

The logo for cleanBC, with 'clean' in green and 'BC' in blue.

CLIMATE LEADERSHIP SYMPOSIUM

Public Sector and Local
Government Action

cleanBC

our nature. our power. **our future.**



From Gas to Electricity: TRU's Low Carbon District Energy System

Matt Milovick, VP

Administration & Finance, TRU

Samson Tam, Director Development, Creative Energy

BC Climate Leadership Symposium, October 19, 2023

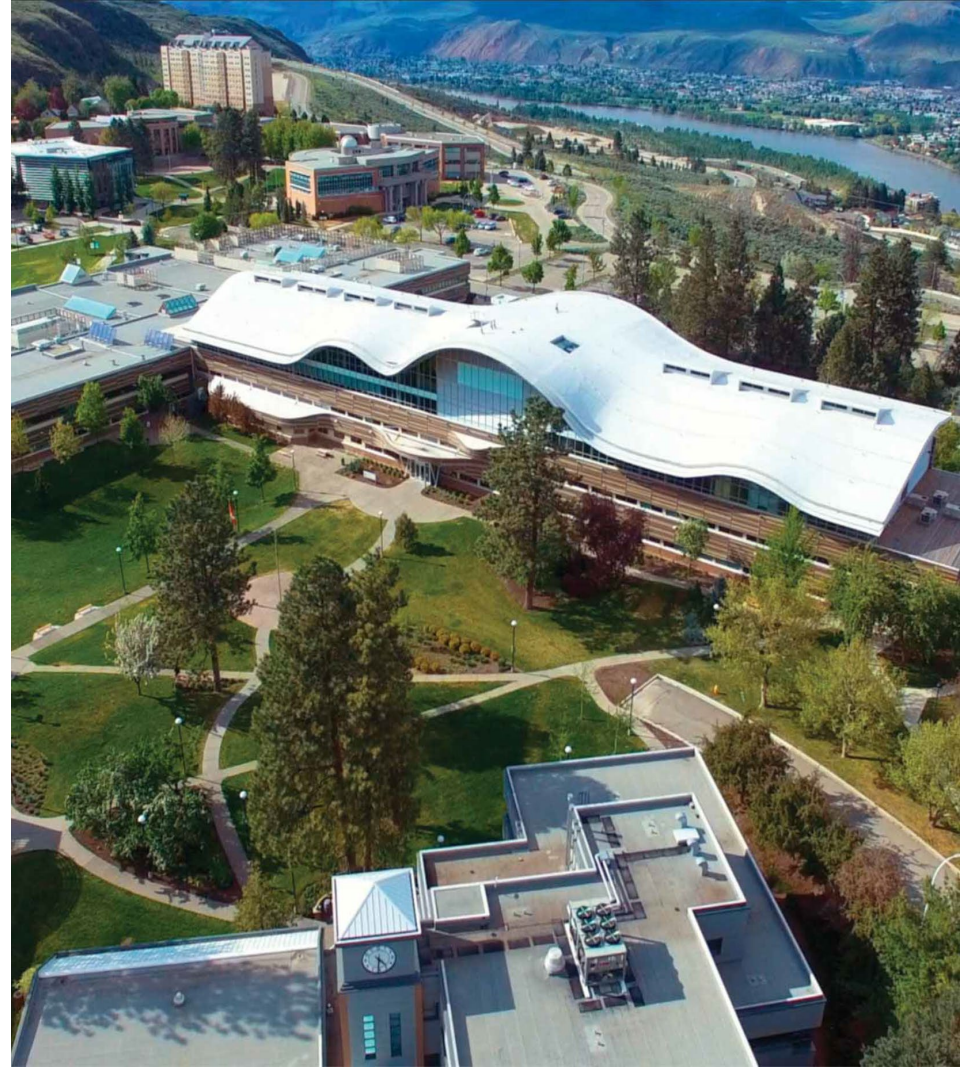




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The Problem

How to make a 53-year old campus, with no district energy system, fossil fuel-free by 2030?



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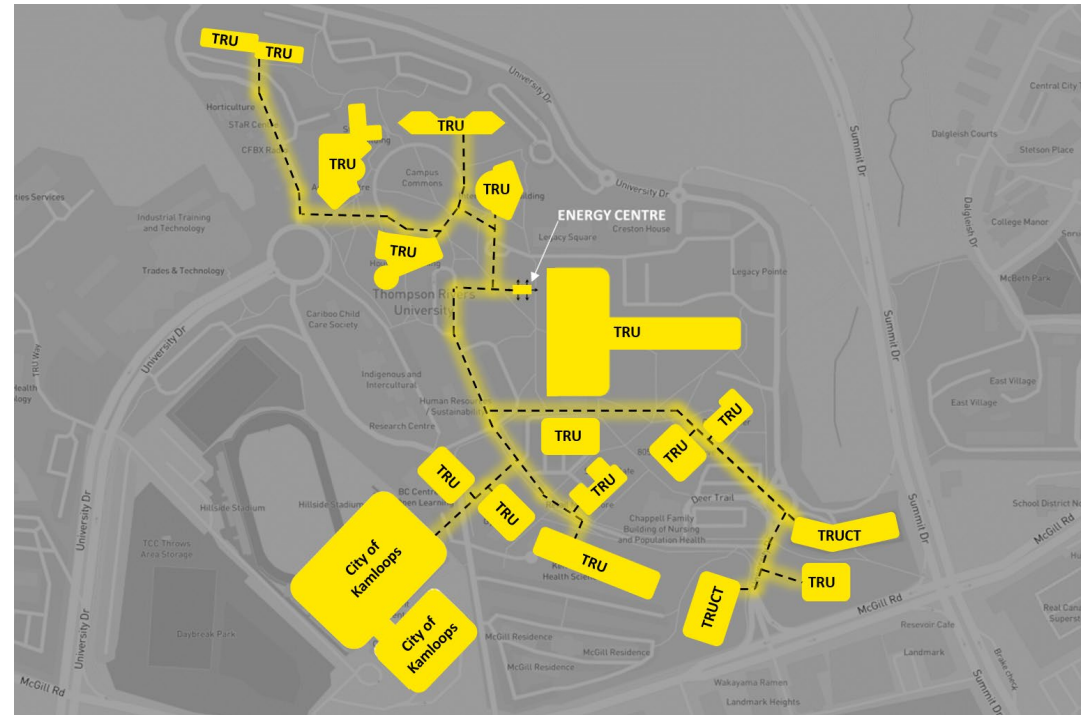


The Solution

An electrified Low-Carbon District Energy System (LCDES) using a two-stage air-source/water source heat pumping approach (ASHP/WSHP).



