CREATIVENERGY

YOUR DISTRICT ENERGY PARTNER

THOMPSON RIVERS UNIVERSITY

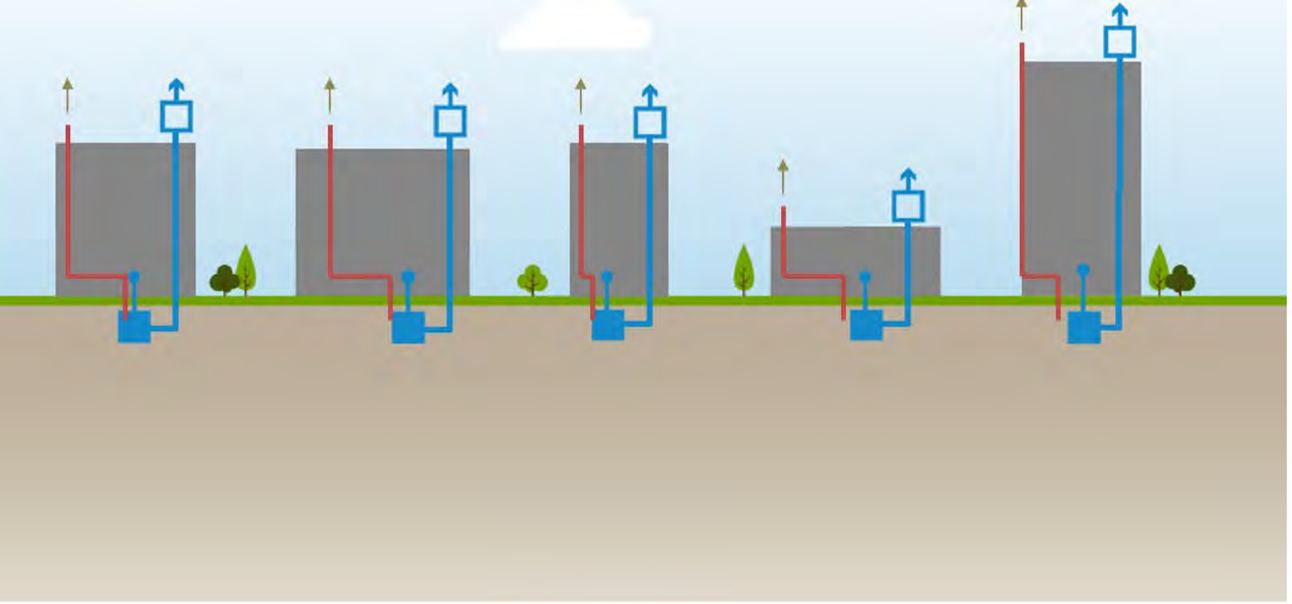
LCDES PHASE 1 – WORKSHOP 3

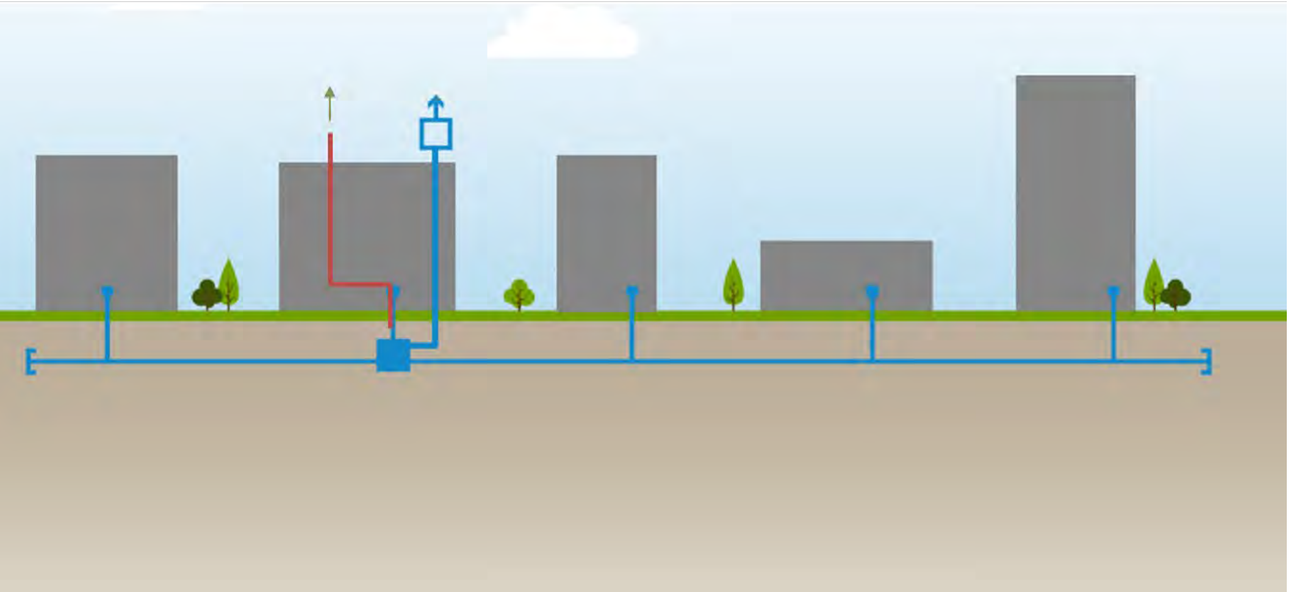
November 7, 2020

Stantec

AGENDA

- OVERVIEW
- SUSTAINABILITY OUTCOMES
- PROJECT ECONOMICS





THOMPSON RIVERS UNIVERSITY

OVERVIEW

50 YEARS CREATIVENERGY

OVERVIEW

