CREATIVENERGY

25 November 2021

Via E-filing

Mr. Patrick Wruck
Commission Secretary
BC Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

Re: British Columbia Utilities Commission (BCUC, Commission)
Creative Energy Thompson Rivers Limited Partnership (Creative Energy)
Application for a Certificate of Public Convenience and Necessity (CPCN)
Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)(Application)

Creative Energy Thompson Rivers Limited Partnership submits the enclosed application to the BCUC for a CPCN, pursuant to sections 45 and 46 of the Utilities Commission Act, to construct, own and operate a low carbon district energy system (**LCDES**) to provide heating to TRU at the TRU campus in the City of Kamloops. As set out in the application a primary driver for the LCDES is TRU's strategic sustainability objective and its priority to achieve a carbon neutral or zero-carbon campus by 2030.

The LCDES is planned to be located within a building constructed and owned by TRU on the campus. To avoid unnecessary duplication of services, TRU will provide electricity and natural gas service to the LCDES using TRU's existing connections to electricity and gas utilities. TRU will charge Creative Energy for electricity and natural gas on a flow through basis equal to what TRU pays for the amount of electricity and natural gas delivered to the LCDES as metered, and in accordance with s. 9 of the Contribution Agreement.

Contemporaneous with our CPCN Application, TRU will apply to the BCUC for an order pursuant to section 88(3) of the Utilities Commission Act exempting TRU from regulation under Part 3 and section 71 of the Act in respect of TRU's provisions and resale to Creative Energy of electricity supplied by BC Hydro and natural gas supplied by FortisBC. The arrangement whereby TRU supplies and resells electricity and gas to Creative Energy for use in Creative Energy's LCDES within a building owned by TRU and to provide heating to TRU avoids the need otherwise to install new electricity and gas connections to the BC Hydro and FortisBC systems.

In relation to the pending TRU exemption application and for the same reasons, our Application and draft order set out a request for an order, also pursuant to section 88(3) of the Utilities Commission Act, exempting Creative Energy from any requirement to file a contract with TRU under section 71 of the Act

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if any such obligation is triggered in relation to TRU's provision of electricity and natural gas to Creative Energy Thompson River Limited Partnership with respect to the LCDES.

Creative Energy respectfully requests that our Application and the pending TRU application for exemption from regulation as a public utility be heard together by the same Commission Panel.

Yours sincerely,

Rob Gorter
Director, Regulatory Affairs and Customer Relations

Enclosure.

Creative Energy Thompson Rivers Limited Partnership

APPLICATION FOR A

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

Thompson Rivers University (TRU)

Low-Carbon District Energy System (LCDES)

November 25, 2021

CREATIVENERGY

Table of Contents

Tables

Figures

Appendices

Attached Electronically

1. Indicative Cost of Service and Rates Model
2. Comparative LCOE analysis

1 Introduction

1.1 Application Summary

Creative Energy Thompson Rivers Limited Partnership (**Creative Energy Thompson Rivers LP, Creative Energy**) submits this application to the British Columbia Utilities Commission (**BCUC, Commission**) for a Certificate of Public Convenience and Necessity (**CPCN**), pursuant to sections 45 and 46 of the Utilities Commission Act (the **Act**), to construct, own and operate a Thermal Energy System (**TES**) to provide low carbon heating (**Low Carbon District Energy System, LCDES**) to the Thompson Rivers University (**TRU**) in the City of Kamloops (**City**)(**Application**).

TRU is a public teaching and research university offering undergraduate and graduate degrees with its main 250-acre campus located in Kamloops, BC. In 2014 TRU identified that Increasing Sustainability was one of its five strategic priorities and in 2018 TRU became the first university in Canada to achieve a STARS[1] Platinum rating through the Association for the Advancement of Sustainability in Higher Education (**AASHE**). TRU has made a commitment to achieve carbon neutrality by 2030 and the LCDES is a significant strategic project to achieve its carbon objectives.

Consequently, in February 2020 TRU and Creative Energy Developments Limited Partnership (**CEDLP**) entered a Memorandum of Understanding to jointly evaluate the merits of a low-carbon electrified district energy system compared to building scale low carbon technology alternatives and, as applicable, to develop a Class 3 design and cost estimate, draft commercial agreements, and undertake public consultation to support an application for a CPCN.

TRU and Creative Energy Thompson Rivers LP have now entered into agreements where Creative Energy Thompson Rivers LP will construct, own, and operate the TRU LCDES to provide low-carbon heating to 8 existing buildings and one new building through an electrically

[1] Sustainable Tracking, Assessment, & Rating System (**STARS**) is a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. It is administered by AASHE.

powered central heating plant consisting of water-to-water and air-source heat pumps, with natural gas boilers for peaking and back up. The TRU LCDES is also envisioned to be expandable to connect additional TRU buildings and City of Kamloops buildings in the future if and as required. Such future load has not been confirmed at this time and is not determinative of the current need for the LCDES; expansion of the LCDES beyond the 9 buildings is therefore outside the specific scope of the project and the requested approvals in this Application.

In May 2021 Creative Energy and TRU collaborated to consult with stakeholders and local First Nations into the project and through a formal process. The project received overwhelming support as further described in section 9.

Creative Energy submits that under the specific characteristics of the TRU LCDES and the circumstances of this Application, and guided by the Commission's principles to use the least amount of regulation needed to protect the ratepayer while ensuring also that the benefits of regulation outweigh its costs, that a limited public hearing is required to review and determine that the requested CPCN should be granted. We review a proposed regulatory process in section 3.

1.2 Organization of the Application

This Application is organized as follows and with consideration of the BCUC's CPCN Application Guidelines[2]:

- Section 1 introduces the Application, outlines the key planning context that underpins the decision by TRU to pursue low carbon energy service from a LCDES, and reviews the contents of each section.

[2] 2015 Certificate of Public Convenience and Necessity Application Guidelines, Appendix A to Order G-20-15.

- Section 2 provides information on Creative Energy Thompson Rivers LP and the technical and financial capacity of its affiliated partners and project team to undertake to construct, own and operate the TRU LCDES.

- Section 3 outlines the regulatory approvals being sought and the proposed regulatory process.

- Section 4 defines the project need and justification in direct relation to the strategic sustainability policy imperatives of TRU and how the project supports the applicability of BC's energy objectives in the *Clean Energy Act*.

- Section 5 reviews the alternatives assessment, including the technology options and preferred solution to meet TRU's strategic objectives.

- Section 6 provides a detailed description of the proposed LCDES project, including project scope, components and costs, implementation schedule, human resources requirements, environmental benefits and the relevant permits and approvals required.

- Section 7 provides financial information into the indicative cost of service and rates of the LCDES.

- Section 8 provides information on project risks.

- Section 9 reviews the consultation processes undertaken and the First Nations and public/stakeholder support for the proposed LCDES.

2 Applicant

2.1 Creative Energy Thompson Rivers LP

Creative Energy Thompson Rivers LP was formed for the purpose of developing, designing, constructing, owning and operating the TRU LCDES.

The TRU LCDES will be a functionally separate utility system in the Creative Energy group of utilities. As a result of undertaking the project proposed in this Application, Creative Energy Thompson Rivers LP will be a public utility under the Act, and we understand that it will be considered a Stream B TES under the Commission's TES Regulatory Framework Guidelines, as explained further in section 3.

Creative Energy Vancouver Platforms Inc. (**CEVP**) staff are providing expert services to Creative Energy Thompson Rivers LP and the costs of those services are and will be directly assigned to the TRU LCDES. Once the LCDES is operational, residual general and administrative expenses will be allocated to the cost of service of the LCDES in accordance with the Commission-approved Massachusetts formula for the assignment of such expenses across all projects supported by the functions administered by CEVP.

Creative Energy's team for this Application is set out in Table 1.

Table 1: Creative Energy team and organizations supporting the Application

Role	Individual / Firm
Application Sponsor	Krishnan Iyer, President & CEO
Application Counsel	Lawson Lundell LLP
Project Director	Vice President, Development
Project Manager	Senior Manager, Projects & Construction
Regulatory Affairs	Director, Regulatory Affairs
Financial	Manager, Corporate Development

2.2 Technical Capacity to Design and Operate the Project

CEVP staff have extensive experience in the development, design, implementation, operation and maintenance of district thermal energy systems. CEVP staff have the technical capacity to design, develop and operate the TRU LCDES.

For more than 50 years, CEVP has operated the reliable and efficient Core Steam district energy system in downtown Vancouver. CEVP staff have also developed and implemented numerous other TES, including systems with large heating and cooling components and that include low carbon energy delivery, in the design phase or under construction.

2.3 Financial Capacity to Build the Project

Creative Energy Thompson Rivers LP has the financial capacity to fund the Project through a combination of debt and equity provided by its ultimate shareholders, Westbank Holdings Inc. (**Westbank**) and Instar Asset Management Inc. (**Instar**).

Westbank is Canada's leading luxury residential and mixed-use real estate development company.

Instar was founded in 2013 to offer private capital solutions to support the delivery of quality essential infrastructure that accelerates growth and prosperity for communities, businesses and stakeholders. Instar has a wealth of experience investing in and directing infrastructure businesses, including power generation, district energy, and renewable energy assets.

2.4 Contact Information

All communications with respect to this Application should be directed to the primary and alternate contacts below and to the Creative Energy information email box as listed also.

Primary Contact

Rob Gorter
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3 Approvals Sought and Proposed Regulatory Process

3.1 Regulatory Approvals Sought

This CPCN Application seeks the following approval.

1. Pursuant to sections 45 and 46 of the *Utilities Commission Act*, a certificate of public convenience and necessity for the construction and operation of the TRU LCDES as described in the Application.

2. Pursuant to section 88(3) of the *Utilities Commission Act*, to exempt Creative Energy from any requirement to file a contract with TRU under section 71 of the Act if any such obligation is triggered in relation to TRU's provision of electricity and natural gas to Creative Energy Thompson River Limited Partnership with respect to the TRU LCDES.

A draft final order is provided in Appendix A to this Application.

3.1 Proposed Regulatory Process

Regulatory process considerations are guided by the Commission's TES Regulatory Framework Guidelines (**TES Guidelines**) and Alternative Energy Services (**AES**) Inquiry Report[3]. While the Commission is currently reviewing the TES Guidelines within a public proceeding with the intent to update the TES Guidelines, the TES Guidelines currently in effect and the key principles articulated by the Commission in its AES Inquiry Report support the Commission's determination as to the required form of regulation of the TRU LCDES and, in particular, the level of oversight and process to do so cost-effectively in full view of the characteristics and circumstances of the TRU LCDES.

[3] Commission Report on an Inquiry into the Offering of Products and Services in Alternative Energy Solutions and Services and Other New Initiatives dated December 27, 2012.

Our proposed regulatory process to seek CPCN approval therefore considers the appropriate level of regulation as informed by the characteristics and circumstances of the LCDES in view of the Commission's key principles for regulating TES (AES Inquiry Report pp. 18-19):

1. Once an activity is found to require regulation (for example, pursuant to Stream B designation under the TES Guidelines), the appropriate form of regulation must be determined. Regulation itself runs a spectrum.

2. Where regulation is required use the least amount of regulation needed to protect the ratepayer.

3. The benefits of regulation should outweigh the costs.

The AES Inquiry Report reviews that the form of regulation then should:

- provide adequate customer protection in a cost-effective manner;

- consider administrative efficiency;

- consider the level of expenditure, the number of customers, the sophistication of the parties involved and the track record of the utility in undertaking similar projects; and

- require the provision of sufficient information to allow the Commission to assess the new business activity, and any rates to be set, against BC's Energy Objectives and the requirements of the *Utilities Commission Act* and the *Clean Energy Act*.

The Act at section 46(2) sets out that the Commission has the discretion whether or not to hold any hearing at all on an application for a CPCN. While we are not proposing that the Commission not hold any hearing on this Application, we do emphasize that the legislative authority for such discretion is informative of the flexibility the Commission ought to consider into the merits of the proposed process here.

We emphasize the following characteristics and circumstances of the TRU LCDES:

- The cost to construct the TES is less than $15 million;
- The TRU LCDES has been conceived and developed as TRU's preferred system to directly further its strategic objectives;
- TRU will be the one and only customer of the TES serving the university buildings on a single parcel of land; and
- Creative Energy has the experience and resources to design, construct and operate the TRU LCDES.

The single parcel of land does not strictly align with the definition of 'Site' under the TES Guidelines within the university campus setting given that individual buildings on the TRU campus site require individual Building Permits. While the Site definition in the TES Guidelines as informing the definition of a Stream A TES utility may not be suitable to a university setting, the intent of the definition may align with the purpose as presented in this case.

Within this context overall and in support of an efficient process for reviewing the Application, we respectfully propose a limited written hearing process on the requested timeline below. The 'limited' nature of the proposed public process will allow for stakeholder review and participation. Specifically, we propose and will ensure that the following stakeholders are provided direct notice of this Application and ensuing process:

- TRU
- TRU Community Trust
- First Nations - Tk'emlúps te Secwepemc (**TteS**); and
- City of Kamloops.

A BCUC Public Notice of the Application could also be published in a TRU newsletter or a local City of Kamloops newspaper, for example.

Considering the characteristics and location of the LCDES and the nature of the one customer and its role in identifying the LCDES as TRU's preferred system to directly further its strategic objectives, the limited hearing process will recognize that interventions by the set of usual residential and commercial ratepayer representation may not be required and ought to be vetted in advance to support administrative and regulatory efficiency if necessary.

The proposed process contemplates that one round of information requests may be sufficient and that a written arguments phase may not be required subject to any interveners submitting otherwise.

The proposed process is expected therefore to provide sufficient information to allow the Commission to assess the project against BC's Energy Objectives and the requirements of the *Utilities Commission Act* and the *Clean Energy Act* and to thereby assess the public convenience and necessity in a cost-effective and efficient manner with due regard to the level of expenditure, the number of customers, the sophistication of the parties involved and the track record of the Creative Energy broadly in undertaking similar projects.

Table 2: Suggested Regulatory Timetable

Action	**Date**
Application Filed	November 25, 2021
BCUC Procedural Order	December 31, 2021
Notice of Application and Proceeding	January 7, 2022
BCUC IR No. 1 to Creative Energy	January 21, 2022
Intervenor registration	January 21, 2022
Intervenor IR No. 1 to Creative Energy*, if any*	February 4, 2022
Creative Energy Response to IR No. 1	February 18, 2022
Creative Energy Final Argument, *if necessary*	*To be determined*
Intervenor Final Argument, *if necessary*	*To be determined*
Creative Energy Reply Argument, *if necessary*	*To be determined*

Creative Energy requests that the Commission issue its final order on this CPCN Application on or before May 31, 2022. A decision approving the CPCN by such date is supportive of the construction timeline and implementation schedule.

4 Project Need, Justification and Alternatives

The proposed TRU LCDES and this Application together represent a significant milestone on TRU's path to a sustainable and carbon-neutral future. The need and justification for the LCDES can be directly traced along that path from initial consideration of centralized energy services under a Campus Master Plan, review of low carbon building scale alternatives as part of the Campus Strategic Sustainability Plan, to the direct engagement and agreement with Creative Energy to deliver a low carbon district energy system.

4.1 Campus Master Plan

TRU first explored the viability of district energy on campus in 2013 as part of its Campus Master Plan[4]. The consideration of district energy was evaluated based on a centralized natural gas boiler plant and against the criteria of improving energy efficiency on the campus while reducing energy costs.

As an outcome of the Campus Master Plan, TRU developed its first Campus Strategic Sustainability Plan[5] and a Campus Strategic Energy Management Plan[6], which in combination helped shape its plans and aspirations for being a leader in sustainability.

As an outcome of its strategic plans, TRU implemented a series of capital projects and energy conservation measures to improve energy efficiency on campus. These efforts included:

- Boiler plant retrofits, which converted mid-efficiency natural gas boilers to high-efficiency natural gas boilers;

[4] https://www.tru.ca/__shared/assets/2013_Campus_Master_Plan31594.pdf

[5] https://www.tru.ca/__shared/assets/2014_Campus_Strategic_Sustainability_Plan_Final33659.pdf

[6] https://www.tru.ca/__shared/assets/TRU_Strategic_Energy_Management_Plan_201638869.pdf

- Control optimizations, such as demand control ventilation, occupancy sensors for lighting and HVAC, tighter set point scheduling, and temperature reset strategies for the HVAC systems; and

- LED lighting retrofits.

4.2 A Focus on Low Carbon District Energy

By 2016 TRU had completed significant demand-side and energy efficiency measures and began to shift its strategic sustainability focus from energy efficiency and cost reduction to greenhouse gas emissions reduction. District energy was therefore on the forefront of planning efforts once again, but with an emphasis on low carbon solutions.

4.2.1 Consideration of Biomass

TRU investigated a mid-sized biomass heating system (to be TRU-owned) and a larger scale biomass heating system (to be third-party owned). There was significant interest in these projects at the time, but concerns were raised into the public reception, air quality issues, and a need for variance to the City of Kamloops' Bylaw 45-1, which prohibits the use of outdoor wood-fired boilers.

Thus, instead of proceeding with a large district scale biomass system, TRU planned on using the development of their new Industrial Training and Technology Centre (**ITTC**) building – a 5,344 m^2 building that begun construction in 2017 and opened at the end of 2018 – to pilot the use of small-scale biomass to heat the new building, and to interconnect the heating system with the existing Trades and Technology building – a much larger existing building beside the new ITTC – in order to further reduce natural gas use.

This smaller scale biomass heating system advanced to detailed design. At a City of Kamloops Council meeting on May 2, 2017, a motion was passed instructing City staff to prepare the documentation necessary for Council to decide whether to rescind the Prohibition of Outdoor Wood-fired boilers Bylaw No. 45-1, 2008. This instruction resulted in significant public response

with concerns over air quality[7]. A follow-up Council meeting was held on May 9, 2017, to review this matter further and a vote was held on Bylaw No. 45-2, Prohibition of Outdoor Wood Boilers Repeal Bylaw, 2017. The vote on Bylaw No. 45-2 was defeated leaving the ban on outdoor wood fired boilers in place. With Bylaw No. 45-1 remaining in effect and given the lack of public support and internal concerns from other stakeholders, TRU abandoned the consideration of heating with biomass.

4.2.2 Consideration of Electrification

With biomass not available as a low-carbon heating source TRU focused on using electrification to decarbonize, and in 2018 it implemented an electric boiler plant to heat the new ITTC building and the existing Trades and Technology building in a carbon-friendly manner.

With the electric boiler plant serving as a pilot project, in 2020 TRU developed the Chappell Family Building for Nursing and Population Health - a new 4,552 m^2 health sciences building – with heat recovery chillers and electric boilers for 100% electric based heating – its first new academic building without a natural gas connection.

Around this time, TRU commissioned Stantec Consulting to complete a study to determine the efforts needed to retrofit nine of its existing academic buildings to electric based heating, primarily though a combination of air-source heat pumps, ground-source heat pumps, and electric boilers (**TRU Electrification Study**). Please refer to Appendix B.

4.3 2019 Campus Strategic Sustainability Plan

TRU's identified need and justification for a low-carbon district energy system was further resolved with the release of its updated 2019 Campus Strategic Sustainability Plan[8]. The single

[7] Air quality has been a long-standing issue in Kamloops largely due to the local forestry industry in the area, and public sensitivities to air quality have increased since the proposal of the Ajax open pit mine.

[8] https://tru.ca/__shared/assets/campus-strategic-sustainability-plan-2020-202547354.pdf

highest priority identified in this plan is to achieve a carbon neutral or zero-carbon campus by 2030.

Thus, by the end of 2019 TRU had a commitment to achieve carbon neutrally by 2030, and with the TRU Electrification Study in hand, it was able to gauge the scope of the physical and financial undertaking of what building-scale solutions would require.

TRU also commenced discussions with Creative Energy staff with the intent to explore options to electrify under a district energy approach and to compare against building-scale solutions.

In February 2020 TRU and Creative Energy Developments LP entered into a Memorandum of Understanding to jointly evaluate the merits of a low-carbon electrified district energy system, and if deemed a better option than a building scale alternative, to develop a Class 3 design and cost estimate, draft commercial agreements, undertake public consultation, and apply for a CPCN.

On January 4, 2021, TRU further solidified its commitment to carbon neutrality by becoming a signatory of the Race to Zero campaign ran by the EAUC (the Alliance for Sustainability Leadership in Education), UN Environment Programme, and Second Nature, publicly committing to its 2030 carbon neutrality objective[9].

4.4 BC Energy Objectives

The internal TRU strategic objectives driving the need for the LCDES project is described above. It is important to note that this policy basis and the ultimate implementation of the project both align with and will support the applicable BC energy objectives as defined in the CEA, the importance of which is emphasized through the BCUC's guidelines for CPCN applications generally.

[9] https://www.sdgaccord.org/race-to-zero-for-universities-and-colleges-sign

We thus note that the TRU LCDES supports the applicable BC energy objectives to:

- reduce BC greenhouse gas emissions (CEA section 2(g));
- encourage the switching from one kind of energy source or use to another that decreases greenhouse gas emissions in BC (CEA section 2(h));
- encourage economic development and the creation and retention of jobs (CEA section 2(k)); and
- achieve BC's energy objectives without the use of nuclear power (CEA section 2(o)).

5 Alternatives Assessment and Preferred LCDES Option

The alternatives for a LCDES were explored by TRU and Creative Energy under a stepwise approach that consisted of:

1. An initial screening assessment that qualitatively compared a 'long-list' of technology options; and

2. An assessment of the economics and other attributes of a 'short-list' of low carbon thermal energy system alternatives, both building scale and district scale, and including a high-level comparative Levelized Cost of Energy (**LCOE**) analysis of the short-list options.

5.1 Technology Options Screening Analysis

As reviewed in the table below a long-list of various technologies was developed as an initial review of the technological mixes that could be used for an LCDES and to facilitate qualitative comparisons as a screening assessment. The structure and assessment of the comparison among technologies was developed based on expert opinion and the collective expertise of both Creative Energy and the consultants that were supporting TRU and Creative Energy.

Each technology option was assessed and screened in or out to create a short-list for further analysis; a summary of which is set out in the following table. Biomass and Sewer Heat Recovery were screened out for the reasons discussed further below.

The descriptors 'low', 'medium', and 'high' were based on professional knowledge and expert judgement, which together qualified and informed a relative comparison between each technology as opposed to denoting a range in absolute quantitative values. The table cell colours of green, yellow, and red are similarly used to annotate positive, neutral, and negative attributes comparatively.

Table 3: Technology Screening

Technology	Capital Cost	Fuel Costs	O&M Costs	Space & Complexity	Carbon Emissions	Screening Outcome
Condensing Natural Gas Boiler	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[10]	medium	low	low	medium	low	**In**
Sewer Heat Recovery	high	low	high	high	low	Out

5.1.1 Biomass Heating – Screened out

As reviewed in section 4, TRU previously explored biomass heating as a source of low-carbon energy in three different iterations. TRU did not want to re-explore the use of biomass; the option was screened out for non-financial reasons, including:

- Air quality concerns from the community;
- City of Kamloops By-Law 45-1 which prohibits the use of outdoor wood burning boilers;
- Overall lack of public support for the project, both within TRU and from the broader community; and
- Less alignment with CleanBC strategy compared to an electrification approach.

[10] Water Source Heat Pumps were not included in the screening assessment because they are generally implicit to other technologies and not stand-alone technology options. For example, they do not work without a source of heat, such as geo-exchange or sewage.

5.1.2 Sewer Heat Recovery – Screened out

Early in project exploration an option of obtaining heat from the City of Kamloops sewer main was considered. This option was not advanced to the comparative analysis stage for the following reasons:

- Approximate generation capacity is only 500 – 750 kW requiring an alternative low-carbon source to be provided in addition;
- The sewer location is at a very steep grade, making the technical feasibility challenging;
- Due to the combination of multiple low-carbon technologies and expected technical challenges, sewer heat recovery did not appear to be economic due to the high upfront cost of installing more than one low-carbon technologies and the high upfront costs of the sewer heat recovery facility itself; and
- The City of Kamloops expressed concerns and reservations about allowing a district energy system to build facilities proximate to its sewer line.

5.2 Low Carbon Thermal Energy System Alternatives

The remaining technology options that were screened in (short-listed) for further investigation were evaluated through a comparative Levelized Cost of Energy (**LCOE**) analysis using indicative cost and energy estimates.

As set out in the table below, the two building scale options that TRU had previously analysed were included to compare the district energy approaches against building-scale alternatives. The building scale options were based on two third party reports commissioned by TRU and that were completed prior to Creative Energy's engagement and which can be referenced in Appendix B. These reports were used as high-level proxies to estimate the capital and operating costs for the building scale options because these reports only included 6 of the 9 buildings that the LCDES will serve and did not consider the associated costs to serve the 3 additional buildings that are included within the current LCDES scope.

Table 4: Assessment of Alternatives – Common Assumptions

Input	**Assumption**
Design and Construction Contingency	15% of hard costs
Soft Costs	7% of hard costs
Blended Electricity Costs (TRU estimate)	$86 / MWh
Natural Gas Cost (TRU estimate)	$41 / MWh
Electricity Carbon Intensity	11 kg/MWh[11]
Natural Gas Carbon Intensity	178 kg/MWh
Discount Rate (Creative Energy WACC)	6.34%
Annual Heating Demand (Preliminary project scale)	9,011 MWh[12]
Estimated Seasonal Efficiency of Existing Natural Gas Boilers	80%

Table 5: Assessment of Alternatives – Comparison of Costs and Key Attributes

	Hard Costs $	Nat. Gas Use (MWh)	Electricity Use (MWh)	CO2 Emissions (tonnes)	Staffing (FTE)	Non-Fuel O&M Costs $ (year 1)
Distributed Natural Gas Boilers Not an option	*n/a*	*11,264*	*124*	*2,006*	*n/a*	*n/a*
Building Scale Geo-Exchange	21,212,400	4,149	2,301	764	1.5	150,000
Building Scale Air-Source Heat Pumps	17,997,800	4,149	3,295	775	1.5	150,000
District Energy Geo-Exchange	26,350,000	508	3,050	124	1	100,000
District Energy Electric Boilers	5,770,000	508	8,789	187	1	75,000
District Energy Air & Water Source Heat Pumps	8,450,000	867	3,852	197	1	100,000

[11] At the time of the alternatives analysis, 10.67 kg/MWh (rounded up to 11 kg/MWh) was being used based on the *2018 B.C. Methodological Guidance for Quantifying Greenhouse Gas Emissions.* This value has been functionally 'retired' as of the 2021 reporting year, which is why a different grid emissions intensity is used in Section 6.11 of this application.

[12] The scale of the LCDES scope was still being refined during the comparative LCOE analysis stage and included additional loads that were ultimately removed from the scope which is why the load forecast used here is greater than the actual load forecast for the LCDES. Thus, we believe the indicative results presented in Table 6 and Figure 1 are robust to the decision into the preferred alternative at a smaller scale.

Further discussion of the alternatives is provided below. The comparative LCOE of each option is provided at the end of this section.

5.2.1 Building Scale - Electrification through Geo-Exchange - Uneconomic

The TRU Electrification Study was used as a proxy to assess and compare this option (please refer to Appendix B). This option in uneconomic due to high upfront capital cost to retrofit the existing buildings and the new electrical feeders needed for most buildings, as well as the need to oversize the geo-exchange field to prevent field drift and saturation due to the one-directional energy flow (i.e., heating only).

5.2.2 Building Scale - Electrification through Air-Source Heat Pumps - Uneconomic

The TRU Electrification Study was used as a proxy to assess and compare this option. This option is uneconomic due to high upfront capital cost to retrofit the existing buildings and the new electrical feeders needed for most buildings, and the relatively short median asset life of building-scale air-source heat pumps.

5.2.3 District Scale - Geo-Exchange – Potentially feasible - Uneconomic

The use of a geo-exchange district energy system was explored and deemed to be uneconomic mainly due to high capital costs related to the need to oversize the geo-exchange field as explained above.

5.2.4 District Scale - Electric Boiler – Potentially feasible - Uneconomic

The use of electric resistive boilers was also explored. Although it has the lowest capital costs (not including contribution to BC Hydro's cost to upgrade its upstream electrical distribution system) the high operating costs of using electric resistive heat was found to be punitive to the project economics. In addition, the higher electrical demand would require a new BC Hydro distribution service, which, based on an initial review with BC Hydro's engineers would have added an estimated $4-$4.5 million to the project capital costs (over and above the initial estimates), and an additional 2 years to the schedule.

5.2.5 District Scale - Air-Source/Water-Source Heat Pumps – Preferred Option

The economic and preferred option is a two-stage air-source/water-source heat pump system with high efficiency gas boilers to provide peaking and back-up capabilities. Air-source heat pumps are used to extract heat from the ambient air and produce low-quality heat through medium-temperature hot water, and water-source heat pumps are used to provide a second stage of temperature lift to produce high quality heat that can be used by the connected buildings through medium-temperature hot water. The natural gas boilers are sized for full load to provide 100% back-up heating, and to operate during cold temperature days below negative 15°C where the air-source heat pumps cannot operate effectively. On an annual basis, the low-carbon capacity is expected to cover 95% of the load and reduce over 900 tonnes of greenhouse gas emissions which is approximately a 90% reduction compared to heating with natural gas boilers[13].

5.3 Summary of Alternatives Assessment and Preferred Option

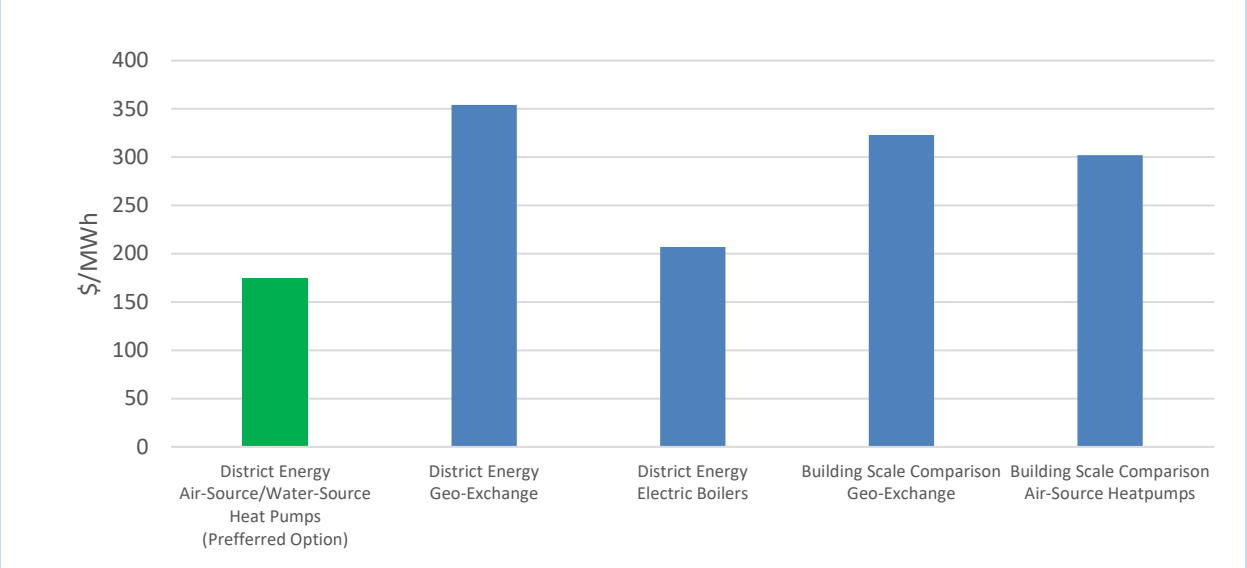
The indicative LCOE comparison demonstrates a large economic advantage for the Preferred Option of 15% – 50% lower levelized cost compared to alternatives, with comparatively equivalent forecast carbon reduction performance. The second-most economically competitive option (District Energy – Electric Boilers) has an understated LCOE as it does not include a contribution to BC Hydro upstream system upgrade costs and has disadvantages also associated with the delay to build a new BC Hydro distribution service. The District Energy Air-Source/Water-Source Heat Pumps option therefore moved forward as the Preferred Option for further refinement.

[13] The annual greenhouse gas reductions are marginally less than the annual load coverage from the low-carbon capacity (i.e. air-source heat pumps and water-source heat pumps) because of the residual carbon in the grid electricity. For example, the low-carbon capacity covers 95% of annual load but only provides an approximate 90% reduction in GHGs because of the carbon emissions attributed to the consumption of electricity necessary operate the heat pumps.

Table 6: Comparative Assessment of Alternatives – Levelized Cost of Energy and Carbon Reductions

	NPV of Costs (30 years)	NPV of Energy (30 years)	LCOE $/MWh	% Carbon Reductions
Building Scale Geo-Exchange	$38,611,562	119,650 MWh	$323	62%
Building Scale Air-Source Heat Pumps	$36,099,259		$302	61%
District Energy Geo-Exchange	$42,311,618		$354	94%
District Energy Electric Boilers	$42,311,618		$207	91%
District Energy - **PREFERRED** Air & Water Source Heat Pumps	$20,826,211		$174	90%

Figure 1: LCOE of Alternatives



6 Project Description

This section reviews the detailed scope and definition of the preferred and proposed project to implement a two-stage air-source/water-source heat pump system with high efficiency boilers that provide peaking and back-up capabilities.

