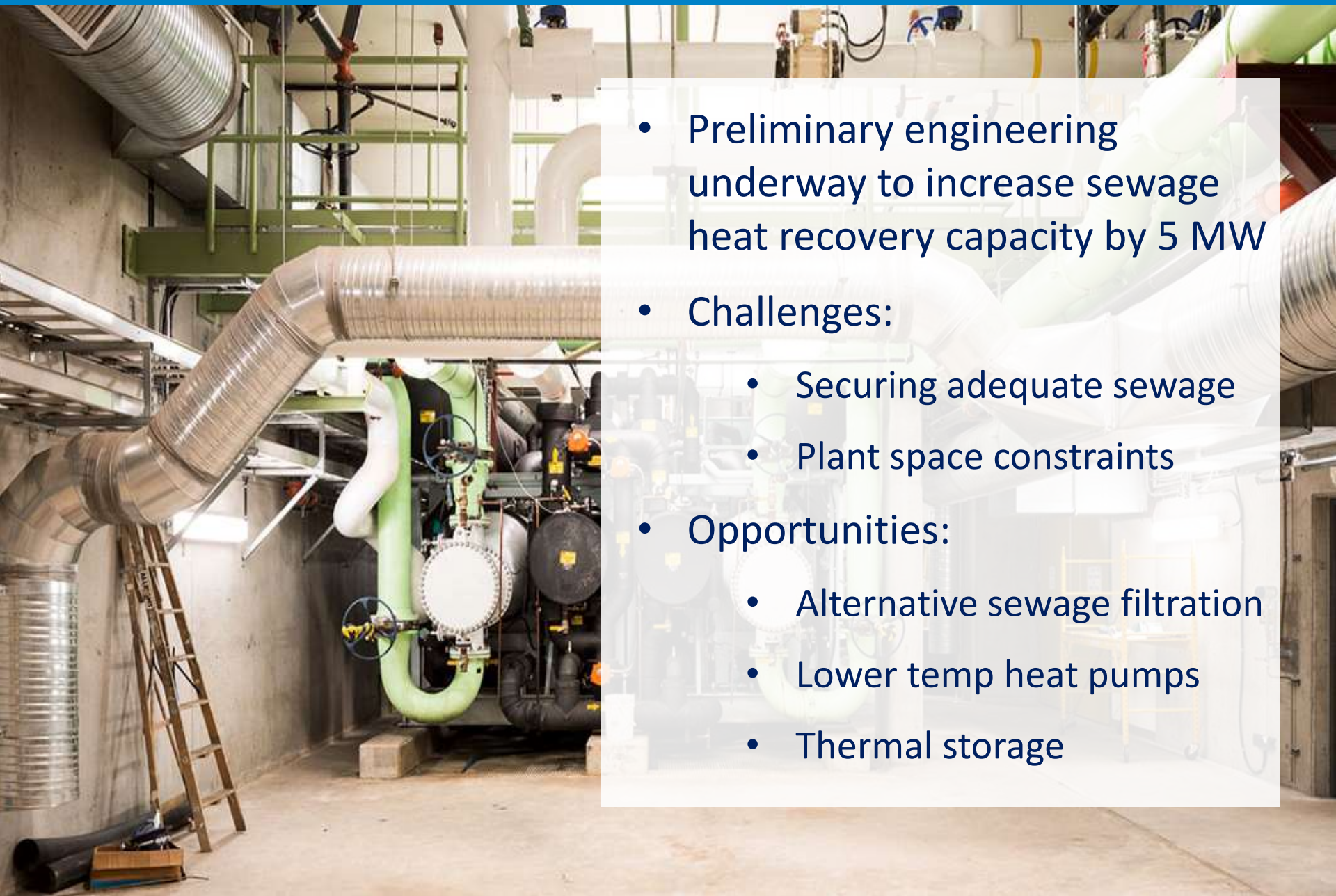


1. Sewage is filtered to remove solids
2. Filtered sewage passes through heat pump evaporators (shell & tube heat exchangers)
3. Two heat pumps – sewage flows in series & district heat water flows in series or parallel (output 65-80^{o} C)
4. Sewage flow reversed periodically to prevent heat exchanger fouling
5. Effluent mixed with filtered solids and sent to treatment plant
6. Boilers used for peaking & backup