Phase 1 Scope

PHASE 1A

PHASE 1B

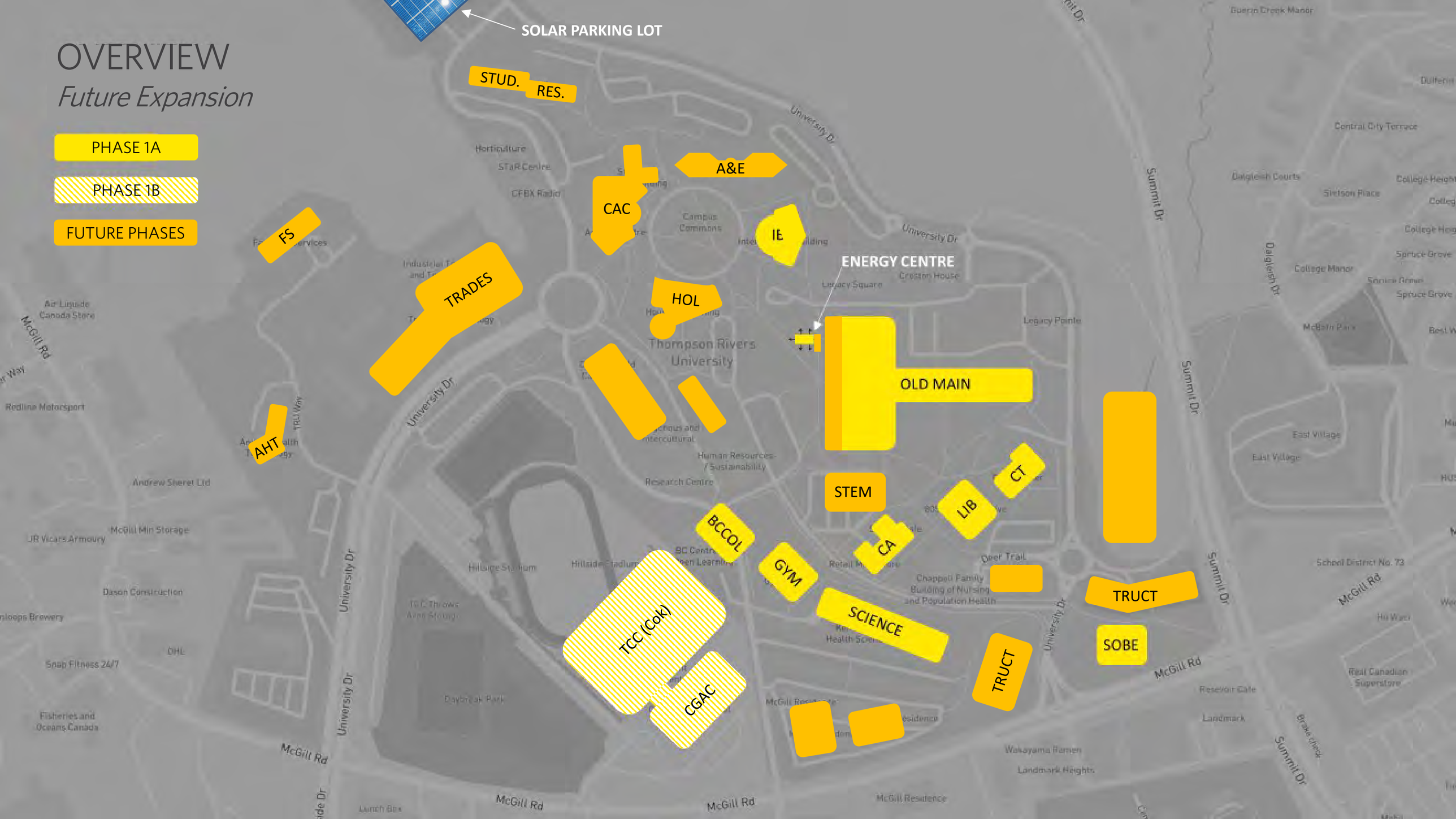
OVERVIEW

Future Expansion

PHASE 1A

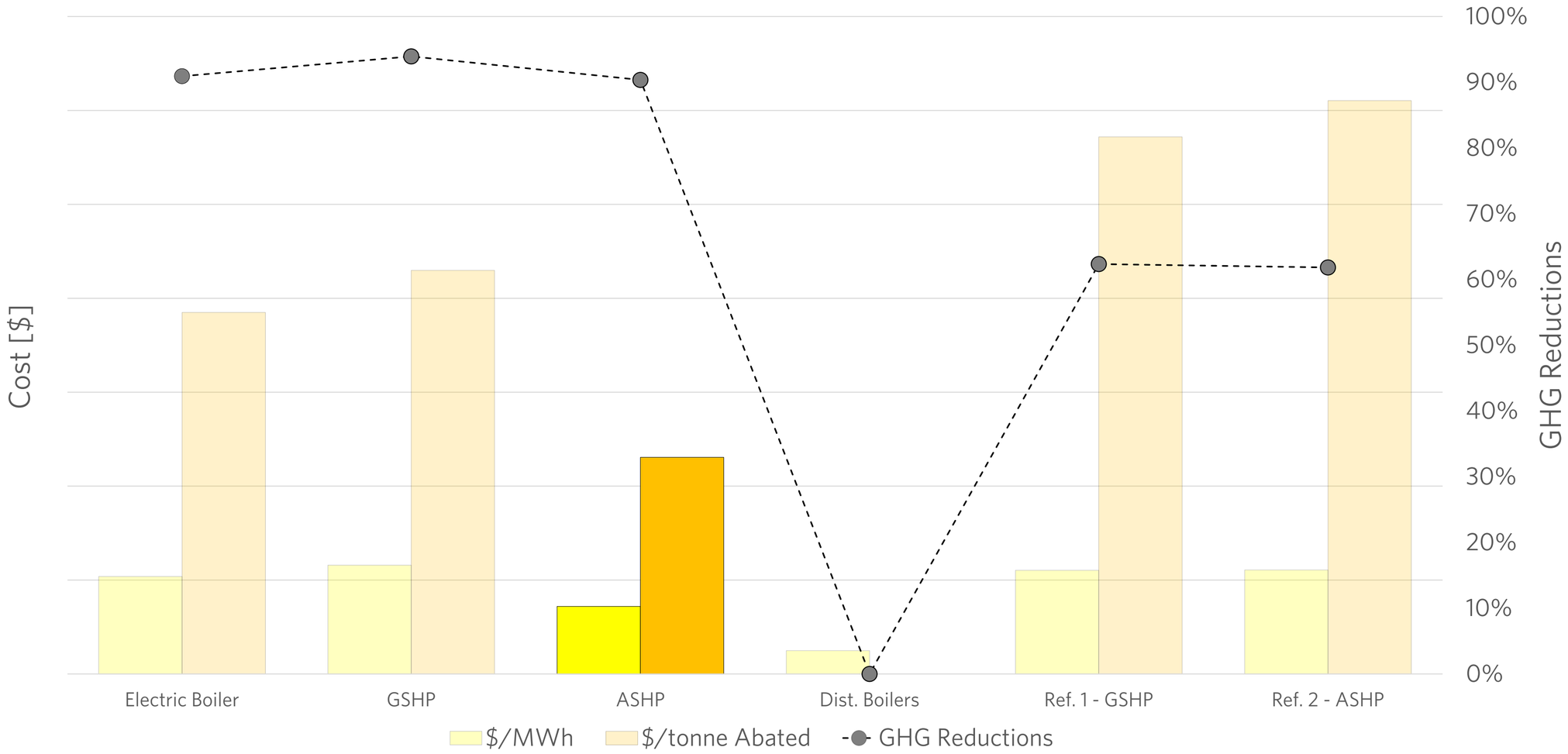
PHASE 1B

FUTURE PHASES



OVERVIEW

Technology Screening



**Biomass not considered for due to local air quality sensitivities and other non-financial reasons.*

***Screening analysis based on earlier load estimates from February 2020.*

OVERVIEW