LCDES Energy Centre Rendering



LCDES 2030 Network



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TRU - Overview

Founded in 1970

250-acre campus (Kamloops)

Teaching and research university

1% Design Day: -25°C (-13°F)

Heating Degree Days: 3,450

Current Primary Heating Source:

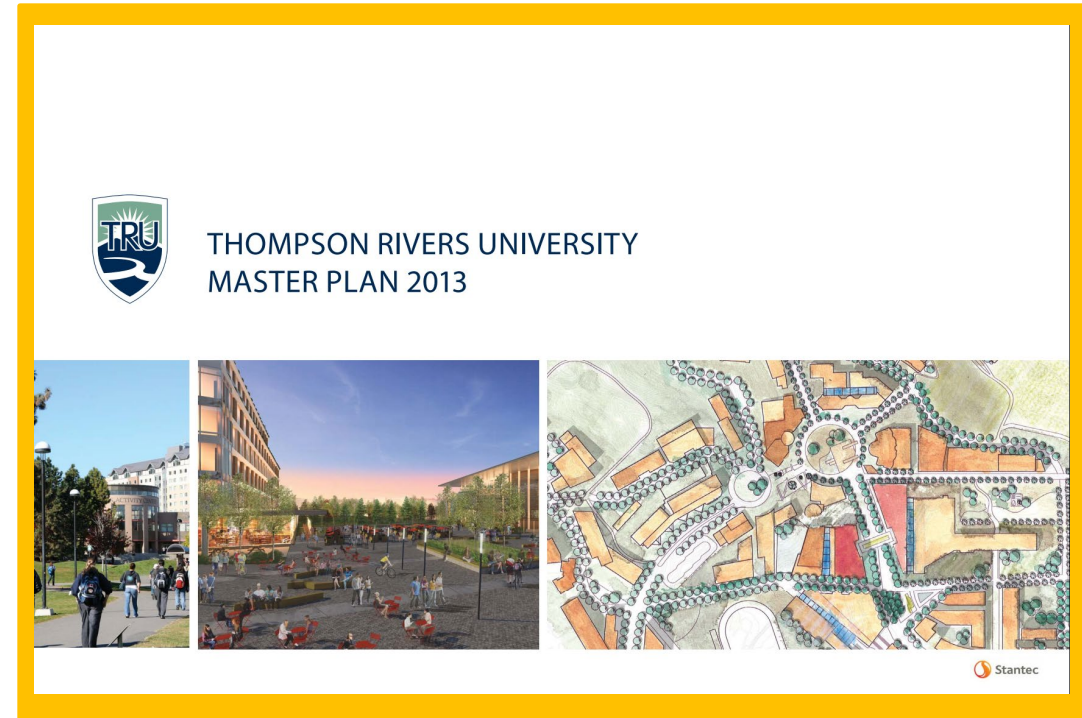
- Distributed Gas Boilers
- Power Source: Grid Electricity (hydroelectric)





2013 Campus Master Plan included:

- Energy Management Plan
- Implementation Guidelines
- **District Energy Feasibility Study**
- Deep Services Study
- **Campus Strategic Sustainability Plan**



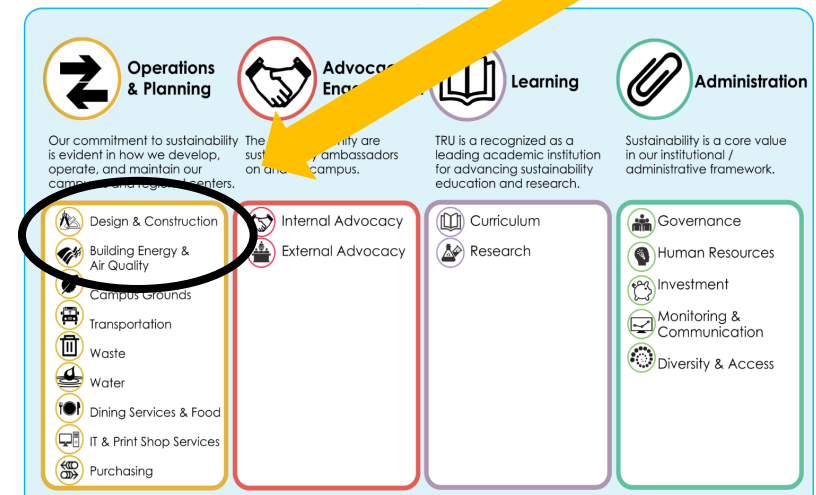
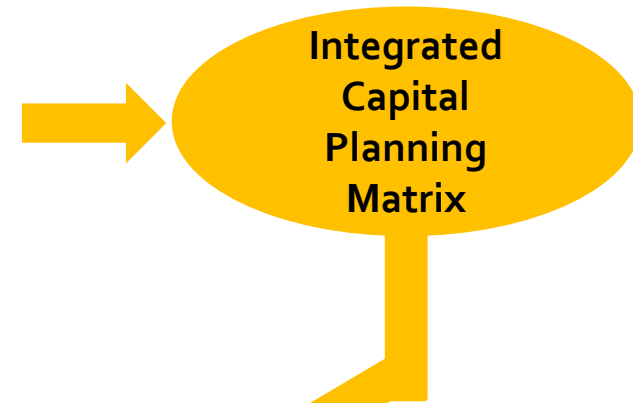
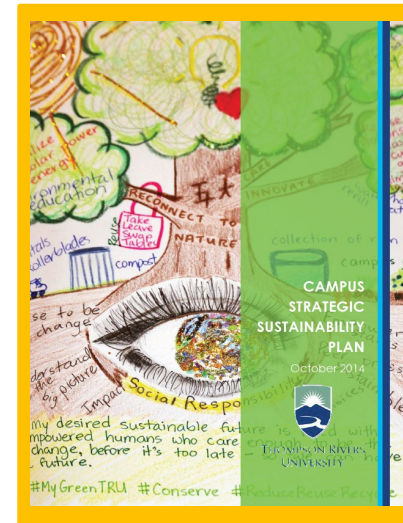
Campus Sustainability Plan (2015)

4 Pillars

- Operations and Planning
- Advocacy and Engagement
- Learning
- Administration

AASHE STARS used as planning framework

Awarded STARS Platinum Rating in 2018 (first Canadian university)



Campus Sustainability Plan (2020)