NEU Process Diagram



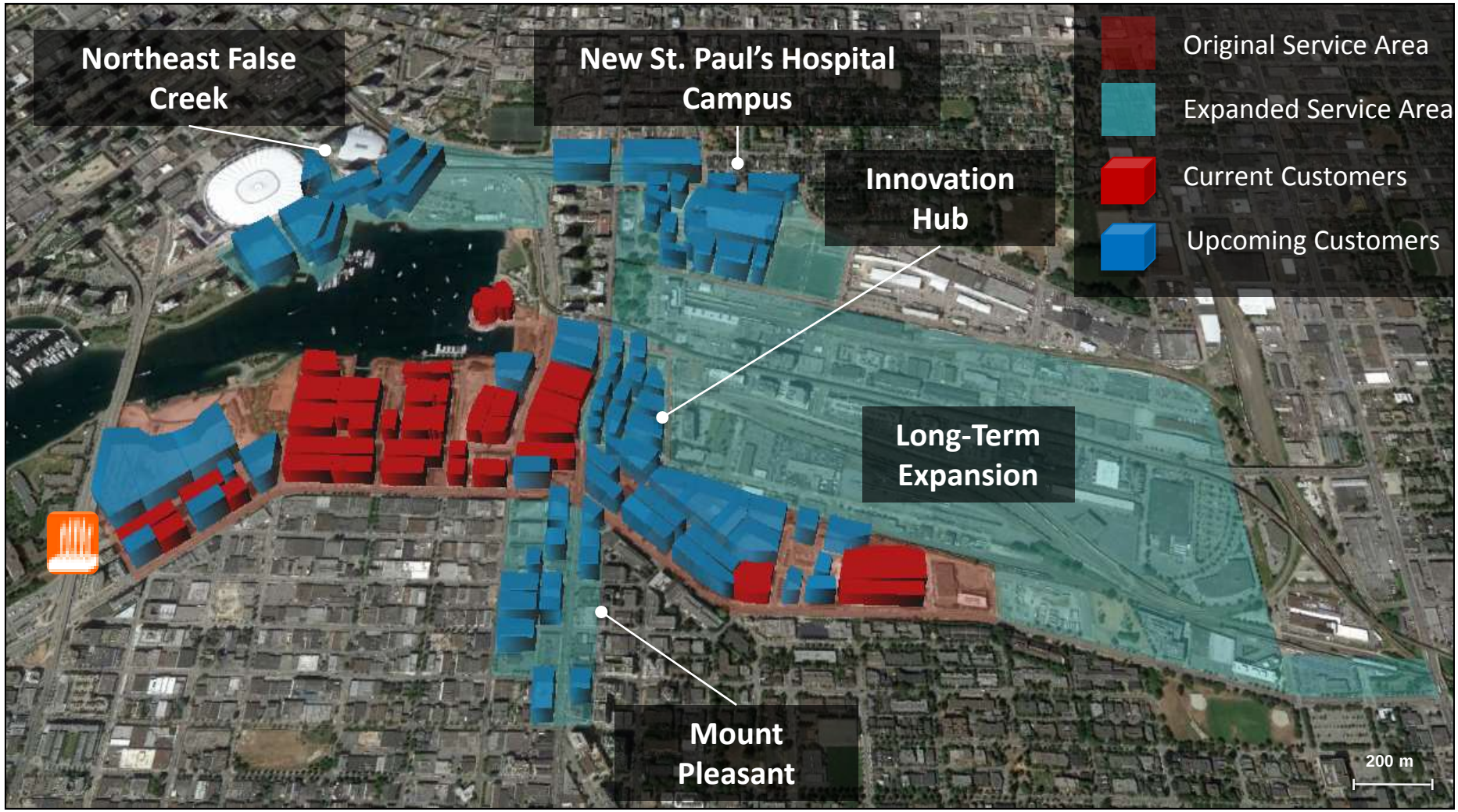
Sewage Heat Recovery Expansion



- Preliminary engineering underway to increase sewage heat recovery capacity by 5 MW
- Challenges:
  - Securing adequate sewage
  - Plant space constraints
- Opportunities:
  - Alternative sewage filtration
  - Lower temp heat pumps
  - Thermal storage