Preferred Solution – 2-Stage ASHP/WSHPs with NG Peaking and Back-up Boilers

ELECTRICITY FROM BC HYDRO

HEAT FROM AIR

AIR SOURCE HEAT PUMPS

LOW GRADE HEAT

WATER SOURCE HEAT PUMPS

HEAT TO DISTRICT ENERGY SYSTEM

NATURAL GAS

GAS BOILERS

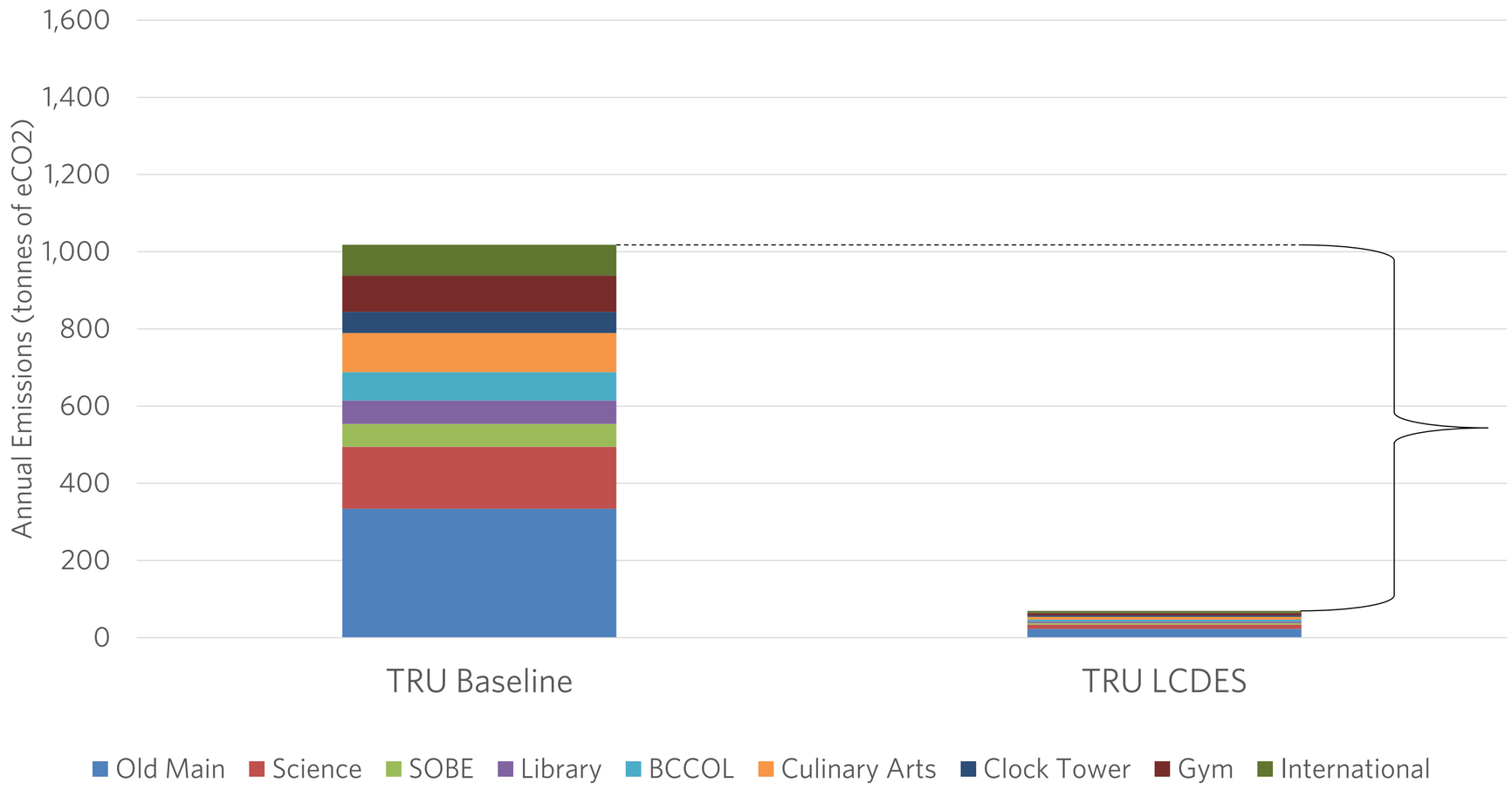
THOMPSON RIVERS UNIVERSITY