6.1 Project Scope

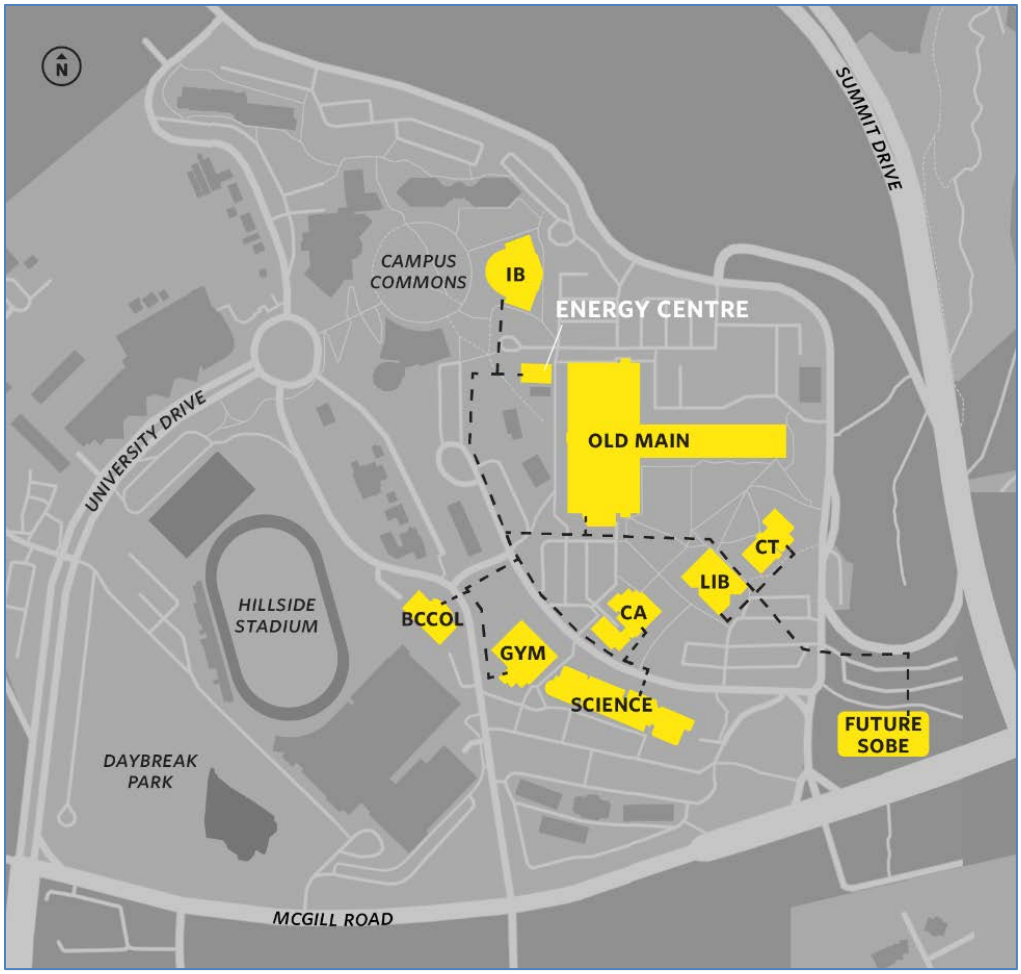
Project scope includes engineering design, procurement, construction, commissioning, and operation of the LCDES. The project will provide low-carbon energy for approximately 56,600 square metres of building floor space at TRU.

The LCDES components include an Energy Centre (**EC**), Energy Transfer Stations (**ETS**) at each connected building, and a Distribution Piping System (**DPS**) for delivering the thermal energy from the Energy Centre to the connected buildings.

6.2 Project Location

The proposed LCDES will be constructed at Thompson Rivers University in Kamloops, BC. The figure below illustrates the service area. The location of the Energy Centre, connecting buildings, and the expected routing of Distribution Piping System are also shown.

Figure 2: LCDES Service Area



6.3 Project Design

6.3.1 Energy Center

A new fully serviced Energy Center Building will be constructed by TRU at the northwest corner of the Old Main building to house the EC. The new building may also house other TRU facilities such as TRU's existing generator. The cost of the EC Building and service connections will be carried by TRU entirely. The connected services for the EC building are electricity, natural gas, water, sewer, internet, and phone line. The EC will generate the required heat for space heating and domestic hot water for the connected buildings. The heating output capacity of the EC will be approximately 4,800 kW, based on the total capacity of 3 boilers at 92% efficiency.

The key components of the EC are:

- Three air source heat pumps (**ASHP**) to generate heating water at a minimum of 35°C in winter and up to 55°C in shoulder seasons and summer. The ASHPs will have integrated circulation pumps. The heating capacity of each ASHP is approximately 400 kW in winter and up to 769 kW in shoulder seasons and summer.

- Two water source heat pumps (**WSHP**), which will use the 35°C water produced by the ASHPs on the source side and generate heating water at up to 72°C on the load side. The heating capacity of each WSHP is approximately 913 kW.

- Three high-efficiency natural gas boilers to provide peaking and backup to the heat pump system. At 92% efficiency under design conditions, each boiler has approximately 1,600 kW heat output.

- Circulation and distribution pumps, buffer and expansion tanks, chemical treatment station, and controls system.

The system operating mode will vary based on outdoor air temperature, as summarized in the table below.

Table 7: System Operating Mode

Outdoor Air Temperatures	**Supply Temperature**	**Primary Heat Source**	**Secondary Heat source**	**Notes**
< -15°C	70°C to 85°C	Gas Boilers	-	ASHPs will not operate effectively below -15°C
-15°C to 5°C	70°C	ASHP+WSHP	Gas Boilers	Gas boilers used for peaking
> 5°C	70°C	ASHP	ASHP+WSHP	ASHP directly heat DPS return water up to 55°C. ASHP and WSHP will raise the supply temperature to 70°C

Above approximately 0°C, the ASHP can deliver water at 55°C which can be used to directly heat the Distribution Piping System (**DPS**) return water. The ASHPs and WSHPs will provide approximately 95% of the heating on an annual basis.

The figures below illustrate the EC operational concept on a year-round basis. In the shoulder season and during summer operation the ASHP can provide 55°C (medium grade) heat directly to the DPS return water. During winter operation the ASHP and WSHP are backed-up with the high-efficiency natural gas boilers to meet peak demand.

Figure 3: Shoulder season and summer operation

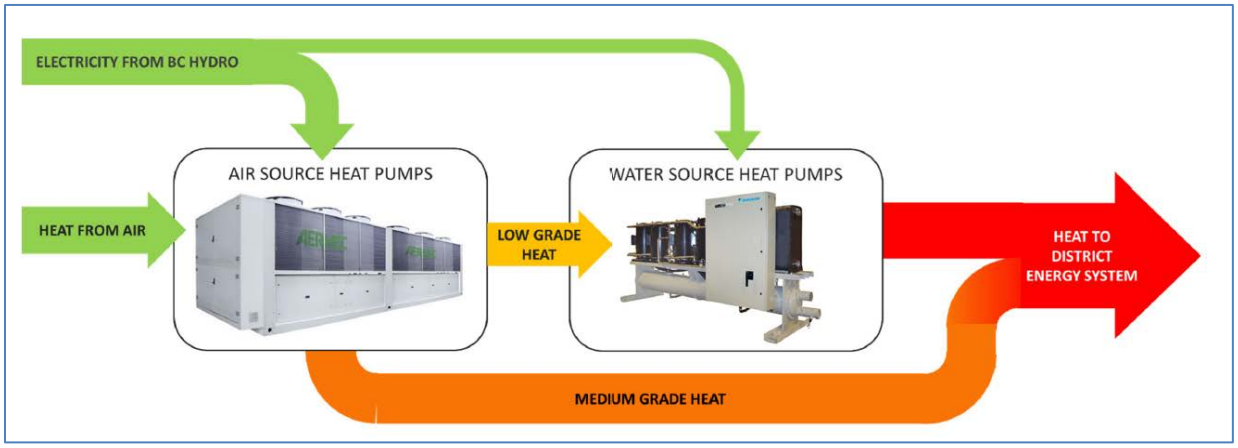
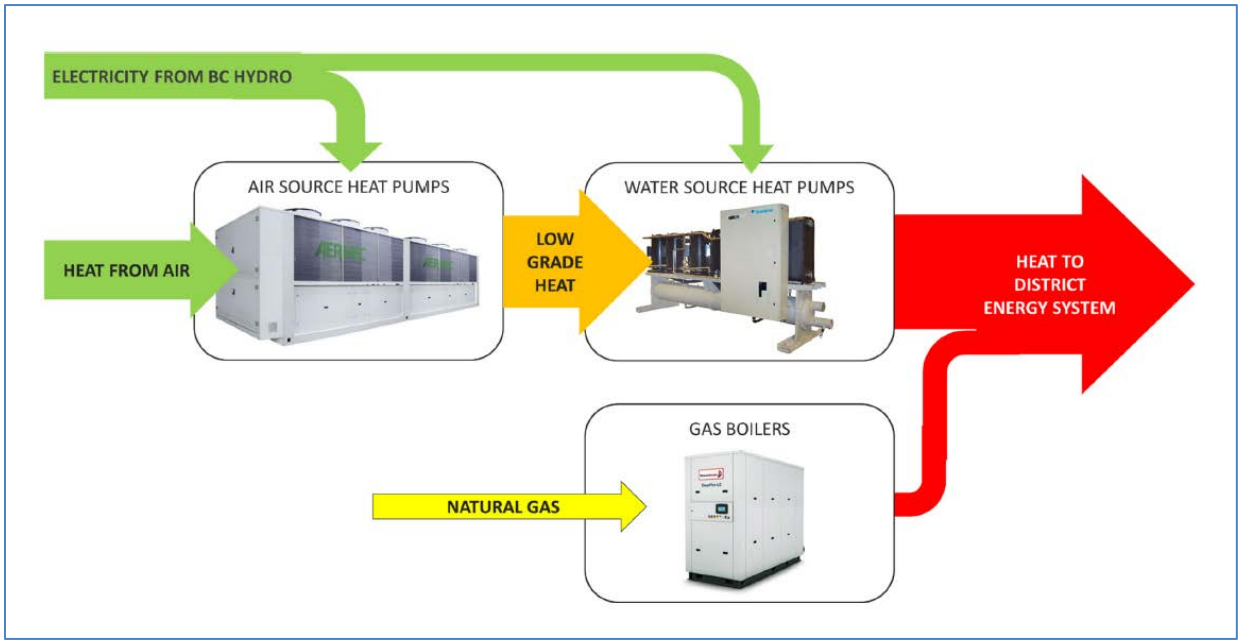


Figure 4: Winter operation



6.3.2 Energy Transfer Station (ETS)

There are eight (8) existing buildings and one (1) new building to be served by the LCDES:

1. Old Main
2. Science
3. Library (LIB)
4. BC Centre for Open Learning (BCCOL)
5. Culinary Arts (CA)
6. Clock Tower (CT)
7. Gymnasium (GYM)
8. International building (IB)
9. SOBE (future new building)

Each building will have an ETS at the point of service connection. Each ETS will include isolation valves, pressure and temperature instruments, a thermal energy meter, controls system and flow control valves. The point of connection of each TRU building to the Creative Energy LCDES is at the ETS isolation valve.

6.3.3 Distribution Piping System

The generated heat at the EC will be delivered to the ETS in the connected building through the DPS. The DPS consists of supply and return insulated pipes (closed loop system), isolation valves, and chambers that are installed one meter below ground on average. The approximate linear trench length of the DPS is 1,500 meters.

6.4 Implementation and Build-Out Schedule

The anticipated construction build-out schedule and implementation timeline of the LCDES is shown in table below. As reviewed above, the SOBE Management Building is a new building that is expected to be constructed in parallel with the district energy system with occupancy occurring shortly after the district energy system energization.

Table 8: Implementation Schedule

	Milestone	**Target Date**	**Responsible Party**
1	Signed Agreements	November 2021	TRU & Creative Energy
2	Start of EC building construction	March 2022	TRU
3	Start of retrofits for connecting buildings	March 2022	TRU
4	CPCN Application Approval	May 2022	Creative Energy
5	Start of Detailed Design	June 2022	Creative Energy
6	Major Equipment Procurement	September 2022	Creative Energy
7	EC building site services connection	October 2022	TRU
8	EC Building available for EC Installation	January 2023	TRU
9	Start of EC construction	February 2023	Creative Energy
10	Start of DPS construction	March 2023	Creative Energy
11	Start of ETS construction	June 2023	Creative Energy
12	Completion of EC Building Construction	July 2023	TRU
13	Testing & commissioning retrofitted buildings	November 2023	TRU
14	Testing & Commissioning of EC, DPS, and ETS	December 2023	Creative Energy
15	LCDES Service Commencement	April 2024	TRU & Creative Energy

6.5 Peak Load and Annual Energy Demand

6.5.1 Load Forecast

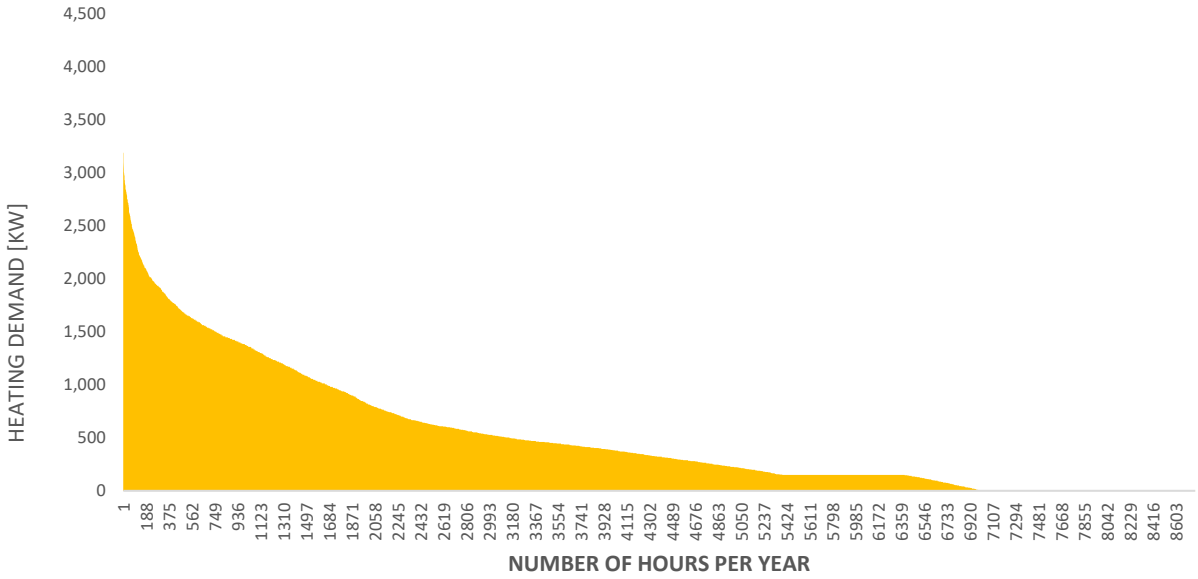
The table below provides a summary of the buildings served by the LCDES and the associated design heating loads.

Table 9: Peak and Annual Load

Building		Floor Area	Estimated Peak combined Heating/DHW Load	Estimated Annual Combined Heating/DHW Load
#	Name	m^2	kW	MWh
1	Old Main	19,800	1,500	1,485
2	Science	10,800	700	714
3	Library (LIB)	2,400	200	269
4	BC Centre for Open Learning (BCCOL)	3,600	300	327
5	Culinary Arts (CA)	1,859	470	451
6	Clock Tower (CT)	2,340	230	243
7	Gymnasium (GYM)	3,700	500	417
8	International Building (IB)	5,620	450	356
9	SOBE (Future Building)	6,500	250	296
Total (undiversified)		56,619	4,600	4,558
Diversified design peak (90%)			4,140	

A load duration curve is provided below based on the modelling efforts described in the following section.

Figure 5: Load Duration Curve – Demand



6.5.2 Methodology Review

Load estimates were completed by reviewing historical natural gas consumption on the TRU buildings through its Pulse Energy system, an energy management software that is commonly used in campus settings. This data was then normalized against hourly ambient temperature data to create an hourly demand model. The hourly demand model was used to estimate annual heating load and to model the plant dispatch to estimate plant efficiency and fuel consumption based on both outside air temperatures and demands. Peak loads for each connected building were then estimated by linearly extrapolating the energy demand with the outside air temperature to estimate the demand on a 1% design day temperature of -25°C.

The annual energy demand and peak demand for the new SOBE Management building was estimated by using a heating demand intensity of 45 kWh/m^2/year and a heating capacity factor of 38 W/m^2. These values were based on comparable factors at TRU, with a reduction adjustment made to account for the more efficient envelope performance that is expected from the future building compared to existing.

A 90% diversity factor was applied to the sum of the building peaks to estimate the plant load based on engineering expertise, building types, and building occupancy. All connected buildings

are for academic use with similar load profiles driven primarily by outside air temperature and space heating. They have limited base load and diversity of use.

The estimate plant load is 4,140 kW, and the estimated annual consumption is 4,558 MWh.

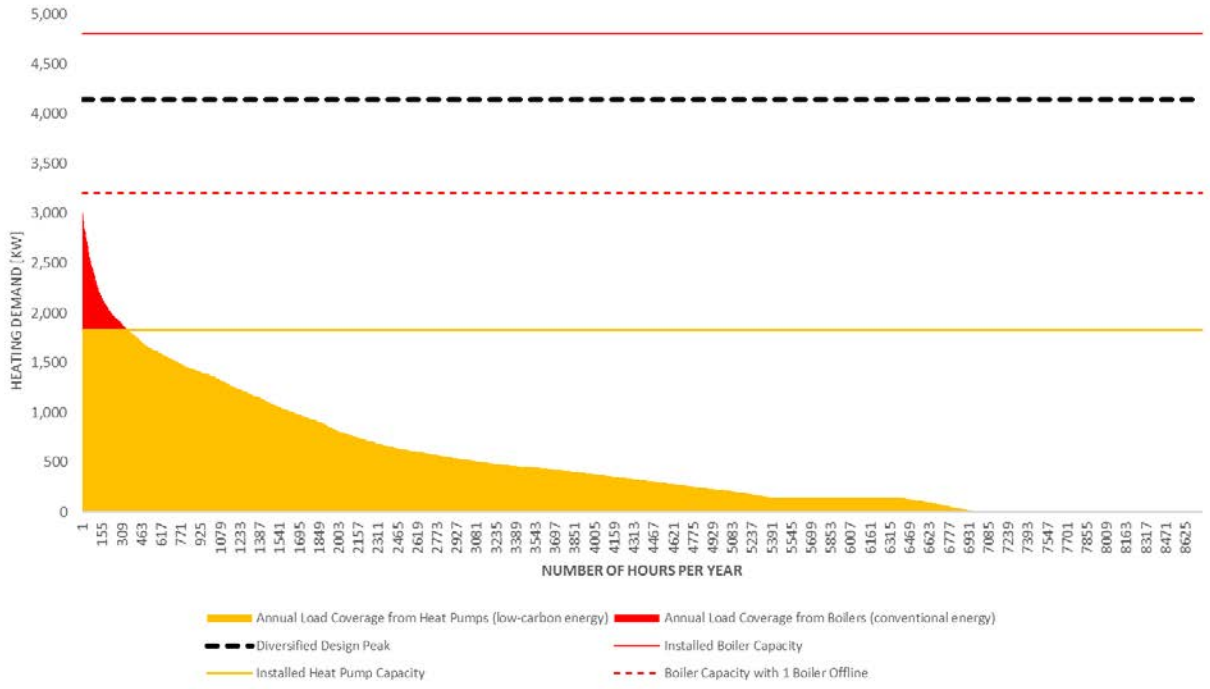
6.6 Project Sizing

The sizing of the LCDES was evaluated by Stantec Consulting and reviewed by Creative Energy. Please refer to the Stantec Basis of Design Memo at Appendix C. The plant has been sized to provide approximately 95% of the annual heating load through three ASHPs and two WSHPs, with a combined heating output capacity of 1,826 kW. The natural gas boilers will be used for peaking and back-up purposes only, but because the winter design temperature in Kamloops is below the minimum operating temperature of the ASHPs, the boiler plant has been sized for 100% of the peak demand.

Three high-efficiency natural gas boilers will be installed each with an output capacity of 1,600 kW, or 4,800 kW total at a design efficiency of 92%. This provides 116% of the estimated peak demand. With one boiler out of service, the boiler plant output reduces to 3,200 kW, providing 77% of the peak load.

The load coverage and sizing was determined by using the hourly demand model described in Section 6.5.2 and creating a dispatch model that simulates hour-by-hour dispatch of the air-source heat-pumps, water-source-heat pumps, and natural gas boilers in order to meet the energy demands of the buildings. The Coefficient of Performance (COP) of the heat pumps was simulated on an hourly basis based on the outside air temperature and the entering water/leaving water temperatures of the heat pumps, with support from the manufacturer to provide COP values based on the varying temperature conditions. The load duration curve below demonstrates the comparative use of the low-carbon generation (i.e., heat pumps) versus the natural gas generation.

Figure 6: Load Duration Curve - Demand and Capacities



6.7 Project Costs

The estimated capital cost for the LCDES is within a Class 3 degree of accuracy as defined in the AACE International Recommended Practices. Creative Energy employed two engineering firms to develop Class 3 design drawings for LCDES. The EC and ETS Class 3 design drawings were developed by Stantec Consulting; the DPS Class 3 design drawings were developed by Rathco Engineering. All drawings are provided in Appendix D.

Class 3 design drawings typically include:

- Plan and general layout of piping and equipment;
- schematic and flow diagrams;
- equipment schedule (selection and sizing);
- quantity of major equipment;

- Pipe sizes and lengths; and
- Pumps mounting, and pipe details.

The Class 3 design drawings by Stantec Consulting were used as the basis of estimate by a professional quantity surveyor to generate class 3 cost estimates for the EC and ETS. Rathco Engineering used the DPS Class 3 design drawings to generate class 3 estimate for DPS. Creative Energy used theses estimates to develop a complete Class 3 cost estimate.

Table 10: Capital Cost Estimate - AACE Class 3

Category	Cost ($)
Predevelopment	30,000
Engineering	468,000
Construction	6,745,250
Legal	80,000
Regulatory	90,000
Management	479,500
Contingency (20%)	1,578,550
Total	9,471,300

Predevelopment includes the cost of business development and customer relationship management.

Engineering includes the cost of the feasibility study, design and engineering, system specifications and drawings development, engineer's shop drawings and material reviews, and engineering field inspections for the project.

Construction includes the cost of permitting, materials, equipment, labour and installation, inspections, commissioning, and system start up for the project.

Legal includes the legal fees for developing and executing agreements with customers.

Regulatory includes the cost of legal support, and the public engagement and consultation in support of Application development as well as costs of BCUC review and participant assistance.

Management includes the cost of any type of work performed by CEVP staff related to all aspects and categories of the project including predevelopment, engineering, construction, and regulatory.

Contingency has been applied in the amount 20% of total costs.

Please refer to a more detailed Class 3 cost estimate at Appendix E.

6.7.1 Human Resources Requirements

The Energy Centre will be an unsupervised plant with remote monitoring. It is expected that the plant will only require direct staffing requirements equivalent to one half of one full-time equivalent position. Third-party service providers will be utilized to complete routine maintenance and provide "on-call" services for unplanned maintenance and emergency response. Preliminary budget estimates for the operating and maintenance services have been solicited from Olympic International[14] for the purpose of estimating an indicative cost of service for this CPCN Application. Please refer to Section 7.2 below for further detail.

6.8 Agreements

The following agreements between Creative Energy and Thompson Rivers University are in place or pending:

- Infrastructure Agreement details the terms of LCDES design, construction, ownership, and responsibilities. This agreement is in place. Please refer to Appendix F.

[14] Olympic International is a reputed HVAC equipment supply and service provider established in 1963 based out of North Vancouver with a regional office in Kelowna that provides service coverage to the BC Interior region, including Kamloops. Olympic International is also the supplier for the heat pumps that are currently specified in the Class 3 design.

- Contribution Agreement details the terms of contribution toward costs such as utilities cost of Energy Center or lease payments for the Energy Center building. This agreement is in place. Please refer to Appendix G.

- Statutory Rights of Way (SRW) Agreement details the terms of access to LCDES assets. This agreement requires TRU to first receive approval of the Ministry of Advanced Education within 6 months of the effective date of the Infrastructure Agreement. As outlined in the Ministry of Advanced Education's Capital Asset Reference Guide[15], universities, colleges, and institutes must comply with statutory requirements applicable to the disposition of property, which includes approval and consent from the Ministry. Disposition of property is further defined as "[…] *to transfer by any method and includes assign, give, sell, grant, charge, convey, bequeath, devise, lease, divest, release and agree to do any of those things."* An executed SRW agreement between TRU and Creative Energy is still pending the Ministry's approval. A final survey will be submitted to the Ministry once the system is installed but the SRW Agreement can be executed based on the initial drawings. Please refer to the Form of SRW at Schedule 6 to the Infrastructure Agreement at Appendix F.

- Customer Service Agreement (**CSA**) details the terms of energy services. Please refer to the CSA at Schedule 9 to the Infrastructure Agreement at Appendix F. Creative Energy will seek approval of the CSA as part of a rates application to follow CPCN approval as applicable.

6.9 Safety and Reliability

Operations safety measures at the EC will be considered according to industry standards including Technical Safety BC (TSBC), BC Building code, and municipal requirements. Some of these measures include:

[15] http://www2.gov.bc.ca/assets/gov/education/post-secondary-education/institution-resources-administration/capital-planning/carg.pdf

- Pressure relief valves for relieving excessive pressure or temperature in the closed loop system;
- Pressure relief valves for boilers' natural gas regulators;
- Ventilation for operating personnel and refrigerant leaks;
- Exit door sizing; and
- Fire alarms and sprinklers.

Safety measures during construction will include:

- Signage and fencing for construction and work areas;
- Signage during pressure testing;
- Temporary pathways for pedestrians; and
- Trench walls shoring or sloping in accordance with Work Safe BC requirements.

6.10 Permits and Approvals

6.10.1 Preliminary Plan Approvals

Creative Energy is required to submit its DPS drawings to the City of Kamloops for review and approval. Subject to CPCN approval the construction of the DPS can proceed upon City of Kamloops approval of these drawings.

Creative Energy, through its mechanical contractor, will notify Technical Safety BC prior to installation of the boilers and heat pumps.

6.10.2 Building Permits

The only required building permit is for the EC Building, which will be designed and constructed by TRU. The building and occupancy permits will be obtained from the City of Kamloops by TRU through its consultants and contractor.

6.10.3 Environmental Permitting

This project does not require environmental permitting or an environmental assessment.

6.10.4 Operating Permits

Technical Safety BC will issue operating permits at the end of EC construction. These operating permits include gas piping, boilers, heat pumps, expansion tanks and any other pressure vessels.

6.10.5 Statutory Rights of Way

A Statutory Rights of Way (SRW) Agreement will be executed with TRU as discussed in section 6.8.

6.11 Environmental Benefits and Impacts

The primary environmental benefit of this project will be to reduce approximately 90% of greenhouse gas emissions from the existing buildings - currently heated through natural gas - and to avoid approximately 90% of greenhouse gas emissions from the new SOBE building - as compared to heating with natural gas. The aggregate greenhouse gas reduced or avoided is estimated to exceed 900 tonnes of CO_2e/year, or roughly one-third of TRU's overall Scope 1 and Scope 2 reported emissions.

Table 11: Summary of environmental benefits and impacts

Common Parameters	
Thermal Demand	4,558 MWh/year
Natural Gas Carbon Intensity	0.180 tonnes/MWh
Electricity Carbon Intensity	0.029 tonnes/MWh[16]
Baseline	
Technology	Natural gas condensing boiler producing high temperature hot water: ~80% seasonal efficiency.
Natural Gas Use	5,698 MWh/year
Greenhouse Gas Emissions	1,026 tonnes CO_2e/year (100% from natural gas)
TRU LCDES	
Technology	Two-stage air-source/water-source heat pumps with natural gas condensing boilers for peaking/back-up
Natural Gas Use	261 MWh/year
Electricity Use	2,251 MWh/year
Greenhouse Gas Emissions	112 tonnes CO_2e/year (65% from natural gas, 35% from electricity)
Greenhouse Gas Reductions	
Baseline	1,026 tonnes CO_2e/year
TRU LCDES	112 tonnes CO_2e/year
Reduction (absolute)	913 tonnes CO_2e/year
Reduction (relative)	89%

The project will also contribute to improved air quality from a reduction of natural gas combustion.

The potential for noise pollution from the air-source heat pumps will be mitigated by TRU as part of its design of the energy centre building itself which will include the necessary acoustic attenuation as determined by an acoustical consultant.

[16] 0.029 tonnes/MWh is based on a 3-year rolling average of Grid Factors found on the Province of BC's website for the Integrated Grid for 2017, 2018, and 2019: https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity 2020 was an anomalous year due to dry weather and was omitted from the rolling average. Data for 2021 is not yet available. The Grid Factor is expected to decrease over time.

6.12 Customer

TRU will be the only customer of the district energy system at this time, and the aggregate connection of the TRU buildings will be considered one single customer. For clarity, each TRU building will not be considered an individual customer.

TRU is a public teaching and research university offering undergraduate and graduate degrees and vocational training. Its main campus is 250-acres and located in Kamloops, BC, and its name comes from the two rivers which converge in Kamloops, the North Thompson and South Thompson. The University has a satellite campus in Williams Lake, BC and a distance education division called TRU-Open Learning. It also has several international partnerships through its TRU World division. TRU offers 140 on-campus programs and approximately 60 online or distance programs through the Open Learning division, including trades apprenticeships, vocational certificates and diplomas, bachelor's and master's degrees and law.

6.13 Future Expansion

There are additional buildings on and adjacent to the TRU campus that are anticipated to connect to the LCDES in the near future. The EC Building and the LCDES are being designed to prepare for future expansion or phases. In particular, the City of Kamloops' Tournament Capital Centre (**TCC**) and the Canada Games Aquatic Centre (**CGAC**), as shown on the figure below, are anticipated to connect to the LCDES in the near future.

In addition, we expect that the TRU Community Trust (**TRUCT**) will seek to connect to the LCDES new buildings it develops under its mandate to plan, develop and market TRU lands to benefit TRU and its community. TRUCT was given the rights and mandate to develop approximately 90 acres of campus land with a mix of residential, commercial, retail and hospitality units.

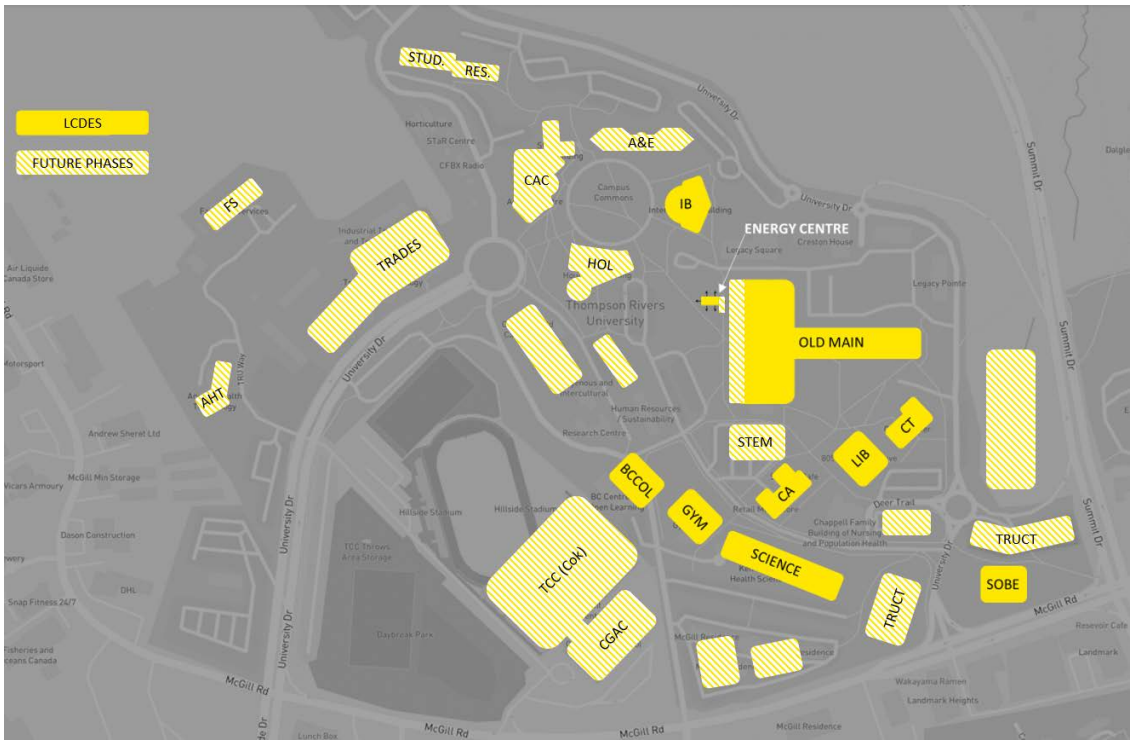
The table below reports the load associated with this CPCN Application and estimates of the load associated with future development at the TRU campus. While TRUCT developments would be expected to connect to the LCDES, the development timing, size, and occupancy types

are uncertain and the estimates provided must necessarily be considered high-level and indicative for the purpose of this discussion.

Table 12: LCDES High-level Build-out Potential

	Building	Owner	Area [m2]	Peak Demand [kW]	Annual Demand [kWh]
LOW CARBON DISTRICT ENERGY SYSTEM	Old Main	TRU	19,800	1,500	1,485,000
	Science	TRU	10,800	700	714,000
	SOBE Management Building (future)	TRU	6,500	250	296,000
	Library	TRU	2,400	200	269,000
	BC Centre for Open Learning	TRU	3,600	300	327,000
	Culinary Arts	TRU	1,859	470	451,000
	Clock Tower	TRU	2,340	230	243,000
	Gymnasium	TRU	3,700	500	417,000
	International Building	TRU	5,620	450	356,000
	Subtotal		**56,619**	4,600	**4,558,000**
	Diversified Total (90%)			**4,140**	
POTENTIAL EXPANSION	Canada Games Aquatic Centre	CoK	3,100	1,400	2,156,000
	Tournament Capital Centre	CoK	1,000	300	292,000
	800 University (Hotel)	TRUCT	7,000	440	455,000
	800 University (Office)	TRUCT	5,000	250	250,000
	TRUCT Phase 3/4 (MURBs)	TRUCT	27,881	1,500	2,091,075
	Arts & Education	TRU	5,661	425	367,965
	Animal Health & Technology	TRU	1,180	89	76,700
	Campus Activity Centre	TRU	6,413	481	416,845
	House of Learning	TRU	6,552	491	425,880
	Subtotal		**63,787**	5,375	**6,531,465**
	Diversity Total (90%)			**4,838**	
FULL BUILD-OUT POTENTIAL	Subtotal		**120,406**	9,975	**11,089,465**
	Diversified Total (85%)			**8,479**	

Figure 7: LCDES Service Area and Potential Future Expansion



6.13.1 Capacity for Expansion

The initial capacity of the EC will be 4,800 kW, designed to meet the capacity requirements of the 9 TRU buildings of 4,140 kW. To service future building additions, the capacity of the EC would need to be increased. The EC Building of TRU is being sized to accommodate additional equipment, which additional equipment could include a high efficiency boiler, water source heat pumps, air source heat pumps, pumps, and thermal energy storage. As discussed above, the EC Building will be owned and constructed by TRU at its cost.