Expansion of the Service Area

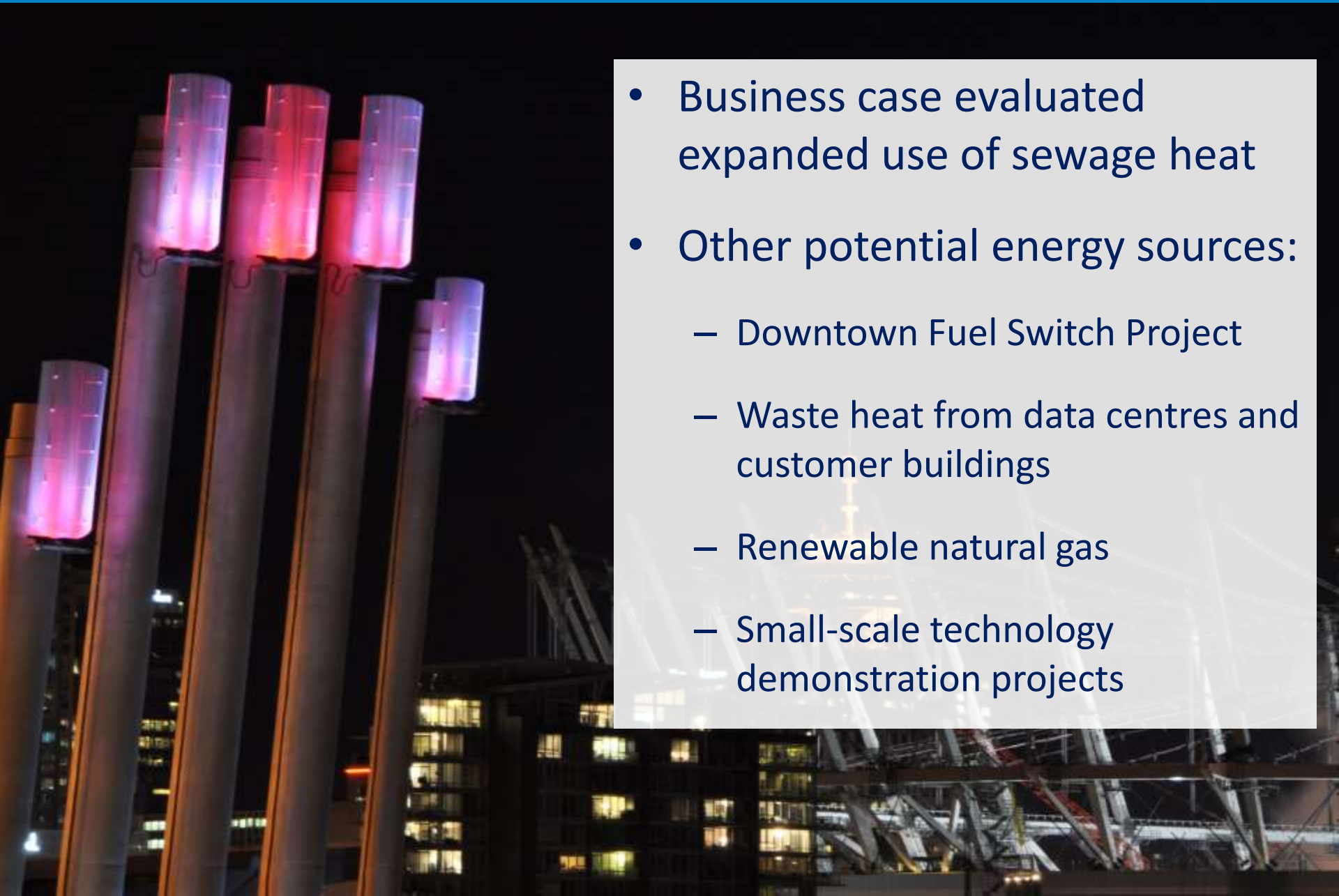
- In Feb 2018, City Council approved expansion plans to secure 100% renewable energy outcomes for ~22 million ft^2 of buildings



Role of the City

- Expansion plan is based on City ownership of the distribution network, and existing False Creek Energy Centre
- This maintains direct control to achieve GHG performance targets, without provincial regulation
- Flexibility for private sector investment in energy production