SUSTAINABILITY OUTCOMES

50 YEARS CREATIVENERGY

SUSTAINABILITY OUTCOMES

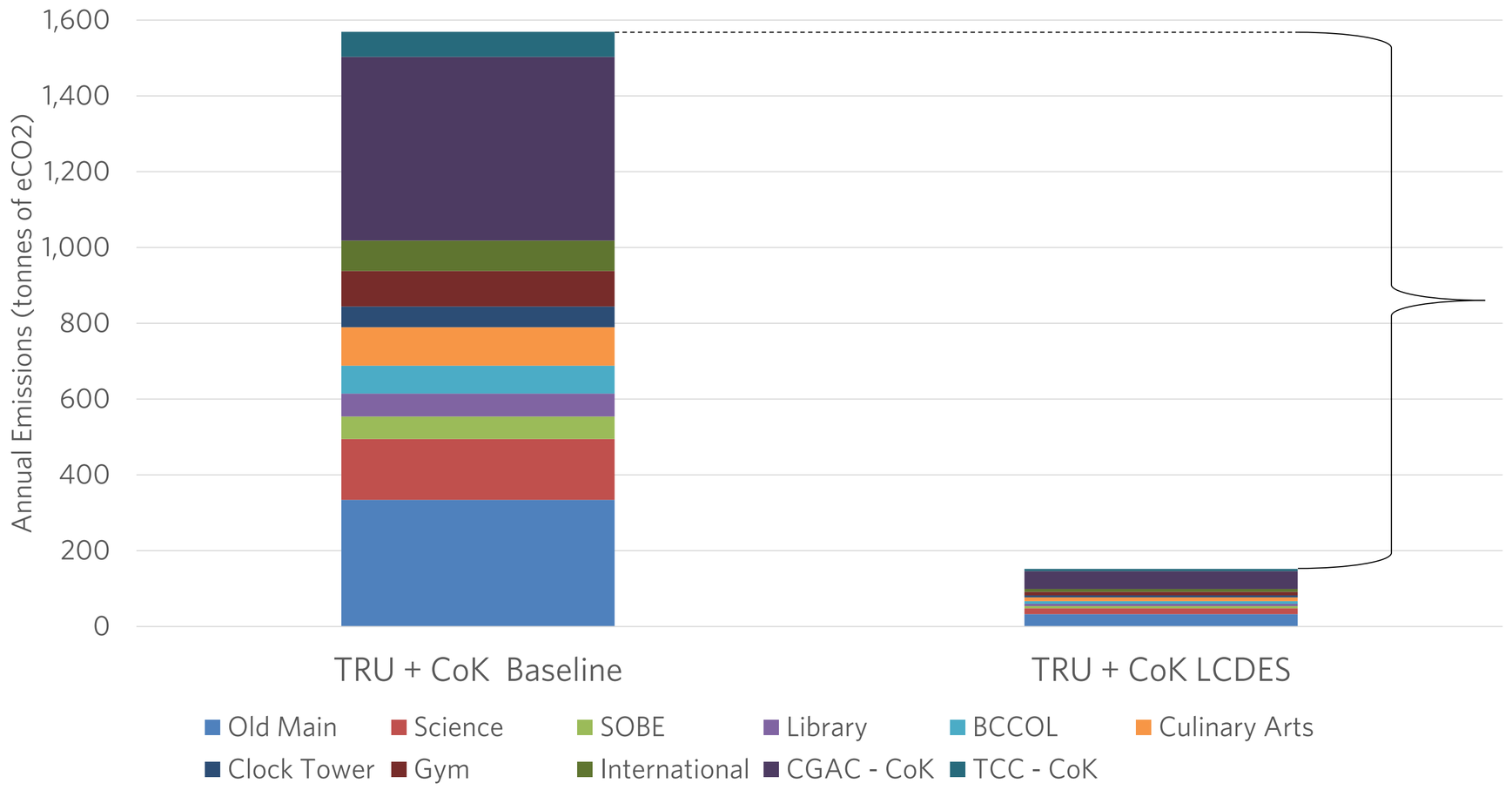
Phase 1 Decarbonization – TRU Only



~950 Tonnes Abated, Equivalent to 93% Reduction in GHGs

SUSTAINABILITY OUTCOMES

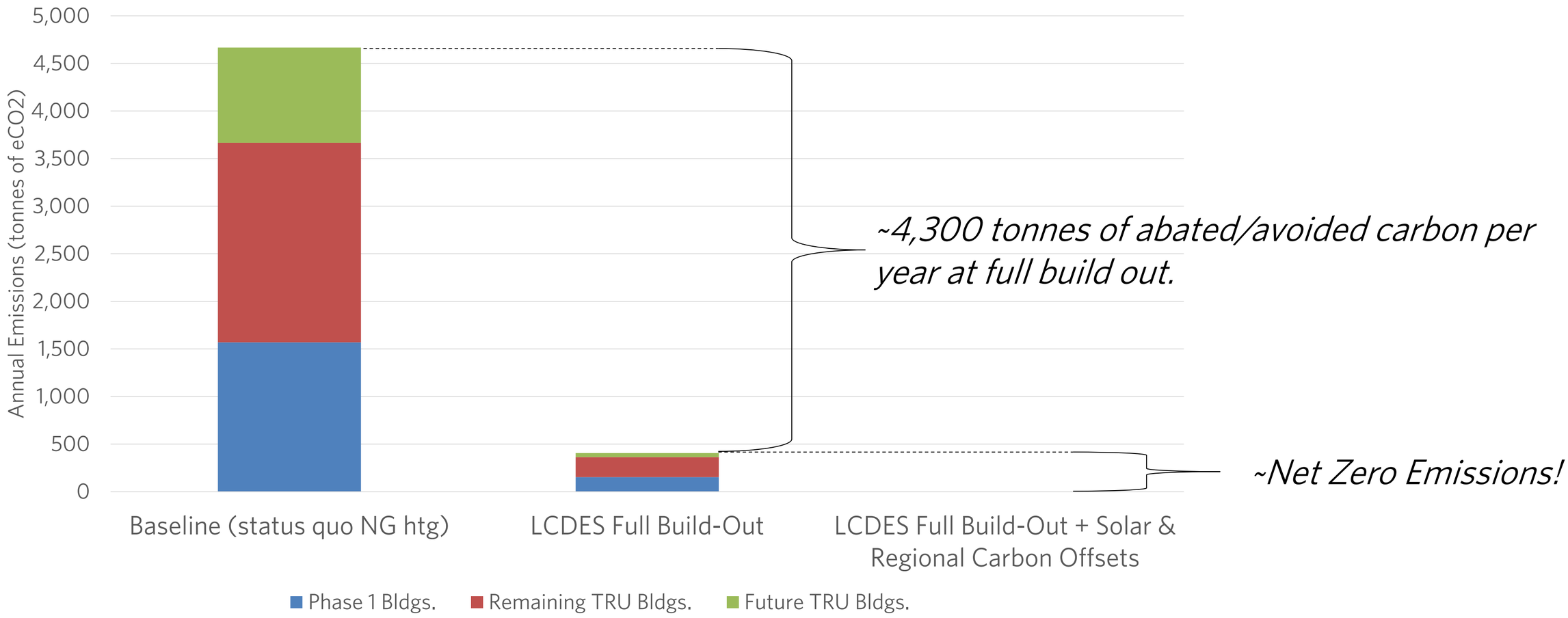
Phase 1 Decarbonization – TRU + CoK



~1,400 Tonnes Abated, Equivalent to 90% Reduction in GHGs

SUSTAINABILITY OUTCOMES

Future Expansion – Roadmap to Zero Emissions



~4,300 tonnes of abated/avoided carbon per year at full build out.

~Net Zero Emissions!

SUSTAINABILITY OUTCOMES

Carbon Neutral by 2030?

Natural Gas

- Natural gas must be virtually eliminated from campus, with only modest amounts being used for heating peaking and resiliency functions, cooking, and classroom functions (i.e. HVAC lab at ITTC).

Residual Carbon

- Greenhouse gases from the minor use of onsite natural gas and residual carbon from BC Hydro's electricity grid will need to be offset.

Onsite Solar

- Onsite solar can provide resiliency, reduce campus energy use, and may have a positive business case if prices continue their downward pattern.
- Solar can support a carbon neutral future but will only play a modest role as it offsets BC Hydro's 97% carbon-neutral electricity.

Regional Carbon Offsets

- Purchasing high quality, regional carbon offsets will help bridge the final gap to a carbon neutral future.
- Creative Energy can help....