Creative Energy's infrastructure is being designed to future proof the LCDES to be expandable, while minimizing the incremental capital costs incurred at this time. As reviewed below the incremental capital cost initially relates primarily to upsizing the distribution piping system, as well as ancillary items such as electric sizing within the Energy Centre and natural gas connections.

The DPS will be designed to accommodate a greater load of up to 8,500 kW in future with a relatively small incremental impact to the initial cost of the project. The required DPS main size within and outside the EC building to serve initial load (4,140 kW) is 6" diameter; however, the plan is to design and install 8" diameter DPS mains. The estimated additional cost associated with the larger DPS size is approximately $225,000, or 2.5 percent of the total capital and development costs of the LCDES. Installing the minimum 6" diameter DPS main size initially would be imprudent as the piping would have to be excavating, removed and replaced with 8" DPS mains when additional buildings connect. This work would need to be performed while the LCDES infrastructure is energized, increasing cost and risks. Please refer to the table that follows.

Table 13: DPS sizing to accommodate expansion of the LCDES

DPS Item	Incremental Cost of Larger Size
DPS underground Mains – Material and Labour *(350m at increment $55/m 8" vs. 6" pipes)*	$19,250
DPS underground Mains – Civil and excavation *(350m at increment $250/m 8" vs. 6" pipes)*	$87,500
DPS and Piping within EC – Material and Labour *(150m at increment $50/m 8" vs. 6" pipes)* *(100m at increment $60/m 10" vs 8" pipes)*	$ 13,500
Future Caps and Valve allowance (underground)	$10,000
Future Caps and Valve allowance (within EC)	$15,000
Distribution pumps	$25,000
EC - Electrical service	$35,000
EC - Gas service	$5,000
Engineering	$15,000
Total	$225,250

The size and technology of the LCDES is scoped and judged by Creative Energy and TRU to provide substantial reduction in GHG emissions and expedient and cost-effective project delivery and implementation, concentrated to the most load-dense part of the campus. The size of the LCDES was planned also with regard to the electrical capacity of TRU's energy service agreement with BC Hydro and the capacity available, acknowledging that the load of additional heat pumps may trigger an electrical service upgrade. Within the footprint of the EC building and the available electrical service capacity, one more water-source heat pump and one or 2 more air-source heat pumps could be accommodated which would be expected to add an additional ~1MW of low-carbon thermal energy capacity.

Further expansion beyond that may require an electrical service upgrade and/or an expansion to the EC building footprint. BC Hydro has estimated that to bring a new distribution line in would cost $2M - $4M and would take at least 2 years. The use of thermal energy storage tanks outside and near to the EC building may allow future load to be served without an electrical upgrade or building expansion. This requires further study of feasibility.

7 Indicative Cost of Service and Rates

7.1 Development and Capital Costs

As reviewed in section 6.7 and summarized in Table 10 above, the total capital cost the project is $9.47 million.

7.2 Operating Costs

7.2.1 Fixed Operating Costs

Contribution to TRU Costs

Creative Energy will pay to TRU an annual payment equal to $20 per square metre multiplied by the total usable area of the EC Building, which annual payment will be increased annually, as agreed between Creative Energy and TRU as per the Contribution Agreement (see Appendix G). A usable area of 250 m^2 has been assumed for the purpose of modeling the indicative cost of service of the LCDES.

Maintenance

Maintenance costs over the project life are calculated as the total of 1) annual recurring maintenance costs and 2) recapitalization costs.

The estimate of recurring maintenance is based on a bottom-up estimate of the maintenance of the heat pumps, boilers, and balance of plant, as solicited from Olympic International. Using a combination of the budgetary estimates supplied by Olympic International and Creative Energy's experience operating thermal plants, the following estimate of recurring maintenance costs was developed.

Table 14: Estimate of recurring maintenance costs

	Annual Forecast Maintenance
Heat Pumps	$ 29,616
Boiler Maintenance	$ 3,000
Balance of Plant	$ 2,000
DPS	$ 3,000
ETS	$ 6,000
Total	$ 43,616[17]

For recapitalization costs, the compressors of the ASHP have a projected life of 15 years and are quoted to cost $200,000 in 2021 dollars to replace. An additional $200,000, in real terms, has been allowed for in year 15 to replace compressors on the ASHPs and WSHPs, condenser fans on the ASHPs, and pump motors; we assume a one-time cost of $200,000 inflated to 2039 dollars.

Operators

The EC will be an unsupervised plant with remote monitoring. The labour cost is forecast to be $45,000 per year based on a third-party vendor estimate from Olympic International. We expect that the plant will only require direct staffing requirements equivalent to one half of one FTE. We assume for modelling purposes that the all-in compensation of one FTE is $100,000. This labour cost is inflated at 2% per annum. Unplanned maintenance, service calls, and emergency response will be provided via a third-party service provider, who will have local resources available on-call.

[17] The estimate of recurring maintenance represents approximately 0.45% of capital, which factor is used for modelling the indicative annual cost of service purposes within the construct of the LCDES financial model. Total annual maintenance is escalated at inflation each year for the life of the project.

Insurance

Costs relating to business interruption and replacement insurance are estimated at 0.3% of capital cost of $9,471,300, which is consistent with other projects owned and operated by affiliates in the Creative Energy group.

Billing, Support & Administration

This cost is also known as overhead, or allocable overhead in the context of regulatory rate setting. To forecast this cost, we applied the approved 3-factor Massachusetts formula for the allocation of such costs to an indicative allocable overhead amount and the in-service and expected completions of other Creative Energy[18] utility projects between now and 2024.

Billing Support & Administration costs are estimated as approximately $75,000 in 2024, corresponding to 0.79% of capital for modeling purposes. This amount is in turn is escalated at 2% inflation per year over the life of the project.

Taxes

The combined (provincial and federal) corporate tax applicable to Creative Energy is 27%. Income taxes are calculated as the amounts due per year assuming a CCA Rate of 8%, actual interest expense, and earnings before interest and tax based on the annual cost of service.

Financing Costs

Financing costs are calculated assuming a deemed capital structure of 57.5% debt, and 42.5% equity. The cost of debt for the project is assumed to be 4.0%, and the cost of equity has been assumed to be 9.5% for the indicative purposes of the analysis overall.

[18] The reference to Creative Energy in this specific instance is the applicable utility entities in the Creative Energy group to which such cost allocation will apply in accordance with our Inter-affiliate Conduct and Transfer Pricing Policy.

Rate Base

The project assumes that the full capital costs of $9,471,300 (in 2021 dollars) will enter rate base during the first year of service, 2024. In addition to the capital costs, we have calculated that AFUDC during construction will amount to approximately $800,000 based on an indicative construction schedule of 1 year, deemed capital structure of costs of financing, and a provision for income taxes on the Cost of Equity portion of AFUDC. Therefore, the total amount entered into rate base is approximately $10.65 million in 2024. Once the assets have entered service, they will be depreciated over a period of 30 years. Please refer to the following table.

Table 15: LCDES assets and expected service life:

Asset	Expected Service Life (years)
Energy Centre (with compressor replacements at year 15 for ASHPs)	30
Distribution Piping System	40
Energy Transfer Stations	30

7.2.2 Variable Operating Costs

Variable operating costs consist of natural gas costs and electricity costs. Both the natural gas and electricity will be procured by TRU and supplied to Creative Energy by TRU, to produce the thermal energy that is supplied back to TRU only. TRU will sub-meter the energy and demand usage at the EC and apply the Fortis and BC Hydro tariff rates as if they applied directly to Creative Energy.

Natural Gas Costs

The forecast of annual gas consumption of the plant is 261 MWh per annum based on the dispatch model described in Section 6.6.

The utility will be sourcing its gas from TRU directly, and therefore will incur gas costs in line with what the rest of the TRU campus incurs. Currently, TRU's campus is on a Rate 25 schedule for transportation costs from FortisBC and buys gas directly from Shell. For modelling purposes,

the all-in rate for gas (inclusive of market price of gas, supplier charges, shipping costs to Fortis pipeline, carbon tax and Fortis transportation costs is $13/GJ in 2020, or $11/GJ excluding carbon tax costs of $40/tonne, which cost is inflated at 2 percent per year.

Carbon tax is modelled to increase in accordance with the Federal Carbon tax plan under which a $50 per tonne tax in 2022 will increase by $15 per tonne per year starting in 2023 through to $170 per tonne in 2030, after which we inflate the tax at 2 percent per year from 2031 onwards.[19]

Electricity Costs

Annual electricity consumption of the plant is forecast at 2,251 MWh per year based on the dispatch of resources described in Section 6.6.

The utility will also source its electricity from TRU, which is currently a BC Hydro LGS customer. According to officials in TRU's finance department, the average, all-in cost of electricity varies between $85-88/MWh each month. For modelling purposes we therefore used the mid-point of $86.60/MWh to forecast electricity costs as a starting point in 2021, which cost is then inflated at 2 percent each year.

7.3 Forecast Cost of Service

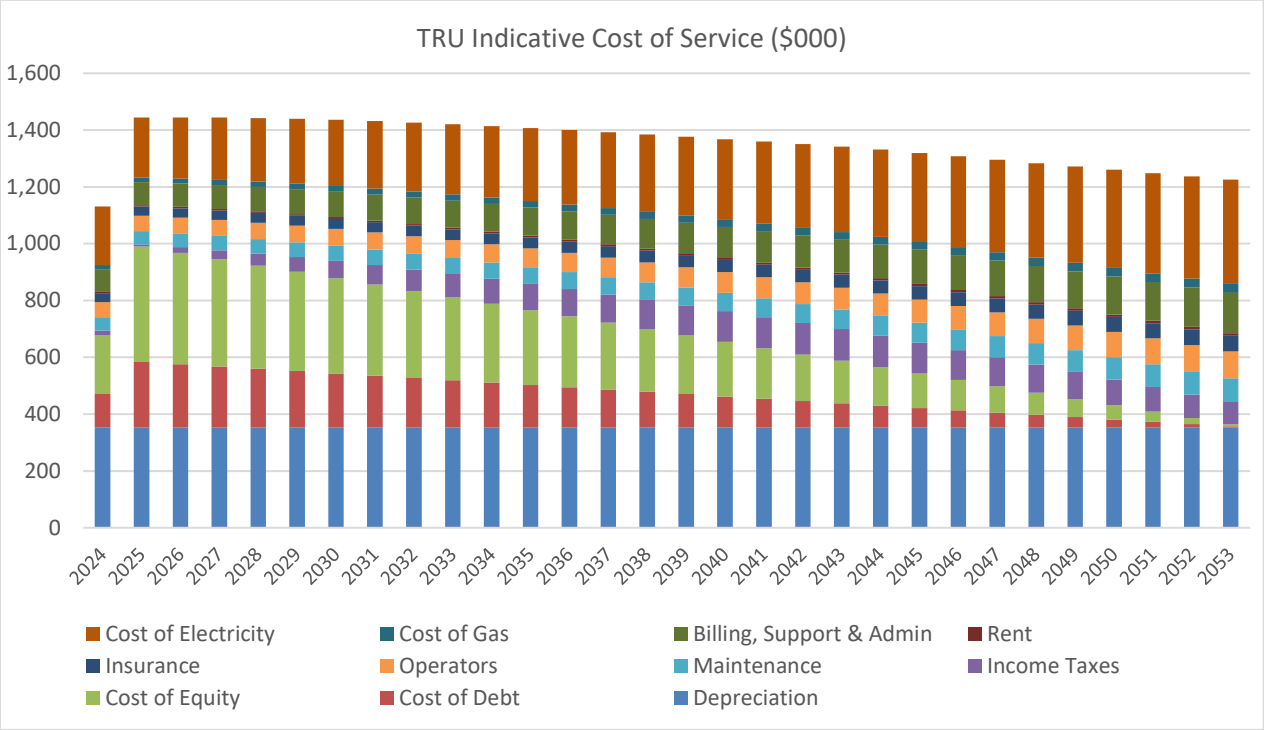
The indicative annual forecast cost of service of the TRU LCDES is summarized in the table and chart that follow. The table provides annual summary values in 10-year increments while the chart illustrates the relative amounts and directional change in the cost-of-service components over the assumed 30-year term of asset depreciation.

[19] https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/carbon-pollution-pricing-federal-benchmark-information.html

Table 16: Indicative Cost of Service of the TRU LCDES

Component ($000)	2024 (partial)	2033	2043	2053
Depreciation	353	353	353	353
Cost of Debt	118	166	85	4
Cost of Equity	207	292	150	7
Income Taxes	17	82	112	79
Maintenance	47	56	69	84
Operators	53	63	77	94
Insurance	31	37	46	56
Contribution to TRU Costs	5	6	7	9
Billing, Support & Admin	80	95	116	141
Total Fixed Cost of Service	910	1,152	1,014	826
Cost of Gas	15	22	27	32
Cost of Electricity	207	247	301	367
Total Variable Cost of Service	222	269	328	399
Total Cost of Service	1,118	1,340	1,633	1,991

Figure 8: Indicative Cost of Service of the TRU LCDES



7.4 Indicative Rates and Sensitivity

Under its strategic objective to develop the LCDES and through its coordinated planning and agreements with Creative Energy, TRU understands and accepts the indicative cost of service of the LCDES.

Creative Energy has not yet finalized its rate design, rate-setting and billing approach but it will consult with TRU as the sole customer of the LCDES upon CPCN approval and in advance of bringing forward to the BCUC a request for approval of rates for the LCDES, which timing will be coordinated also in advance of the planned project completion and in-service date.

For indicative purposes at this time, we provide below the forecast annual recovery of costs under a simple levelized design through which recovery of fixed charges will escalate at 2 percent per year. For presentation purposes we provide the indicative recovery of fixed costs per unit capacity ($/kW) and energy ($/MWh) for total installed capacity and forecast energy consumption of 4,100 kW and 4,558 MWh, respectively. Variables charges will recover fuel costs on a flow-through basis per MWh of energy and are thus equivalent in total to the forecast amounts set out in the annual cost of service summary provided in the table in the previous section.

Table 17: Indicative Annual Levelized Cost Recovery: Total & Per Unit of Capacity and Energy

	2024	2033	2043	2053
Levelized Recovery of Costs – Total $000				
Fixed Cost Recovery	896	1,071	1,306	1,592
Variable Cost Recovery	222	269	328	399
Total Cost Recovery	1,118	1,340	1,634	1,991
Levelized Recovery of Costs – $ per unit				
Fixed Cost Recovery $/kW capacity	219	261	318	388
Fixed Cost Recovery $/MWh energy	197	235	286	349
Variable Cost Recovery $/MWh energy	49	59	72	88
Total Cost Recovery $/MWh energy	246	294	358	437

We have also estimated a levelized cost of energy over the 30-year term of analysis to support an assessment of indicative impacts of project risk/input sensitivity. The estimated levelized cost of energy of the LCDES project is $305/MWh.

The figure that follows below illustrates the sensitivity of the costs to be recovered under the following plausible, even if unlikely, scenarios:

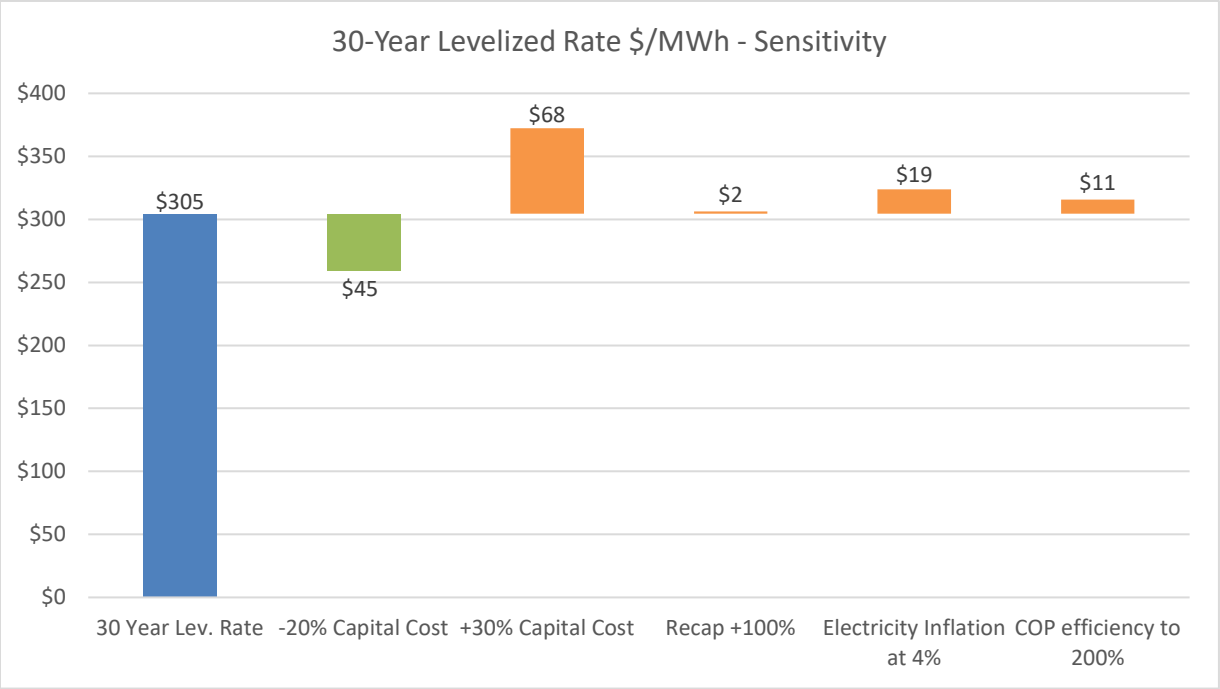
- **Capital Sensitivity and Class 3 Estimation Variance** Increase in commodity prices, or other factors that may underscore a capital cost decrease or increase. A -20%/+30% range has been used for the sensitivity analysis.

- **Recapitalization Sensitivity** Lower asset duration and increased recapitalization. A 100% higher estimate, $400,000 in real terms at year 15, has been used for the sensitivity which is reflective of a scenario where all the heat pumps and boilers needing to be replaced at year 15, but at higher than forecast cost.

- **Electricity Cost Sensitivity** An additional increase of 2% year-over-year (i.e., 4% annual) for electricity cost escalation has been used for the sensitivity analysis. Sensitivity to natural gas prices is not being tested due to minimal amounts of natural gas use.

- **Efficiency Sensitivity** Lower performance of the air-source/water-source heat pumps configuration. A 25% reduction in the Coefficient of Performance has been used for the sensitivity analysis. Boiler efficiency is not being tested due to minimal amounts of natural gas use.

Figure 9: Review of Sensitivity of Levelized Cost of Energy



8 Risk Analysis

8.1 Technology

Technology risk is low. All components of the district energy system are “off-the-shelf” and have been tried and tested. Additionally, the low-carbon capacity is fully backed-up by natural gas boilers to ensure continuity of service in the event that the low-carbon capacity is temporarily offline. The EC will also be equipped with remote monitoring for 24/7 trending of operations to enable continuous improvement and identification of potential faults, where local third-party vendors can respond to service calls and unplanned maintenance as required. Additionally (and as a secondary measure), Creative Energy has an operating team in downtown Vancouver that can be mobilized to Kamloops in an emergency situation if there are equipment issues.

8.2 Construction Costs

Construction cost risk is low. Construction costs have been developed to a Class 3 AACE cost estimate and include a 20% contingency. Fixed price contracts will be used for the plant construction and mechanical works involved for the DPS to mitigate escalation, and unit-pricing will be used for the civil works related to distribution piping system to control per-unit costing. Unit pricing is a common method of cost control in construction where the quantity of units can be estimated prior to construction with a known unit price; the final cost however would be known once work is complete. Also, TRU continuously conducts various construction works on TRU lands for constructing new underground services or new buildings. By doing this, TRU has extensive experience in managing traffic on Campus. This will reduce the construction related risks significantly for Creative Energy while constructing LCDES assets on TRU lands as compared to, for example, the same construction work if the LCDES were to be built in downtown Vancouver. TRU has the knowledge and expertise to manage the roadways and pedestrian pathways on its campus during construction and Creative Energy will work closely with TRU to build the LCDES assets efficiently.

8.3 Operations Costs

Operations cost risk is low. Contracts for maintenance that align with current budget estimates will be structured with 3rd party providers, and foreseeable renewal/replacement costs within the term have been allowed for. The EC will be equipped with remote monitoring for 24/7 trending and fault detection. Local third- party vendors will be used for unplanned maintenance, service calls, and emergency response, and additionally, Creative Energy has an operating team in downtown Vancouver that can be mobilized to site as required as a secondary measure.

8.4 TRU and Public Acceptance

Public acceptance is high as evidenced through the public consultation and other engagement to date. This project has been well received by TRU, local First Nations, and other stakeholders, with considerable support relating to the merits of the project to reduce greenhouse gas emissions and local air pollution.

8.5 Fuel Availability

The risk of fuel availability is low. The main source of fuel for the LCDES is electricity, which is provided to TRU from BC Hydro's West Kamloops substation, feeder WKA123, to a main meter on campus. The campus is metered at a central location and the downstream distribution on the TRU campus is owned by TRU, and the LCDES will connect to the TRU distribution. The TRU distribution will be upgraded as part of its building construction for the EC (outside the scope and capital cost of Creative Energy). The BC Hydro feeder currently has 3 – 4 MW of capacity left under the current Energy Service Agreement – the TRU LCDES will only require 2 MW of electricity.

8.6 Load Forecast and Customer Base Uncertainty

The risk related to load forecast uncertainty is low. Eight of the connecting buildings are existing buildings at Thompson Rivers University and all of the connecting buildings are owned by a single entity, Thompson Rivers University. Only one Customer Service Agreement will be in

place between Creative Energy and Thompson Rivers University for the nine connecting buildings.

8.7 Financial risk

The risk of under-recovered costs and/or stranded assets is low. An infrastructure agreement will be in place before start of LCDES detailed design. Customer rates will designed to allow for full cost recovery over 30-year terms. Creative Energy's LCDES construction and operation will not impact rates or service for customers of any other TES in the Creative Energy group of utilities.

Coincident with the expectation of future customer expansion there is low risk and consequence that the small cost of excess capacity will not be used. As reviewed in section 6.13, the estimated additional cost associated with the larger DPS size is approximately $225,000.

8.8 Ministry Approval of SRW

In both Creative Energy's and TRU's judgement, the likelihood of not receiving ministry approvals for the SRWs is low, but the impact to the project would be high. If the approvals are not received the project would not proceed. As a condition precedent to the Infrastructure Agreement, approvals are to be received before May 9, 2022 (6 months after the agreement date). No material design costs, or construction costs would be spent before receiving these approvals. Refer to Section 6.8 for further details.

9 Consultation

9.1 First Nations Consultation

Creative Energy provided information about the project to Tk'emlúps te Secwepemc (**TteS**) chief and council via email on March 31, 2021, and met with TteS on April 6, 2021. The meeting was conducted virtually over Microsoft Teams. An overview of the project was presented to the attendees followed by a question-and-answer period. TteS recorded the virtual session.

TteS were fully supportive of the LCDES project noting that green and environmentally friendly initiatives are desired with First Nations. No concerns were raised during the meeting about the project. TteS were interested in being kept informed of the project progress.

Please refer to the First Nations Engagement Record at Appendix H, which includes a record of the questions received and answers provided.

9.2 Public Consultation

From April 20 to May 21, 2021, Creative Energy provided information about the proposed Thompson Rivers University Low-Carbon District Energy System and sought input from the community.

Engagement materials including a discussion guide and online feedback form were available online at creative.energy/TRU, and there was an opportunity to provide email submissions and to participate in a virtual information session.

TRU and Creative Energy worked together to identify individuals, groups, and stakeholders that could be impacted by LCDES project. Notification of the opportunity to participate in the engagement period included:

- A project webpage at creative.energy/TRU included information about the proposed project and opportunities to engage with the project team and provide input. A link

to register for the virtual information session was available on the project website along with a dedicated project email address to accept submissions.

- TRU Communications department sent letters via emails to TRU on-campus operators and external stakeholder groups inviting them to participate in the engagement opportunity.

- TRU Communication department developed and shared posts on TRU social media channels on April 21 2021 and April 27 2021 to create student awareness of the engagement opportunity and with information on how to participate.

- A section of the TRU employee newsletter was dedicated to advertising the engagement opportunity and registration.

Due to restrictions related to the COVID-19 pandemic, engagement was undertaken virtually. The virtual information session was hosted by Creative Energy on May 4, 2021, from 1:00–2:30 p.m. Three Creative Energy team members attended and provided a presentation about the Low-Carbon District Energy System. Following the presentation, a question-and-answer period between attendees and the project team was facilitated by a member of TRU administrative leadership. The participants generally were supportive of the project, and no concerns were raised during the question-and-answer period.

Please refer to the virtual open house summary report at Appendix I, which includes a record of the questions received and answers provided. Please refer also to the public consultation summary report at Appendix J.

Appendix A

Draft Order

Order Number
●

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

Creative Energy Thompson Rivers Limited Partnership
Application for a Certificate of Public Convenience and Necessity
Thompson Rivers University Low-Carbon District Energy System

ORDER

WHEREAS:

A. On March 2, 2015, the British Columbia Utilities Commission (**Commission**) issued Order G-27-15 approving revisions to the Thermal Energy Systems (**TES**) Regulatory Framework Guidelines (**TES Guidelines**);

B. On November 25, 2021, consistent with the requirements of the TES Guidelines for a Stream B TES, Creative Energy Thompson Rivers Limited Partnership (**LP**) applied to the Commission for a Certificate of Public Convenience and Necessity to construct, own and operate a Thermal Energy System (**TES**) to provide low carbon heating (**Low Carbon District Energy System, LCDES**) to the Thompson Rivers University (**TRU**) in the City of Kamloops (**City**)(**the CPCN Application);**

C. Creative Energy Thompson Rivers LP seeks approval, pursuant to section 88(3) of the Utilities Commission Act, for an exemption from any requirement to file a contract with TRU under section 71 of the Act in relation to TRU's provision of electricity and natural gas to Creative Energy Thompson River Limited Partnership with respect to the TRU LCDES (**Exemption Request**)

D. The Commission has reviewed the CPCN Application and Exemption Request and is satisfied that the requested approvals ought to be granted.

NOW THEREFORE the British Columbia Utilities Commission orders as follows:

1. Creative Energy Thompson Rivers LP's CPCN Application is approved.

2. Pursuant to section 88(3) of the Utilities Commission Act, the Commission, having been granted advance approval by the Minister responsible for the administration of the Hydro and Power Authority Act, effective as of the date of this order and in respect of TRU's provision of electricity and natural gas to Creative Energy Thompson River LP with respect to the TRU LCDES, exempts Creative Energy from section 71 of the Utilities Commission Act.

3. The exemption referred to in Directive 2 of this order remains in effect until the Commission orders that the exemption no longer applies.

DATED at the City of Vancouver, in the Province of British Columbia, this ___ day of ___ 2020.

Appendix B

TRU Electrification Study

Thompson Rivers University Electrification Study – 805 TRU Way, Kamloops, BC

Final Report

Stantec

Prepared for:
Thompson Rivers University
805 TRU Way, Kamloops, BC V2C 0C8

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November 15, 2019

THOMPSON RIVERS UNIVERSITY

Stantec Project Number: 115613124, 895

Table of Contents

LIST OF APPENDICES

Executive Summary

Thompson Rivers University (TRU) commissioned Stantec Consulting Ltd. to conduct a detailed electrification study of nine buildings at the university campus ("the facility") located at 805 TRU Way, Kamloops, BC. These buildings include:

1. Arts and Education (A&E)
2. Students Residence Tower
3. Campus Activity Centre (CAC)
4. International Building (IB)
5. Clock Tower (CT)
6. Culinary Arts (CATS)
7. Sciences (S)
8. Gymnasium (Gym)

The objective of this study is to conduct an energy assessment, which helps identify the approaches to electrify the buildings with the aim to minimize greenhouse gas (GHG) emissions and to support TRU's long-term energy goals in pursuing a carbon neutral campus.

Stantec has completed a site visit on all 9 buildings, studied utility information, assessed the heating/cooling and DHW system capacities and loads with the use of temporary sub-metering or operational records where available, and reviewed the building operational conditions to assess the potential approaches to electrification.

This study will support an incentive application to BC Hydro under the Provincial CleanBC Incentive program, for which the study received an approval letter to proceed.

The study results in this report encompasses the assessment of the Air Source Heat Pump (ASHP) and Ground Source Heat Pump (GSHP). Only those measures that meet the CleanBC guidelines are recommended here. Measures regarding reduction in energy consumption in nature or renewable energy (e.g. Solar PV, Solar DHW, etc.) or no increase in electric demand are not recommended and assessed here.

A five-day site visit was conducted in March 2019 for the facility. The assessment of the facility has revealed the potential for the implementation of electrification measures. The implementation of mechanical systems, automated controls, and electrical utility saving measures, which may improve the overall efficiency of the facility were not part of the study's scope and therefore, not assessed in this report.

Upgrades in back-up equipment (e.g. the second natural gas boiler where a building may have two boilers) is not recommended to maintain the economic viability of the measure (as replacement of primary equipment would be paramount), and their replacement is considered optional pending availability of TRU budget on a building case by case basis in the future.

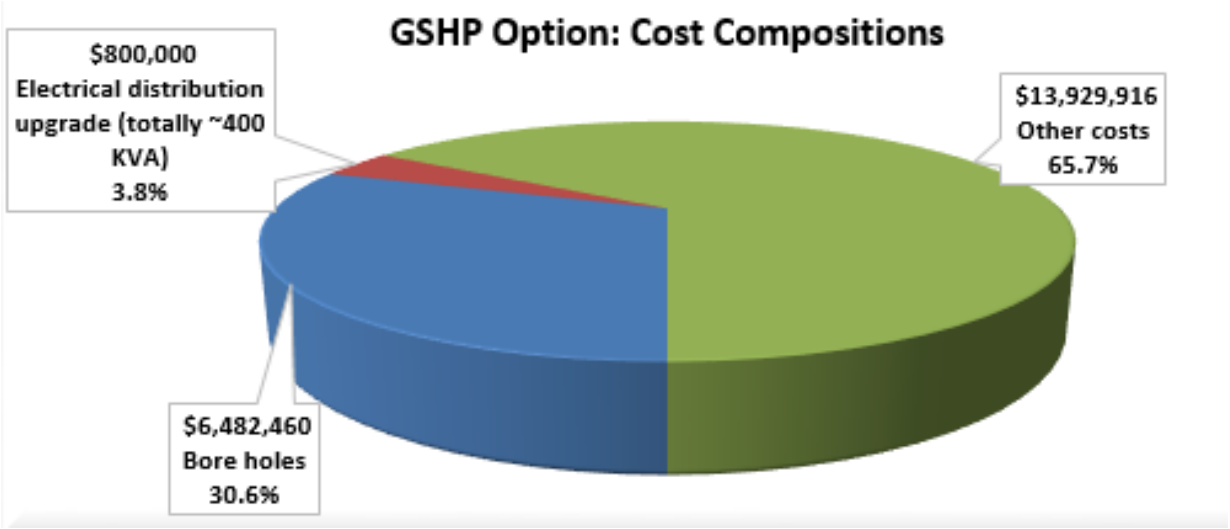
Replacement of the primary equipment can meet majority of the load if not all; however, top-up heating/cooling may be required during peak heating/cooling days by use of the existing back-up units (e.g. natural gas boiler, air-cooled chiller).

Much of the electrification recommendations identified in this report for TRU buildings hinge on water to Water Source Heat Pump (WWHP) technology using geo-exchange, as well as Air-Source Heat Pump (ASHP). The latter would be the most suitable application in Kamloops' cold climate, with outdoor air temperatures of of -5 C° and up, which occurs 77% of time during a year. Auxiliary heating source (Electric boiler for central plant, electric element in the RTUs/AHUs, and electric DHW heater) is anticipated and will substitute the ASHP when temperature drops below -5 C°. Therefore, both GSHP and ASHP in the study targets the same (maximum) GHG reduction, which means the building will rarely use natural gas after the HP implementation.

The estimated cost figures provided in this report are an absolute value for TRU preliminary budgetary planning purposes. BC Hydro may provide a rebate for a portion of the incremental cost, which is the difference between the CRM cost and the corresponding Base Case cost of like-for-like replacement.

A) GSHP: 9 buildings:

It is estimated that the implementation of all electrification measures in the 9 buildings would cost CAD $21.2 million. Installation of geo-exchange boreholes constitutes of 30.6% of the total, while upgrade to electrical distribution (for Science, Student Residence, and Gym) accounts for 3.8% and other costs for equipment, installation, low temperature/high efficiency coils replacement and retrofit, etc. account for the remaining 65.7%.



96.9% of the natural gas usage in the nine buildings, which is equivalent of 25,410 GJ, will be eliminated, while the rest of remaining GHG of 191.6 tonnes is due to the buildings' total electricity use (with low GHG intensity) and the natural gas usage for the Kitchen in CATS and CAC buildings.

GSHP Savings and Cost Estimates

Financial Info - All 9 Buildings		
COSTS	Capital Cost	$ 21,212,376
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 21,212,376
SAVINGS	Electricity Consumption	$ (187,233)
	Electricity Demand	$ (39,851)
	Natural savings	$ 276,717
	TOTALSAVINGS	$ 49,633
GHG Reduction	**1,227.8**	tonnes
GHG Reduction	**86.5%**	%
Remaining GHG	**191.6**	tonnes: Elec. Source or Kitchen Eq.

Energy Savings		
Electricity Consumption	(2,177,133)	kWh
Electricity Demand	(1,328)	kW
Gas Consumption	25,410	GJ
Total	4,881,262	ekWh
Percentage (gas)	96.9%	%
Percentage as of total	29.0%	%

The implementation of the GSHP will cause an increase in the electrical consumption by 2,177,130 kWh and added demand of 1.3 MW. As noted above from a preliminary analysis and shown in the table below, three buildings (the Science building, the Student Residence, and the Gym) will require an upgrade in their electric service.