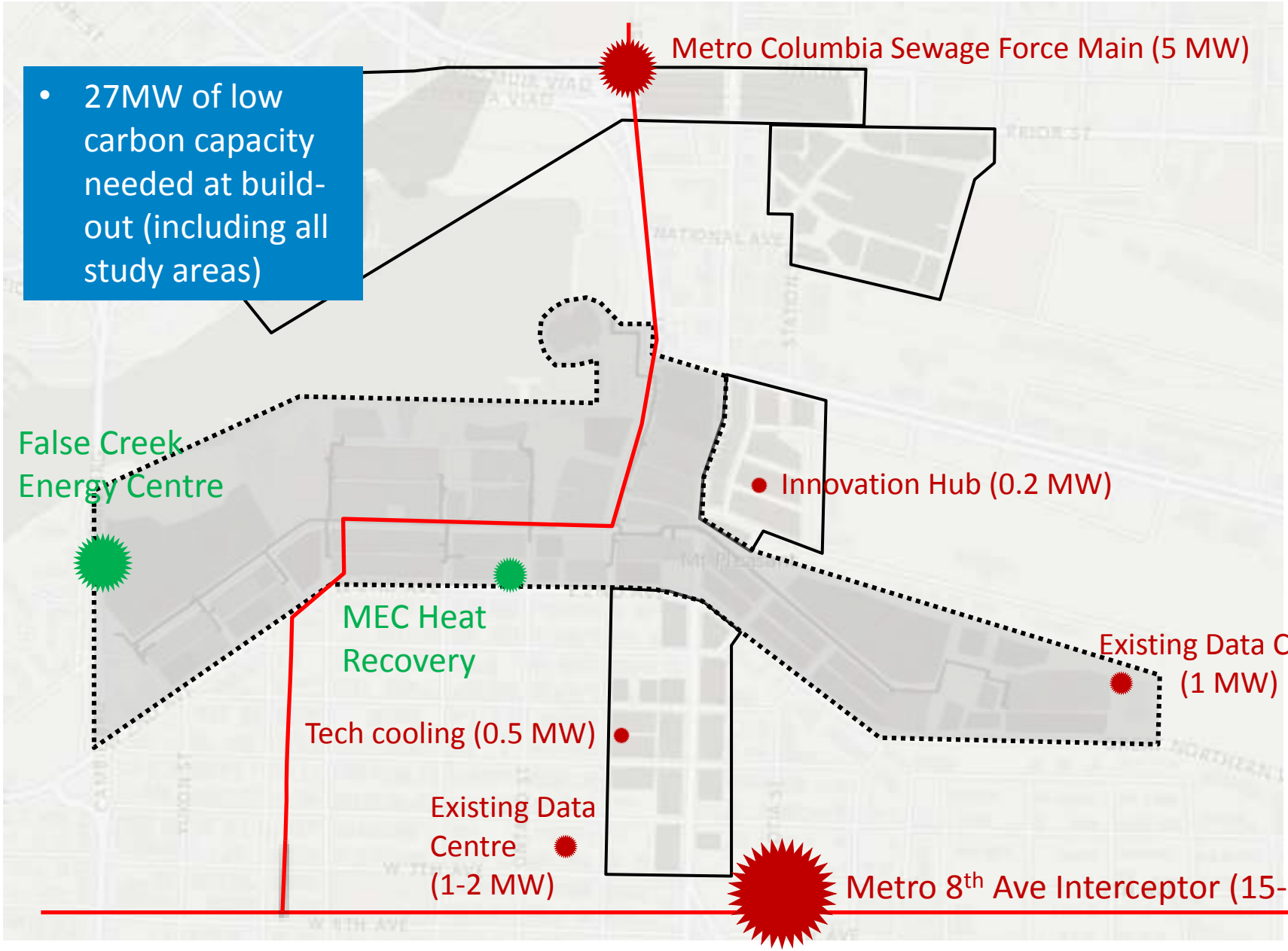
Energy Source Options for Expansions



- Business case evaluated expanded use of sewage heat
- Other potential energy sources:
  - Downtown Fuel Switch Project
  - Waste heat from data centres and customer buildings
  - Renewable natural gas
  - Small-scale technology demonstration projects

Waste Heat Opportunities

- 27MW of low carbon capacity needed at build-out (including all study areas)



Technical Review for Expansion Areas

1. NEU Technology & System Design	• Explore lower temperature approaches for expansion areas to maximize efficiency & waste heat recovery potential
2. Design Requirements for Buildings	• Explore opportunities for increased flexibility in building-side mechanical design requirements
3. Sharing of Economic Benefits	• Connection fee to share economic benefits of connection between developers and utility customers