SUSTAINABILITY
PRIORITIES

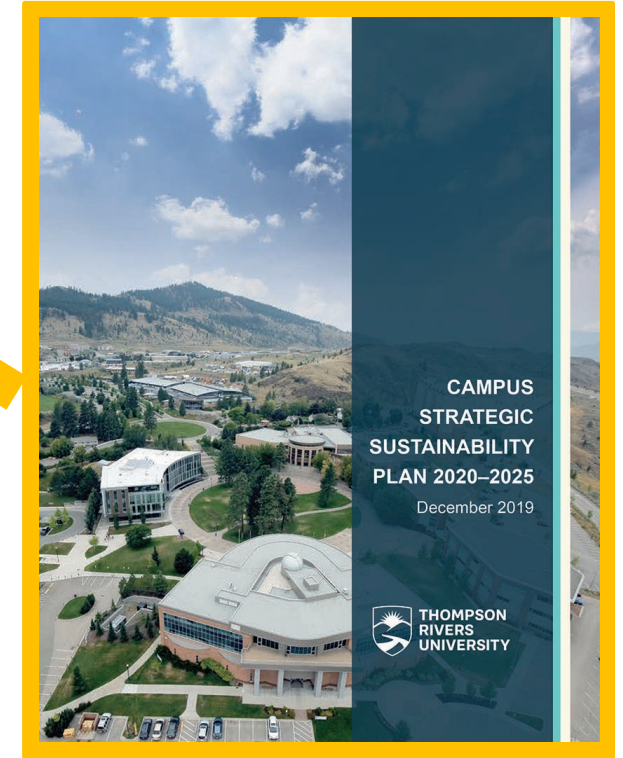
1. Carbon Neutral and Net Zero Campus
2. Eliminate Single-Use Plastics and Other Single-Use Items
3. Integrate Sustainable Purchasing Throughout Campus Operations
4. Conserve Potable Water
5. Advance Sustainability Performance of Campus Built Environment
6. Champion Sustainability Beyond Campus for Global Impact

86% of the community rated sustainability as either “very important” or “extremely important”

Achieving a “carbon neutral and net zero campus” identified as highest priority

Pledged to be carbon neutral by 2030

Gas heating from buildings accounts for nearly all GHG emissions on campus





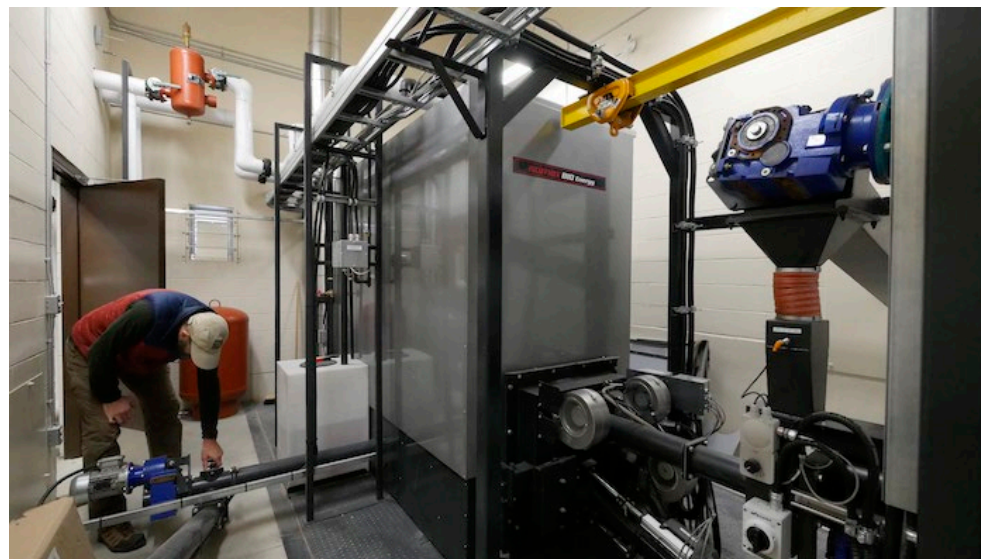
Exploring Biomass

BC has plenty of wood and wood waste

Installed pellet boiler at our William's Lake Campus (partnership with SD27) in 2018

City of Kamloops

- Prohibition of outdoor wood boilers by-law
- Rescinded in 2017; reactivated 5 days later
- Air quality very sensitive issue in Kamloops (wildfires)
- Policy doesn't follow the science
- Forced us to change our strategy in Kamloops



ITTC Hybrid System

Abandoned biomass while ITTC was under construction

What did we do?

- Used the outbuilding originally planned for the biomass boiler and installed an electric boiler (1st one at TRU)
- Cross-connected the School of Trades and Technology and the new ITTC building (opened 2018)
- Can fuel switch between both facilities (created a “mini-district”)



Making the Plunge – Nursing & Pop Health

Nursing and Population Health building opened July 2020

First building with no natural gas connection

100% reliant on electric based heating

- Heat recovery chillers serve as the 1st stage of heating
- Electric boilers provide peaking and back-up



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Other Electrification Projects

Early Childhood Education Centre
(opened 2023)

East Village Residence Phase I (opening
2023)

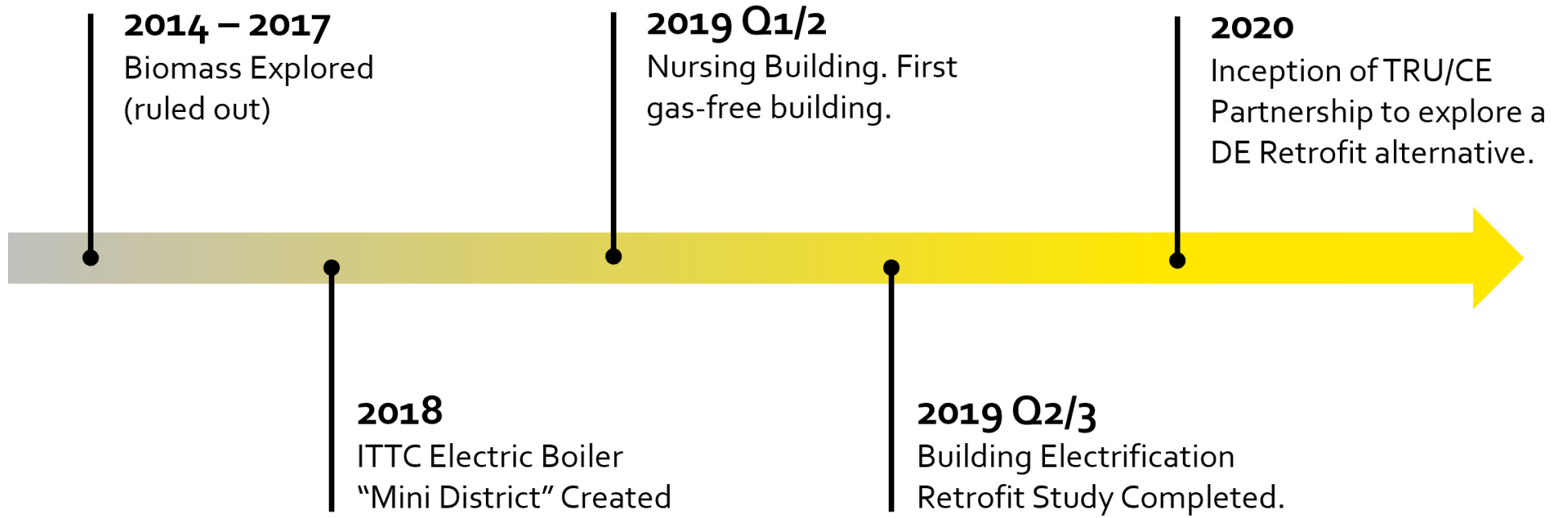
East Village Electrification Retrofit
(completed 2023)



