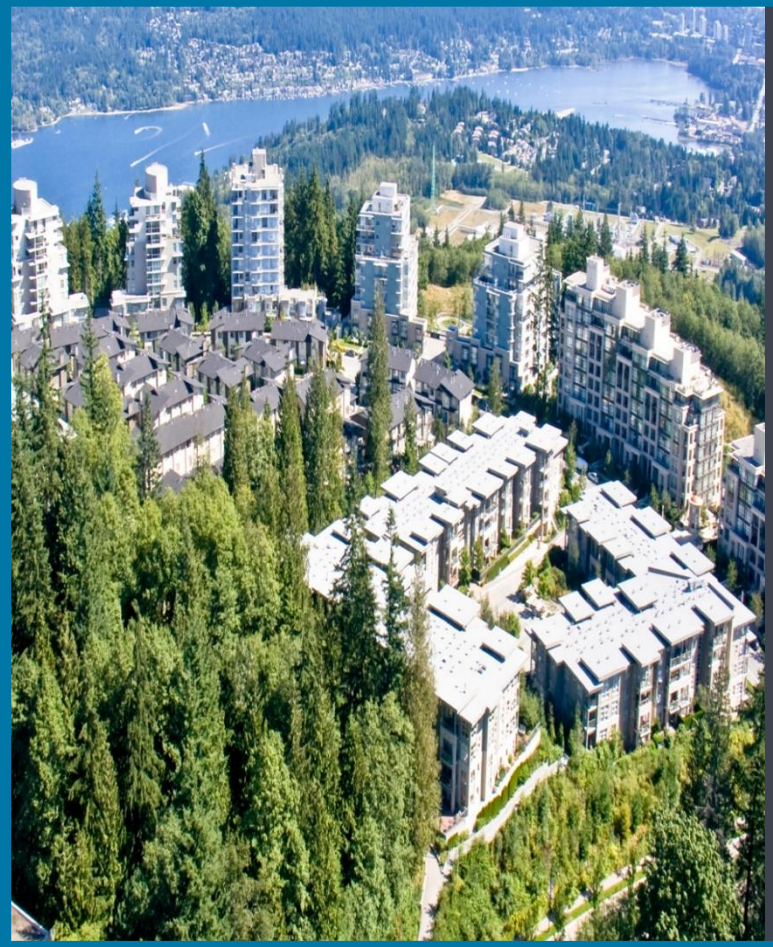

CampusEnergy2021
BRIDGE TO THE FUTURE
Feb. 16-18 | CONNECTING VIRTUALLY
WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16



Achieving 80% Carbon Reduction at Simon Fraser University

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Q&A Will Not Be Answered Live

Please submit questions in the Q&A box.
The presenters will respond to questions off-line.

Topic Introduction

- A journey to achieving up to 80% GHG emissions reduction at Simon Fraser University (SFU)
- Development, construction and initial start-up of a low-carbon central energy plant (biomass) – in operation since October 2020
- Infrastructure shared by SFU and adjacent residential development
- Minimal impact on SFU's existing infrastructure – replacement of one natural gas boiler with 10 MW heat exchanger

Burnaby Mountain DEU - What, Where, How

UniverCity Community and SFU Campus, Burnaby, BC

- Residential development adjacent to Simon Fraser University campus

DE from Idea to Implementation

- Low carbon DE initiated by SFU Community Trust, a master developer of SFU Endowment Lands
- DE as one of the means to help achieve GHG reduction targets
- All new buildings will be connected to DES
- Privately developed utility regulated by a provincial regulatory authority

Burnaby Mountain District Energy Utility

Original Concept: UniverCity Only

- Initially residential area only
- 3 MW biomass + 9 MW NG peaking
- 23 residential buildings connected

Final Concept: UniverCity + SFU

- Residential area and SFU campus
- 13.5 MW low carbon energy (biomass) serving SFU and residential development
- NG peaking for residential customers
- SFU providing its own NG peaking and back-up

SFU Connecting to BMDEU – Key Drivers, Opportunities

Key Drivers

- SFU internal goal and provincial requirement to reduce GHG emissions
- Public sector required to pay for GHG offsets
- Opportunity to start replacing aging thermal energy generation equipment at SFU

Opportunities

- Timing of low-carbon DEU development at UniverCity
- Opportunity to connect to receive green energy, while utilizing existing infrastructure for peaking and back-up