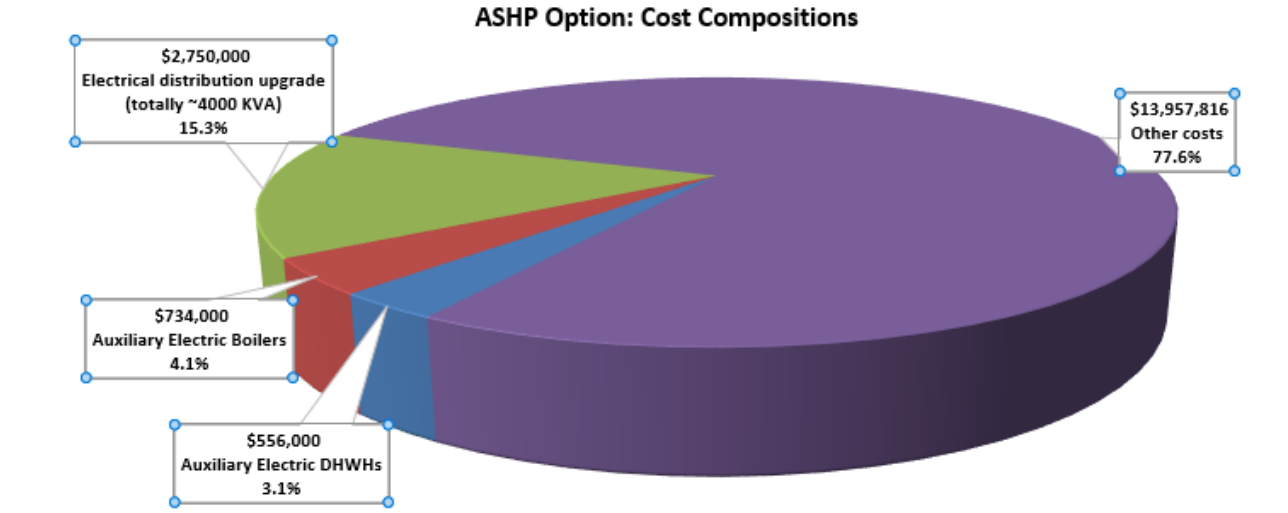
Table i: Electrical Impacts from GSHP Upgrade

Elec. Impact from GSHP Upgrade -kW										
Building	Arts and Education	CAC	IB	CT	CATS	GYM	Science	Old Main	Residence	Total
Main Distribution (in kW)	586	1954	1172	313	300	313	313	1407	1172	7528
Winter building peak load (kW)	150	290	236	91	130	75	220	500	300	1992
GSHP Option Peak Load (kW)	417	263	110	98	165	260	290	609	1053	3266
Elec. Upgrade Req. (kW)	-19	-1401	-826	-123	-4	22	198	-298	181	-2270

The annual energy cost savings of the GSHP option will be estimated to be $49,630.

B) ASHP: 9 buildings:

It is estimated that the implementation of all electrification measures in the 9 buildings would cost $17.9 million (CDN). Upgrade to electrical distribution (for the Science building, the Student Residence, the Gym, CATS, Clock Tower, and OldMain) accounts for 15.3% of the total cost, while the Auxiliary Electric DHWHs constitutes of 3.1%, Auxiliary Electric boilers at 4.1% and other costs for equipment, installation, low temperature/high efficiency coils replacement and retrofit, etc. account for the remaining 77.6%.



The higher relative cost of equipment is due to the fact that the ASHP is generally more expensive than WWHP, and a higher unit capacity will be required due to a de-rated capacity at low ambient temperature. Electric boilers will be an added cost as it should take care of the heating load in colder outdoor air temperature conditions.

ASHP Savings and Cost Estimates

Financial Info - All 9 Buildings		
COST	Capital Cost	$17,997,816
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$17,997,816
SAVINGS	Electricity Consumption	$ (272,719)
	Electricity Demand	$ (67,903)
	Natural savings	$ 276,717
	TOTALSAVINGS	$ (63,905)
GHG Reduction	**1,215.0**	tonnes
GHG Reduction	**85.6%**	%
Remaining GHG	**204.5**	tonnes: Elec. Source or Kitchen Eq.

Energy Savings		
Electricity Consumption	(3,171,156)	kWh
Electricity Demand	(2,314)	kW
Gas Consumption	25,410	GJ
Total	3,887,239	ekWh
Percentage (gas)	96.9%	%
Percentage as of total	23.1%	%

96.9% of the natural gas uses in the nine buildings, which is equivalent of 25,410 GJ will be eliminated while the rest of remaining GHG of 204.5 tonnes is due to the buildings' total electricity use (with low GHG intensity) and the natural gas uses for the Kitchen in CATS and CAC buildings.

The implementation of the ASHP will cause an increase in the electrical consumption by 3,171,150 kWh and added demand of 2.3 MW. As noted above from a preliminary analysis

and shown in the table below six buildings: Science, Student Residence, Gym, CATS, CT, and Old Main will require an upgrade in their electric service.

Table ii: Electrical Impacts from ASHP Upgrade

Elec. Impact from ASHP Upgrade -kW										
Building	Arts and Education	CAC	IB	CT	CATS	GYM	Science	Old Main	Residence	Total
Main Distribution (in kW)	586	1954	1172	313	300	313	313	1407	1172	7444
Winter building peak load (kW)	150	290	236	91	130	75	220	500	300	2198
ASHP (elec.Bolier) Option Peak L	417	1042	390	348	584	918	1027	2154	1450	4333
Elec. Upgrade Req. (kW)	-19	-621	-546	126	414	680	934	1247	577	2793

The annual energy cost savings of the ASHP option will be estimated to be - $63,900, depicting that the buildings will experience higher energy cost consumption due to the increased use of the electric boilers when offsetting the ASHP operation at the outdoor temperature below -5 °C.

C) ASHP vs. GSHP Comparison:

The table below summarizes the differences between the two options. As indicated in the previous sections the ASHP requires less capital costs ($3.2 million) but the resulting energy savings are lower as well (994,000 kWh).

ASHP vs. GSHP Savings and Cost Estimates

Financial Info -		
COST	Capital Cost	$ (3,214,560)
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ (3,214,560)
SAVINGS	Electricity Consumption	$ (85,486)
	Electricity Demand	$ (28,052)
	Natural savings	$ -
	TOTALSAVINGS	$ (113,538)
GHG Reduction	**(12.8)**	tonnes
GHG Reduction	**(0.0)**	%
Remaining GHG	**12.8**	tonnes: Elec. Source or Kitchen Eq.

Energy Savings		
Electricity Consumption	(994,023)	kWh
Electricity Demand	(987)	kW
Gas Consumption	-	GJ
Total	(994,023)	ekWh
Percentage (gas)	-	%
Percentage as of total	-5.9%	%

In the next phase, TRU will be sought to provide input on the proposed approaches and their suitability, and advise on the probability and priority of securing capital funds over the course of a defined timeline. Stantec will then finalize the study including the estimated energy/GHG emission reduction of the selected approach, and submit a final report to BC Hydro for the funding process.

Finally, we recommend that a detailed building-wide audit and re-commissioning process (ASHRAE Level 2 audit) are conducted for these nine buildings. This audit will determine energy

savings to reduce the heating load of each building so that the sizing and performance of the new boilers/HPs are optimized. This process can reduce the capital investment cost of the replacement by sizing a smaller yet adequate equipment.

Glossary

AHU	Air handling unit
BEPI	Building energy performance index
BMS	Building management system
Building Room Number	Fan room 290
CDD	Cooling degree days
CFL	Compact fluorescent lamp
CUSUM	Cumulative sum control chart
DCV	Demand control ventilation
DDC	Direct digital control
DHWT, DHWH	Domestic hot water tank, domestic hot water heater
DSM	Demand side management strategy focusing on energy end-uses saving than changing source (supply)of energy
DX	Direct expansion cooling
CRM	Carbon reduction measure
FP	Fan powered unit
GHG	Greenhouse gas
GJ	Giga joule
HDD	Heating degree days
HEX, HX	Heat exchanger
HRV	Heat recovery ventilator
HWST/ HWRT	Heating water supply/return temperature
IRR	Internal rate of return
kWh	Kilowatt hour
LED	Light-emitting diode
MUA	Make up air unit
NRCan	Natural Resources Canada
OA, OAD, OAT	Outdoor air, outside air temperature, outdoor air damper
O&M	Operations and maintenance
PU Rating	Priority and urgency. 1 being the highest and 3 being the lowest
RTU	Roof top unit
SAT	Supply air temperature
Tstat	Thermostat
TU, VAV, CD	Terminal unit, variable air volume mixing box, Control Damper
UFAD	Under floor air distribution, damper
VFD	Variable frequency drive

1.0 Context and Methodology

1.1 BACKGROUND

The intent of this report is to provide an energy assessment of the Facility, located at 805 TRU Way, Kamloops, British Columbia, for the electrification of the campus' nine selected buildings.

The assessment identifies the potential savings in greenhouse gas (GHG) emissions resulting from the implementation of the **Carbon reduction measures (CRMs)**. An opinion of probable costs to implement the measures is also provided. These capital upgrades will provide ongoing operational savings and a reduction in the environmental impact of the site's operation.

1.1.1 Client Information

Customer Name	Thompson Rivers University
Site Address	805 TRU Way, Kamloops, BC
Contact Person	James Gudjonson, Director of Environment and Sustainability Natalie Yao, Energy Specialist
Contact Information	jgudjonson@tru.ca Main Office: 250-828-5000
Site Electricity Provider	BC Hydro: Large General Service, account # 7925 7721 431, Meter number 6202131
Natural Gas Account	FortisBC

1.1.2 Project Drivers

Thompson Rivers University is committed to reducing energy consumption and greenhouse gas emissions in its operations and conducting its business in a sustainable and socially responsible manner. This commitment is driven by the Environment and Sustainability department who works hard to reduce greenhouse gas emissions and continually explore opportunities to reduce their impact on the environment at the corporate, team, and community levels.

This is part of a nation-wide initiative for sustainability stewardship to reduce energy consumption and GHG emissions. This energy study will be used as a business cases to fund each CRM and guide the Thompson Rivers University facility teams to plan for future electrification and energy performance projects.

1.1.3 Acknowledgements

Stantec would like to acknowledge the contribution of Thompson Rivers University staff whose help was invaluable in completing this report. We would like to thank James Gudjonson, Tom O'Byrne and Natalie Yao for their assistance in facilitating this assessment and for accompanying Stantec representatives during the building audit, and for their assistance in providing information during the walkthrough of the building and data collection from other sources and O&M manuals.

1.2 PROCESS

1.2.1 Site Visits

A site visit was conducted by Homay Khatami in March 2019. The visit included a site review to review and inventory the equipment with significant energy consumptions (e.g. HVAC and controls systems); a detailed interview with facility operators regarding the building's function; a study on BMS; measuring the load in a few buildings by temporary clamp on meters; and further discussion regarding any persistent issues and opportunities for optimization.

1.2.2 Utility Analysis

The facility's energy consumption was analyzed to:

- Develop a baseline against which CRM performance can be quantified.

The facility is metered for electricity use by one BC Hydro meter, and metered for gas consumption by using a Fortis meter. A submetering system is used to measure the electricity and natural gas at each building level. The data was downloaded from the Pulse Energy online platform and used throughout this report.

Historical data available regarding electricity, gas consumption and the energy performance of the site for three years (2016, 2017 and 2018) was analysed, along with other pertinent and available information (such as building systems and operation profiles) to assess the annual consumption of the facility. Heating energy is normalized for heating degree hours in Kamloops, BC in a weather bin data format.

1.2.3 Utility Rates

A marginal utility rate is used which effectively assumes that reduction in consumption and/or demand will only reduce the cost by a rate that applies to the last unit of energy used. The expected utility rates are subject to revisions given planned Fortis Energy rate increases and potential BC hydro increases over the coming years.

We have used the marginal cost of electricity as $ 0.086 /kWh for consumption and $8.77/kW for demand, and the marginal cost of natural gas as $10.89 per GJ. The building is considered a

large size commercial facility for natural gas usage, and a large general service facility for electricity usage, given that they are fed from the Fortis and BC Hydro respectively.

Table 1: Marginal Energy Rates

Item	Value $	Unit
Marginal Electricity Rate	0.086	$/kWh
Marginal Electricity Demand Rate	8.77	$/kW/Month
Natural Gas	10.89	$/GJ
Thermal Boiler Efficiency	82	%
Carbon Offsets *	30	$/Tonne eCO2

* Only applicable for public organizations.

1.2.4 Site Info

Table 2 lists the site details, including total area and weather data used for modeling weather-sensitive savings opportunities.

Table 2: Building Site Information

Item	Value	Units
Site Area	Refer to the respective section for the area of each building	m^2
Weather data source	climate.weather.gc.ca	*[Base 18°C]*
HDD	3,580	°C day/year
CDD	456	°C day/year

* Heating and cooling degree days have been used as the past 3-year average of Kamloops climate.

1.2.5 Lighting System Assessment

No assessment of the site's lighting installation was completed as this was not part of the project scope. However, during the site visit, we noted potential opportunities for ECMs:

1. Retrofits with reduced wattage lamps and fixtures;
2. Daylight harvesting;
3. De-lamping; and
4. Control improvement.

The assessment could be furthered by a detailed review of the existing fixtures as well as lighting levels and controls throughout the site.

1.2.6 Mechanical System Assessment

The mechanical portion of the assessment involved taking an inventory of mechanical components related to heating and cooling loads, and conducting an appraisal of operational times and efficiencies for each mechanical component. This is further detailed in the next few sections of the report.

1.2.7 Building Automation Assessment

The building management system (BMS) was analyzed to identify the current modes of operation and system operational behaviors. The observations were then used to synthetize the cause(s) and effect(s) of energy consumption and establish the optimized sequences of operation.

1.2.8 Carbon Reduction Measures

CRM(s) are selected based primarily on the most possible reduction and cost-effective opportunity. Further criteria included: occupant comfort, indoor air quality (IAQ), potential added or reduced maintenance, facility personnel opinion, integration with existing systems and capital maintenance initiatives.

The GHG savings calculations are based on engineering calculations of the anticipated reductions taking into consideration direct savings/increase from electrical and natural gas consumption and electrical demand where appropriate. Savings associated with heating and cooling measures are calculated in a weather bin data model that take into consideration the heating and cooling degree-days of the site (Kamloops), which are taken from Environmental Canada, which assumes an average balance point[1] temperature of 18°C.

Costs associated with implementing each measure are estimated based on the capital cost for the materials and labor (including demolition and installation). A contingency cost (i.e. a safety factor to allow for complications arising from installations in existing buildings) and project management cost are applied to the estimated capital cost at 10%. The cost is at a preliminary budgetary estimation.

All costs represent Stantec's opinion of probable cost and are provided as estimates to give economies of scale. Development of more detailed and accurate costs is recommended in the next stage, should the implementation of the CRMs be sought.

[1] The balance point temperature is the external temperature at which the building's heating equipment is initiated.

For any systems or equipment that are on site and not functioning (not consuming energy) no GHG reduction measures have been considered.

1.2.9 Recommendations

From the options considered, recommendations are submitted based on financial and technical feasibility using indicators such as highest GHG reduction potentials, capital cost and other important factors of the IAQ and human comfort.

2.0 Emission Reduction Measures (ERMs) per Building

2.1 ARTS AND EDUCATION

2.1.1 Building General Info

Item	Attribute	Description
1	Size	5661 m^2
2	Annual Electric Consumption	730,000 kWh
3	Annual Natural Gas Consumption	1,191 GJ
4	Electric Peak Demand	180 kW
5	Space Heating	2# Natural gas fired Boilers with 1,382 MBH output each, with distributed water to air HPs
6	Space Cooling	1# Heat recovery chiller with ~45 tonnes output, with distributed water to air HPs
7	DHW Production	1# Natural gas fired DHW heater with 100 MBH output

2.1.2 ERMs

The building already uses distributed water source heat pumps and a heat recovery chiller. There is one option for the electrification of the building. The proposed upgrades for electrification are as follows:

1. Replacement of one (of two) existing gas fired boiler with an equivalent electric boiler.
2. Replacement of the only existing gas fired DHWH with a water to water DHW heat pump (DHW HP). The source side of the DHW HP is to connect to the existing distributed water source heat pumps loop.

Measure Savings and Cost Estimates

Financial Info - Arts and Education			
COSTS	Capital Cost	$	390,533
	Project Management Cost		
	TOTAL COST	$	390,533
SAVINGS	Electricity Consumption	$	(17,252)
	Electricity Demand	$	(5,871)
	Natural savings	$	12,970
	TOTALSAVINGS	$	(10,153)
GHG Reduction	**56.3**	tonnes	
GHG Reduction	**83.7%**	%	
Remaining GHG	**11.0**	Elec. Source	

Energy Savings		
Electricity Consumption	(200,607)	kWh
Electricity Demand	(137)	kW
Gas Consumption	1,191	GJ
Total	130,227	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	13.3%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.2 STUDENTS RESIDENCE TOWER

2.2.1 Building General Info

Item	Attribute	Description
1	Size	19,717 m^2
2	Annual Electric Consumption	2,007,342 kWh
3	Annual Natural Gas Consumption	6,256 GJ
4	Electric Peak Demand	300 kW (Est.) no data was available
5	Space Heating	2# Natural gas fired Boilers with 2,580 MBH output each, with distributed water to air HPs
6	Space Cooling	1# cooling tower with 3,388 MBH heat rejection capacity, and distributed water to air HPs at zones
7	DHW Production	4 immersion heat exchanger DHWTs acquire heat directly from the boilers

8	Ventilation	4# MUAs: 1# with hydronic heating coil, 3# with gas fired burner with the heating output capacity of 790 MBH, 640 MBH and 790 MBH each.

2.2.2 ERMs

The building already uses distributed water source heat pumps. The proposed upgrades for electrification are as follows:

1. Replacement of one (out of two) existing gas fired boiler with an equivalent electric boiler.
2. Replacement of the three existing gas fired Make up Air Units (MUAs) with HP MUAs connecting to the existing HP condensing loop. If air source HP MUAs are used, the MUAs to be fitted with electric element for winter peak condition when OAT is below -5 °C.
3. Sewage/Sanitary Heat Recovery Heat Pump for DHW pre-heat. A feasibility study was conducted by IWS company for a PIRANHA Model in March 2017.
4. There are 12 dryers, 9 fireplaces and 1 BBQ that use natural gas. They can be replaced with electric source of energy but are not included in this project and calculation.
5. Upgrade to the existing electrical service/switch gear will be needed in both WWHP and ASHP options with varied load additions, as estimated and depicted in **Table ii** in the executive summary section.

Measure Savings and Cost Estimates

Financial Info - Residence			
COSTS	Capital Cost	$	1,160,338
	Including Equipment, Trans.		
	Inst., Cx, Design. (prelim.)		
	TOTAL COST	$	1,160,338
SAVINGS	Electricity Consumption	$	(69,315)
	Electricity Demand	$	(12,820)
	Natural savings	$	68,128
	TOTALSAVINGS	$	(14,007)
GHG Reduction	**309.2**	tonnes	
GHG Reduction	**92.3%**	%	
Remaining GHG	**36.3**	Elec. Source	

Energy Savings		
Electricity Consumption	(805,987)	kWh
Electricity Demand	(402)	kW
Gas Consumption	6,256	GJ
Total	931,792	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	24.9%	%

By the implementation of these measures, slight natural gas is still consumed in the building for the Item (4) above, if not replaced with electric version. GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.3 CAMPUS ACTIVITY CENTRE (CAC)

2.3.1 Building General Info

Item	Attribute	Description
1	Size	6,413 m^2
2	Annual Electric Consumption	1,326,000 kWh
3	Annual Natural Gas Consumption	3,234 GJ
4	Electric Peak Demand	396 kW
5	Space Heating	4# Natural gas fired Boilers with 1,382 MBH output each
6	Space Cooling	1# chiller with 90 tonnes capacity connected to an evaporative cooling tower
7	DHW Production	2# Natural gas fired DHWHs with 400 MBH and 450 MBH output each
8	Ventilation	1# central supply fan (SF-1) with hydronic heating and cooling coils. #1 FC-1 with hydronic heating coil.

2.3.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with the IB Building.
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the one (out of two) existing gas fired DHWHs with new water to water DHW heat pumps (DHW HP) of similar capacity. The source side of the DHW HP is to connect to the Geo-Exchange system.
4. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.

5. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.

   The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - CAC			
COSTS	Capital Cost	$	2,136,275
	Including Equipment, Trans.		
	Inst., Cx, Design. (prelim.)		
	TOTAL COST	$	2,136,275
SAVINGS	Electricity Consumption	$	(15,588)
	Electricity Demand	$	(2,283)
	Natural savings	$	30,361
	TOTALSAVINGS	$	12,489
GHG Reduction	**135.5**	tonnes	
GHG Reduction	**76.6%**	%	
Remaining GHG	**41.5**	tonnes: Elec. Source or Kitchen Eq.	

Energy Savings		
Electricity Consumption	(181,262)	kWh
Electricity Demand	(68)	kW
Gas Consumption	2,788	GJ
Total	593,164	ekWh
Percentage (gas)	86.2%	%
Percentage as of total	26.7%	%

2.3.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of an air source heat pump (ASHP) system with the capacity of the two existing boilers. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Replacement of two (out of four) existing gas fired boilers with equivalent electric boilers to run only when OAT is below -5 °C.
3. Replacement of the one (out of two) existing gas fired DHWHs with a new air to water DHW heat pump (DHW HP) of similar capacity to run when the OAT is above -5 °C.
4. Replacement of the one (out of two) existing gas fired DHWHs with a new electric DHW heater of similar capacity to run when the OAT is below -5 °C.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - CAC		
COST	Capital Cost	$ 1,693,420
	Including Equipment,	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 1,693,420
SAVINGS	Electricity Consumption	$ (25,615)
	Electricity Demand	$ (3,844)
	Natural savings	$ 30,361
	TOTALSAVINGS	$ 902
GHG Reduction	**134.0**	tonnes
GHG Reduction	**75.7%**	%
Remaining GHG	**43.0**	Elec. Source

Energy Savings		
Electricity Consumption	(297,848)	kWh
Electricity Demand	(115)	kW
Gas Consumption	2,788	GJ
Total	476,578	ekWh
Percentage (gas)	86.2%	%
Percentage as of total	21.4%	%

There are a few gas ranges, grills, pizza oven, and deep fry stove in the commercial kitchen that use natural gas estimated to be 446 GJ. They can be replaced with electric source of energy but are not included in this project and calculations.

2.4 INTERNATIONAL BUILDING (IB)

2.4.1 Building General Info

Item	Attribute	Description
1	Size	4,586 m^2
2	Annual Electric Consumption	767,000 kWh
3	Annual Natural Gas Consumption	1,051 GJ
4	Electric Peak Demand	236 kW
5	Space Heating	2# Natural gas fired Boilers with 1,320 MBH output each
6	Space Cooling	1# air cooled chiller with 130 tonnes capacity
7	DHW Production	4# electric DHWHs with 80 MBH (Est.) heating output each
8	Ventilation	3# AHUs with hydronic heating and cooling coils

2.4.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with the CAC Building.
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested, is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.
4. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - IB			
COSTS	Capital Cost	$	1,199,595
	Including Equipment, Trans.		
	Inst., Cx, Design. (prelim.)		
	TOTAL COST	$	1,199,595
SAVINGS	Electricity Consumption	$	(6,455)
	Electricity Demand	$	(3,877)
	Natural savings	$	11,445
	TOTALSAVINGS	$	1,113
GHG Reduction	**51.0**	tonnes	
GHG Reduction	**82.4%**	%	
Remaining GHG	**10.9**	Elec. Source	

Energy Savings		
Electricity Consumption	(75,057)	kWh
Electricity Demand	(111)	kW
Gas Consumption	1,051	GJ
Total	216,888	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	20.5%	%

2.4.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of an air source heat pump (ASHP) system with the capacity of the one existing boiler. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Replacement of one (out of two) of existing gas fired boilers with an equivalent electric boiler to run only when OAT is below -5 °C.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - IB			
COST	Capital Cost	$	881,225
	Including Equipment,		
	Inst., Cx, Design. (prelim.)		
	TOTAL COST	$	881,225
SAVINGS	Electricity Consumption	$	(14,063)
	Electricity Demand	$	(13,708)
	Natural savings	$	11,445
	TOTALSAVINGS	$	(16,326)
GHG Reduction	**49.8**	tonnes	
GHG Reduction	**80.6%**	%	
Remaining GHG	**12.0**	Elec. Source	

Energy Savings		
Electricity Consumption	(163,521)	kWh
Electricity Demand	(391)	kW
Gas Consumption	1,051	GJ
Total	128,424	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	12.1%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.5 CLOCK TOWER (CT)

2.5.1 Building General Info

Item	Attribute	Description
1	Size	2,976 m^2
2	Annual Electric Consumption	270,000 kWh
3	Annual Natural Gas Consumption	1,080 GJ
4	Electric Peak Demand	91 kW
5	Space Heating	2# Natural gas fired Boilers with 880 MBH output each
6	Space Cooling	1# air cooled chiller with 60 tonnes capacity
7	DHW Production	3# electric DHWHs with 1.5 kW and 15 Gallons output each
8	Ventilation	1# gas fired RTU (RTU-1) with 296 MBH and two AHUs (F-1/2) with hydronic heating and cooling coils

2.5.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with other 4 adjacent buildings (i.e. CATS, Science, Gym, and OM).
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested, is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the existing gas heat RTU-1 with a new hydronic RTU. The RTU will be fitted with single high-efficient hydronic switch-over coil for heating/cooling. The coil will be tied to the GSHP connecting to the Geo-Exchange system.
4. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.
5. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - CT			
COSTS	Capital Cost	$	1,120,315
	Including Equipment, Trans.		
	Inst., Cx, Design. (prelim.)		
	TOTAL COST	$	1,120,315
SAVINGS	Electricity Consumption	$	(6,140)
	Electricity Demand	$	(1,002)
	Natural savings	$	11,761
	TOTALSAVINGS	$	4,619
GHG Reduction	**52.5**	tonnes	
GHG Reduction	**92.3%**	%	
Remaining GHG	**4.4**	Elec. Source	

Energy Savings		
Electricity Consumption	(71,398)	kWh
Electricity Demand	(29)	kW
Gas Consumption	1,080	GJ
Total	228,602	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	40.1%	%

2.5.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of an air source heat pump (ASHP) system with the capacity of the one existing boiler. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.

2. Replacement of one (out of two) of existing gas fired boilers with an equivalent electric boiler to run only when OAT is below -5 °C.
3. Replacement of the existing gas fired RTU-1 with an air source heat pump RTU with back up electric heating. The HP portion of RTU will run at the condition when the OAT is above -5 °C and the electric element will act as back up heat when OAT is below -5 °C.
4. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in the table in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - CT		
COST	Capital Cost	$ 974,305
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	$ 48,715.25
	TOTAL COST	$ 1,023,020
SAVINGS	Electricity Consumption	$ (10,571)
	Electricity Demand	$ (3,542)
	Natural savings	$ 11,761
	TOTALSAVINGS	$ (2,352)
GHG Reduction	**51.8**	tonnes
GHG Reduction	**91.1%**	%
Remaining GHG	**5.1**	Elec. Source

Energy Savings		
Electricity Consumption	(122,917)	kWh
Electricity Demand	(101)	kW
Gas Consumption	1,080	GJ
Total	177,083	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	31.1%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.6 CULINARY ARTS (CATS)

2.6.1 Building General Info

Item	Attribute	Description
1	Size	1,858 m^2
2	Annual Electric Consumption	390,000 kWh
3	Annual Natural Gas Consumption	2,917 GJ
4	Electric Peak Demand	130 kW

5	Space Heating	2# Natural gas fired Boilers with 1320 MBH and 880 MBH output each
6	Space Cooling	1# air cooled chiller with 60 tonnes capacity, R-22
7	DHW Production	2# gas fired DHWHs with 120 MBH output for Meat building 1# gas fired DHWH with 247 MBH output for Kitchen 1# gas fired DHWH with 528 MBH output for DHW use of the building
8	Ventilation	1# gas fired RTU (RTU-1) with 278 MBH output for Alumni dining and kitchen, and two AHUs (F-6 and F-13) with hydronic heating and cooling coils

2.6.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with other 4 adjacent buildings (i.e. CT, Science, Gym, and OM).
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP, the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the existing gas heat RTU-1 with a new hydronic RTU. The RTU will be fitted with single high-efficient hydronic switch-over coil for heating/cooling. The coil will be tied to the GSHP connecting to the Geo-Exchange system.
4. Replacement of the existing gas fired DHWHs with new water to water DHW heat pumps (DHW HP). The source side of the DHW HP is to connect to the Geo-Exchange system.
5. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.
6. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - CATS		
COSTS	Capital Cost	$ 2,019,255
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 2,019,255
SAVINGS	Electricity Consumption	$ (14,221)
	Electricity Demand	$ (2,403)
	Natural savings	$ 27,707
	TOTALSAVINGS	$ 11,083
GHG Reduction	**123.6**	tonnes
GHG Reduction	**82.9%**	%
Remaining GHG	**25.6**	tonnes: tonnes: Elec. Source or Kitchen Eq.

Energy Savings		
Electricity Consumption	(165,364)	kWh
Electricity Demand	(101)	kW
Gas Consumption	2,544	GJ
Total	541,379	ekWh
Percentage (gas)	87.2%	%
Percentage as of total	45.1%	%

2.6.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of an air source heat pump (ASHP) system with the capacity of the one existing boiler. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Replacement of one (out of two) of existing gas fired boilers with an equivalent electric boiler to run only when OAT is below -5 °C.
3. Replacement of the existing gas fired RTU-1 with an air source heat pump RTU with back up electric heating. The HP portion of RTU will run at the condition when the OAT is above -5 °C and the electric element will act as back up heat when OAT is below -5 °C.
4. Replacement of the two (out of four) existing gas fired DHWHs with two new air to water DHW heat pumps (DHW HP) with similar capacity to run when the OAT is above -5 °C.
5. Replacement of the two (out of four) existing gas fired DHWHs with two new electric DHW heaters with similar capacity to run when the OAT is below -5 °C.
6. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in **Table ii** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - CATS		
COSTS	Capital Cost	$ 1,892,630
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 1,892,630
SAVINGS	Electricity Consumption	$ (26,318)
	Electricity Demand	$ (4,933)
	Natural savings	$ 27,707
	TOTALSAVINGS	$ (3,544)
GHG Reduction	**121.8**	tonnes
GHG Reduction	**81.6%**	%
Remaining GHG	**27.4**	Elec. Source

Energy Savings		
Electricity Consumption	(306,024)	kWh
Electricity Demand	(208)	kW
Gas Consumption	2,544	GJ
Total	400,718	ekWh
Percentage (gas)	87.2%	%
Percentage as of total	33.4%	%

There are six gas ranges, grills and ovens, and two steam bowls in the training kitchen that use natural gas, which is estimated to consume 373 GJ. They can be replaced with electric source of energy but are not included in this project and calculation.

2.7 SCIENCES (S)

2.7.1 Building General Info

Item	Attribute	Description
1	Size	10,831 m^2
2	Annual Electric Consumption	1,110,000 kWh
3	Annual Natural Gas Consumption	2,700 GJ
4	Electric Peak Demand	250 kW
5	Space Heating	2# Natural gas fired Boilers with 962 MBH output each serve middle building 2# Natural gas fired Boilers with 707 MBH output each serve east/west building 74 zonal distributed water to air HPs
6	Space Cooling	DX cooling directly in the AHUs/MUAs, and 74 zonal distributed water to air HPs
7	DHW Production	1# gas fired DHW boiler with 322 MBH output

8	Ventilation	2# gas fired 100% OA MUA (SF-103/104) with 800 MBH and 680 MBH output each for Labs, and four AHUs (SAH-1/2 and SF-101/102) with hydronic heating and cooling coils

2.7.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with other our adjacent buildings (i.e. CATS, CT, Gym, and OM).
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested, is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the two existing gas heat RTUs: SF-103/104 with new hydronic RTU. The RTU will be fitted with single high-efficient hydronic switch-over coil for heating/cooling. The coil will be tied to the GSHP connecting to the Geo-Exchange system.
4. Replacement of the existing gas fired DHWH with new water to water DHW heat pump (DHW HP). The source side of the DHW HP is to connect to the Geo-Exchange system.
5. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.
6. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.
7. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in the **Table i** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - Science		
COSTS	Capital Cost	$ 3,125,245
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 3,125,245
SAVINGS	Electricity Consumption	$ (15,157)
	Electricity Demand	$ (2,692)
	Natural savings	$ 29,403
	TOTALSAVINGS	$ 11,554
GHG Reduction	**131.2**	tonnes
GHG Reduction	**88.8%**	%
Remaining GHG	**16.6**	Elec. Source

Energy Savings		
Electricity Consumption	(176,248)	kWh
Electricity Demand	(110)	kW
Gas Consumption	2,700	GJ
Total	573,752	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	30.8%	%

2.7.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of an air source heat pump (ASHP) system with the capacity of the two existing boilers. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Replacement of two (out of four) existing gas fired boilers with equivalent electric boilers to run only when OAT is below -5 °C.
3. Replacement of the existing gas fired RTUs: SF-103/104 with air source heat pump RTUs with back up electric heating. The HP portion of RTUs will run at the condition when the OAT is above -5 °C and the electric element will act as back up heat when OAT is below -5 °C.
4. Replacement of the one existing gas fired DHWH with one new air to water DHW heat pump (DHW HP) with similar capacity to run when the OAT is above -5 °C.
5. Replacement of the existing gas fired DHWH with one new electric DHW heater with similar capacity to run when the OAT is below -5 °C.
6. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in **Table ii** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - Science		
COSTS	Capital Cost	$ 2,377,795
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 2,377,795
SAVINGS	Electricity Consumption	$ (28,160)
	Electricity Demand	$ (5,550)
	Natural savings	$ 29,403
	TOTALSAVINGS	$ (4,307)
GHG Reduction	**129.2**	tonnes
GHG Reduction	**87.5%**	%
Remaining GHG	**18.5**	Elec. Source

Energy Savings		
Electricity Consumption	(327,443)	kWh
Electricity Demand	(227)	kW
Gas Consumption	2,700	GJ
Total	422,558	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	22.7%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.8 GYMNASIUM (GYM)

2.8.1 Building General Info

Item	Attribute	Description
1	Size	3,700 m^2
2	Annual Electric Consumption	326,000 kWh
3	Annual Natural Gas Consumption	1,700 GJ
4	Electric Peak Demand	160 kW
5	Space Heating	No boiler. By Ventilation systems below
6	Space Cooling	DX cooling directly in the RTUs
7	DHW Production	2# gas fired DHWHs with 160 MBH output each
8	Ventilation	4# Natural gas heat RTUs: GAH-1 thru 4 with 1440 MBH, 800 MBH, 320 MBH, and 384 MBH output each serve Gym, offices, and basement fitness.