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Timeline Summary



Making the Case for LCDES



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LCDES Technology Screening

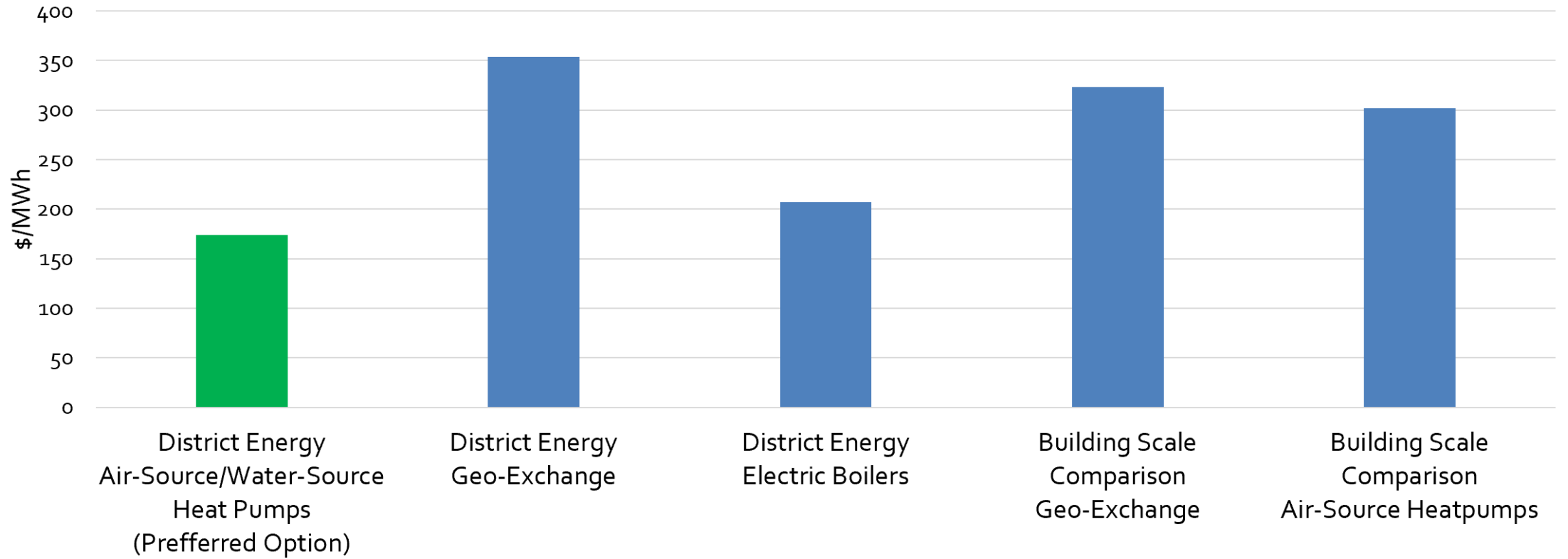
Technology	Capital Cost	Fuel Costs	O&M Costs	Space & Complexity	Carbon Emissions	Screening Outcome
Back-Up Natural Gas Boilers	low	low	low	low	high	In
Electric Boilers	low	high	low	low	low	In
Biomass Boilers	high	low	high	high	low	Out
Geo-Exchange	high	low	low	medium	low	In
Air-Source Heat Pumps	medium	low	low	medium	low	In
Sewer Heat Recovery	high	low	high	high	low	Out