SFU Connecting to BMDEU – Benefits

- Economies of scale
- No upfront Institutional capital required
- Clear and transparent delivery model and pricing (provincial rate regulation)
- Risk / reward mechanism in place to maximize performance and efficiencies
- Risk and liabilities transferred to a third party
- ~75% Institutional GHG reduction achieved by one capital project

UniverCity DEU (Up to November 2020)

- 23 buildings, (2.1 mmsq.ft)
- DE system currently at ~57% buildout (December 2020)
- Full build out by 2024

Technical Specifications

- 2 temporary energy centers (TEC's 1 and 2) using Natural Gas boilers (2.3 MW and 6 MW respectively)*
- 1.8 km of piping installed to date
- 11 buildings connected to date
- 2019 annual energy produced 11,500 MWh or 41,400 GJ
- 2019 annual emissions 2,070 tCO_2

** BMDEU CEP in Service, TEC's decommissioned November 2020*

SFU Burnaby Campus

- ~25,000 students, ~5,000 faculty and staff
- SFU Burnaby campus is a complex of interconnected academic buildings + student residencies ~3.5 mmsq.ft
- Central DEU with 5km of piping (mainly in building, some direct buried)
- SFU Central Energy Plant (CEP), located under W.A.C. Bennett Library
- 4 NG boilers installed capacity* 31.8 MW
- 2019 energy produced 58,731 MWh or 211,430 GJ
- 2019 annual emissions 10,571 tCO_2

