

# Turning TRIUMF Accelerators into Green Machines

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# Today's Agenda:

- 1. Background**
- 2. Strategic Planning for Sustainability**
- 3. District Energy Feasibility Study**



# Background: TRIUMF Canada's National Laboratory for Particle and Nuclear Physics

- Canada's leader in probing the structure and origins of matter and in advancing isotopes for science and medicine.
- TRIUMF is owned & operated by a consortium of 17 Canadian universities and was founded in Vancouver 42 years ago.
- TRIUMF is committed to reducing the carbon footprint of research itself... not just the typical administrative activities associated with a large "industrial" organization.



# Background: University of British Columbia



## UBC At a Glance:

- 1,000 acres
- 50,000+ students
- 8,500 student housing residents
- 8,000 market/non market housing residents



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# UBC Strategic Planning for Sustainability



GHG reduction targets,  
against a 2007 baseline:

- 33% by 2015
- 67% by 2020
- 100% by 2050

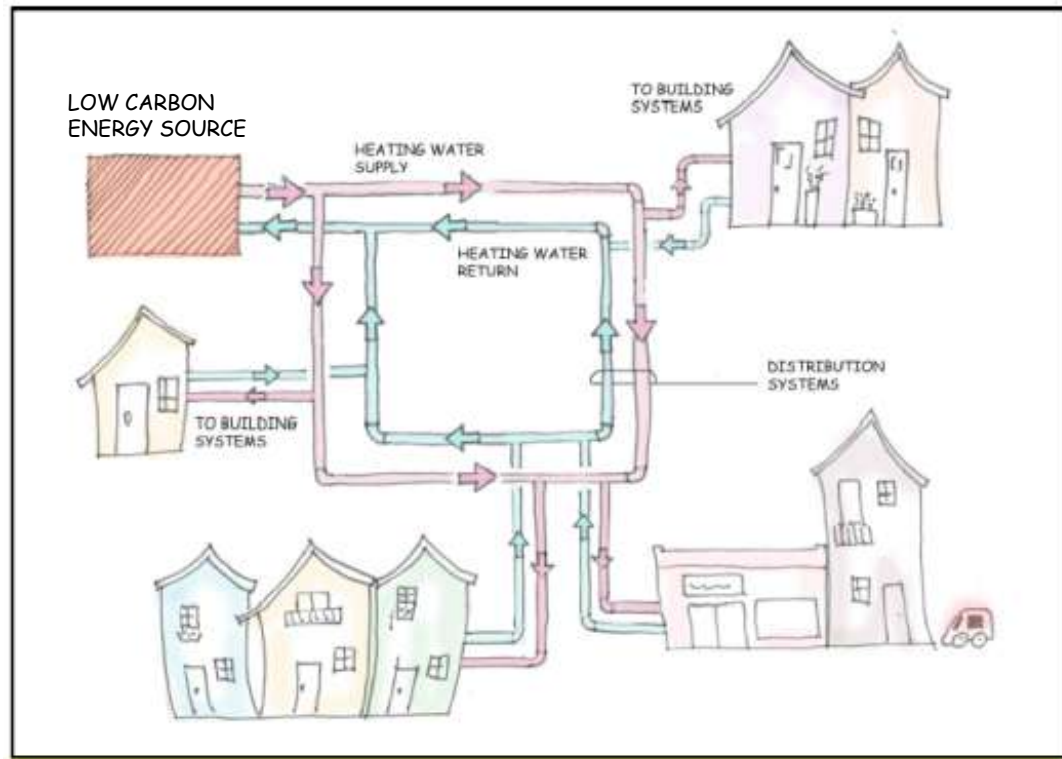


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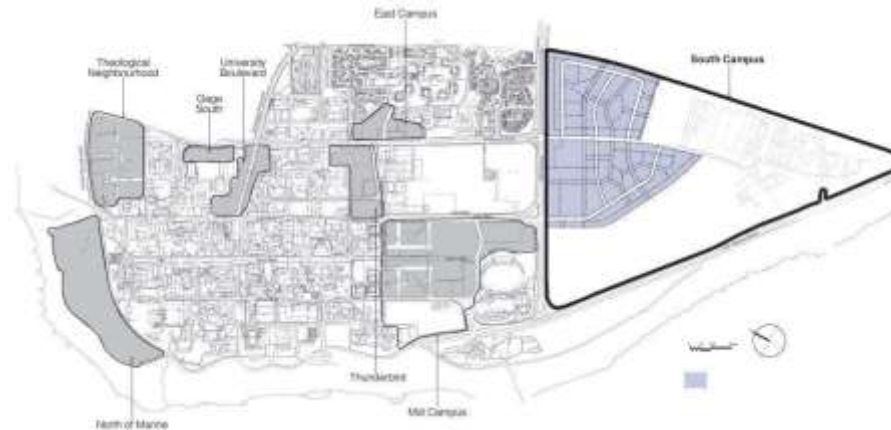
# DE System Pre-Feasibility Study

What is District Energy and Why is it Sustainable?



# DE System Pre-Feasibility Study

## Stage 1 (Energy Demand): Future buildings at Wesbrook Place



	Units	BAU Scenario (at full build out)
Total Future Floor Space	m <sup>2</sup>	392,000
Total energy requirements at build out	(MWh / yr)	33,000
Heating Electricity Consumption	MWh / year	9,060
Natural Gas Consumption	GJ / year	116,000
Peak Energy Demand	MW	13
GHG emissions	tonnes of CO <sub>2</sub> e / year	5,640



# DE System Pre-Feasibility Study

Stage 2 (Options Analysis): Low Carbon Energy Sources

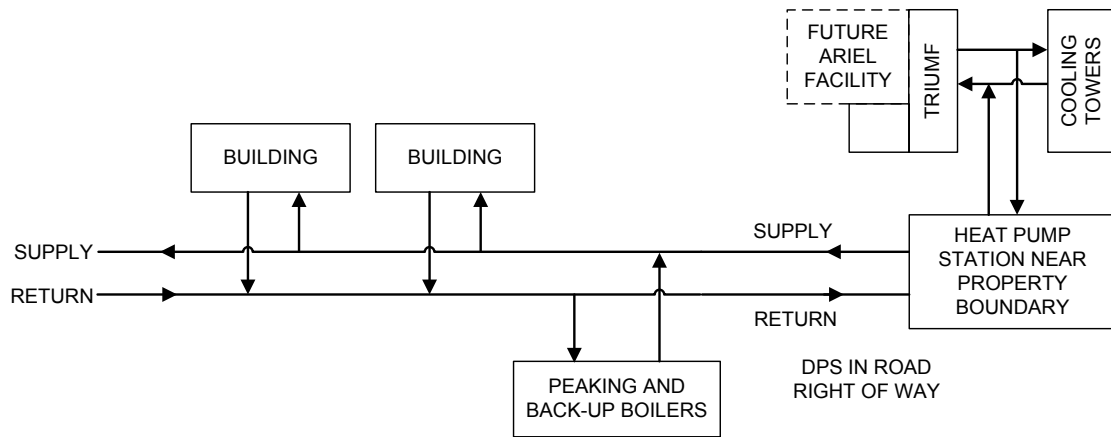
- **Ground Source Geothermal Energy**
- **Biomass Combustion (Cogeneration?)**
- **Sewer Heat Recovery**
- **Industrial Heat Recovery (TRIUMF)**