The Shortlist

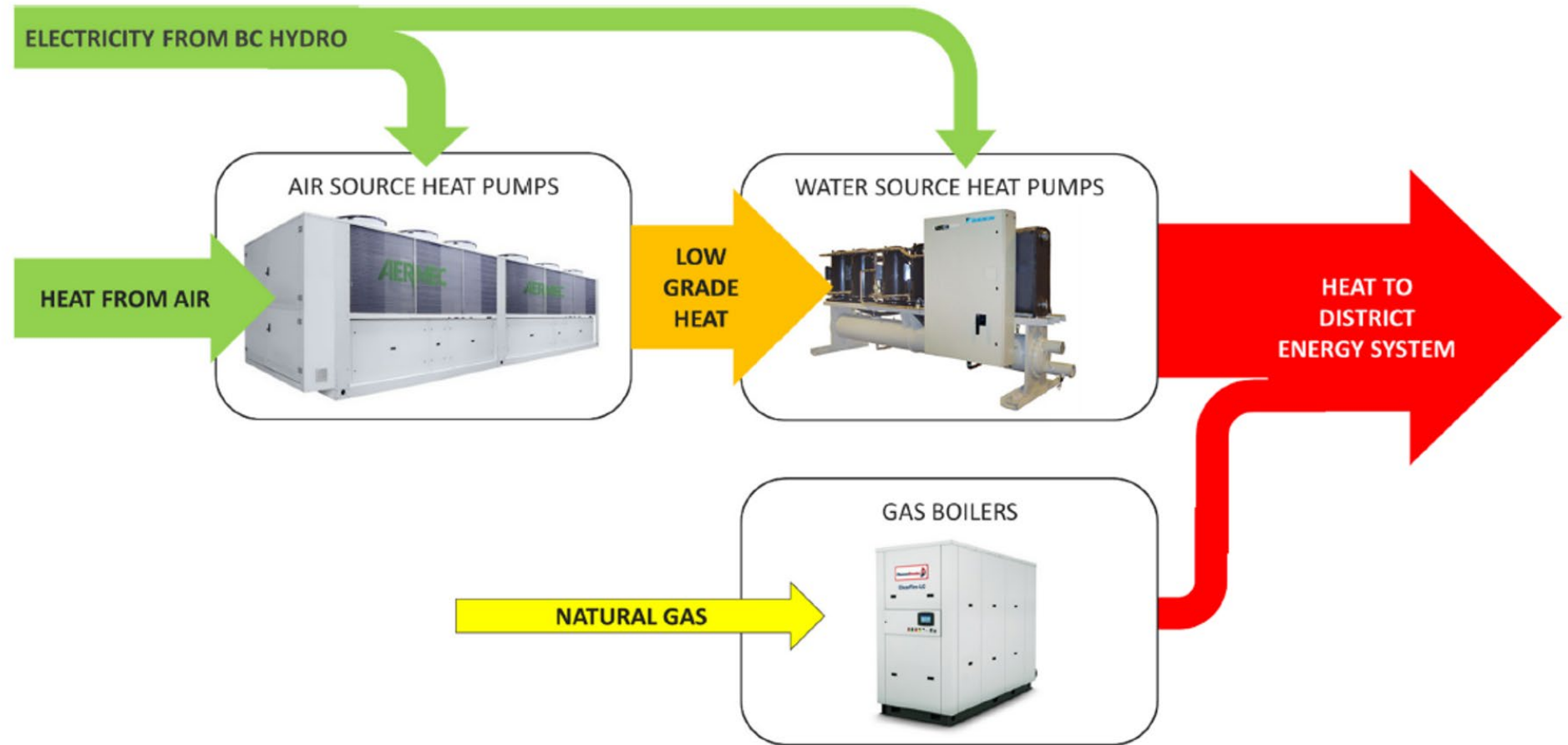
Comparative LCOEs





Our Choice

Two-stage ASHP/WSHP selected as most economical option



How it Works – Phase I (2020-24)

ASHP provides low-grade heat to 50°C (122°F)

WSHP provides high-grade heat to 72°C (162°F)

The HP's operate down to -15°C (5°F), covering more than 95% of the annual heating load

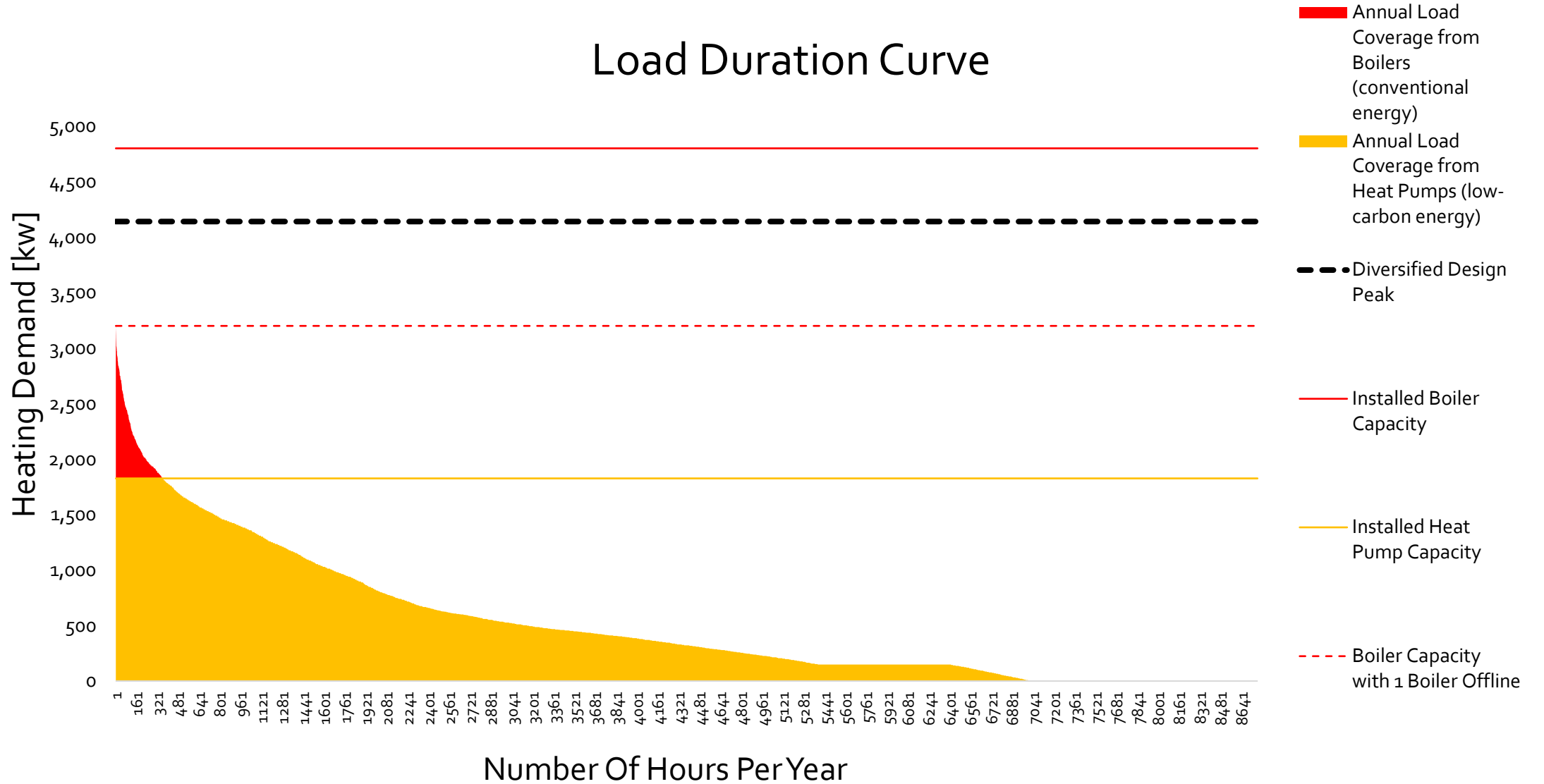
- Recent development in ASHPs may increase this down to -20°C (-4°F)

Gas boilers provide back-up and peaking when outside air is below (-15°C (5°F) (less than 5% of the annual load) °



Case Study (2020-2024)

Load Duration Curve



How it Works – Phase 2 (2024-30)

Connect remaining TRU buildings, City of Kamloops recreational facilities, and TRU Community Trust developments

ASHP/WSHP capacity expanded

Electric boilers and thermal energy storage integrated due diligence in progress) to abate the remaining ~ 5% of gas heat