** Originally 5 NG boilers, 1 x NG boiler removed to make way for ETS*

BMDEU Service Area

SFU

W.A.C. Bennett Library/ SFU CEP

BMDEU CEP In Service
October 23, 2020

UniverCity Residential Neighborhood

BMDEU Central Energy Plant

Biomass Boiler

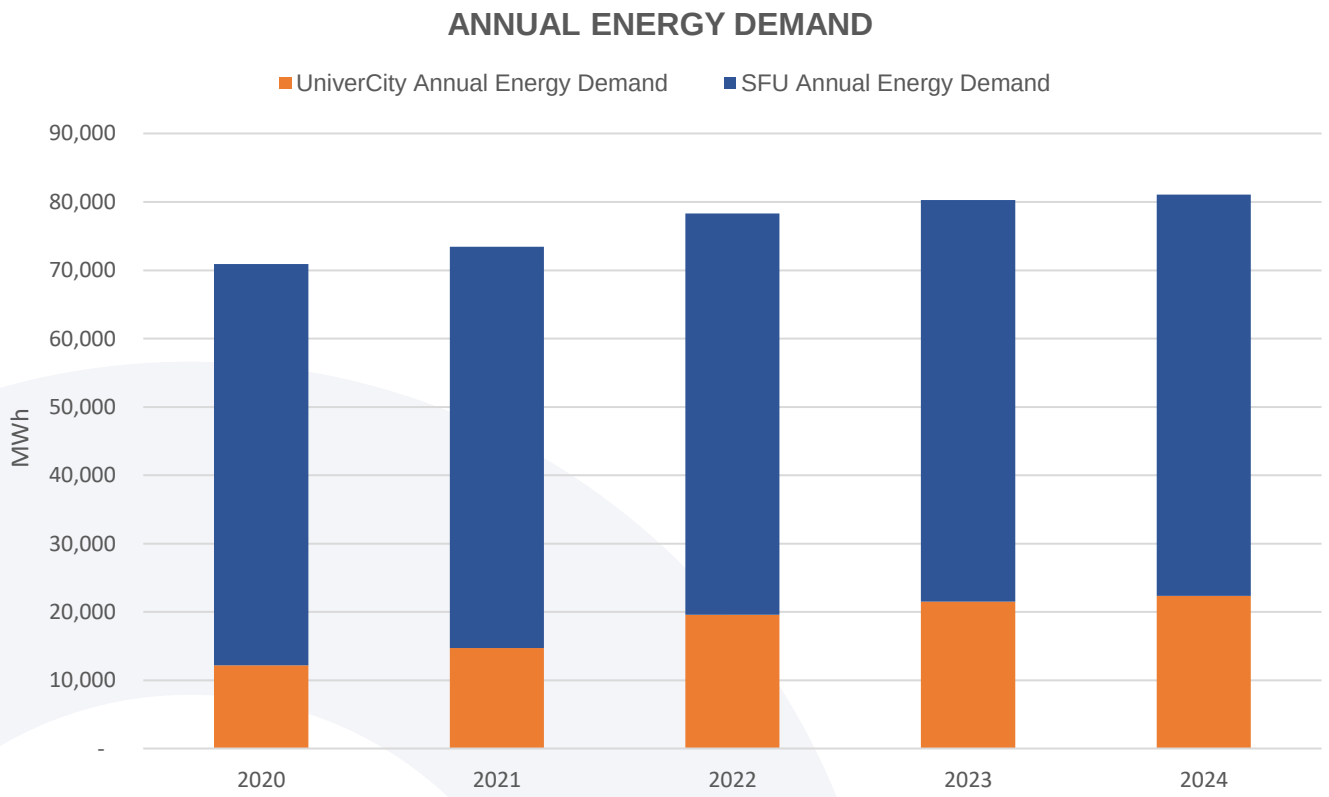
Natural Gas Boilers

- 13.5 MWt Biomass boiler
- 2 x 3 MWt natural gas boilers providing peaking and back-up for UniverCity only
- 3rd Bay provided for future use (Ultimate NG Capacity 12 MW)
- 1.7 km (trench) of new district piping installed connecting SFU and UniverCity with CEP

BMDEU Energy Transfer Station at SFU

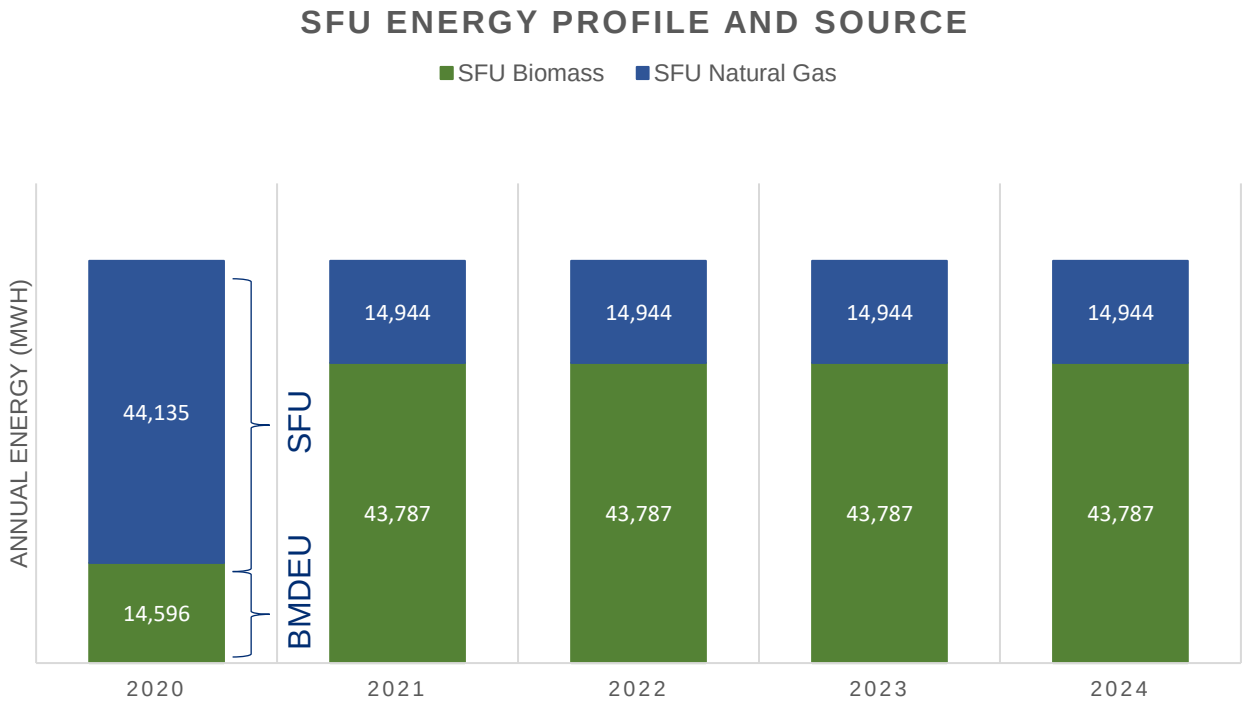
- 10MW (contract rated) Energy Transfer Station replaced one end of life SFU NG boiler
- Provides baseload low carbon (green) energy for SFU CEP
- Expected to provide for up to ~75% of SFU annual energy consumption
- SFU provides peaking with own NG boilers