2.8.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with other 4 adjacent buildings (i.e. CATS, CT, S, and OM).
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested, is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP the heat extracted during the winter will need to be replenished into the ground during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.
3. Replacement of the four AHUs coils with high-efficiency, hydronic heating coils (GAH-1/2/3/4) with more passes coils to become compatible with low temperature.
4. Replacement of one (out of two) of the existing gas fired DHWHs with new water to water DHW heat pump (DHW HP). The source side of the DHW HP is to connect to the Geo-Exchange system.
5. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in the **Table i** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - GYM		
COSTS	Capital Cost	$ 2,300,485
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 2,300,485
SAVINGS	Electricity Consumption	$ (9,505)
	Electricity Demand	$ (3,177)
	Natural savings	$ 18,513
	TOTALSAVINGS	$ 5,832
GHG Reduction	**82.6**	tonnes
GHG Reduction	**93.6%**	%
Remaining GHG	**5.6**	Elec. Source

Energy Savings		
Electricity Consumption	(110,521)	kWh
Electricity Demand	(128)	kW
Gas Consumption	1,700	GJ
Total	361,701	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	45.3%	%

2.8.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of air source heat pump (ASHP) system with the heating capacity of the existing AHUs. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Addition of electric element to the AHUs, to top up heating only when OAT is below -5 °C.

3. Retrofit the heating coils of the existing gas fired AHUs to include hydronic heating. The AHUs will be fitted with high-efficient hydronic switch-over coil for heating/cooling. The HP portion of AHUs will run at the condition when the OAT is above -5 °C and the electric element will act as back up heat when OAT is below -5 °C.
4. Replacement of the one (out of two) existing gas fired DHWH with one new air to water DHW heat pump (DHW HP) with similar capacity to run when the OAT is above -5 °C.
5. Replacement of the one (out of two) existing gas fired DHWH with one new electric DHW heater with similar capacity to run when the OAT is below -5 °C.
6. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in **Table ii** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - GYM		
COST	Capital Cost	$ 1,955,645
	Including Equipment, Taxes, Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 1,955,645
SAVINGS	Electricity Consumption	$ (19,264)
	Electricity Demand	$ (5,771)
	Natural savings	$ 18,513
	TOTALSAVINGS	$ (6,522)
GHG Reduction	**81.1**	tonnes
GHG Reduction	**92.0%**	%
Remaining GHG	**7.1**	Elec. Source

Energy Savings		
Electricity Consumption	(224,002)	kWh
Electricity Demand	(232)	kW
Gas Consumption	1,700	GJ
Total	248,221	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	31.1%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

2.9 OLD MAIN (OM)

2.9.1 Building General Info

Item	Attribute	Description
1	Size	19,814 m^2
2	Annual Electric Consumption	2,695,000 kWh
3	Annual Natural Gas Consumption	6,100 GJ

4	Electric Peak Demand	600 kW
5	Space Heating	Block A: 3# Natural gas fired Boilers with 880 MBH, 2,580 MBH, and 1,769 MBH output Block B: 2# Natural gas fired Boilers with 1,320 MBH and 993 MBH output Block C: 2# Natural gas fired Boilers with 850 MBH output each
6	Space Cooling	- One water cooled chiller with 254 tonnes cooling output - DX cooling directly in the RTUs and AHUs below
7	DHW Production	Block A: 3# gas fired DHWHs with 293 MBH, 190 MBH, and 190 MBH output each Block B: 1# gas fired DHWH with 287MBH output
8	Ventilation	Block A: 4# Natural gas heat RTUs: RTU-11 thru 14 with 100 MBH, 63 MBH, 100 MBH, and 63 MBH output each serve L1 and L2 east offices 5# AHUs: (AHU-1 thru 5) with hydronic heating and cooling coils serve L1 thru L4 VAVs Block B: 2# AHUs: (AHU-1 thru 2) with hydronic heating and cooling coils serve North and South spaces respectively Block C: 16# Natural gas heat RTUs: RTU-1 thru 3 and ACU-1 thru 8 and other RTUs ranging 60 MBH through 376 MBH output each (totalled 1,564 MBH output) serve different offices and shops

2.9.2 GSHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of a Geo-Exchange System, which is shared with other 4 adjacent buildings (i.e. CATS, CT, S, and Gym).
2. Installation of a ground source heat pump (GSHP) system, which could leverage the free heating and cooling energy sources from the ground (the Geo-Exchange System) all year around. The GSHP suggested, is a heat recovery system that could provide heating, cooling and/or the both at the same time. In order to maximize the efficiency of the GSHP, the heat extracted during the winter will need to be replenished into the ground

during cooling season, and vice versa. This WWHP system will provide a lower heating water temperature of about 55°C ± 10%.

3. Replacement of the existing gas heat RTUs with an Installation of new hydronic equivalent. The equipment will be fitted with single high-efficient hydronic switch-over coil for heating/cooling. The coil will be tied to the GSHP connecting to the Geo-Exchange system.
4. Replacement of the existing gas fired DHWHs with new water to water DHW heat pumps (DHW HP). The source side of the DHW HP is to connect to the Geo-Exchange system.
5. Replacement of the AHUs coils with high-efficiency and more passes coils to become compatible with low temperature.
6. Part of this capital cost is related to the replacement of the AHUs coils with coils with more passes, replacement of the radiant ceiling with higher capacity, replacement of baseboard heaters (BBHs) with BBH fitted with higher capacity/blowers to become compatible with low temperature.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

GSHP Savings and Cost Estimates

Financial Info - Old Main		
COSTS	Capital Cost	$ 7,760,335
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 7,760,335
SAVINGS	Electricity Consumption	$ (33,599)
	Electricity Demand	$ (5,726)
	Natural savings	$ 66,429
	TOTALSAVINGS	$ 27,104
GHG Reduction	**296.5**	tonnes
GHG Reduction	**88.2%**	%
Remaining GHG	**39.8**	Elec. Source

Energy Savings		
Electricity Consumption	(390,689)	kWh
Electricity Demand	(242)	kW
Gas Consumption	6,100	GJ
Total	1,303,757	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	29.7%	%

2.9.3 ASHP ERM

The proposed upgrades for electrification are as follows:

1. Installation of air source heat pump (ASHP) system with the heating capacity of the half of the capacity of the existing boilers. This ASHP can provide both heating and cooling to the building. The system runs when the OAT is above -5 °C.
2. Replacement of the half of existing gas fired boilers with equivalent electric boilers to run only when OAT is below -5 °C.
3. Replacement of the 19 existing gas fired RTUs (in Block A and Block C) with air source heat pump RTUs with back up electric heating. The HP portion of RTUs will run at the condition when the OAT is above -5 °C and the electric element will act as back up heat when OAT is below -5 °C.
4. Replacement of the half of existing gas fired DHWH with DHW heat pump (DHW HP) with similar capacity to run when the OAT is above -5 °C.

5. Replacement of half of existing gas fired DHWH with new electric DHW heaters with similar capacity to run when the OAT is below -5 °C.
6. Upgrade to the existing electrical service/switch gear will be needed as estimated and depicted in **Table ii** in the executive summary section.

The combined energy/GHG savings and capital upgrade cost of the measures are outlined in the table below.

ASHP Savings and Cost Estimates

Financial Info - Old Main		
COSTS	Capital Cost	$ 6,671,925
	Including Equipment, Trans.	
	Inst., Cx, Design. (prelim.)	
	TOTAL COST	$ 6,671,925
SAVINGS	Electricity Consumption	$ (62,161)
	Electricity Demand	$ (11,864)
	Natural savings	$ 66,429
	TOTALSAVINGS	$ (7,596)
GHG Reduction	**292.2**	tonnes
GHG Reduction	**86.9%**	%
Remaining GHG	**44.1**	Elec. Source

Energy Savings		
Electricity Consumption	(722,807)	kWh
Electricity Demand	(501)	kW
Gas Consumption	6,100	GJ
Total	971,638	ekWh
Percentage (gas)	100.0%	%
Percentage as of total	22.1%	%

Minor GHG emission would exist in part from grid electricity use, which may be offset by on-site electricity production.

3.0 Study Limitations

This preliminary feasibility study is prepared by Stantec Consulting Ltd. ("Stantec") for the account of TRU ("the Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The calculations herein are our estimate of cost and savings potentials at this preliminary study, and are not guaranteed. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by the client and others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

In the next stage, it is required that for detailing the measures proposed in this report, a detailed study and conceptual design document and granular cost estimate are developed.

Appendix A Contact Details

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Appendix C
Basis of Design

Stantec

Memo

To:	Creative Energy Amin Hassanshahi	From:	Stantec Consulting Keith Bate
File:	115602068	Date:	August 13, 2021

Reference: Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)

This memo has been prepared to summarise the basis of design for the TRU LCDES and provide an overview of the design development documents submitted.

OVERVIEW OF SYSTEM

The LCDES will provide thermal energy for space heating and domestic hot water production in eight existing and one planned future buildings on the TRU Campus. In future phases the LCDES will provide thermal energy to other buildings on campus and neighboring buildings outside the campus.

A new Energy Centre building will be constructed at the north west corner of the Old Main building. The energy centre building will contain the heating plant, distribution pumps and a control room / office. Buried pre-insulated steel piping will distribute heating water to the buildings served by the system. Valved and capped connections will be provided for future expansion to planned development sites.

CONNECTED BUILDINGS AND DESIGN LOADS

The table below provides a summary of the buildings served by phase 1 of the LCDES and the associated design heating loads.

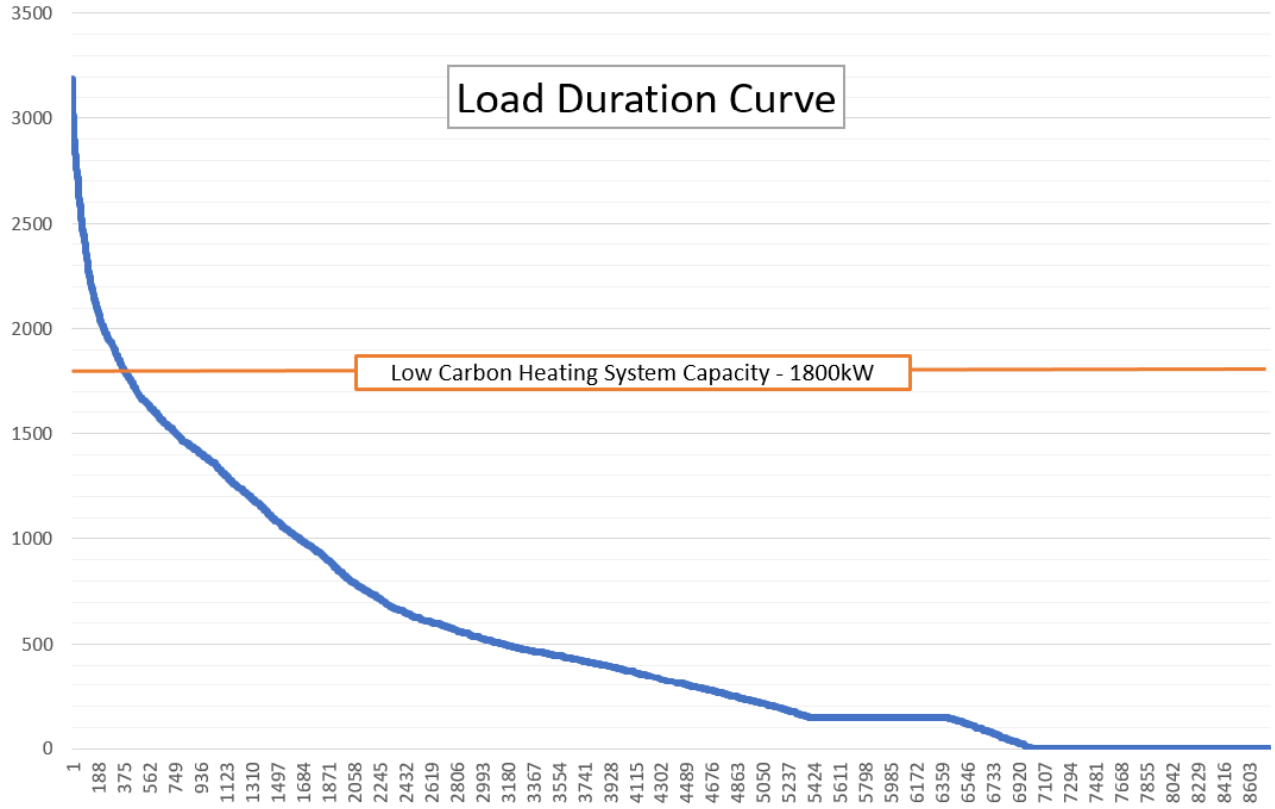
	Building	Floor area	Estimated peak heating load (kW)	Estimated annual heating load (MWhr)
PHASE 1 TRU BUILDINGS	Old Main	19,800 m^2	1,500 kW	1,485 MWhr
	Science	10,800 m^2	700 kW	714 MWhr
	SOBE Management Building (Future)	6,500 m^2	250 kW	296 MWhr
	Library	2,400 m^2	200 kW	269 MWhr
	BC Centre for Open Learning	3,600 m^2	300 kW	327 MWhr
	Culinary Arts	1,859 m^2	470 kW	451 MWhr
	Clock Tower	2,340 m^2	230 kW	243 MWhr
	Gymnasium	3,700 m^2	500 kW	417 MWhr
	International Building	5,620 m^2	450 kW	356 MWhr
	TOTAL	**56,619 m^2**	**4,140 kW**	**4,558 MWhr**

Notes:

1. A diversity of 90% has been applied to the estimated peak heating load.

Reference: **Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)**

The load-duration curve for LCDES is shown below.



ENERGY CENTRE

The central heating plant located in the energy centre building will consist of the following:

- Three (3) air source heat pumps (ASHPs) to generate heating water at a minimum of 35°C in winter and up to 55°C in shoulder seasons and summer. ASHPs will have integrated circulation pumps. Example ASHP performance data is provided in the table below.
- Two (2) water source heat pumps (WSHPs) which will use the 35°C water produced by the ASHP on the source side and generate heating water at up to 72°C on the load side. The heating capacity of each heat pump is 913kW and the CoP is 4.5.
- Three (3) 6,000 MBH condensing gas fired boilers to provide peaking and backup to the heat pump system. At a typical 92% efficiency each boiler has approximately 1,600kW heat output.
- Circulation and distribution pumps, buffer tanks and expansion tanks.

The net CoP of the ASHP+WSHP combination at a range of outdoor air temperatures is shown below. Different temperatures for the ASHP/WSHP interface were reviewed and 35°C was found to achieve the optimum net efficiency. Above approximately 0°C the ASHP can deliver water at 55°C which can be used to directly heat the district energy return water, as noted under the following system operating mode section.

Reference: **Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)**

Outdoor air temperature (°C)	Heating water temperature (°C)	Capacity (kW)	ASHP CoP	ASHP+WSHP CoP
-15	35	400	2.460	1.86
0	35	468	2.645	1.94
10	35	700	3.789	2.34
10	55	650	2.572	N/A
20	35	808	4.252	2.47
20	55	769	2.998	N/A
25	35	838	4.336	2.49

The efficiency of both the ASHP and the WSHP also increase at part load conditions. Efficiency at 25% capacity is in the order of 30% higher than full load.

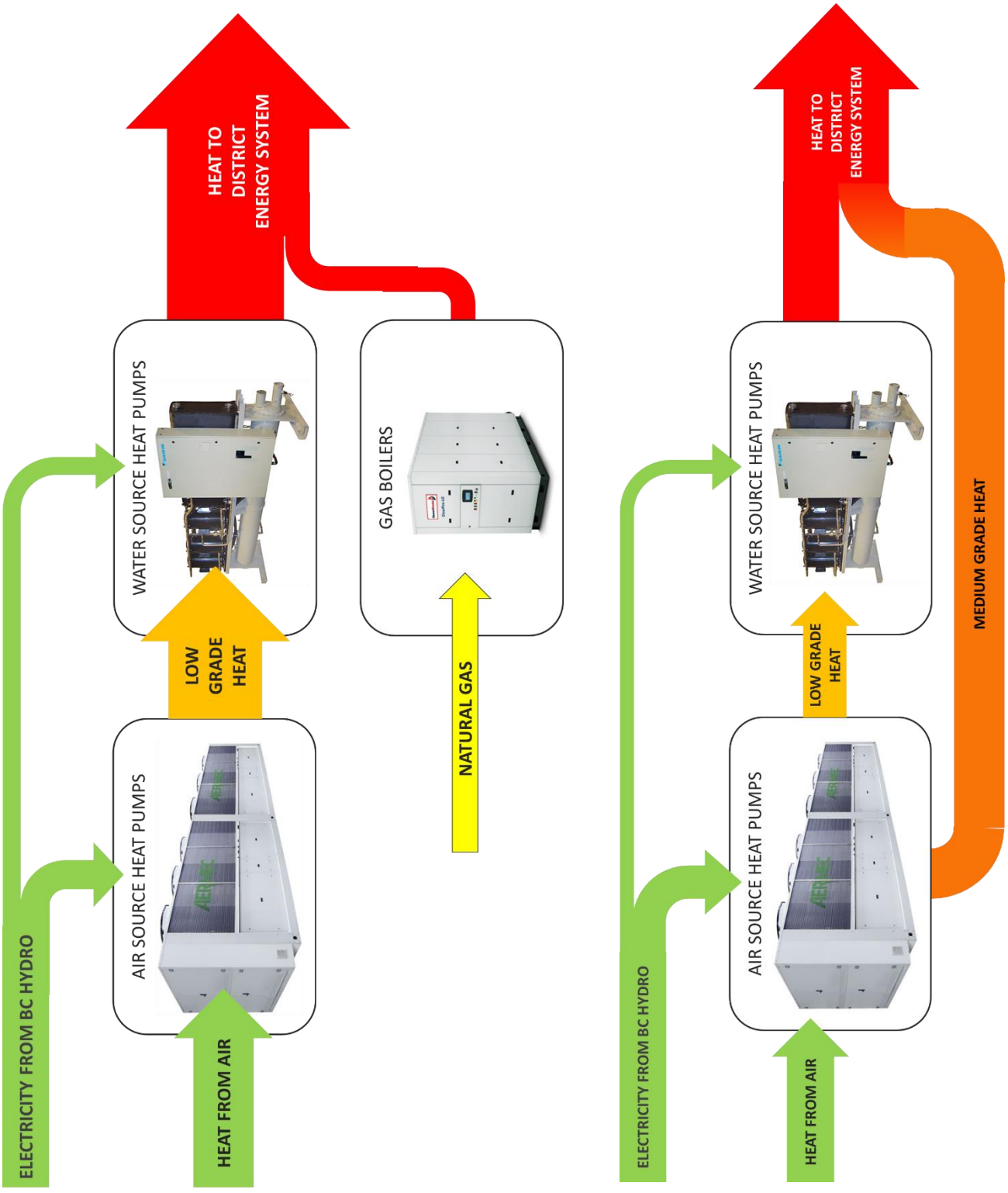
Diagrams illustrating the central plant concept is provided on the following page.

- The diagram on the left shows winter operation with the ASHP+WSHP operating with the gas boilers.
- The diagram on the right shows shoulder season and summer operation when the ASHP can provide medium grade heat directly to the DES return water.

The ASHP and WSHPs will provide approximately 90% of the heating load on an annual basis.

The heating surface area of each boiler is 26.8m^2. The total heating surface area for three boilers is therefore 80.4m^2. Based on the guide on the Technical Safety BC website https://www.technicalsafetybc.ca/boiler-pv-and-refrigeration/estimate-plant-classification the plant is therefore exempt from the boiler plant operating permit requirement [Section 6 of B.C. Reg. 104/2004] as it is a fluid heating plant with a heating surface area below 150m^2. The plant would remain exempt with up to five boilers of this capacity installed.

Reference: **Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)**



Reference: **Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)**

SYSTEM OPERATING MODES

The system operating mode will vary based on outdoor air temperature, as summarized in the table below.

Outdoor air temperatures	Supply temperature	Primary heat source	Secondary heat source	Notes
Below -15°C	70 - 85°C	Gas boilers	N/A	*ASHPs will not operate below -15°C Boilers can deliver water at up to 90°C if needed to meet peak demands*
-15°C to 5°C	70°C	ASHP+WSHP	Gas boilers	*Gas boilers can be used to boost supply water temperature above 70°C if needed at the lower end of this temperature range*
Above 5°C	70°C	ASHP	ASHP+WSHP	*ASHP will directly heat return water up to 55°C and ASHP+WHSP will raise to 70°C*

Notes:

1. There is a range of heating equipment in the existing buildings. Some buildings are served by water source heat pumps connected to a water loop which typically operates with a minimum temperature of approximately 20°C. New domestic hot water heat exchangers will have return water temperatures in the order of 30°C. There are also several existing gas fired air handling units and roof top units which will be converted to hydronic heating. It is intended that the new hydronic heating coils be selected with return water temperatures of approximately 40°C. It is therefore expected that the LCDES will operate with an average return water temperature no higher than 40°C, resulting in a temperature differential of approximately 30°C.

2. The WSHPs are selected to operate at a constant entering source water temperature and therefore have the same heating capacity (913kW) at all outdoor air temperatures. At low outside air temperatures the heating capacity of the ASHP is matched to the source side capacity of the WSHP. When outdoor air temperatures are higher the ASHP capacity significantly exceeds the source side capacity of the WSHP. At an outdoor air temperature of 10°C for example, the heating capacity of each ASHP at 35°C is 700kW and so only three would be needed to meet the full source side load of all the WSHPs. The maximum supply water temperature from the ASHPs above 32°C outdoor air temperature is 55°C. As the return water temperature from the LCDES is expected to be in the order of 40°C, one or two of the spare ASHPs can therefore be used to meet approximately 50% of the load directly by raising the return water temperature to 55°C, with the remaining demand met by the WSHP raising the water to the final supply temperature of 70°C. It is anticipated that the system would operate in this mode at outside air temperatures above 5°C, improving the overall CoP.

Reference: **Thompson Rivers University (TRU) Low Carbon District Energy System (LCDES)**

ENERGY TRANSFER STATIONS

Each building will have an energy transfer station (ETS) with a thermal energy meter, and some buildings may have two as there are two DES connections.

The ETS and boundary of ownership will be where the heating mains enter the building. There will therefore be some piping and equipment owned by TRU which is hydraulically connected to the DES. This approach has been taken to avoid long runs of piping owned by Creative Energy being run through TRU buildings, and because some equipment, such as heating coils retrofitted to air handling units, will be supplied directly from the LCDES for efficiency and economy.

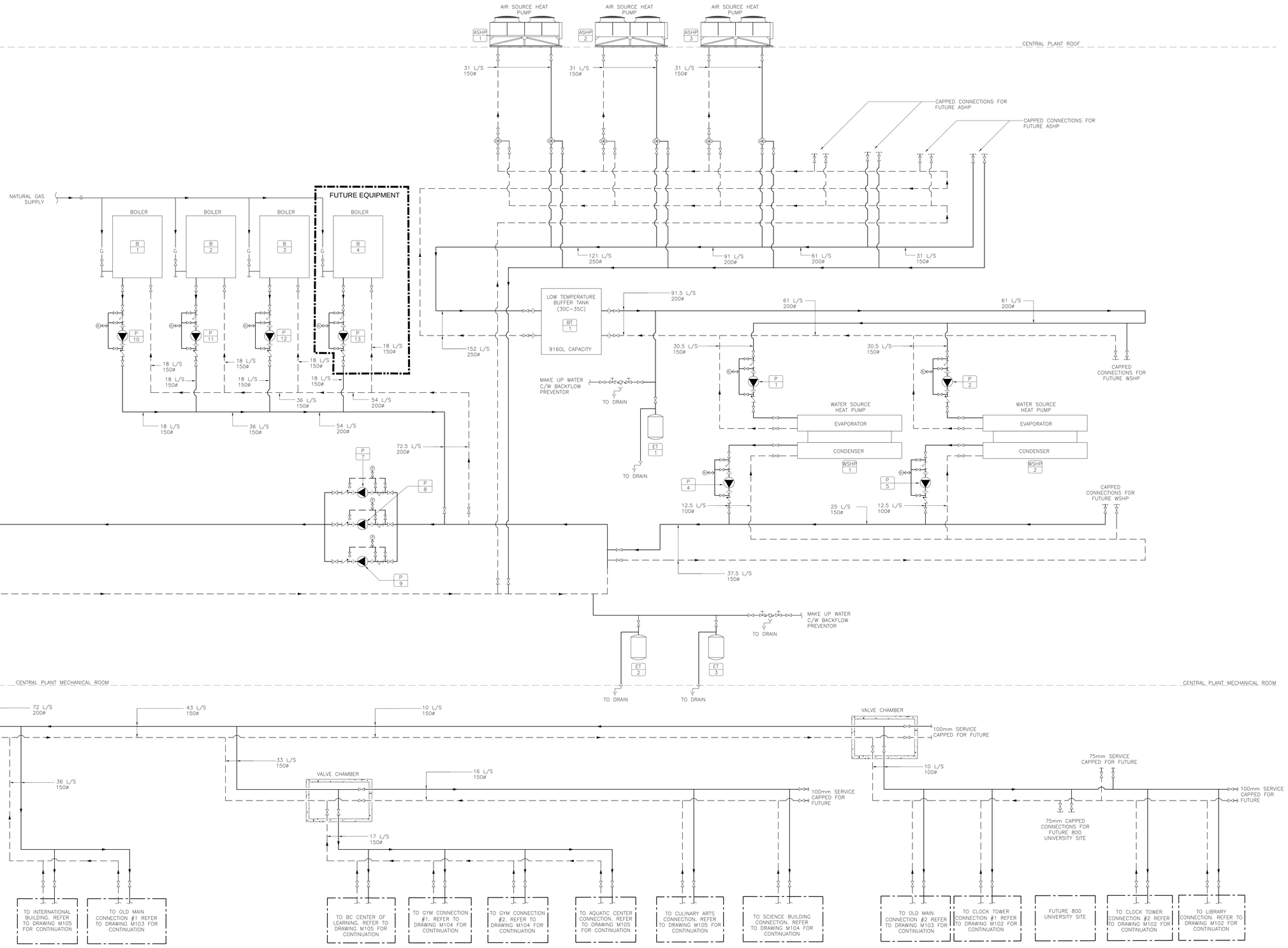
Stantec Consulting Ltd.

Keith Bate
Principal, Mechanical Engineer

Phone: 604 696 8137
Fax: 604 696 8100
Keith.Bate@stantec.com

Appendix D

LCDES Design Drawings



1 M100 CENTRAL PLANT AND DISTRIBUTION PIPE SCHEMATIC

NTS

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Notes

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Issued	By	Appd	YYYY.MM.DD
File Name: TRU_LCDES_SCHEMATICS	Dwn.	Dsgn.	Chkd. YYYY.MM.DD

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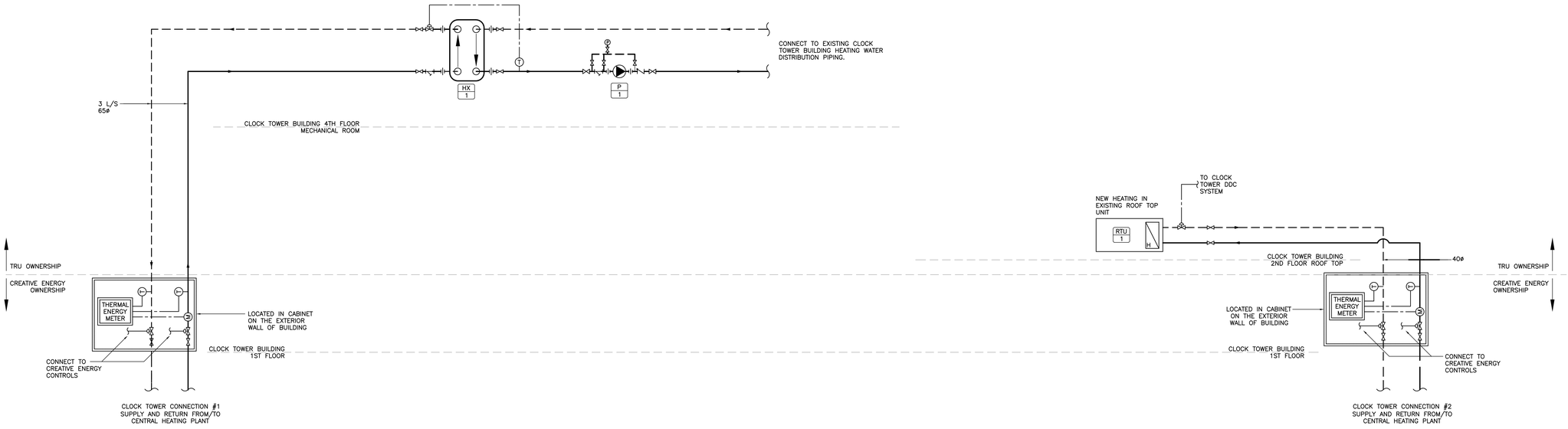
LOW CARBON DISTRICT ENERGY SYSTEM

KAMLOOPS, BC

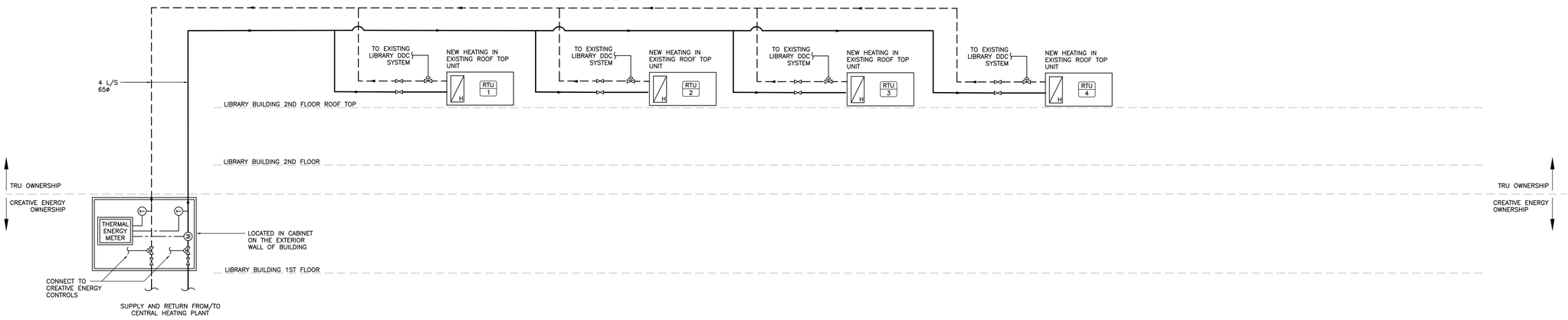
Title
CENTRAL PLANT SCHEMATIC

Project No.	Scale
115602068	NTS
Revision: 0	Sheet: 2 of 10

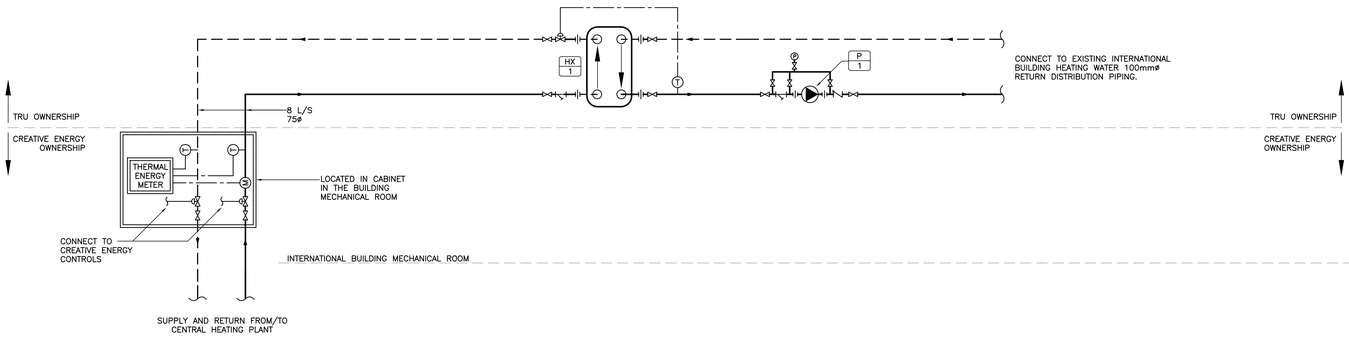
Drawing No.
M101



1 M102 CLOCK TOWER BUILDING PIPE SCHEMATIC



2 M102 LIBRARY BUILDING PIPE SCHEMATIC



3 M102 INTERNATIONAL BUILDING PIPE SCHEMATIC

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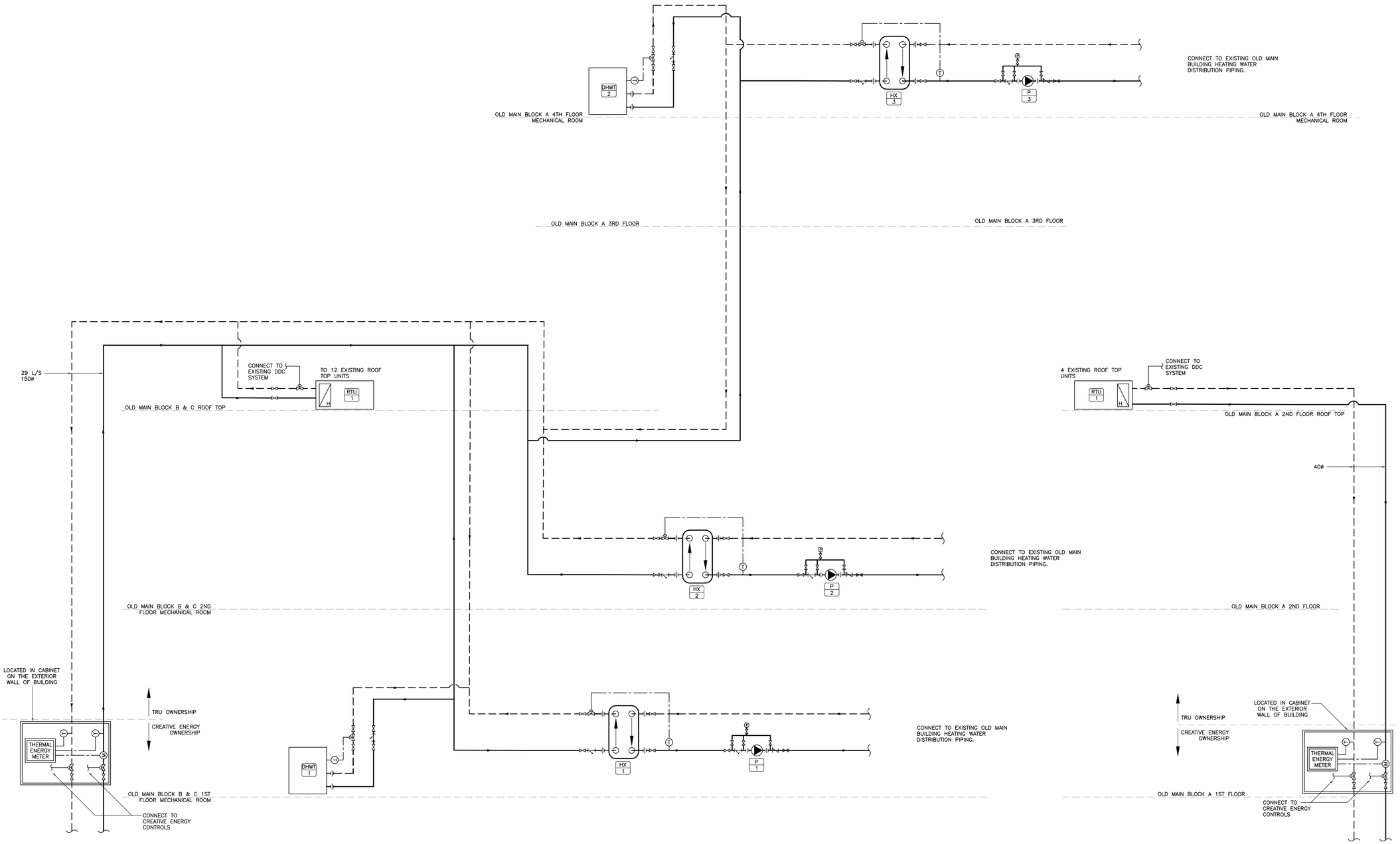
LOW CARBON DISTRICT ENERGY SYSTEM