Gas boilers relegated to back-up purposes only





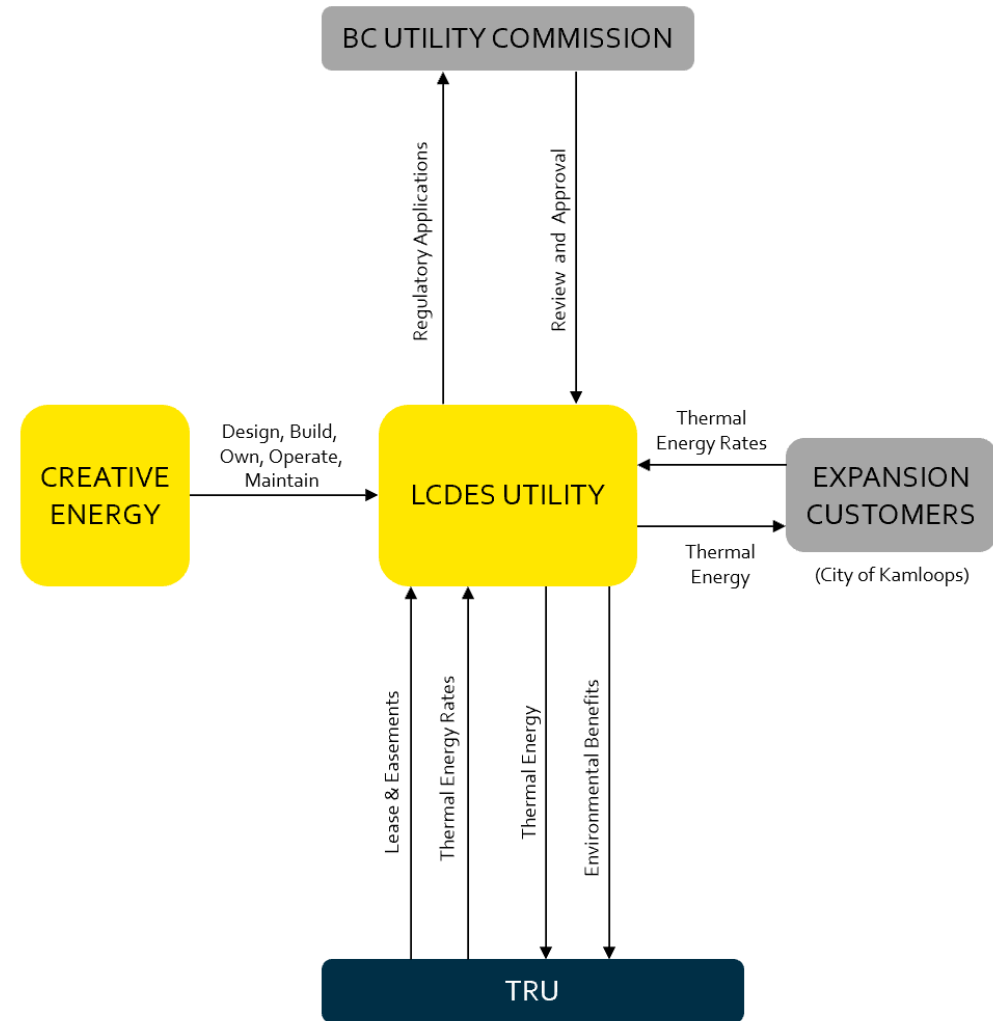
Partnership Approach

TRU builds and owns the LCDES building

CE builds and owns the LCDES system and supplies renewable energy to TRU

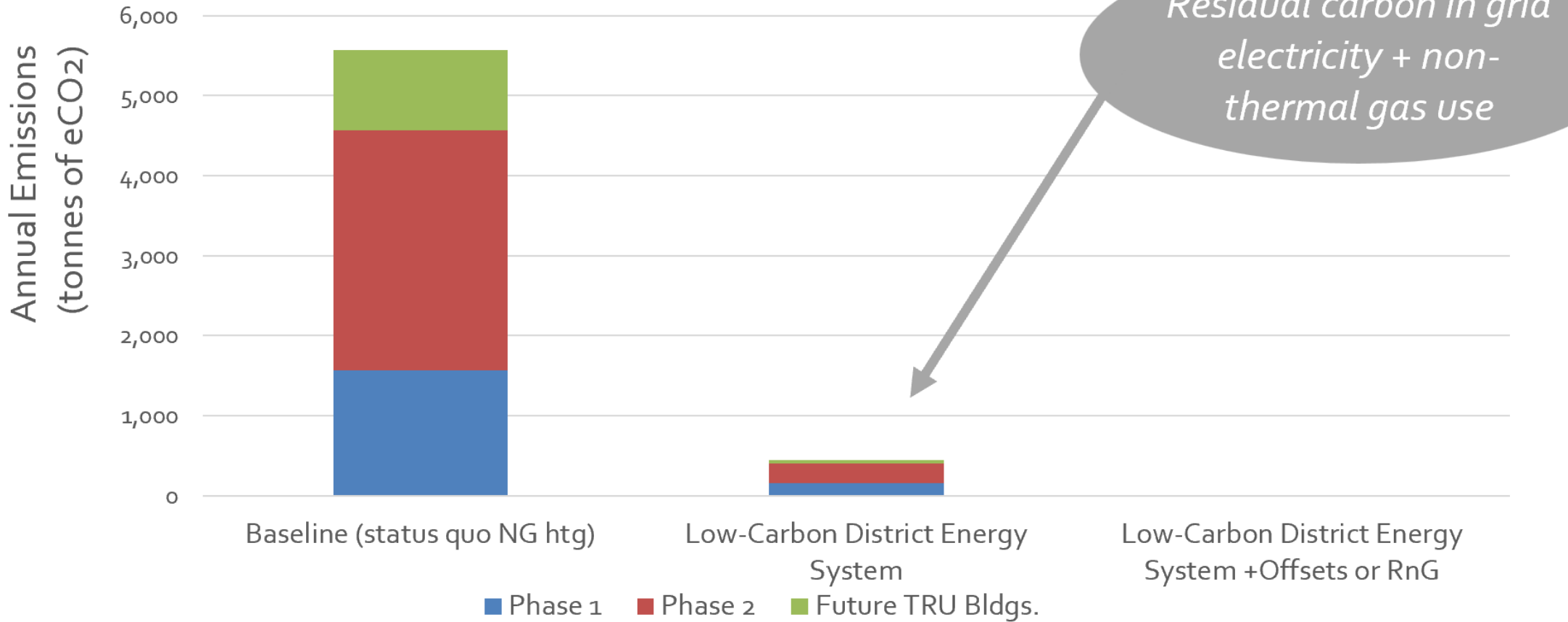
TRU becomes landlord and customer for CE
Expansion of the system reduces the rates improving LCDES economics for all