Expected Customer Energy Profile



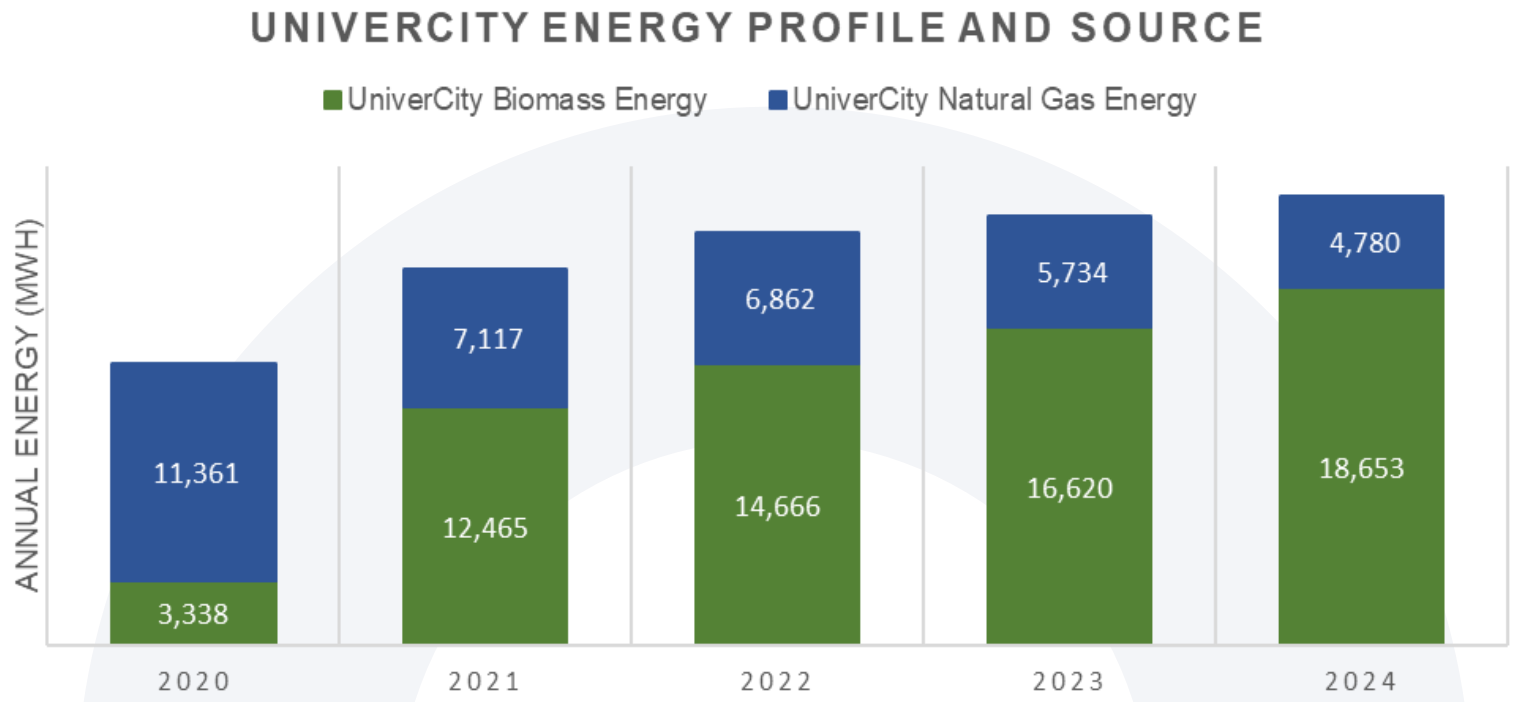
SFU Energy Profile for BMDEU

- SFU load forecast is stable for next few years. Biomass does have more capacity, should growth occur
- Expected to achieve ~75% of GHG savings over NG baseline
- Thermal models show SFU NG boilers only in operation for 4 / 5 months of the year with biomass as baseload
  - This allows for redeployment and optimization of existing SFU FTE's