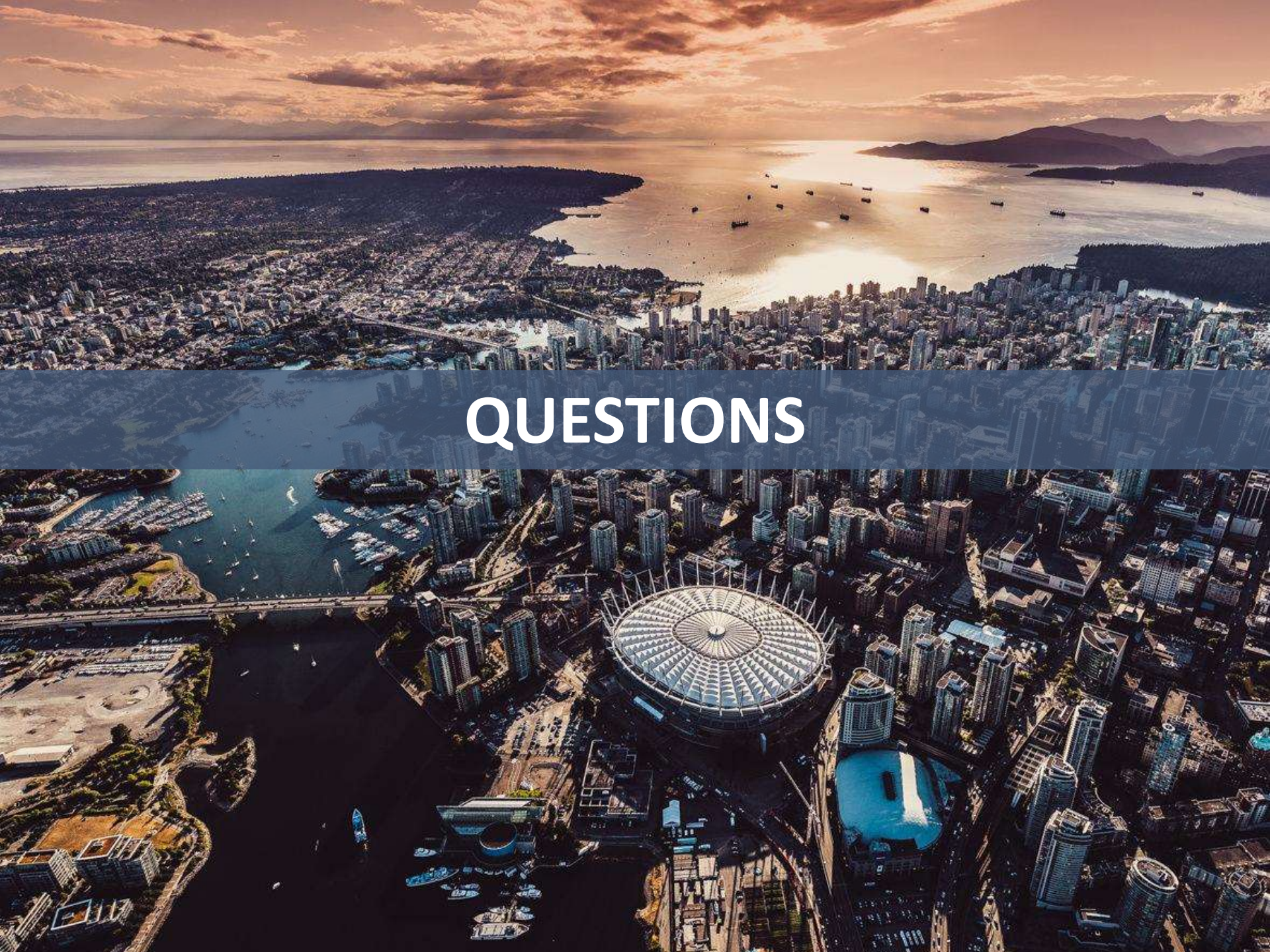
SUMMARY

The Zero Emissions Building Plan significantly lowers GHG emissions in new buildings. T**he NEU provides unique opportunities**:

1. **High level of City control to achieve Renewable City Strategy objectives** for pre-2030 buildings
2. **Ability to leverage resource recovery opportunities**, including sewage heat and other local waste sources
3. **A highly adaptable and resilient energy solution** for buildings

NEXT STEPS

- **Sewage Heat Expansion:**
  - Q4, 2018: initiate procurements (pending status of other low carbon options)
  - 2019 – 2020: detailed design and construction
- **Distribution System Expansion:**
  - **2019**: Mt Pleasant
  - **2020 - 2021:** NE False Creek and Innovation Hub
- **Technical Optimization Review:**
  - complete Q3 2018



QUESTIONS