KAMLOOPS, BC

Title
CLOCK TOWER, LIBRARY AND INTERNATIONAL BUILDING SCHEMATICS

Project No.	Scale
115602068	NTS
Revision	Sheet
0	2 of 10

Drawing No.
M102



1 M103 **OLD MAIN BUILDING SCHEMATIC**

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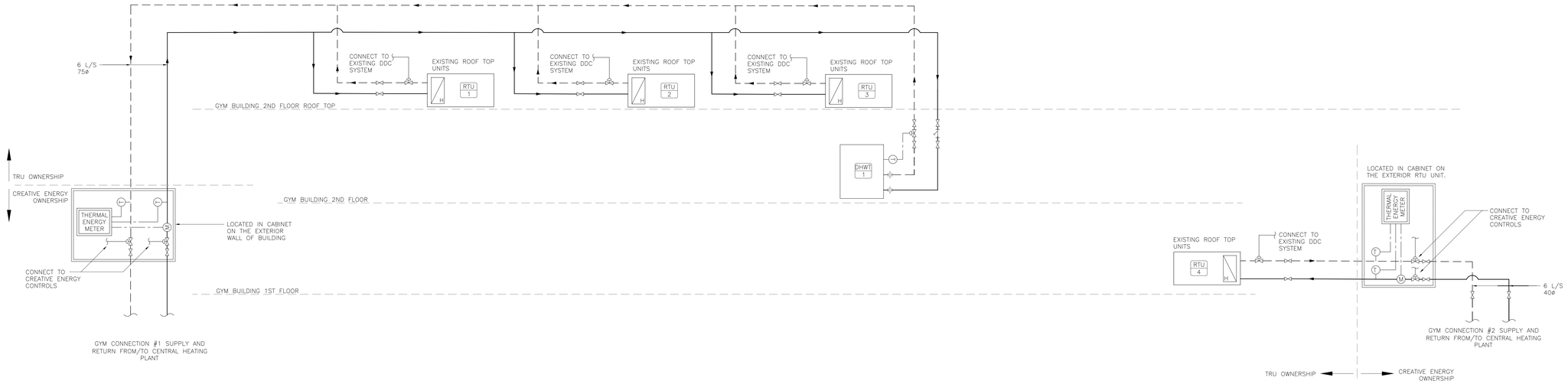
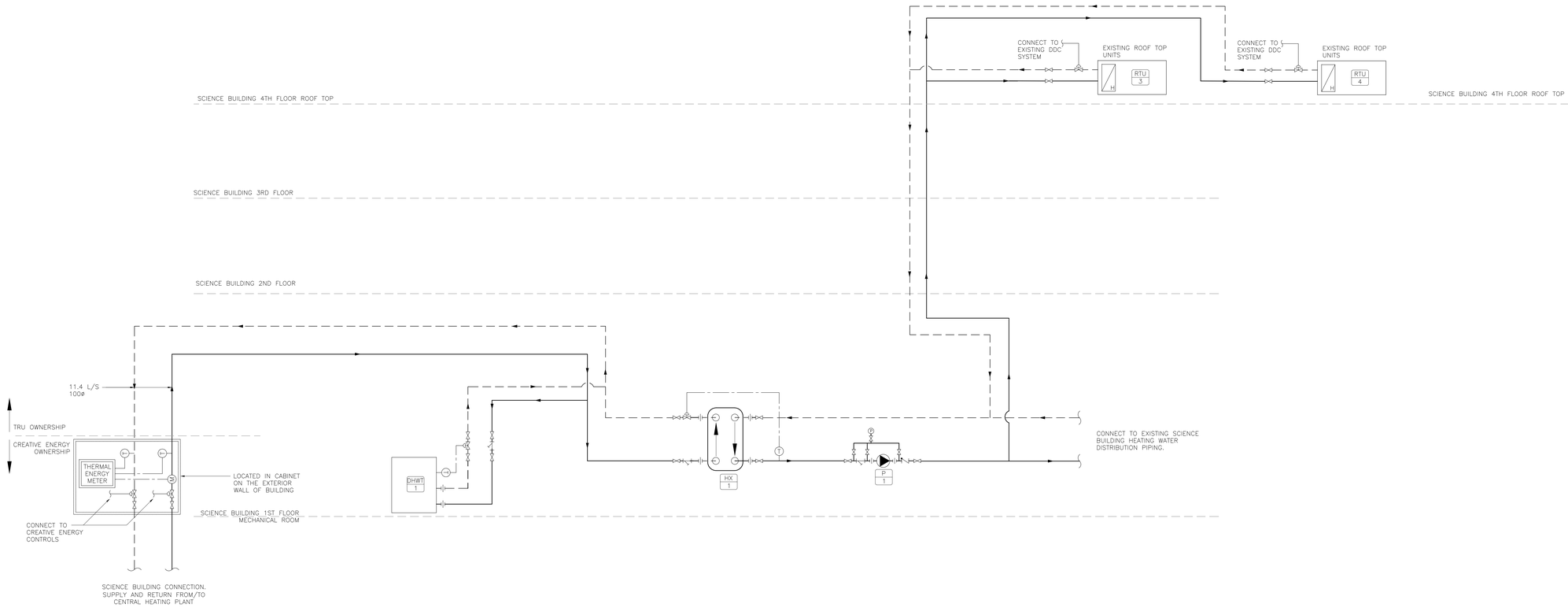
Title
OLD MAIN BUILDING SCHEMATICS

Project No.	Scale
115602068	NTS
Revision	Sheet
0	2 of 10

Drawing No.
M103



1 M103 GYMNASIUM BUILDING PIPE SCHEMATIC



2 M103 SCIENCE BUILDING PIPE SCHEMATIC

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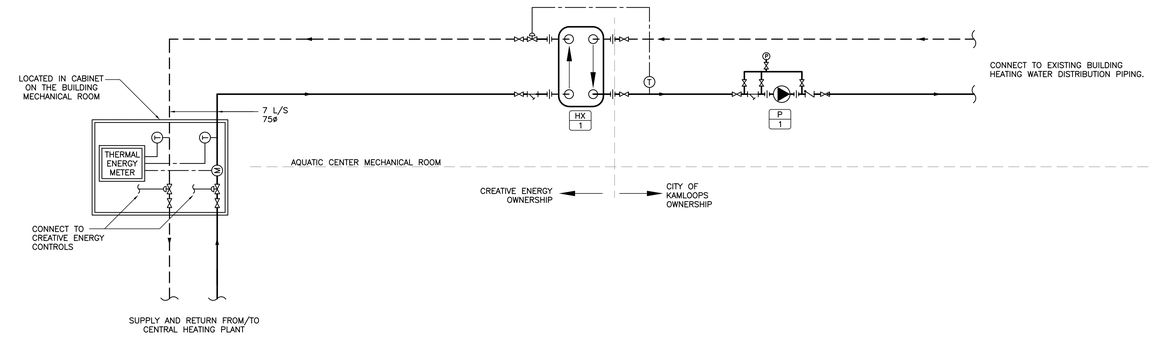
LOW CARBON DISTRICT ENERGY SYSTEM

KAMLOOPS, BC

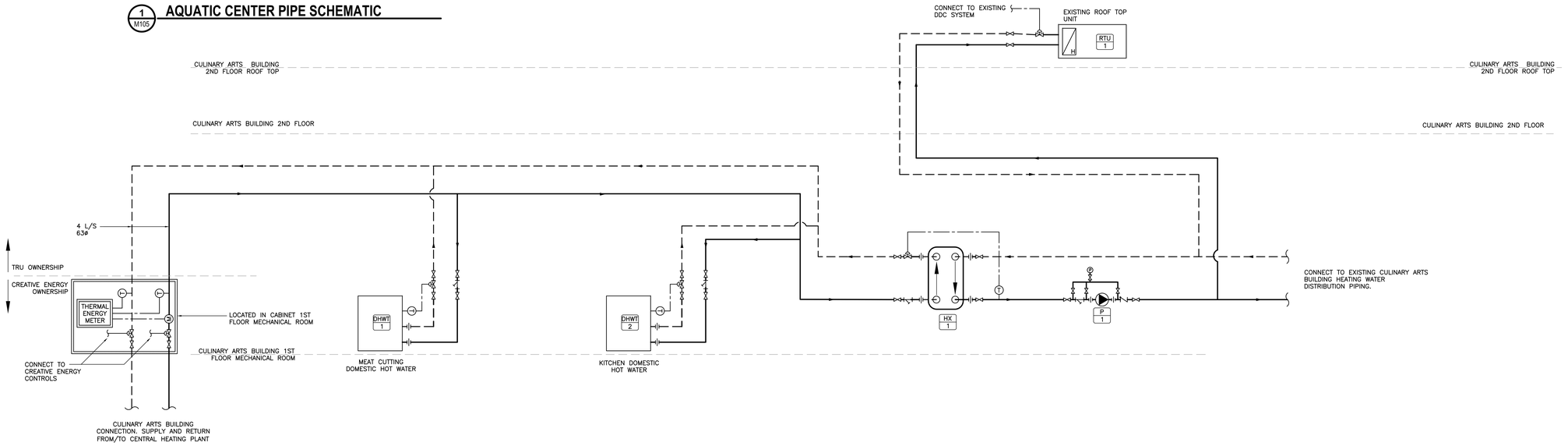
Title
GYMNASIUM AND SCENCE BUILDING SCHEMATICS

Project No. 115602068 | Scale NTS

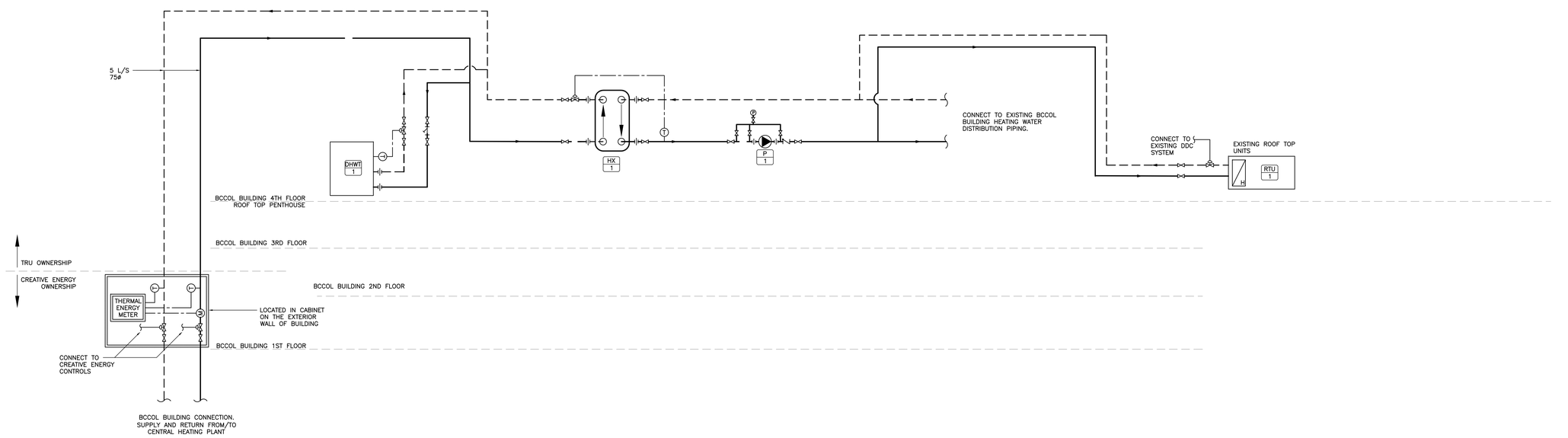
Revision 0 | Sheet 2 of 10 | Drawing No. **M104**



1 M105 AQUATIC CENTER PIPE SCHEMATIC



2 M105 CULINARY ARTS BUILDING PIPE SCHEMATIC



3 M105 BCCOL BUILDING PIPE SCHEMATIC

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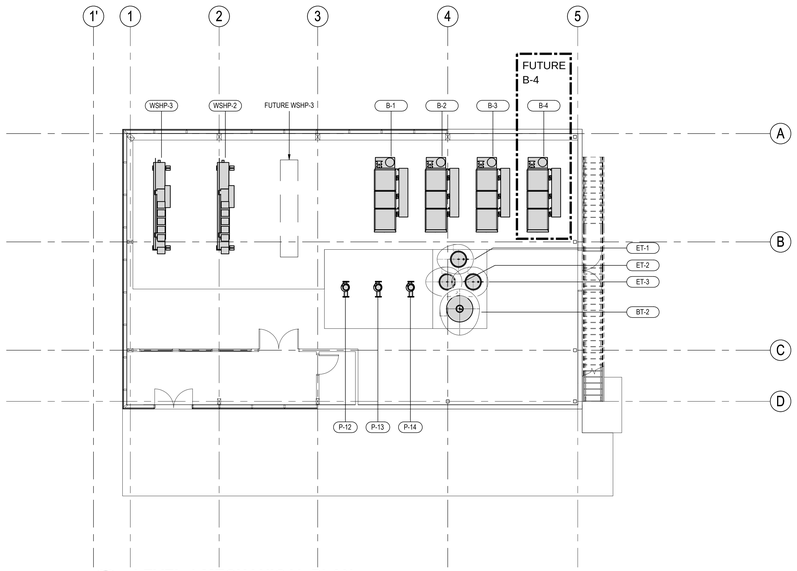
LOW CARBON DISTRICT ENERGY SYSTEM

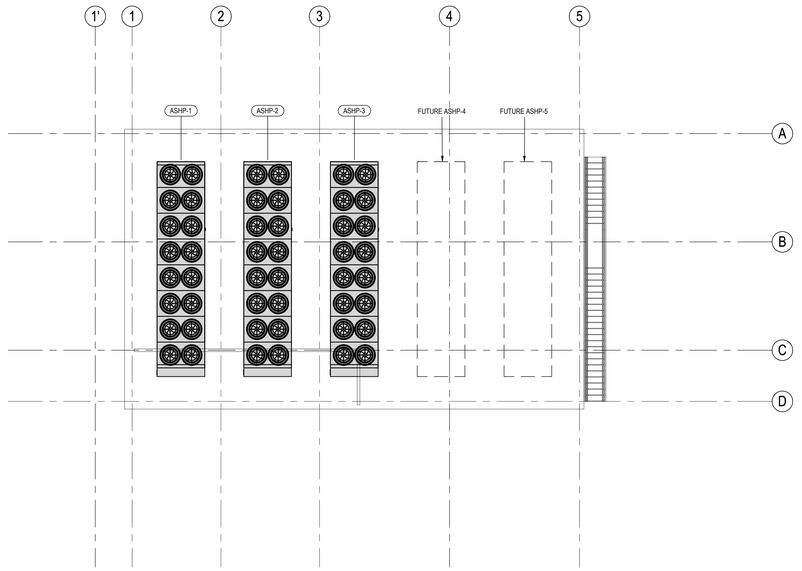
KAMLOOPS, BC

Title
AQUATIC CENTRE, CULINARY ARTS AND BCCOL SCHEMATICS

Project No.	Scale
115602068	NTS
Revision 0	Sheet 2 of 10
	Drawing No. M105



1 M100 **LEVEL 1 MECHANICAL PLAN**
1 : 100



2 M100 **ROOF TOP MECHANICAL PLAN**
1 : 100

BUFFER TANK SCHEDULE

UNIT IDENTIFICATION		MANUFACTURE	MODEL NO.	VOLUME (L)	DIAMETER (MM)	HEIGHT (MM)	WEIGHT (KG)	NOTES
MARK	SYSTEM SERVED							
BT-1	LOW TEMPERATURE			9160				

NOTES:
1.

EXPANSION TANK SCHEDULE

UNIT IDENTIFICATION		MANUFACTURE	MODEL NO.	VOLUME (L)	DIAMETER (MM)	HEIGHT (MM)	WEIGHT (KG)	NOTES
MARK	SYSTEM SERVED							
ET-1	LOW TEMPERATURE							
ET-2	HIGH TEMPERATURE							
ET-3	HIGH TEMPERATURE							

NOTES:
1.

PUMP SCHEDULE

UNIT IDENTIFICATION		PUMP TYPE	CONTROL	PERFORMANCE				PUMP MOTOR			ELECTRICAL		OPERATING WEIGHT (kg)	MANUFACTURER	MODEL NUMBER	NOTES
MARK	SYSTEM SERVED			FLUID TYPE	FLUID TEMP (°C)	FLOW (l/s)	PUMP HEAD (kPa)	MIN EFFICIENCY (%)	BHP	HP	SPEED (RPM)	VOLTS	PHASE			
P-1	WATER SOURCE HEAT PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		30.5						575	3		TBC		
P-2	WATER SOURCE HEAT PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		30.5						575	3		TBC		
P-3	WATER SOURCE HEAT PUMP (FUTURE)																
P-4	WATER SOURCE HEAT PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		12.5						575	3		TBC		
P-5	WATER SOURCE HEAT PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		12.5						575	3		TBC		
P-6	WATER SOURCE HEAT PUMP (FUTURE)																
P-7	DISTRICT ENERGY DISTIBUTION	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		72.0						575	3		TBC		
P-8	DISTRICT ENERGY DISTIBUTION	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		72.0						575	3		TBC		
P-9	DISTRICT ENERGY DISTIBUTION	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		72.0						575	3		TBC		
P-10	GAS BOILER PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		18.0						575	3		TBC		
P-11	GAS BOILER PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		18.0						575	3		TBC		
P-12	GAS BOILER PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		18.0						575	3		TBC		
P-13	GAS BOILER PUMP	SINGLE PUMP IN-LINE CENTRIFUGAL	VFD	WATER		18.0						575	3		TBC		FUTURE

NOTES:
1.

GAS BOILER SCHEDULE

UNIT ID	FUEL			FLUID				PHYSICAL CHARACTERISTICS				ELECTRICAL			MANUFACTURER	MODEL NUMBER	NOTES
	FUEL TYPE	INPUT (KW)	OUTPUT (KW)	FLUID TYPE	FLOW (l/s)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	WEIGHT (kg)	HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)	VOLTS	PHASE	AMP			
B-1	NATURAL GAS	1758	1689	WATER	18.0	50.0	72.0	5.0	3,127	2131	1000	3449	208	3	20	VIESSMANN	VITOCROSSAL 300, CA3B 6.0	

NOTES:
1.

AIR SOURCE HEAT PUMP SCHEDULE

UNIT ID	COMMON DATA		HEATING PERFORMANCE							COMPRESSORS				FANS	ELECTRICAL				PHYSICAL CHARACTERISTICS				MANUFACTURER	MODEL NUMBER	NOTES
	FLUID TYPE	REFRIG TYPE	FLUID (l/s)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	FOULING FACTOR	COP	DESIGN AMBIENT (°C)	TYPE	NO OF COMP	NO OF CIRCUITS	NO OF STAGES	NO OF FANS	VOLTS	PHASE	MCA	MOP	OPERATING WEIGHT (kg)	DIMENSIONS HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)			
ASHP-1 TO ASHP-3	WATER	R410A	30.2	31.8	35.0	21.5	0.0001	2.5	-15	SCROLL	6	2	1	16	575	3	348.2	398	7,170	2,450	2,200	9,920	AERMEC	NRB2400XH-A-J800	

NOTES:
1.

WATER SOURCE HEAT PUMP SCHEDULE

UNIT ID	CAPACITY AND PERFORMANCE						EVAPORATOR WATER					CONDENSOR WATER					COMPRESSOR			ELECTRICAL		PHYSICAL CHARACTERISTICS				MANUFACTURER	MODEL NUMBER	NOTES
	COOLING UNIT CAPACITY (KW)	HEAT UNIT CAPACITY (KW)	HEATING C.O.P.	REFRIG TYPE	REFRIG CHARGE (kg)	NPLV	FLUID TYPE	FLOW (l/s)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	FLUID TYPE	FLOW (l/s)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	TYPE	NO OF COMP/CIRCUIT	NO OF CIRCUITS	VOLTS	PHASE	OPERATING WEIGHT (kg)	DIMENSIONS HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)			
WSHP-1 AND WSHP-2	709.0	914	4.5	R410A	-	14	WATER	30.5	35.0	29.4	178.5	WATER	12.8	54.1	71.1	123.4	SCROLL	3	2	575	3	3,616	1,974	935	4,321	DAIKIN	TGZ190	

NOTES:
1.

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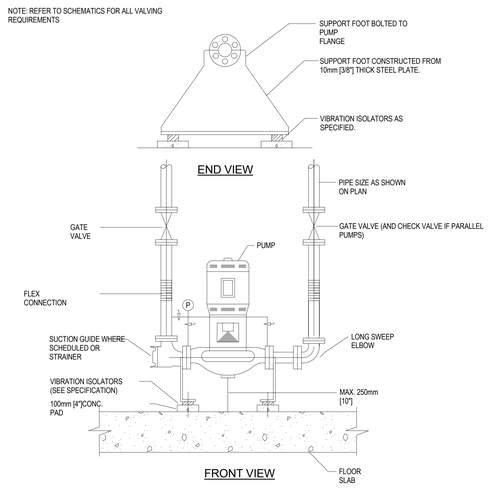
TRU DISTRICT ENERGY ANALYSIS

805 TRU Way, Kamloops, BC V2C 0C8

Title
CENTRAL PLANT LEVEL 1 AND ROOFTOP MECHANICAL PLAN AND EQUIPMENT SCHEDULES

Project No.	Sheet	Scale
115602068	1 of 7	1 : 100
Revision	Drawing No.	**M100**

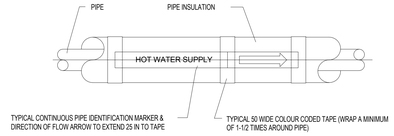
NOTE: REFER TO SCHEMATICS FOR ALL VALVING REQUIREMENTS



NOTES: - SUPPORT FOOT TO BE BOLTED TO THE FLOOR SLAB, THROUGH THE CONC. PAD NEOPRENE WASHERS AND BUSHINGS ON THE BOLTS (MIN. 2 BOLTS).

1 M101 VERTICAL IN-LINE PUMP INSTALLATION

1 : 100

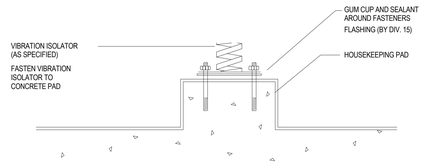


NOTES

APPLY A CONTINUOUS COATING OF CONTACT CEMENT TO THE LABEL TO ENSURE PERMANENT ADHESION REFER TO SPECIFICATION FOR COLOUR CODING OF SERVICES INSTALL AT 15000 INTERVALS (MAXIMUM) AND AT EACH CHANGE DIRECTION.

3 M101 PIPE IDENTIFICATION

1 : 100

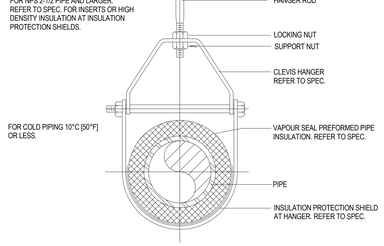


5 M101 PAD MOUNTED EQUIPMENT

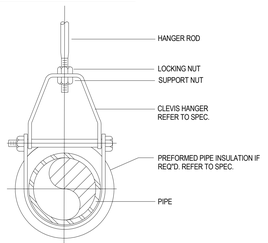
1 : 100

FOR NPS 2-1/2 PIPE AND LARGER. REFER TO SPEC. FOR INSERTS OR HIGH DENSITY INSULATION AT INSULATION PROTECTION SHIELDS.

FOR COLD PIPING 10°C [50°F] OR LESS.



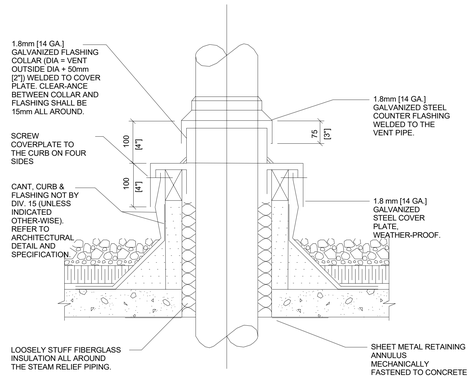
HANGER DETAIL FOR PIPING WITH VAPOUR SEALED INSULATION



HANGER DETAIL FOR INSULATED HOT PIPING UP TO NPS 3 (75mm) OR ALL SIZES OF BARE PIPE

2 M101 PIPE HANGER

1 : 100



4 M101 PIPE PENATRATION THROUGH ROOF

1 : 100

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TRU DISTRICT ENERGY ANALYSIS

805 TRU Way, Kamloops, BC V2C 0C8

Title
MECHANICAL DETAILS

Project No.	Sheet	Scale
115602068	7 of 7	1 : 100
Revision	Drawing No.	M101

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

DES-02

DES-03

DES-05

DES-06

DES-04

FUTURE

CREATIVENERGY

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9. PIPES DESIGNED TO EN13941 AND REGULATED TO ASME B31.1 AND LOCAL CODES.
10. PIPE DESIGN PARAMETERS AND SIZING PROVIDED BY OTHERS

EN253 PIPING PARAMETERS

NOMINAL DIAMETER	CARRIER PIPE (STEEL) OD [mm]	JACKET (HDPE) OD [mm]
DN200	219.1	355
DN150	168.3	280
DN100	114.3	225
DN80	88.9	180
DN65	76.1	160
DN50	60.3	140
DN40	48.3	125

TL: Xm = TRENCH LENGTH

NO.	DATE	REVISION
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0	20/11/04	PROGRESS DRAWINGS – CLASS C LEVEL OF DESIGN

PROJECT

TRU – DISTRICT HEATING NETWORK

DRAWING TITLE

OVERALL PLAN VIEW

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE 20/11/02

DRAWING NUMBER

DES-01

PLOTTED 2021-1-15
RATHCO_DTDRAWINGS_20210114.DWG
CREATED 2020-11-4

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

VERTICAL 90° BEND TYP. OF 4
DN80
TL:11m
DN80
TL:10m
90° BEND TYP. OF 2
DN80
TL:20m
PARALLEL TEE TYP. OF 2
150-80-150
DN150
TL:
19.5m
90° BEND TYP. OF 2
DN150
TL: 36m
90° BEND TYP. OF 2
DN150
TL:14m
DN150
TL:20m
ENERGY CENTRE
VERTICAL 90° BEND TYP. OF 4
PARALLEL TEE TYP. OF 2
200-150-200
DN200
TL: 3.5m TL: 7.5m
VERTICAL 90° BEND TYP. OF 4
DN200
TL:10.5m
DN200
TL: 17.5m
90° BEND TYP. OF 2
ELASTIC BEND IN PIPE DURING
INSTALLATION. R = 110m
DN200
TL: 70.5m
2C#10 AWG IN EXISTING CONDUIT (REMOTE CB TRIP)

PLOTTED 2021-1-15
RATHCO_DTDRAWINGS_20210114.DWG
CREATED 2020-11-4

CREATIVENERGY

RATHCO
YOUR UNFAIR ADVANTAGE

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0	20/11/04	PROGRESS DRAWINGS – CLASS C LEVEL OF DESIGN

PROJECT
TRU – DISTRICT HEATING NETWORK

DRAWING TITLE
DETAIL PLAN VIEW 1

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE: 20/11/02

DRAWING NUMBER
DES-02

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

DN200
TL: 69m

ELASTIC BEND IN PIPE DURING INSTALLATION. R = 110m

DN150 ISOLATION VALVE WITH VALVE STEM ACCESS AND 2 X VENTS SEE DES-07 FOR INSTALLATION DETAILS

PARALLEL TEE TYP. OF 2
200 - 150 - 200

DN150
TL: 78.5m

45° BEND TYP. OF 2

REDUCER TYP. OF 2
200-150

DN150 ISOLATION VALVE WITH VALVE STEM ACCESS AND 2 X VENTS SEE DES-07 FOR INSTALLATION DETAILS

DN150
TL: 32.5m

DN150
TL: 31m

PARALLEL TEE TYP. OF 2
150-65-150

90° BEND TYP. OF 4

DN150
TL: 30m

DN150
TL: 10.5m

DN150
TL: 26.5m

45° BEND TYP. OF 2

DN65
TL: 60.5m

DN150
TL: 33m

90° BEND TYP. OF 2

PARALLEL TEE TYP. OF 2
DN150

MH #V01B
HV MANHOLE

MH #LV01B
HV/LV MANHOLE

6-78mm2 DB2 HV POWER/SPARE
3-103mm2 DB2 NPH POWER/SPARE
9-103mm2 DB2 (HV POWER)
3-103mm2 DB2 (SPARE)

2-24mm DB2 COMMS

PB

CREATIVENERGY

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DN80	88.9	180
DN65	76.1	160
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PROJECT

TRU – DISTRICT HEATING NETWORK

DRAWING TITLE

DETAIL PLAN VIEW 2

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE: 20/11/02

DRAWING NUMBER

DES-03

PLOTTED 2021-1-15

CREATED 2020-11-4 RATHCO_DTDRAWINGS_20210114.DWG

FUTURE

DN80 TL: 23m

DN150 TL: 31.5m

REDUCER TYP. OF 2
150-100
REDUCER TYP. OF 2
100-80

VERTICAL 90° BEND TYP. OF 4

PARALLEL TEE TYP. OF 2
DN150

DN40 TL: 6m

VERTICAL 90° BEND TYP. OF 4

DN150 TL: 20m

REDUCER TYP. OF 2
DN150-DN100
DN100-DN40

DN150 TL: 25.5m

90° BEND TYP. OF 2

REDUCER TYP. OF 2
DN150 - DN100
REDUCER TYP. OF 2
DN100 - DN80

DN150 TL: 13m

PARALLEL TEE TYP. OF 2
150-100-150

DN100 TL: 18m

DN80 TL: 12m

VERTICAL 90° BEND TYP. OF 4

FUTURE

DN80 TL: 35m

DN80 TL: 7.5m

DN80 TL: 8m

90° BEND TYP. OF 2

VERTICAL 90° BEND TYP. OF 4

PARALLEL TEE TYP. OF 2
100-80-100

ELASTIC BEND IN PIPE DURING INSTALLATION. R = 57m

DN100 TL: 115m

VERTICAL 90° BEND TYP. OF 4

DN100 TL: 6m

PARALLEL TEE TYP. OF 2
DN100

DN100 TL: 58m

TO FUTURE BUILDING, SEE DES-01 FOR EXTENT

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

DN65 TL: 21.5m

VERTICAL 90° BEND TYP. OF 4

CREATIVENERGY

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EN253 PIPING PARAMETERS

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DN200	219.1	355
DN150	168.3	280
DN100	114.3	225
DN80	88.9	180
DN65	76.1	160
DN50	60.3	140
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PROJECT