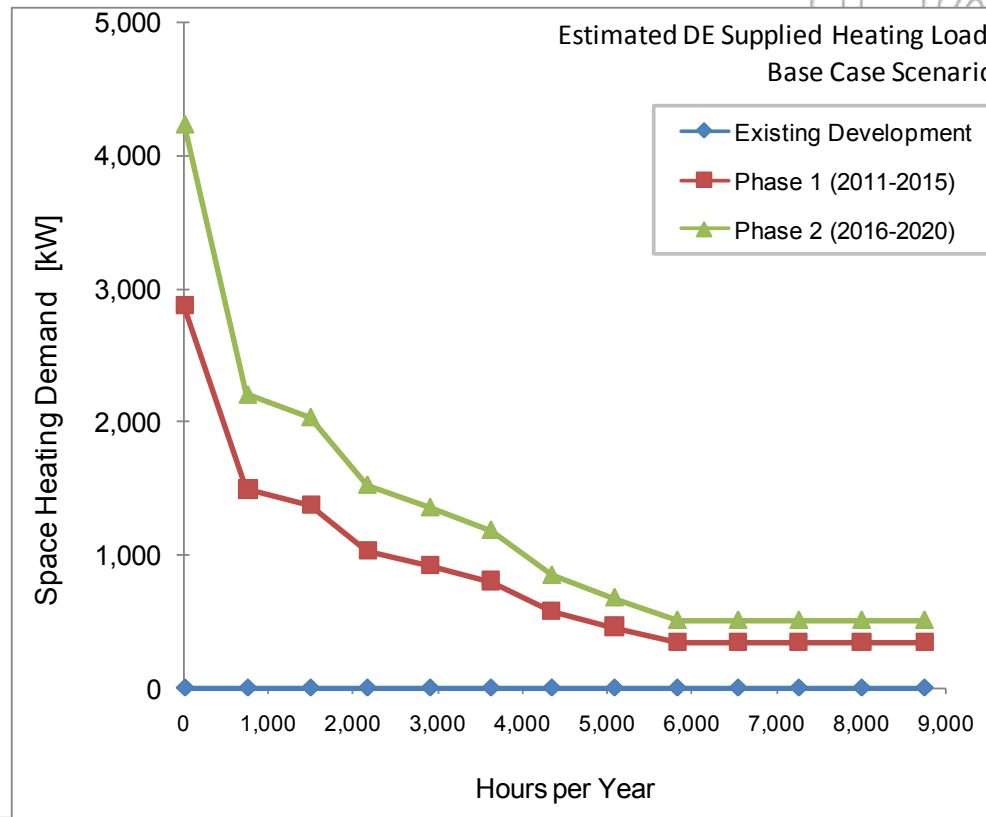
# DE System Pre-Feasibility Study

## Stage 3 (Energy Supply): TRIUMF Heat Capture



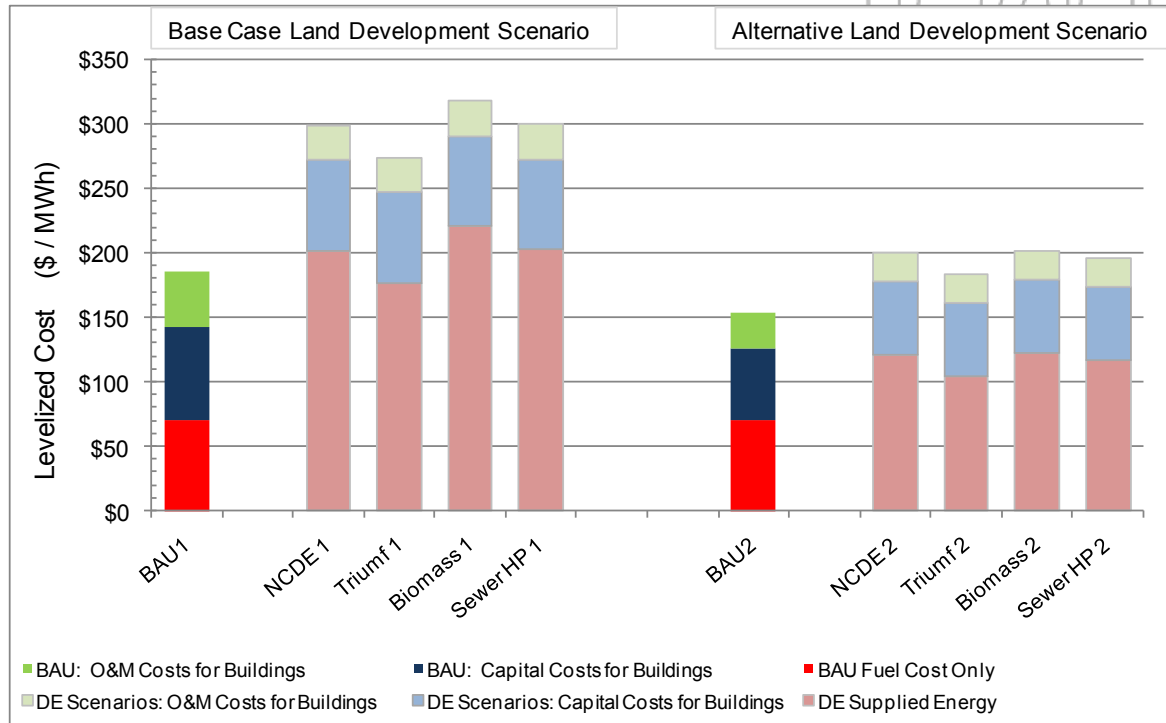
# DE System Pre-Feasibility Study

## Stage 4 (Energy Modeling): Load Duration Curve



# DE System Pre-Feasibility Study

## Stage 5 (financial modeling): Levelized Cost of Ownership



# DE System Pre-Feasibility Study

## Stage 5: Study Results

	BAU	TRIUMF	Savings
Cost of energy	\$71/MWh	\$105/MWh	+30%
Natural gas (GJ/yr)	116,000	57,600	-50%
Electricity (MWh/yr)	9,000	6,700	-25%
GHG Emissions (tonne CO2e/yr)	5,640	2800	-50%

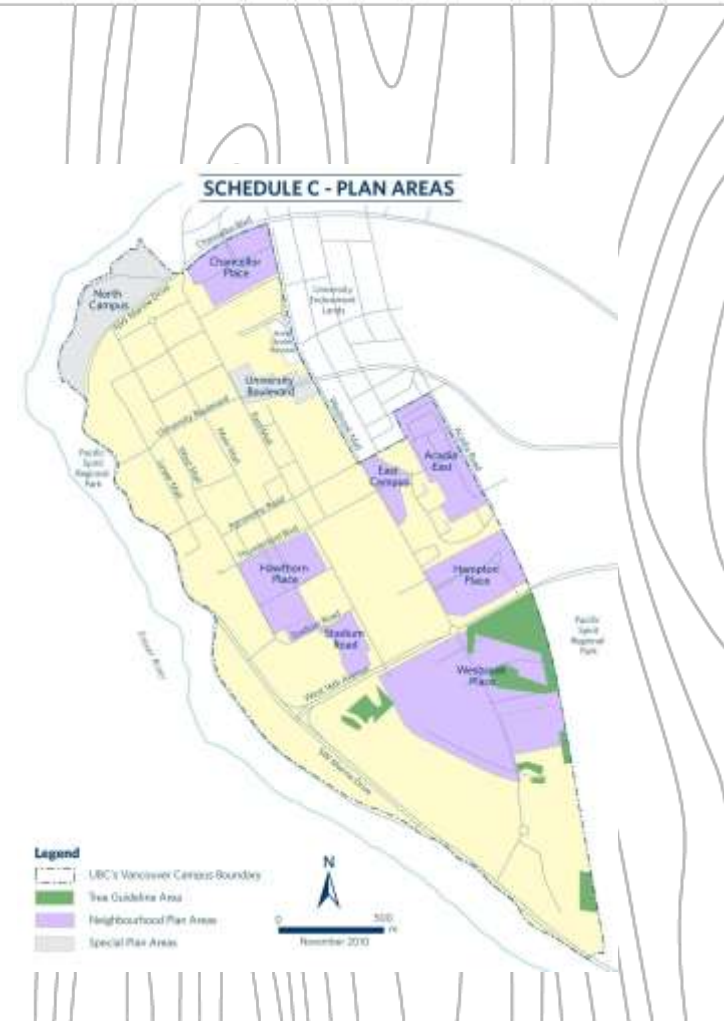
**How do we make DE supplied energy cost more competitive with the traditional mix of energy sources (i.e. direct natural gas and electricity)?**



# Next Steps: Further Feasibility Study

## Study Deliverables: UTown@UBC Neighbourhood DE System

- Class C estimate of capital costs. Drill down on contentious elements such as building side heating system costs.
- Identify synergies with the Institutional DE System (e.g. shared infrastructure)
- Evaluate impact of including all future neighbourhoods (double the floor space)
- Evaluate maximum potential for waste heat recovery at TRIUMF (up to 10MW)
- Evaluate phased integration of future clean energy supply (from off campus)
- TRIUMF to evaluate possibility of accessing all their distributed cooling towers.
- What is the levelized cost of energy now?





# Thank you

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