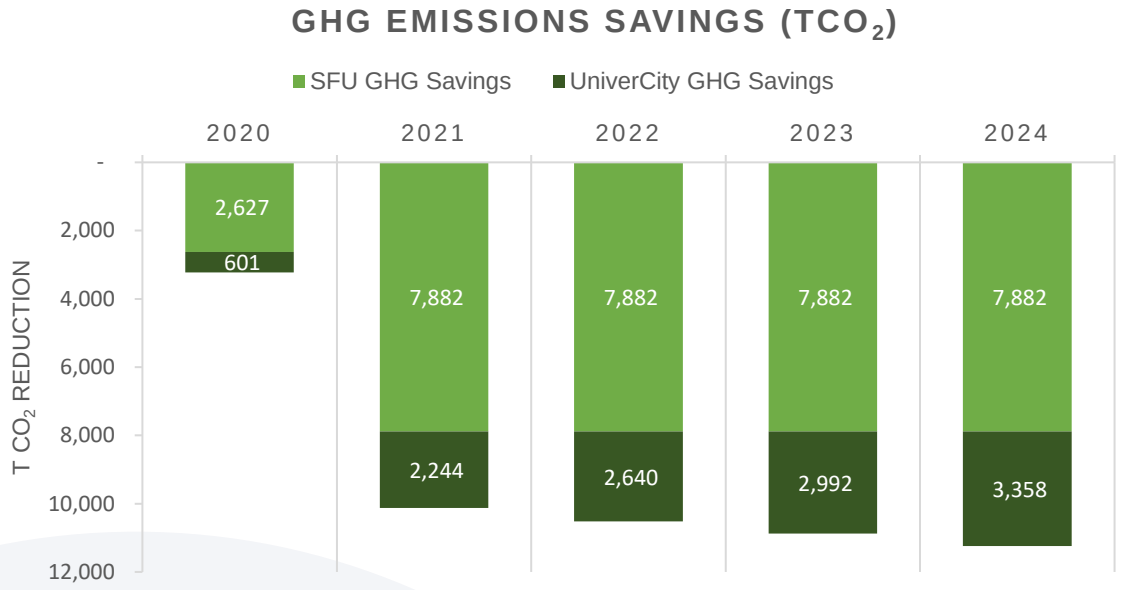


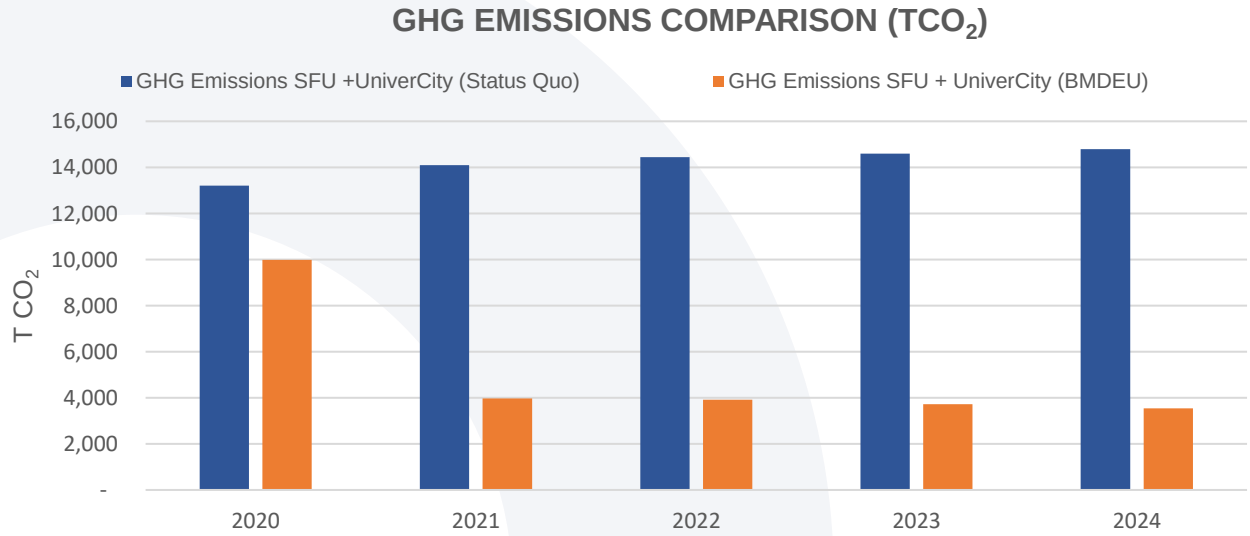
UniverCity Energy Profile for BMDEU

- UniverCity at full build out (2024) is expected to achieve ~80% GHG reduction over NG baseline



Expected Emissions Profile for BMDEU





Lessons Learned

Opportunities

- Phasing:
  - Greenfield DE development phasing to meet the load growth
  - The opportunity for optimization and load scaling by managing the phasing of a low-carbon energy source
- Efficient and innovative delivery model (scope and format) to benefit all interested parties
- Public sector immediate GHG emission savings without upfront capital and significant upgrades to the existing infrastructure, all with a balanced risk transfer to a third party

Challenges

- Permitting – allowing adequate time for permitting process (various agencies), especially with a new concept and technology
- Managing complexities of a multi-scope, multi-party project delivery
- Well defined Business as Usual (Status Quo) scenario

THANK YOU

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