TRU – DISTRICT HEATING NETWORK

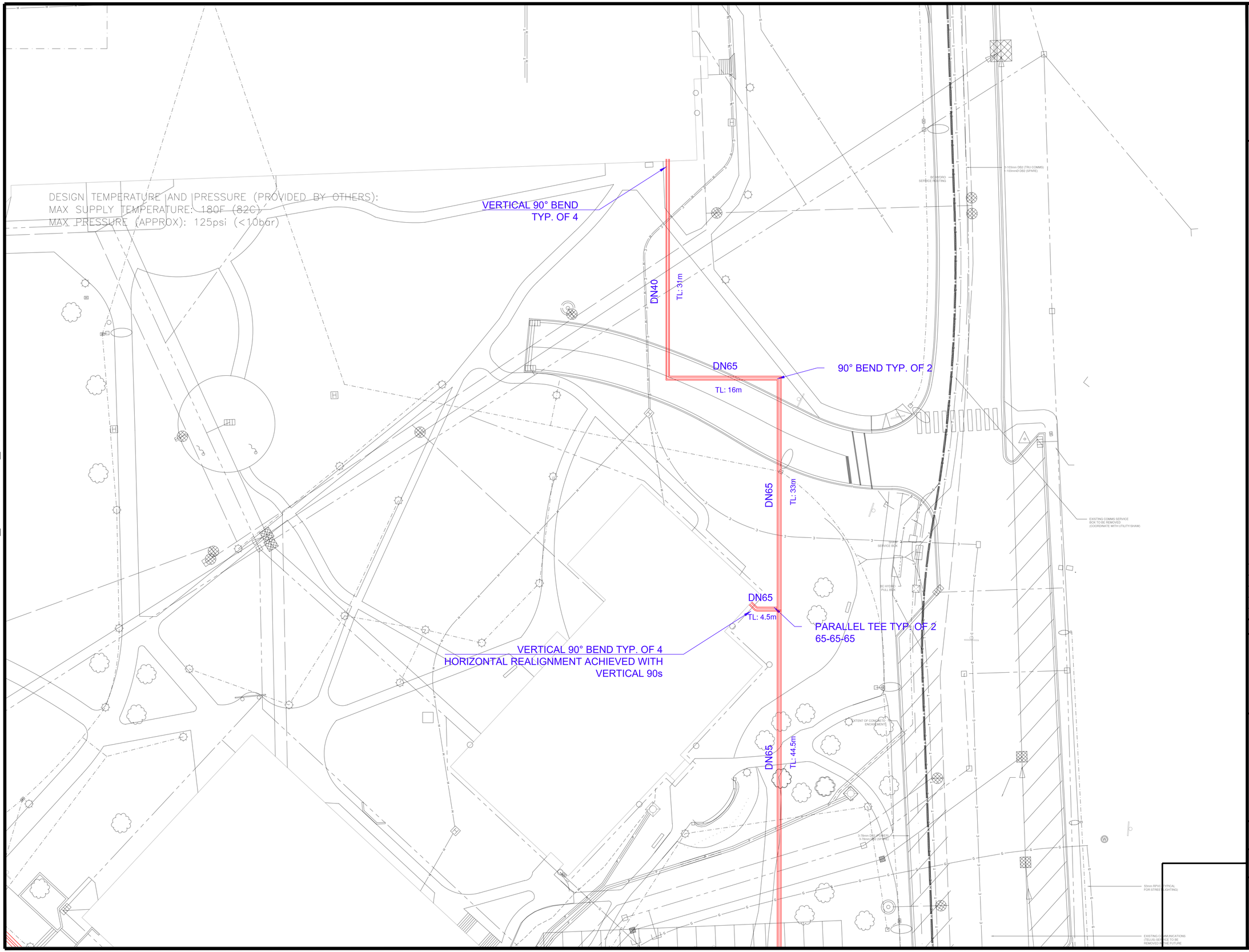
DRAWING TITLE

DETAIL PLAN VIEW 3

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE 20/11/02

DRAWING NUMBER

DES-04



PLOTTED 2021-1-15

CREATED 2020-11-4 RATHCO_DTDRAWINGS_20210114.DWG

CREATIVENERGY

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EN253 PIPING PARAMETERS		
NOMINAL DIAMETER	CARRIER PIPE (STEEL) OD [mm]	JACKET (HDPE) OD [mm]
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DN100	114.3	225
DN80	88.9	180
DN65	76.1	160
DN50	60.3	140
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PROJECT

TRU – DISTRICT HEATING NETWORK

DRAWING TITLE

DETAIL PLAN VIEW 4

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE 20/11/02

DRAWING NUMBER

DES-05

DN150
TL: 42m
VERTICAL 90° BEND TYP. OF 4
DN65
TL: 11m
DN150
PARALLEL TEE TYP. OF 2
150-65-150
TL: 2.5m
45° BEND TYP. OF 2
DN65
TL: 33m
INSTALL DN 150 VALVES AND RECIRCULATION LINES TO
ALLOW FUTURE CONNECTION
FUTURE CONNECTION LINES HIGHLIGHTED
DN150
TL: 77.5m
PARALLEL TEE TYP. OF 2
150-65-150
DN150
TL: 10.5m
DN150
TL: 19m
TL: 3m
90° BEND TYP. OF 2
DN150
TL: 8.5m
DN150
TL: 35m
TL: 3.5m
FUTURE CONNECTION

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

CREATIVENERGY

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EN253 PIPING PARAMETERS		
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DN50	60.3	140
DN40	48.3	125

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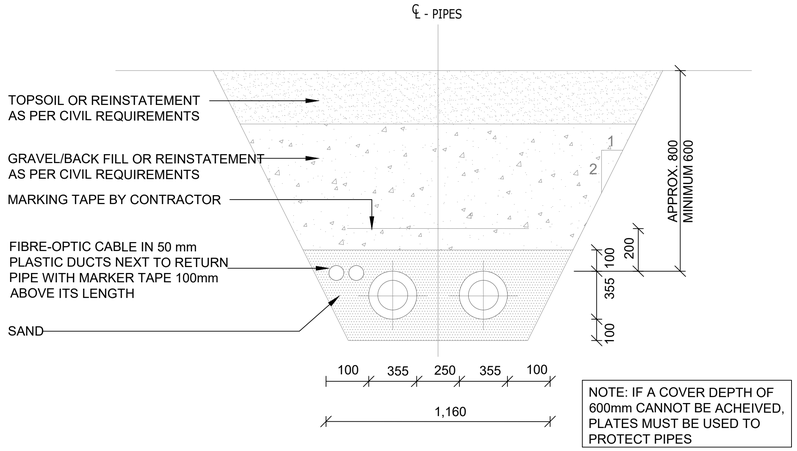
NO.	DATE	REVISION
1	21/01/15	CLASS C DESIGN DRAWINGS – NOTES UPDATED
0	20/12/02	CLASS C DESIGN DRAWINGS – REVISED ROUTING PLAN VIEW 5 ADDED

PROJECT
TRU – DISTRICT HEATING NETWORK

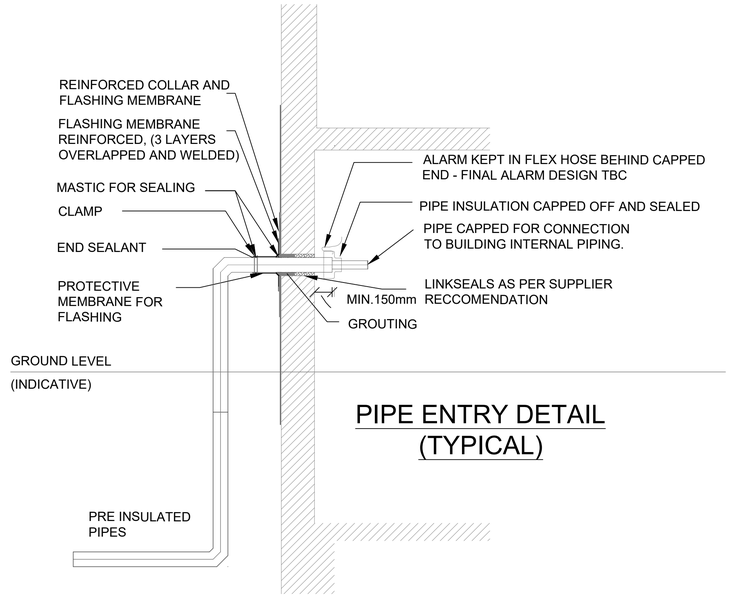
DRAWING TITLE
DETAIL PLAN VIEW 5

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE 20/11/02

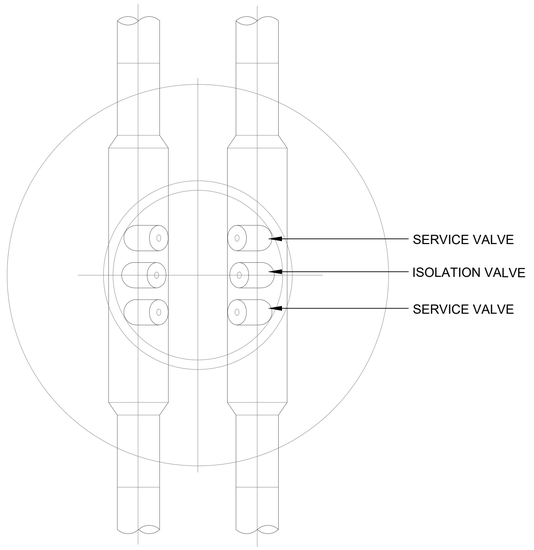
DRAWING NUMBER
DES-06



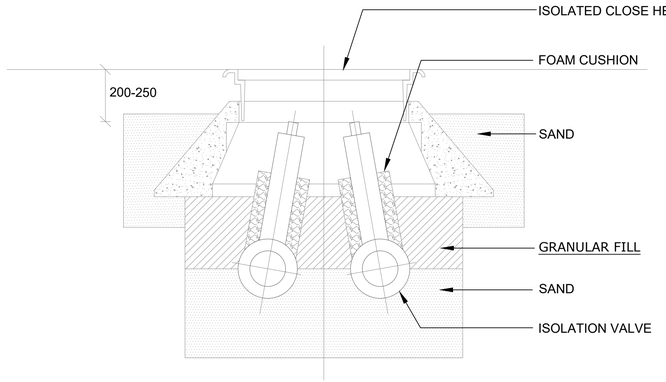
EXCAVATION PROFILE DETAIL (TYPICAL)



PIPE ENTRY DETAIL (TYPICAL)



PLAN



SECTION

VALVE ACCESS DETAIL (TYPICAL)

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

CREATIVENERGY

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11. CONDUIT SIZING PROVIDED BY OTHERS

NO.	DATE	REVISION
1	20/12/02	CLASS C DESIGN DRAWINGS - DRAWING NUMBER CHANGED
0	20/11/10	CLASS C DESIGN DRAWINGS

PROJECT

TRU - DISTRICT HEATING NETWORK

DRAWING TITLE

DETAILS

SCALE	DRAWN BY	CHECKED BY
NTS	JR	MK
		DATE 20/11/02

DRAWING NUMBER

DES-07

Appendix E

Class 3 Cost Estimate Detail

Thompson Rivers University (Kamloops) LCDES - Class 3 Cost Estimate

Prepared: Amin Hassanshahi, AScT, GSC
Senior Manager, Projects & Construction

Update: June 16, 2021

Category	Description/Location	Budget	Year
Predevelopment			
Consultant	Marketing/Communications/Website	$ 30,000	2021-2022
Management	Predevelopment Management	$ 108,000	2020-2021
		$ 138,000	
Legal			
Consultant	Term Sheet and Definitive Agreements	$ 80,000	2021-2024
Management	Agreements and Legal Management	$ 12,000	2020-2024
		$ 92,000	
CPCN / Regulatory			
Consultant	Legal Consulting for CPCN	$ 40,000	2021-2024
Regulatory	BCUC and Intervenors Cost	$ 25,000	2021-2024
Consultant	Public Engagement Support	$ 22,000	2021-2024
Consultant	Public Engagement Webpage Development	$ 3,000	2021-2024
Management	Regulatory Management	$ 62,500	2021-2024
		$ 152,500	
Energy Centre			
Engineering	Feasibility, Detailed Design, Support During Construction	$ 228,800	2020-2024
Construction	Mechanical Equipment and Material	$ 2,722,500	2023
Construction	Mechanical and Controls Works	$ 772,000	2023-2024
Construction	Electrical Works	$ 276,750	2023-2024
Management	EC Management	$ 165,000	2022-2024
		$ 4,165,050	
ETS - Buildings 1 thru 9			
Engineering	Detailed Design, Support During Construction	$ 56,000	2022-2024
Construction	Mechanical Equipment and Material	$ 205,200	2023-2024
Construction	Mechanical and Controls Works	$ 243,800	2023-2024
Construction	Electrical Works	$ 27,000	2023-2024
Management	ETS Management	$ 45,000	2022-2024
		$ 577,000	
DPS			
Engineering	Feasibility, Detailed Design, Support During Construction	$ 183,200	2020-2024
Construction	Pipe and Fittings	$ 598,000	2023-2024
Construction	Civil Works	$ 1,190,200	2023-2024
Construction	Mechancial Works	$ 709,800	2023-2024
Management	DPS Management	$ 87,000	2022-2024
		$ 2,768,200	
Total		**$ 7,892,750**	
Contingency	**20%**	**$ 1,578,550**	
Total (PST Included, GST Extra)		**$ 9,471,300**	

Appendix F

Infrastructure Agreement

INFRASTRUCTURE AGREEMENT

by and between

THOMPSON RIVERS UNIVERSITY

and

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP
by its general partner, CREATIVE ENERGY THOMPSON RIVERS GP INC.

Dated as of November 8, 2021

TABLE OF CONTENTS

INFRASTRUCTURE AGREEMENT

THIS AGREEMENT dated as of November 8, 2021

BETWEEN:

THOMPSON RIVERS UNIVERSITY, a university formed pursuant to the *Thompson Rivers University Act* (British Columbia), with an address at 805 TRU Way, Kamloops, BC V2C 0C8 ("**TRU**")

AND:

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, a limited partnership formed under the laws of British Columbia, with an address at Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1 by its general partner, Creative Energy Developments GP Ltd. ("**Creative Energy**")

WHEREAS:

A. Creative Energy is in the business of developing, constructing, operating and maintaining district energy systems and is a public utility regulated by the BCUC under the *Utilities Commission Act*;

B. Creative Energy proposes to act as the exclusive district energy provider for TRU and their campus in Kamloops, British Columbia for the provision of Thermal Energy to the Buildings (as hereinafter defined); and

C. TRU and Creative Energy entered into a memorandum of understanding dated February 21, 2020 and a term sheet dated February 22, 2021 (together, the "**Term Sheet**") with respect to the feasibility and initial design of an energy production facility and distribution system in respect of the Site.

NOW THEREFORE in consideration of the mutual agreements set out below and for other good and valuable consideration (the receipt and sufficiency of which are acknowledged by each Party), the Parties covenant and agree with each other as follows:

1. INTERPRETATION

1.1 Definitions

In this Agreement, the following terms have the meanings set out below:

"**Affiliate**" has the meaning ascribed to it in the *Business Corporations Act* (British Columbia) and, in the case of a limited partnership, includes (i) a company affiliated with the general partner or any limited partner of such limited partnership and (ii) another limited partnership with a general partner or limited partner that is affiliated with the general partner or any limited partner of the first limited partnership.

"**Agreement Date**" means the date of this Agreement first set out above.

"**BCUC**" means the British Columbia Utilities Commission or any successor thereto.

"**BCUC CPCN Application**" means an application to the BCUC for a CPCN.

"**Building Permit**" means the building permit to be obtained from the City of Kamloops.

"**Building Systems**" means the systems of heat and hot water delivery equipment including water pipes, heat pumps and related equipment, components and controls located within the Buildings and connected to the DES Assets at the Demarcation Points and used for distributing the Energy Services within the Buildings;

"**Buildings**" means the current and proposed buildings on the Site that will be connected to the DES Assets, being namely the buildings named on the Site Map set out in Schedule 1 as follows: Old Main, Ken Lepin Building, SOBE Management Building (proposed), Old Library and Administration Building, BC Centre for Open Learning, Culinary Arts Building, Clock Tower Building, Gymnasium, International Building and Energy Centre Building, together with any other buildings connected to the DES Assets.

"**Business Day**" means any day except a Saturday, Sunday, statutory holiday in the Province of British Columbia or any other day on which public offices are generally not open for business in Kamloops, British Columbia.

"**Changes of Law**" means any change in, or the introduction of new, applicable Laws, industry standards or conditions affecting the performance, operation, maintenance or routine repair of the DES Assets.

"**City**" means the City of Kamloops.

"**Contaminated Site**" has the meaning ascribed to it in the *Environmental Management Act* (British Columbia).

"**Contaminants**" means any radioactive materials, asbestos materials, urea formaldehyde, underground or above ground tanks, pollutants, contaminants, deleterious substances, dangerous substances or goods, hazardous, corrosive, or toxic substances, hazardous waste, waste, pesticides, defoliants, or any other solid, liquid, gas, vapour, odour, heat, sound, vibration, radiation, or combination of any of them, the storage, manufacture, handling, disposal, treatment, generation, use, transport, remediation, or Release into the Environment of which is now or hereafter prohibited, controlled, or regulated under Environmental Laws.

"**Contribution Agreement**" means the agreement between TRU and Creative Energy, substantially in the form attached as Schedule 8, which provides for all payments to be made by Creative Energy to TRU in respect of the Energy Centre Room and the TRU-Supplied Utilities.

"**CPCN**" means a certificate of public convenience and necessity granted by the BCUC to Creative Energy (or another member of the Creative Energy Group) pursuant to the *Utilities Commission Act* authorizing Creative Energy (or another member of the Creative Energy Group) to construct and operate the DES Assets.

"**Creative Energy Group**" means Creative Energy and its Affiliates and their respective officers, directors, shareholders, employees, contractors, agents, successors and permitted assigns.

"**Creative Energy Default**" has the meaning ascribed to it in Section 9.2(a).

"**Creative Energy Users**" means Creative Energy and its contractors, subcontractors, agents, employees and representatives.

"**Customer Service Agreement**" means the Customer Service Agreement between TRU and Creative Energy to be executed and delivered in respect of the provision of Energy Services to the Buildings, in the form attached hereto as Schedule 9, as approved by the BCUC from time to time, and which Customer Service Agreement does not include the Tariff.

"**Definitive Agreements**" means this Agreement, the Customer Service Agreement, the SRW and the Contribution Agreement.

"**Demarcation Points**" means the points at which the pipes forming part of the Building Systems connect to the DES Assets, at each energy transfer station in each of the Buildings, as set out on the Site Map set out in Schedule 1.

"**DES**" means a temporary or permanent central energy plant for the generation of Thermal Energy located primarily in the Energy Centre Room, and including any or all of the following: heat pumps, natural gas boilers, heat recovery equipment and all associated mechanical and electrical interconnections, control systems and structures.

"**DES Assets**" means the thermal energy system consisting of, *inter alia*, pipes, heat pumps, boilers, meters and related components, equipment and controls used for generating, metering and distributing the Energy Services to the Demarcation Points, and including the DES, the Distribution System and the energy transfer station in each of the Buildings, and all additions thereto and replacements thereof, but specifically excluding all Building Systems, as further set out in Schedule 2;

"**DES Costs**" means certain costs incurred or expected to be incurred by Creative Energy in respect of the DES Assets, as identified in Schedule 7.

"**DES Spaces**" means all spaces where the DES Assets are located, including the Energy Centre Room and all ancillary spaces as further set out in Schedule 2.

"**Distribution System**" means, collectively, the system of pipes, fittings and ancillary components and equipment supplying Energy Services to, *inter alia*, the Demarcation Points;

"**Energy Centre Building**" means the building marked as such on the Site Map set out in Schedule 1.

"**Energy Centre Room**" means the energy centre room area located within the Energy Centre Building, which from time to time contains the DES or a portion thereof.

"**Energy Services**" means the heating service via hot water, being space and domestic hot water heating.

"**Environment**" includes the air (including all layers of the atmosphere), land (including soil, sediment deposited on land, fill, lands submerged under water, buildings, and improvements), water (including oceans, lakes, rivers, streams, groundwater, and surface water), and all other external conditions and influences under which humans, animals, and plants live or are developed and "**Environmental**" has a corresponding meaning.

"**Environmental Laws**" means any and all applicable statutes, laws, regulations, orders, bylaws, standards, guidelines, protocols, permits, and other lawful requirements of any Governmental Authority now or hereafter in force relating to or in respect of the Environment or its protection, environmental assessment, health, occupational health and safety, protection of any form of plant or animal life, or transportation of dangerous goods, including the principles of common law and equity.

"**Force Majeure**" has the meaning ascribed to it in Section 15.2.

"**Functional**" means, in relation to the DES Assets:

(a) has been constructed and installed in accordance with Sections 4.1 and 4.2 and the detailed design prepared by Creative Energy, and that such detailed design meets the Load Requirements set out in Schedule 2, subject to any changes to such Load Requirements pursuant to Section 4.3;

(b) has satisfied the applicable commissioning testing and has been commissioned in accordance with industry practice; and

(c) is otherwise capable of performing the function for which it is designed.

"**Governmental Authority**" means any federal, provincial, regional, municipal, local or other government, governmental or public department, court, tribunal, arbitral body, commission, board, bureau or agency and any subdivision, agent, commission, board or authority thereof, including the BCUC and the City.

"**Intellectual Property**" has the meaning ascribed to it in Section 4.5.

"**Laws**" means any law, statute, regulation, bylaw, Permit, order or legal requirement of or issued by or under the direction or authority of any Governmental Authority having jurisdiction.

"**Load Requirements**" means the requirements for the output of the DES Assets to the Buildings, as set out in Schedule 2.

"**Material Permits**" means the Permits described in Schedule 5.

"**Party**" means either TRU or Creative Energy and "**Parties**" means both of them.

"**Permits**" means all permits, licences, certificates, approvals, authorizations, consents and the like required to be issued from any Governmental Authority in respect of the DES Assets (including its design, construction and installation) and the supply of Thermal Energy or the provision of Thermal Energy services.

"**Person**" means an individual or his or her legal personal representative, an unincorporated organization or association, or a corporation, partnership, trust, trustee, syndicate, joint venture, limited liability company, union, Governmental Authority or other entity or organization.

"**Release**" includes any release, spill, leak, pumping, pouring, emission, emptying or discharge, injection, escape, leaching, migration, disposal, or dumping.

"**Residents**" mean the residential and commercial owners or occupiers of units in the Site.

"**Site**" refers to those parts of the lands owned or controlled by TRU at 805 TRU Way, Kamloops, British Columbia where the Energy Centre Building and Distribution Systems will be constructed, as more particularly described in Schedule 1.

"**Site Timeline**" means the schedule of target dates set out in Schedule 4.

"**Service Commencement Date**" means the date on which Thermal Energy is first transferred between the DES Assets and the Buildings.

"**SRW**" means a statutory right of way agreement, substantially in the form attached as Schedule 6, which permits the Creative Energy Users access to the Energy Centre Room and improvements thereon for the purpose of performing Creative Energy's obligations under this Agreement, including the installation, operation, maintenance and removal of the DES Assets.

"**Target Date**" has the meaning ascribed thereto in Schedule 4.

"**Tariff**" has the meaning set out in the Customer Service Agreement.

"**Tenants**" means the residential and commercial tenants and licensees of premises in the Site.

"**Term Sheet**" has the meaning ascribed to in Recital C.

"**Thermal Energy**" means thermal energy for space heating, and for domestic hot water heating.

"**TRU Default**" has the meaning ascribed to it in Section 9.3(a).

"**TRU Group**" means TRU and its Affiliates and its and their respective officers, directors, governors, shareholders, employees, contractors, agents, successors and permitted assigns.

"**TRU-Supplied Utilities**" means the utilities and services set out in Schedule 3.

"**Utilities Commission Act**" means the *Utilities Commission Act* (British Columbia), as it may be amended or supplemented from time to time and includes any legislation enacted in substitution therefor.

1.2 Interpretation

Unless otherwise expressly provided, in this Agreement:

(a) "this Agreement" means this Agreement as it may from time to time be supplemented or amended by the Parties, and includes the attached Schedules;

(b) all references in this Agreement to a designated "Article", "Section" or "Schedule" is to the designated Article or Section of or Schedule to this Agreement;

(c) the words "herein", "hereof" and "hereunder" and other words of similar import refer to this Agreement as a whole and not to any particular portion hereof;

(d) the headings are for convenience only, do not form a part of this Agreement and are not intended

to interpret, define or limit the scope, extent or intent of this Agreement or any provision hereof;

(e) the singular of any term includes the plural, and vice versa; the use of any term is equally applicable to any gender and, where applicable, a body corporate;

(f) the word "including" is not limiting whether or not non-limiting language (such as "without limitation" or "but not limited to" or words of similar import) is used with reference thereto;

(g) references to time of day or date mean the local time or date in Vancouver, British Columbia; and

(h) all references to amounts of money mean lawful currency of Canada.

1.3 Governing Law

This Agreement and each of the documents contemplated by or delivered under or in connection with this Agreement are governed exclusively by, and are to be enforced, construed and interpreted exclusively in accordance with, the laws of the Province of British Columbia, without giving effect to conflicts of laws principles or provisions.

1.4 Severability

Each provision of this Agreement is severable. If any provision of this Agreement is or becomes illegal, invalid or unenforceable in any jurisdiction, the illegality, invalidity or unenforceability of that provision will not affect:

(a) the legality, validity or enforceability of the remaining provisions of this Agreement; or

(b) the legality, validity or enforceability of that provision in any other jurisdiction,

except that if:

(c) on the reasonable construction of this Agreement as a whole, the applicability of the other provision presumes the validity and enforceability of the particular provision, the other provision will be deemed also to be invalid or unenforceable; and

(d) as a result of the determination by a court of competent jurisdiction that any part of this Agreement is unenforceable or invalid and, as a result of this section, the basic intentions of the Parties in this Agreement are entirely frustrated, the Parties will use all reasonable efforts to amend, supplement or otherwise vary this Agreement to confirm their mutual intention in entering into this Agreement.

1.5 Time of Essence

Time is of the essence of this Agreement.

1.6 Statutory References

Unless otherwise specified, each reference to a statute is deemed to be a reference to that statute and to the regulations made under that statute as amended or re-enacted from time to time.

1.7 Schedules

The following are the Schedules attached hereto and incorporated by reference and deemed to be part hereof:

Schedule		**Description**
Schedule 1	-	Site Description and Site Map
Schedule 2	-	Design Loads and Components of the DES Assets and DES Spaces
Schedule 3	-	TRU-Supplied Utilities

Schedule 4	-	Site Timeline
Schedule 5	-	Material Permits
Schedule 6	-	Form of SRW
Schedule 7	-	DES Costs
Schedule 8	-	Contribution Agreement
Schedule 9	-	Customer Service Agreement

2. TRU OBLIGATIONS

2.1 TRU Obligations

TRU will:

(a) Provide an estimate of the Load Requirements, as set out in Schedule 2;

(b) Provide the SRW, as further set out in Section 7.3;

(c) Forthwith following the approval by the BCUC of the later of

(i) the form of Customer Service Agreement; and

(ii) the Tariff,

TRU will execute and deliver a Customer Service Agreement in respect of the Buildings to Creative Energy in such form as is so approved by the BCUC, with the information relating to the Tariff inserted therein;

(d) Arrange for or provide to the DES Assets the TRU-Supplied Utilities, as further set out in Section 2.2;

(e) Provide Creative Energy with plans and drawings for each Building and for the Energy Centre Room by no later than the corresponding date as set out in Schedule 4 and all updates and as-builts thereto concurrently with receipt thereof;

(f) Undertake the necessary building side retrofits and all related construction work at the Site in accordance with this Agreement to ensure building connectivity and compatibility with the DES Assets in accordance with the Site Timeline;

(g) During the construction of the DES Assets, provide:

(i) Traffic control signage and traffic management;

(ii) Appropriate areas for Creative Energy to store:

A. material such as pre-insulated pipes, pipes, fittings, equipment, machinery, tools;

B. excavated spoils material;

C. backfill material; and

D. contractors' office trailers; and

(iii) Temporary power for the Energy Center Building during the construction of the DES Assets; and

(h) Pay the rates contemplated in this Agreement and the related Customer Service Agreement to which it is a party.

2.2 TRU-Supplied Utilities

(a) TRU will:

(i) Provide Creative Energy with all required connections to the TRU-Supplied Utilities, at the specifications set forth in Schedule 3;

(ii) For those services where it is customary and reasonable to do so, provide meters to ensure that Creative Energy will have a separate meter for each third-party utility service and each is metered distinctly from consumption by TRU or any other occupant of the Building or Site.

(b) Consumption costs for the TRU-Supplied Utilities will be billed by TRU to Creative Energy based on submetered consumption, unless Creative Energy has entered into a contract for the supply of utilities directly with the third-party utility service provider, as further set out in the Contribution Agreement.

2.3 No Alternate System or Service Provider

(a) TRU grants Creative Energy an exclusive right to provide Energy Services to the Buildings on the Site, as contemplated herein.

(b) The powers and rights granted to Creative Energy under this Agreement are exclusive to Creative Energy and TRU will not perform, or allow any other Person (except subcontractors and agents of Creative Energy) to perform on its behalf, any work in relation to or to construct, install or operate the DES Assets or any other system that would provide Thermal Energy to any Building on the Site.

2.4 Incorporating Other Sources of Energy

If either Party identifies options for incorporating other sources of energy or other energy supply systems into the DES Assets, that Party will first raise such option with the other Party, to determine whether such source or system can be incorporated on mutually acceptable terms, subject to applicable approval by any Governmental Authority.

2.5 Delay by TRU

If the provision of Energy Services to one or more of the Buildings has not occurred within 90 days after the Target Date (the "**Deadline**"), TRU will commence paying Creative Energy the rates charged by Creative Energy pursuant to the Customer Service Agreement with effect as of the Deadline as if Creative Energy had commenced providing Energy Services to all of the Buildings as of the Deadline. TRU will pay such rates whether or not it has signed a Customer Service Agreement in respect of the Buildings by the Deadline. Notwithstanding the foregoing, TRU will not be required to pay such rates if Creative Energy is the cause of the delay (in which case Creative Energy will use commercially reasonable efforts to commence providing Energy Services as soon as possible).

3. ENERGY CENTRE ROOM

TRU will provide the Energy Centre Room, including all costs associated with the design and construction of the Energy Centre Room, which will be suitable to house the DES in accordance with the design specifications set out in Schedule 2, for the purpose of permitting Creative Energy to perform Creative Energy's obligations under this Agreement. Prior to commencement of construction, TRU will provide its plans and specifications in respect of such building to Creative Energy for its review and approval, such approval not to be unreasonably withheld. Within 30 Business Days after such plans and specifications are delivered to Creative Energy, Creative Energy will provide its written approval or, alternatively, its comments in respect of such plans and specifications. If Creative Energy provides

comments to TRU, TRU will, to the greatest extent possible (acting commercially reasonably), revise such plans and specifications to reflect any reasonable requirements of Creative Energy. If no comments are provided within such 30 Business Day period, the approval of Creative Energy will be deemed to have been given.

TRU will provide acoustic louvers or equivalent equipment that is approved by an acoustic professional engineer for the Energy Centre Room for reducing any noise. TRU will retain and pay all fees and applicable taxes for the acoustic professional engineer, any testing for acoustic issues and for the provision and installation of such equipment, including for the implementation of any comments or specifications provided by Creative Energy in respect of same, acting reasonably. Creative Energy will design and construct each air-source heat pump forming part of the DES Assets located on the roof area within the Energy Centre Room such that the noise output from the operations of each such piece of equipment does not exceed 105.38 dB(A), and shall provide such specifications relating to the DES Assets as may be reasonably required by TRU in connection with the sound attenuation efforts by TRU in respect of the Energy Centre Building.

4. CREATIVE ENERGY'S OBLIGATIONS

4.1 Design, Engineering, and Construction of the DES Assets

Creative Energy will, at its sole cost, design, engineer, permit, procure, test, inspect, construct, install, commission, operate, maintain, repair and replace the DES Assets in a good and workmanlike and professional manner, consistent with industry standards and with the Load Requirements, and in compliance with all applicable Laws, all in accordance with this Agreement and in accordance with the Site Timeline, and will directly engage all such personnel required for same.

4.2 Specifications and Load Requirements

Creative Energy will be solely responsible for developing and finalizing the planning, design and engineering specifications for the DES Assets and will provide TRU with schematic, detailed and construction drawings for equipment within the Energy Centre Room and any ancillary spaces. If there is any dispute between the Parties with respect to the specifications of the DES Assets, such dispute will be resolved in accordance with Section 16.

4.3 Amendments to Design and Specifications

The Parties acknowledge that, during the design and construction phases of the DES Assets, there may be additions and alterations to the design, scope and specifications for the DES Assets, including as a result of a Force Majeure event or unforeseen geotechnical issues or site conditions, all of which such changes shall be in the sole and absolute discretion of Creative Energy, provided that the final design of the DES Assets shall meet the Load Requirements.

4.4 Ownership of the DES Assets

Notwithstanding any degree of annexation or affixation, or rule of law or equity to the contrary, TRU acknowledges and agrees that all components of the DES Assets and all additions or extensions thereto will be and remain the property of and vest in Creative Energy. Subject to the terms and conditions of this Agreement and the Customer Service Agreement, Creative Energy will repair, maintain and replace the DES Assets from time to time at its own cost to keep the same in good working order.

4.5 Ownership of Intellectual Property

TRU acknowledges and agrees that Creative Energy will own all designs, copyrights, materials, drawings, plans, specifications, reports and all other work product prepared by Creative Energy or its sub-consultants in connection with the DES Assets (the "**Intellectual Property**").

4.6 Delivery of Plans and Specifications re: DES Interface

Creative Energy will deliver to TRU, in an electronic format acceptable to TRU, copies of all drawings,

designs, plans, specifications and related information prepared by or on behalf of Creative Energy pertaining to the interface between the Buildings and the DES Assets (at the point of demarcation for each of the Buildings) and the Distribution System.

4.7 Permits and Authorizations

Creative Energy will obtain and maintain all requisite Permits for the construction and installation of the DES Assets and for the operation of the DES Assets, as applicable, including without limitation the Material Permits which are Creative Energy's responsibility under Schedule 5. Without limiting the generality of the foregoing, Creative Energy acknowledges that it will assume sole responsibility for applying to the City, the BCUC, or any relevant Governmental Authority to obtain the Permits and approvals necessary to carry out the requirements of this Agreement and deliver Energy Services.