Arrangement governed by the BC Utilities Commission



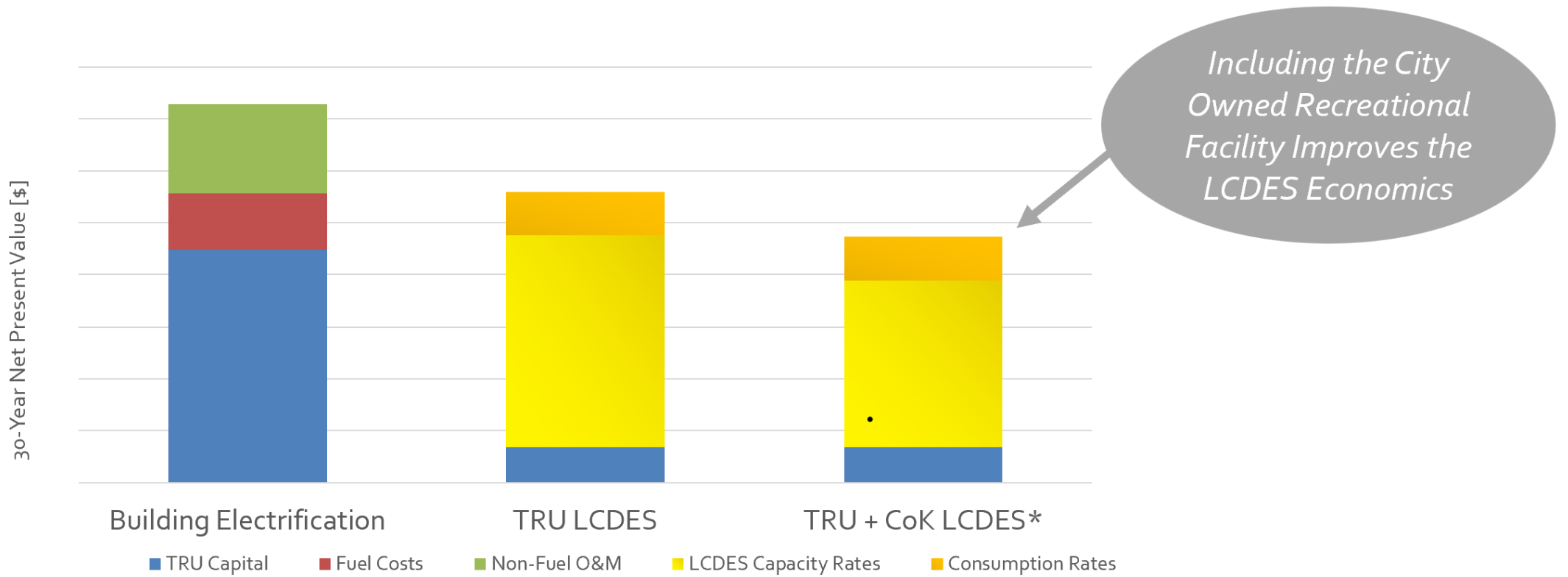


Carbon Benefits



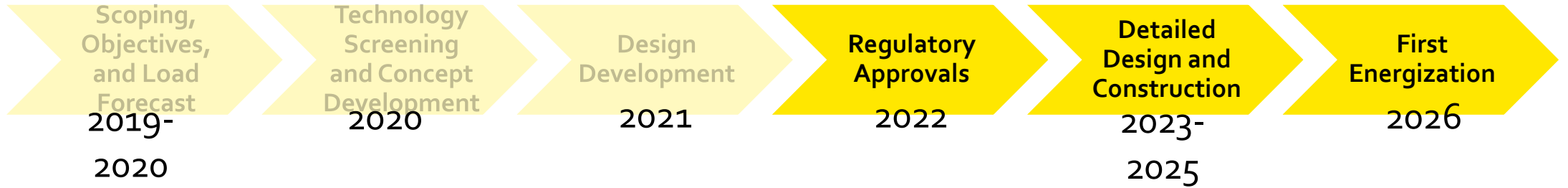


Economic Benefits (vs building scale electrification)

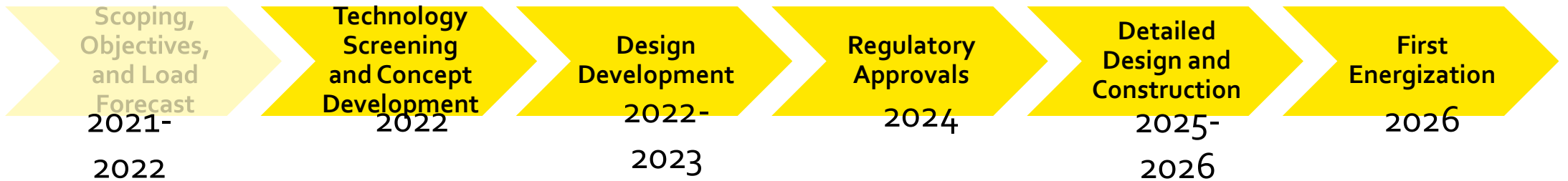


Case Study (Status and Schedule)