PROJECT ECONOMICS

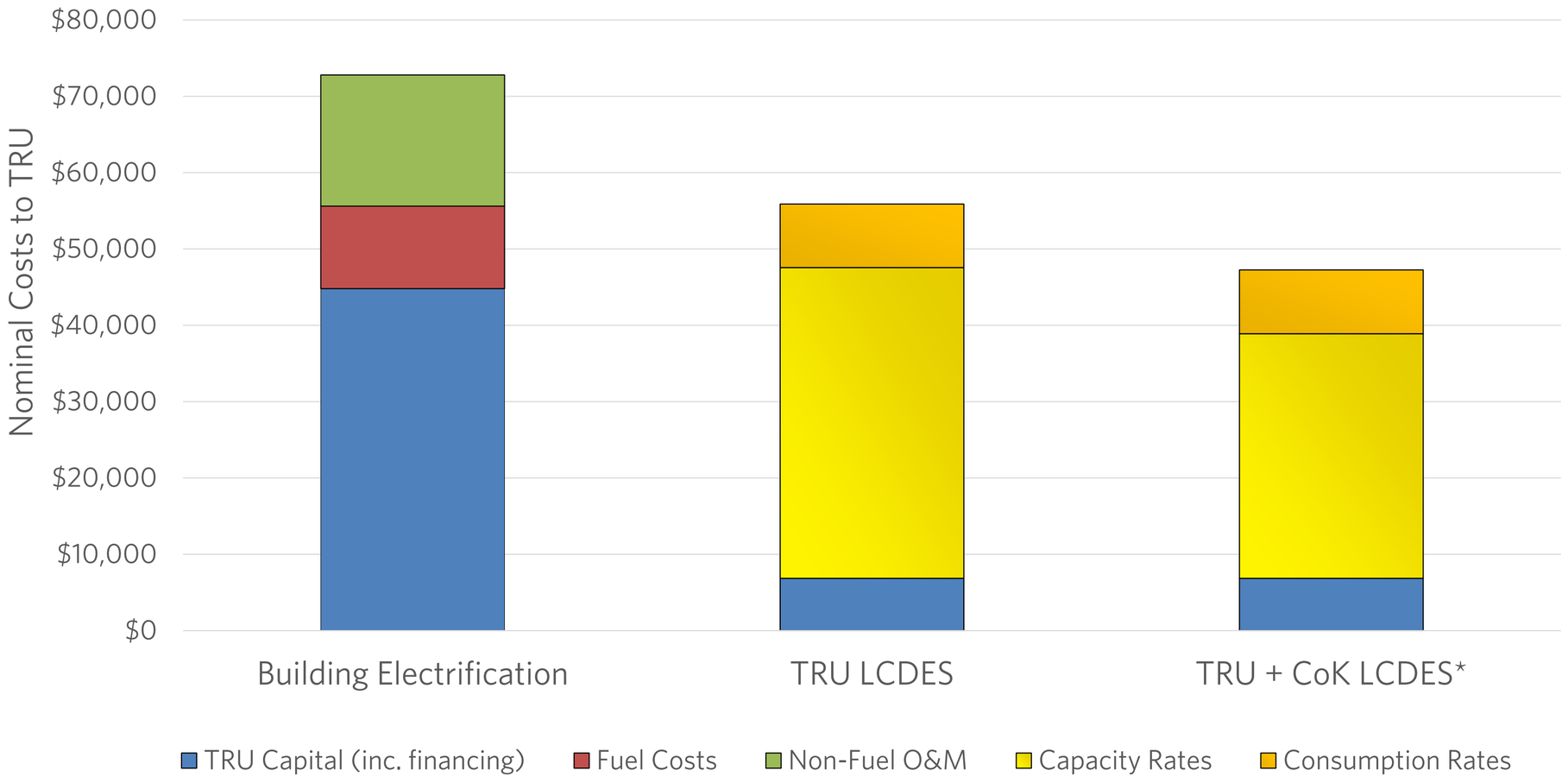
PROJECT ECONOMICS

Working Assumptions

	Value	Comments
Inflation	2%	*All costs are escalated with inflation. No additional escalation allowances have been made.*
Discount Rate	0%	*Undiscounted comparison (i.e. nominal comparison)*
Term Length	30	
Capital Cost Accuracy - Building Elect.	Class D+	*Opinion of probable cost from Stantec's electrification study, adjusted down to equalize for GHG abatement with LCDES.*
Capital Cost Accuracy - LCDES	Class C/D	*DPS is Class D and being refined, remaining estimates are Class C.*
LCDES Economic Life	30 years	
EC Core & Shell Economic Life	60 years	*A terminal value of 50% of the initial capital has been estimated for the remaining life of the building outside the 30-year analysis.*
Reference Case Economic Life	15/30 years	*ASHPs, pumps, and lifting HPs assumed to be 15 years, electrical infrastructure assumed to be 30. 60% of initial capital is assumed to need renewal at year 15.*
Assumed TRU Interest	3%	*Based on Province of BC 30-year Bond Yields and assuming a 30 year amortization.*
Creative Energy WACC	*As a regulated public utility, the revenue requirements are calculated on the BCUC approved methodology. Presently, the capital structure is at a debt/equity ratio of 57.5/42.5% with an equity RoR of 9.5%.*	
Electricity	BC Hydro Large General Service Rate	
Natural Gas	Fortis Rate 3	
Peak Demand Reduction	75%	*Reduction in added peak due to coincidental peak with TRU baseload. Will be updated if hourly electrical consumption from TRU becomes available.*
Total Connected Area	56,000/4,100 m2	*TRU/CoK*
Annual Thermal Energy Demand	4,600/2,500	
Peak Thermal Energy Demand	4.1/1.7 MW	

PROJECT ECONOMICS

30-Year Comparison



** Cost allocation to city dependent on BCUC approval of rate design. These costs do not include potential rental revenue for TRU.*