Phase 1



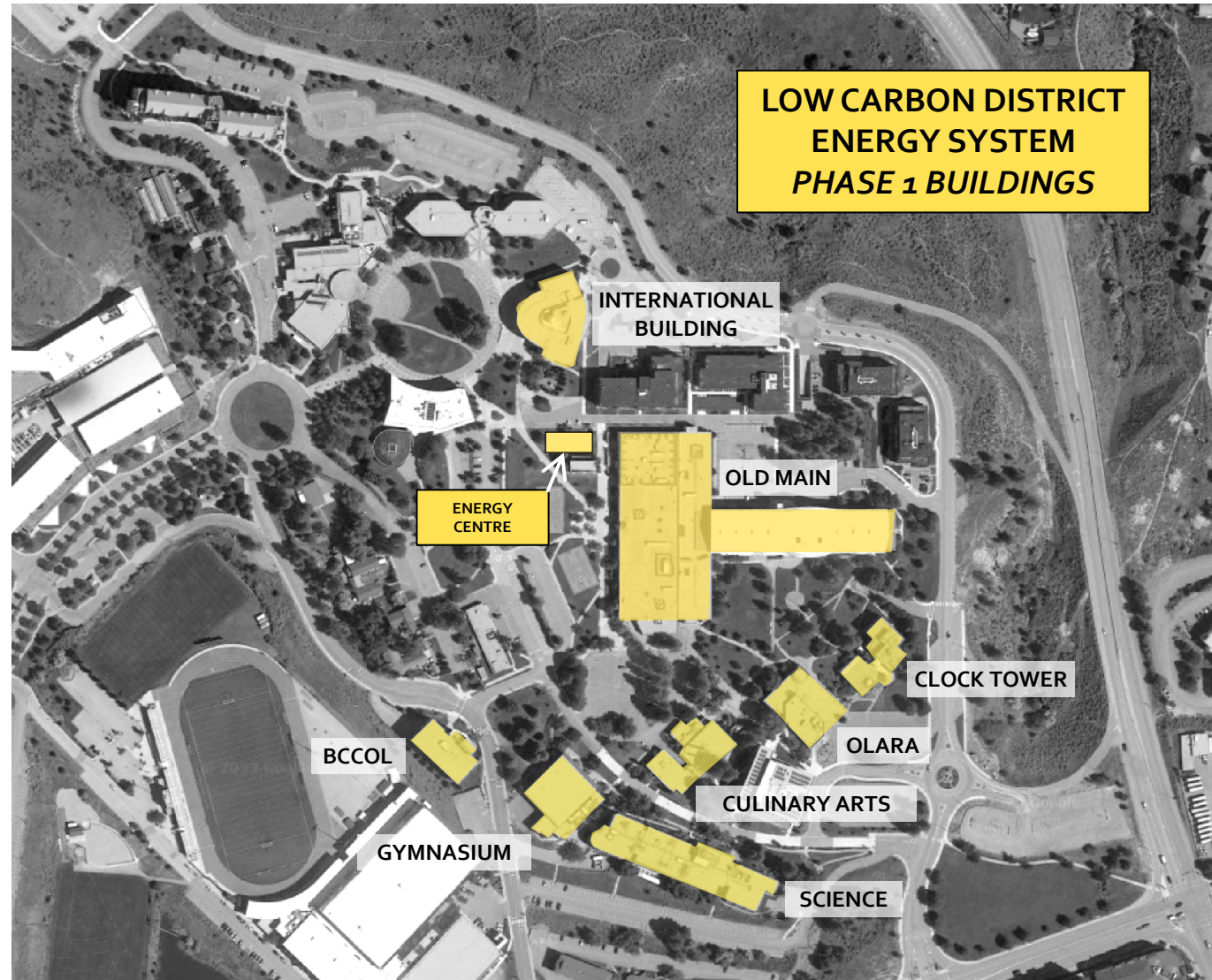
Phase 2





Project Status (Phase I)

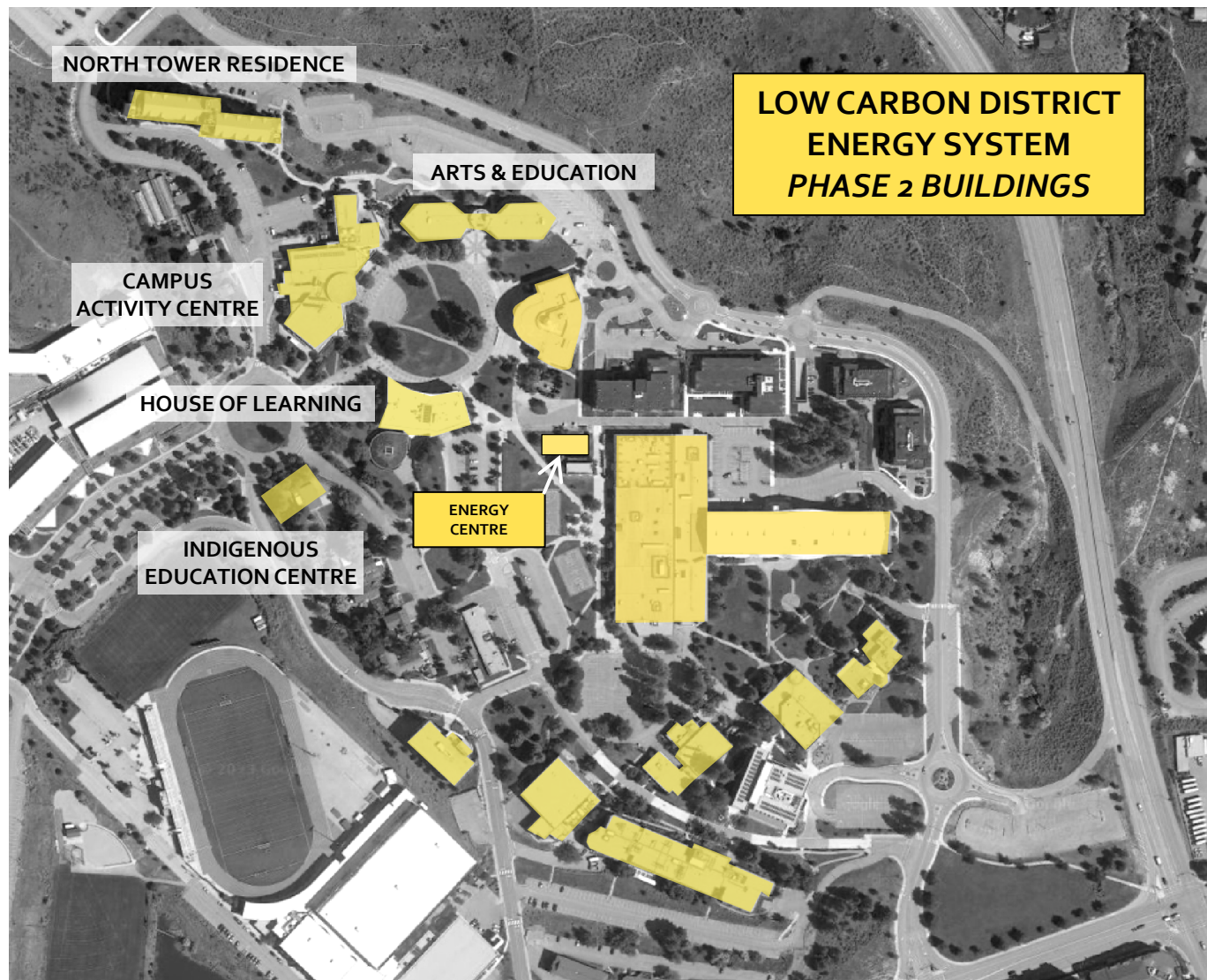
- Phase 1 of the project is proceeding, which includes the new Energy Centre and connection to 8 existing buildings, reducing GHG emissions by approximately 2,000 tons
- A Certificate of Public Convenience and Necessity (CPCN) for Phase 1 was issued by the British Columbia Utilities Commission (BCUC) on May 3, 2023 – “BCUC Decision and Order C-1-23”.
- Design is complete to 80%
- Construction will start in 2024 with service commencement in 2026
- The new Energy Centre will also now house the TRU Sustainability Office and will be located at the heart of the campus as a visible demonstration of TRU’s commitment to sustainability





Next Steps for the Project (Phase II Expansion)

- Phase 2 of the project has now begun which includes 4 additional existing buildings, for a further **3,000 tons** of GHG reductions.
- Phase 2 will also provide low carbon heating to the new Indigenous Education Centre.
- Design is progressing and expected to reach 30% completion by the end of 2023, when the Phase 2 CPCN application will be submitted to the BCUC.
- It is anticipated the construction of Phase 2 will either be included in Phase 1 or follow on directly afterwards.





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Q&A



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THANK YOU!