4.8 Grants

Any grants received by Creative Energy from any Governmental Authority or non-Governmental Authority that may be derived from a reduction in costs for consumption of heat and hot water by the Buildings will be applied by Creative Energy for the sole benefit of TRU or as otherwise directed by the BCUC.

4.9 Signage

Creative Energy will not erect, affix, install or maintain any signs, lettering, identification, promotional or other written materials on the Site or any improvements thereon unless Creative Energy complies with all applicable laws in connection therewith and obtains the prior written consent of TRU, which consent will not be unreasonably withheld.

4.10 Revenue Meters

(a) Creative Energy will install, own, operate and maintain one or more revenue meters used to measure the provision of Energy Services by Creative Energy to the Buildings. The revenue meters will meet Measurement Canada requirements. TRU will have the right to access, view and assess all data, and test its accuracy. The revenue meters will measure water flow and temperature differential between incoming and outgoing water.

(b) TRU, at its discretion, will install, own, operate and maintain any sub-meters used by TRU and its successors to measure individual consumption of Building tenants. Creative Energy will provide consultation and input on TRU's sub-metering plan, as reasonably requested by TRU.

4.11 TRU Contribution

TRU may elect to make a mutually agreed upon capital contribution toward the DES Assets to reduce depreciation and operating costs.

4.12 Project Management

(a) Creative Energy will directly engage a designer for the DES Assets and Creative Energy will be responsible for the construction and installation of the DES Assets with a Creative Energy Project Manager onsite.

(b) Creative Energy will engage the contractor for the DES Assets who will report directly to the Creative Energy Project Manager for supervision and coordinate with TRU personnel or contractor for general coordination and safety protocols. For certainty, TRU (or its general contractor) is responsible for coordination, scheduling and project management of the construction and completion of the Buildings. Creative Energy will coordinate and communicate with TRU regularly as it relates to construction progress.

5. COOPERATION AND COORDINATION

The Parties will cooperate and coordinate with each other and with any applicable Governmental Authority to permit each Party to perform its obligations under this Agreement. Without limiting the generality of the foregoing:

(a) TRU will work and cooperate with Creative Energy as may be reasonably required to, at Creative Energy's sole cost:

(i) secure from the City and any third parties all property access rights required pursuant to this Agreement; and

(ii) apply to the City and other applicable Governmental Authorities for all exemptions, reductions and other relief from property taxes related to the DES Assets as may be available from time to time; and

(b) the Parties will work and cooperate with each other as may reasonably be required to:

(i) meet the Site Timeline, as it may be amended from time to time;

(ii) obtain and maintain Permits, including Material Permits; and

(iii) apply to the City and other applicable Governmental Authorities for all exemptions, reductions and other relief from property taxes related to the DES Assets as may be available from time to time.

6. BCUC REGULATION

6.1 Regulation as Public Utility

Creative Energy, in connection with the Site, will be a public utility under the Utilities Commission Act, regulated by and under the oversight of the BCUC, and, notwithstanding any other provision of this Agreement, Creative Energy will comply with all directives and orders of the BCUC and regulatory requirements set out in the Utilities Commission Act and the regulations thereunder.

6.2 CPCN Application

Without limiting the generality of Section 6.1, Creative Energy will be responsible for preparing and submitting to the BCUC application(s) for one or more CPCNs as required and for approval of the rates for Energy Services for the DES.

7. ACCESS TO LANDS

7.1 Access Rights

TRU will grant to Creative Energy and its subcontractors, agents, employees and representatives, by way of licenses, recorded rights of way, easements or other agreements, and for nominal consideration, non-exclusive access to, on, over and under the Site or portions thereof as reasonably required so that Creative Energy may perform its obligations under this Agreement and the Customer Service Agreement. In addition, TRU will use reasonable efforts to cause the City to grant, at Creative Energy's sole cost, to Creative Energy and its subcontractors, agents, employees and representatives, by licenses, recorded rights of way, easements or other agreements, and for nominal consideration, non-exclusive access to, on, over and under any part of the Site (and any other lands) owned by the City from time to time, as may be required so that Creative Energy may perform its obligations under this Agreement and the Customer Service Agreement.

7.2 Contribution Agreement

Concurrently with the execution and delivery of this Agreement, TRU and Creative Energy will execute and deliver the Contribution Agreement.

7.3 Rights of Way

Within 5 days following the satisfaction of the condition precedent set out in Section 8(b)(iv), and in any event prior to the satisfaction of the condition precedent set out in Section 8(a)(iii), TRU will execute and deliver the SRW in favour of the general partner of Creative Energy. TRU will ensure that the SRW and any other right of way or registrable interest granted to Creative Energy pursuant to this Section 7 are in priority to any financial charges.

7.4 Property Taxes

If property and/or municipal taxes are owing in respect of the DES Assets or Creative Energy's ownership thereof, Creative Energy's use or occupation of any portion of the Site or in respect of any access rights granted by TRU or the City in connection therewith, Creative Energy will be required to pay same to the City or otherwise be responsible therefor.

8. CONDITIONS PRECEDENT

(a) The obligations of Creative Energy pursuant to this Agreement, other than the obligations in Sections 4.1 (relating to design and engineering only), 5(b), 17.1 and 17.2, which will commence on the Agreement Date, are subject to the following conditions:

(i) the board of directors of Creative Energy approving the terms and conditions of this Agreement on or before the date that is 30 days following the Agreement Date, or such other date the Parties agree to in writing;

(ii) the BCUC CPCN Application will have been submitted to the BCUC on or before the date that is 30 days following the Agreement Date, or such other date the Parties agree to in writing; and

(iii) a decision will have been issued by the BCUC approving the BCUC CPCN Application on terms and subject to such conditions as are acceptable to Creative Energy, and such decision will have been issued on or before the date that is 18 months following the date the BCUC CPCN Application is submitted to the BCUC, or such other date the Parties agree to in writing or as extended by Creative Energy by one period of up to three months to a total of 21 months following the date the BCUC CPCN Application is submitted to the BCUC.

Creative Energy is not entitled to benefit from a condition precedent to the extent that it has caused a delay in the satisfaction thereof. If such conditions are not satisfied on or before the applicable dates set out above, then unless the Parties agree otherwise in writing, Creative Energy will have a right to terminate this Agreement on written notice to TRU.

(b) The obligations of TRU pursuant to this Agreement, other than the obligations in Sections 5(b), 17.1 and 17.2, which will commence on the Agreement Date, are subject to the following conditions:

(i) the Board of Governors of TRU approving the terms and conditions of this Agreement on or before the date that is 30 days following the Agreement Date, or such other date the Parties agree to in writing;

(ii) the BCUC CPCN Application will have been submitted to the BCUC on or before the date that is 30 days following the Agreement Date, or such other date the Parties agree to in writing;

(iii) a decision will have been issued by the BCUC approving the BCUC CPCN Application, and if any conditions to such decision require any amendments to the Definitive Agreements, such amendments are acceptable to TRU, and such decision will have been issued on or before the date that is 18 months following the date the BCUC CPCN Application is submitted to the BCUC, or such other date the Parties agree to in writing

or as extended by Creative Energy by one period of up to three months to a total of 21 months following the date the BCUC CPCN Application is submitted to the BCUC;

(iv) the Ministry of Advanced Education and Skills Training approving, on or before the date that is 6 months following the Agreement Date, the grant of the Statutory Right of Way by TRU; and

(v) the BCUC approving, on or before the date that is 18 months following the Agreement Date, TRU's application for an order pursuant to section 88(3) of *Utilities Commission Act* (the "Act") exempting TRU from regulation as a public utility under the Act in respect of TRU's resale of electricity and natural gas to Creative Energy.

TRU is not entitled to benefit from the foregoing condition precedent to the extent that it has caused a delay in the satisfaction thereof. If such condition is not satisfied on or before the applicable date set out above, then unless the Parties agree otherwise in writing, TRU will have a right to terminate this Agreement on written notice to Creative Energy.

9. TERMINATION

9.1 Termination Events

This Agreement may be terminated:

(a) by mutual written agreement of the Parties;

(b) by Creative Energy on written notice to TRU:

(i) if any of the conditions contained in Section 8(a) have not been fulfilled or waived by Creative Energy by the respective deadlines specified therein; or

(ii) at any time during a period of 30 days following the date the BCUC issues its decision in respect of the BCUC CPCN Application if the terms and conditions on which the BCUC approves the BCUC CPCN Application render uneconomic Creative Energy's continued involvement in the implementation and operation of the DES Assets (as determined by Creative Energy, acting reasonably) by reference to the approvals requested in the BCUC CPCN Application;

(c) by TRU on written notice to Creative Energy if any of the conditions contained in Section 8(b) have not been fulfilled or waived by TRU by the respective deadlines specified therein; or

(d) by the party that receives written notice from the other party invoking Force Majeure, but only if the Force Majeure event or occurrence is not remedied within 365 days after such notice and the receiving party delivers written notice of termination to the other party prior to the Force Majeure event or occurrence having been remedied.

9.2 Termination for Creative Energy Default

(a) Creative Energy will be in default under this Agreement (a "**Creative Energy Default**") if:

(i) it passes a resolution for its winding-up or dissolution and its right, title and interest in this Agreement are not assigned to another entity, or it is adjudged bankrupt or insolvent by a court of competent jurisdiction, commences or consents to the institution of bankruptcy proceedings, proposes a compromise or an arrangement, files any petition seeking reorganization, arrangement, composition, liquidation or similar relief for itself, has a receiver or a receiver-manager appointed with respect to its affairs, or makes a general assignment for the benefit of its creditors under any Law relating to bankruptcy, insolvency or other relief for or against debtors generally;

(ii) it is in breach of any material term, covenant, agreement, condition or obligation under this Agreement (including without limitation any failure to achieve a milestone set out in

the Site Timeline within 60 days following the corresponding target date), or it is in breach of multiple terms, covenants, agreements, conditions or obligations under this Agreement which in the aggregate are material, and fails to cure such default within 30 days after receipt of written notice thereof from TRU or, if such default is not capable of being cured within such 30 day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from TRU or, having so commenced, fails to diligently pursue the curing of such default until cured; or

(iii) it is in breach of any material term, covenant, agreement, condition or obligation under any other material agreement between the Parties in respect of the Site (including without limitation the Customer Service Agreement, the Statutory Right of Way Agreement or the Contribution Agreement entered into between Creative Energy and TRU) or it is in breach of multiple terms, covenants, agreements, conditions or obligations thereunder which in the aggregate are material, and fails to cure such default within 30 days after receipt of written notice thereof from TRU or, if such default is not capable of being cured within such 30 day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from TRU, or, having so commenced, fails to diligently pursue the curing of such default until cured.

(b) In the event of a Creative Energy Default, TRU may at its option and without liability therefor or prejudice to any other right or remedy it may have, terminate this Agreement by written notice to Creative Energy.

9.3 Termination for TRU Default

(a) TRU will be in default under this Agreement (a "**TRU Default**") if:

(i) it passes a resolution for its winding-up or dissolution and its right, title and interest in this Agreement are not assigned to another entity, or it is adjudged bankrupt or insolvent by a court of competent jurisdiction, commences or consents to the institution of bankruptcy proceedings, proposes a compromise or an arrangement, files any petition seeking reorganization, arrangement, composition, liquidation or similar relief for itself, has a receiver or a receiver-manager appointed with respect to its affairs, or makes a general assignment for the benefit of its creditors under any Law relating to bankruptcy, insolvency or other relief for or against debtors generally;

(ii) it is in breach of a material term, covenant, agreement, condition or obligation under this Agreement (including without limitation any failure to achieve a milestone set out in the Site Timeline within 60 days following the corresponding target date), or it is in breach of multiple terms, covenants, agreements, conditions or obligations under this Agreement which in the aggregate are material, and fails to cure such default within 30 days after receipt of written notice thereof from Creative Energy or, if such default is not capable of being cured within such 30 day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from Creative Energy or, having so commenced, fails to diligently pursue the curing of such default until cured;

(iii) it is in breach of any material term, covenant, agreement, condition or obligation under any other agreement between the Parties in respect of the Site or it is in breach of multiple terms, covenants, agreements, conditions or obligations thereunder which in the aggregate are material, and fails to cure such default within 30 days after receipt of written notice thereof from Creative Energy or, if such default is not capable of being cured within such 30 day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from Creative Energy, or, having so commenced, fails to diligently pursue the curing of such default until cured.

(b) In the event of a TRU Default, Creative Energy may at its option and without liability therefor or prejudice to any other right or remedy it may have, terminate this Agreement by written notice to TRU.

9.4 Payment of Amounts to Creative Energy Upon Termination

If this Agreement is terminated pursuant to Section 9.3, or if the condition precedent in Section 8(b)(iv) is not waived or declared satisfied, then Creative Energy may deliver to TRU an invoice for the unamortized portion of the DES Costs reasonably incurred by Creative Energy in respect of the DES Assets up to the date of termination and that will not be recovered under the Customer Service Agreement, to a maximum of $400,000 (inclusive of applicable taxes), and TRU will, without prejudice to any other right or remedy Creative Energy may have, pay such invoice within 60 days after its delivery by Creative Energy; provided, however, that Creative Energy will, on an ongoing basis, make its best efforts to mitigate its damages and recover such DES Costs by other means (for example, by making energy available to other developments) and the amount payable by TRU to Creative Energy will be reduced (or reimbursed to TRU if already paid) accordingly.

10. ENVIRONMENTAL MATTERS

10.1 TRU Environmental Covenants

(a) TRU will comply with Environmental Laws in its use and occupancy of the Site and will use commercially reasonable efforts to cause its tenants, contractors, subcontractors and other occupants and users of the Site (excluding Creative Energy and any member of the Creative Energy Group and those for whom they are responsible in law) to comply with Environmental Laws in their respective use and occupancy of the Site. Without limiting the generality of the foregoing, TRU will not, except in compliance with Environmental Laws:

(i) install or use or allow to be installed or used on, in or under such part of the Site as TRU owns from time to time any materials, equipment or apparatus, the installation, use or storage of which is likely to cause the generation, accumulation or migration of any Contaminants; or

(ii) use or allow to be used such part of the Site as TRU owns from time to time to dispose of, handle or treat any Contaminants in a manner in whole or in part that violates Environmental Laws or causes the Site to become a Contaminated Site,

provided that TRU will not be responsible for any such installation, use, storage, disposal, handling or treatment by Creative Energy or any member of the Creative Energy Group or those for whom they are responsible in law.

(b) If required by Environmental Laws, TRU will remediate (including by way of risk assessment), and will be responsible (at the sole cost and expense of TRU or other responsible party) for the remediation (including by way of risk assessment) of, in accordance with Environmental Laws, any and all Contaminants relating to such part of the Site as TRU owns from time to time, except where such remediation is Creative Energy's responsibility pursuant to Section 10.4(a).

10.2 TRU Environmental Liability

(a) TRU acknowledges and agrees that Creative Energy will not under any circumstances whatsoever be liable for any and all liabilities, actions, damages, claims (including remediation cost recovery claims), losses, costs, orders, fines, penalties and expenses whatsoever (including all consulting and legal fees and expenses on a solicitor-client basis and the costs of removal, treatment, storage and disposal of Contaminants and remediation of the Site and any affected adjacent property) which may be paid by, incurred by or asserted against any member of the Creative Energy Group to the extent attributable to:

(i) any breach of or non-compliance with the provisions of Section 10.1 by TRU;

(ii) any Release or alleged Release of any Contaminants at or from the Site related to or as a result of the presence of any pre-existing Contaminants at, on, under or in the Site, including surface and ground water, as at the Agreement Date, or as a result at any time of the operations of TRU or any act or omission of TRU or any Person for whom TRU is at law responsible; or

(iii) the presence of any Contaminants on, in or under the Site except to the extent that such presence arises from any breach of or non-compliance with the provisions of Section 10.3 by Creative Energy or to the extent that such presence arises from or relates to any Release or alleged Release of any Contaminants at or from the Site by Creative Energy, its employees, agents, contractors, subcontractors, licensees, invitees and those for whom it is responsible in law (including the Creative Energy Group).

(b) TRU hereby releases and forever discharges the Creative Energy Group from and against any and all claims, claims for remediation costs, demands, actions, causes of action and suits which any member of TRU Group has or may hereafter have or bring against any member of the Creative Energy Group for or by reason of, or arising from, any of the matters referred to in Section 10.2(a).

10.3 Creative Energy Environmental Covenants

(a) Creative Energy will comply with Environmental Laws in its use and occupation of the Site and will cause its employees, agents, contractors, subcontractors, licensees, invitees and those for whom it is responsible in law (including the Creative Energy Group) to comply with Environmental Laws in their respective use and occupancy of the Site and, without limiting the generality of the foregoing, Creative Energy will not, except in compliance with Environmental Laws:

(i) install or use, or allow to be installed or used, in the DES Assets or on, in or under the Site or any adjacent property any materials, equipment or apparatus, the installation, use or storage of which is likely to cause the generation, accumulation or migration of any Contaminants; or

(ii) use or allow to be used any portion of the Site to dispose of, handle or treat any Contaminants in a manner in whole or in part that violates Environmental Laws or causes the Site or any adjacent property to become a Contaminated Site.

(b) Creative Energy will remediate, and will be responsible (at its sole cost and expense) for the remediation of, in accordance with Environmental Laws, any and all Contaminants relating to the Site for which Creative Energy is liable pursuant to Section 10.4(a).

10.4 Creative Energy Environmental Liability

(a) Creative Energy acknowledges and agrees that TRU is not and will not under any circumstances whatsoever be liable for any and all liabilities, actions, damages, claims (including remediation cost recovery claims), losses, costs, orders, fines, penalties and expenses whatsoever (including all consulting and legal fees and expenses on a solicitor-client basis and the costs of removal, treatment, storage and disposal of Contaminants and remediation of the Site and any affected adjacent property) which may be paid by, incurred by or asserted against any member of TRU Group to the extent attributable to:

(i) any breach of or non-compliance with the provisions of Section 10.3 by Creative Energy; or

(ii) any Release or alleged Release of any Contaminants at or from the Site by Creative Energy, its employees, agents, contractors, subcontractors, licensees, invitees and those for whom it is responsible in law (including the Creative Energy Group);

(b) Creative Energy hereby releases and forever discharges TRU Group from and against any and all claims, claims for remediation costs, demands, actions, causes of action and suits which any member of the Creative Energy Group has or may hereafter have or bring against any member of the TRU Group for or by reason of, or arising from, any of the matters referred to in Section 10.4(a).

10.5 Private Agreement

The Parties acknowledge and agree that the provisions of this Agreement constitute an agreement between them that is a private agreement respecting liability for Contaminants on, in, migrating from or discharged from the Site, and any contamination of adjacent properties resulting from such contamination, and the remediation thereof, as contemplated in the *Environmental Management Act* (British Columbia).

10.6 Survival

Notwithstanding anything to the contrary in this Agreement, the covenants, acknowledgements, agreements and releases granted in this Article 10 will survive the expiry or termination of this Agreement.

11. REPRESENTATIONS AND WARRANTIES

11.1 Representations and Warranties of TRU

TRU represents and warrants to Creative Energy the following, and acknowledges that Creative Energy is relying on such representations and warranties in entering into the transactions contemplated by this Agreement.

(a) Status of TRU. TRU is a university formed pursuant to the *Thompson Rivers University Act* (British Columbia), with full power and authority to enter into and perform all of its obligations under this Agreement.

(b) Litigation. To the best of its knowledge, TRU is not a party to any action, suit or legal proceeding, actual or threatened, and there are no circumstances, matters or things known to TRU which might give rise to any such action, suit or legal proceeding, and there are no actions, suits or proceedings pending or threatened against TRU before or by any Governmental Authority, which could affect TRU's ability to perform its obligations under this Agreement.

(c) No Breach of Agreement. This Agreement and the performance of the obligations of TRU under this Agreement does not and will not breach any provisions of any other agreement or Law that is binding on or applicable to TRU as of the Agreement Date.

(d) No Conflict with Constating Documents. Neither the entering into of this Agreement nor the consummation of the transactions contemplated hereby will result in a breach of the *Thompson Rivers University Act* (British Columbia), and all necessary action on the part of TRU has been taken to authorize and approve the execution and delivery of this Agreement and the performance by TRU of its obligations hereunder.

(e) Resident. TRU is not a non-resident of Canada within the meaning of the *Income Tax Act* (Canada).

(f) Ownership. TRU is the beneficial owner of the Site.

11.2 Representations and Warranties of Creative Energy

Creative Energy represents and warrants to TRU the following, and acknowledges that TRU is relying on such representations and warranties in entering into the transactions contemplated by this Agreement.

(a) Status of Creative Energy. Creative Energy is a limited partnership existing under the laws of British Columbia, with full power and authority to enter into and perform all of its obligations under the Agreement**.**

(b) Litigation. To the best of its knowledge, Creative Energy is not a party to any action, suit or legal proceeding, actual or threatened, and there are no circumstances, matters or things known to Creative Energy which might give rise to any such action, suit or legal proceeding, and there are no actions, suits or proceedings pending or threatened against Creative Energy before or by any Governmental Authority, which could affect Creative Energy's ability to perform its obligations under this Agreement.

(c) No Breach of Agreement. This Agreement and the performance of the obligations of Creative Energy under this Agreement does not and will not breach any provisions of any other agreement or Law that is binding on or applicable to Creative Energy as of the Agreement Date.

(d) No Conflict with Constating Documents. Neither the entering into of this Agreement nor the consummation of the transactions contemplated hereby will result in a breach of any of the terms or provisions of the constating documents of Creative Energy, and all necessary corporate action on the part of Creative Energy has been taken to authorize and approve the execution and delivery of this Agreement and the performance by Creative Energy of its obligations hereunder.

(e) Resident. Creative Energy is not a non-resident of Canada within the meaning of the *Income Tax Act* (Canada).

12. FURTHER COVENANTS

12.1 TRU Covenants

In addition to the other obligations set out in this Agreement, TRU covenants and agrees with Creative Energy at all times and from time to time as follows.

(a) Continued Existence. TRU will comply with all such legal requirements as are necessary to ensure that it remains in existence and in good standing in its jurisdiction of formation at all times while this Agreement is in effect.

(b) Report Third Party Damage. TRU will report to Creative Energy any malicious damage or damage to the DES Assets of which it becomes aware.

(c) Compliance with Laws. TRU will, at its sole cost and expense, abide by and comply with all applicable Laws (including Environmental Laws) in discharging its obligations hereunder.

12.2 Creative Energy's Covenants

In addition to the other obligations set out in this Agreement, Creative Energy covenants and agrees with TRU at all times and from time to time as follows.

(a) Continued Existence. Creative Energy will comply with all such legal requirements as are necessary to ensure that it remains in existence and in good standing in its jurisdiction of formation at all times while this Agreement is in effect.

(b) Report Third Party Damage. Creative Energy will report to TRU any malicious damage or damage to the DES Assets of which it becomes aware.

(c) Compliance with Laws. Creative Energy will, at its sole cost and expense, abide by and comply with all applicable Laws (including Environmental Laws) in discharging its obligations hereunder.

(d) No Adverse Effect on DES Assets. Creative Energy will not take any action or omit to take any action in connection with the DES Assets, including in connection with Creative Energy's ownership, operation or maintenance of same or in connection with any expansion or upgrade of same, that has, or could reasonably be expected to have, an adverse effect on TRU, the DES Assets or the Customer Service Agreement. Notwithstanding the foregoing, any action or omission by Creative Energy in fulfilling its obligations pursuant to this Agreement will be

deemed not to be a breach of this Section 12.2(d) provided such action or omission would, but for this Section 12.2(d), otherwise be in compliance with this Agreement.

(e) Site Reporting. Creative Energy will provide periodic (not less than quarterly) reporting on the progress of construction and installation of the DES Assets.

13. INSURANCE

13.1 TRU Insurance

TRU will obtain and maintain at its own expense throughout the term of this Agreement the following insurance coverage:

(a) Wrap Up General Liability Insurance (project specific) covering construction of the Energy Centre Building against claims for personal injury, death or property damage in amounts it deems adequate but in any event, not less than $10,000,000 per occurrence and in the aggregate;

(b) Property Insurance insuring the property owned by TRU (including the Buildings);

(c) All Risks Builder's Risk policy covering the assets that TRU owns, operates and maintains in accordance with Sections 2 and 3 against fire and other perils from time to time included in such policies affecting similar properties in British Columbia with extended or additional perils supplemental coverage as would be insured against by a prudent owner in an amount not less than 100% of the replacement cost; and

(d) boiler and machinery insurance with limits for each accident in an amount not less than the full replacement cost of all boilers, pressure vessels, heating, ventilating and air-conditioning equipment and miscellaneous electrical apparatus owned or operated by TRU or by others (other than Creative Energy) on behalf of TRU.

13.2 Responsibility

TRU will be responsible for the full amount of all premiums and deductibles required under Section 13.1. All policies required must be effective at the Agreement Date and must, to the extent obtainable, provide that the insurance will not be cancelled without the insurer giving at least 30 days' written notice to Creative Energy. Insurance will be purchased from reputable insurers acceptable to Creative Energy, acting reasonably. Notwithstanding the foregoing, TRU represents and warrants that it is insured as a covered entity under the provisions of the Universities, Colleges and Institutions Protection Program ("UCIPP") which coverage is equal to or greater than the coverage required under Sections 13.1(a), (b), (c) and (d). TRU is deemed to be in compliance with the provisions of these insurance requirements provided that TRU remains insured under UCIPP (or a successor program that provides substantially the same protection as UCIPP).

13.3 Evidence of Insurance

TRU will deliver or cause to be delivered to Creative Energy evidence of all insurance policies required to be obtained and maintained by TRU under Section 13.1 and any amendments, modifications or replacements thereof.

13.4 Creative Energy Insurance

Creative Energy (or Creative Energy's prime engineering consultant in the case of Section 13.4(e)) will obtain and maintain at its own expense throughout the term of this Agreement the following insurance coverage:

(a) (i) Wrap Up Commercial General Liability Insurance (project specific) ("WUL") covering construction of the DES and the DES Assets against claims for personal injury, death or property damage, in amounts it deems adequate but in any event not less than $10,000,000 per occurrence and in the aggregate;

(ii) Any time not otherwise covered under the WUL, Commercial General Liability Insurance against claims for personal injury, death or property damage, covering its operations, including premises/operations liability and products/completed operations liability, in an amount not less than $5,000,000 per occurrence and in the aggregate, following the Service Commencement Date;

(b) All Risks Builder's Risk policy covering the DES and the DES Assets prior to the Service Commencement Date against fire and other perils from time to time included in such policies affecting similar properties in British Columbia with extended or additional perils supplemental coverage as would be insured against by a prudent owner in an amount not less than 100% of the replacement cost;

(c) following the Service Commencement Date, Property Insurance insuring the DES against perils normally included in a standard "all risk" policy, in an amount equal to 100% of the current replacement cost of the DES, and adjusted at least annually to reflect changes in replacement value due to inflation or other factors;

(d) a standard automobile policy including standard contractual liability endorsement against claims for bodily injury, death and damage to property, in an amount of not less than $5,000,000 per occurrence and in the aggregate;

(e) errors and omissions liability insurance for a value of not less than $5,000,000 per claim and in the aggregate prior to the Service Commencement Date and for a period of two years thereafter; and

(f) boiler and machinery insurance with limits for each accident in an amount not less than the full replacement cost of all boilers, pressure vessels, heating, ventilating and air-conditioning equipment and miscellaneous electrical apparatus owned or operated by Creative Energy or by others (other than TRU) on behalf of Creative Energy.

Neither the providing of insurance by Creative Energy in accordance with the requirements of this Agreement nor the insolvency, bankruptcy or failure of any insurance company to pay any claim accruing shall be held to waive any of the provisions of this Agreement with respect to the liability of Creative Energy or otherwise. The presence or absence of such insurance coverage as contemplated by this Agreement does not in any way decrease Creative Energy's liability owed to TRU.

13.5 Responsibility

Creative Energy will be responsible for the full amount of all premiums and deductibles required under Section 13.4. Except as otherwise expressly provided herein, all policies required must be effective at the Agreement Date and must, to the extent obtainable, provide that the insurance will not be cancelled without the insurer giving a least 30 days written notice to TRU. Insurance will be purchased from reputable insurers registered and licensed to underwrite insurance in British Columbia. Where Creative Energy fails to comply with requirements of Section 13.4 or this Section 13.5, TRU may take all necessary steps to effect and maintain the required insurance coverage at Creative Energy's expense.

13.6 Evidence of Insurance

Creative Energy will deliver or cause to be delivered to TRU evidence of all insurance policies required to be obtained and maintained by Creative Energy under Section 13.4 and any amendments, modifications or replacements thereof, all in a form satisfactory to TRU.

13.7 Additional Insured

Each Party will ensure that the other Party is an additional insured under the insurance to be obtained and maintained pursuant to Section 13.1(a), Section 13.4(a) and Section 13.4(b) and, in the event of a claim, the insurance carried by the Party responsible for actions which give rise to such claim will be the primary insurance with respect to such claim.

14. INDEMNITY AND LIABILITY

14.1 Creative Energy Indemnity

Without limiting any other obligation of Creative Energy provided herein, Creative Energy will indemnify, defend, and save harmless the TRU Group from any and all liabilities, actions, damages, claims, losses, costs, orders, fines, penalties, and expenses (including the full amount of all legal fees and expenses on a solicitor and own-client basis) which may be paid by, incurred by, or asserted against the TRU Group or any one or more of them, arising from or in connection with any negligence or wilful misconduct perpetrated by Creative Energy or any Person for whom it is in law responsible or any breach or non-performance by Creative Energy of any of its obligations under this Agreement.

14.2 TRU Indemnity

Without limiting any other obligation of TRU provided herein, TRU will indemnify, defend, and save harmless the Creative Energy Group from any and all liabilities, actions, damages, claims, losses, costs, orders, fines, penalties, and expenses (including the full amount of all legal fees and expenses on a solicitor and own-client basis) which may be paid or incurred by, or asserted against the Creative Energy Group or any one or more of them, arising from or in connection with any negligence or wilful misconduct perpetrated by TRU or any Person for whom it is in law responsible or any breach or non-performance by TRU of any of its obligations under this Agreement.

14.3 Liability

(a) Notwithstanding anything to the contrary in this Agreement:

(i) none of the Creative Energy Group will be responsible or liable for any loss, injury (including death), damage or expense incurred by TRU caused by or resulting from, directly or indirectly, any failure or defect in the DES Assets, unless the loss, injury (including death), damage or expense is attributable to the negligence or wilful misconduct of a member of the Creative Energy Group or any breach or non-performance by Creative Energy of any of its obligations under this Agreement; and

(ii) none of the TRU Group will be responsible or liable for any loss, injury (including death), damage or expense incurred by Creative Energy caused by or resulting from, directly or indirectly, any failure or defect in the DES Assets, unless the loss, injury (including death), damage or expense is attributable to the negligence or wilful misconduct of a member of the TRU Group or any breach or non-performance by TRU of any of its obligations under this Agreement.

(b) For greater certainty, TRU is solely responsible for all expense, risk and liability with respect to:

(i) the Buildings and all other equipment, other than the DES Assets; and

(ii) the use by TRU of the Thermal Energy supplied by Creative Energy except to the extent caused or contributed to by the negligence or wilful misconduct of the Creative Energy Group.

14.4 Consequential Loss

Notwithstanding anything to the contrary in this Agreement, in no event will either Party be liable to the other Party for any indirect or consequential loss, cost or expense whatsoever, including any loss of profits, revenues or other economic loss, suffered by the other Party or its Affiliates or their respective officers, directors, shareholders, employees, contractors, agents, successors or permitted assigns.

14.5 Survival

Notwithstanding anything to the contrary in this Agreement, the indemnities set out in this Article 14 will survive the expiry or termination of this Agreement.

15. FORCE MAJEURE

15.1 Suspension

Subject to the other provisions of this Article 15, if either Party is unable or fails by reason of Force Majeure to perform in whole or in part any of its obligations or covenants set out in this Agreement (except an obligation or covenant to pay), such inability or failure will be deemed not to be a breach of such obligation or covenant and the obligations of both Parties under this Agreement will be suspended to the extent necessary during the continuation of any inability or failure so caused by such Force Majeure.

15.2 Definition of Force Majeure

For purposes of this Agreement, "**Force Majeure**" means any event or occurrence not within the reasonable control of the Party claiming Force Majeure, and which by the exercise of reasonable diligence such Party is unable to prevent or overcome, including any acts of nature such as lightning, earthquakes, storms, washouts, landslides, avalanches, floods and other extreme weather conditions; epidemics; pandemics (including COVID-19); strikes, lockouts or other industrial disturbances; acts of the Queen's or public enemies, sabotage, wars, blockades, insurrections, riots or civil disturbances, fires, explosions, breakages of or accidents to machinery or lines of pipe not preventable by maintenance properly carried out in the ordinary course; any delay by or actions of Governmental Authorities; and Changes of Law. For the purposes of this Article15, a Party is deemed to have control over the actions or omissions of those Persons to which it, its agents, contractors or employees, have delegated, assigned or subcontracted its obligations and responsibilities.

15.3 Exceptions

Neither Party will be entitled to the benefit of Section 15.1 under any of the following circumstances:

(a) to the extent that the inability or failure was caused by the negligence or contributory negligence of the Party claiming Force Majeure;

(b) to the extent that the inability or failure was caused by the Party claiming Force Majeure having failed to diligently attempt to remedy the condition or to resume the performance of such covenants and obligations with reasonable dispatch; or

(c) if the inability or failure was caused by lack of funds by the Party claiming Force Majeure or is in respect of any amount due by the Party claiming Force Majeure hereunder.

The Party claiming Force Majeure, as soon as possible after the happening of the occurrence relied upon or as soon as possible after determining that the occurrence was in the nature of Force Majeure and would affect the claiming Party's ability to observe or perform any of its covenants or obligations under this Agreement, will give the other Party notice to the effect that the claiming Party is unable by reason of Force Majeure (the nature whereof will be therein specified) to perform the particular covenants or obligations.

15.4 Resumption of Obligations

As soon as possible after the Force Majeure event or occurrence is remedied or discontinued, the Party claiming Force Majeure will give notice to the other Party of such remedy, and that such Party has resumed, or is then in a position to resume, the performance of its suspended covenants and obligations hereunder either in whole or in part.

15.5 Settlement of Labour Disputes

Notwithstanding anything to the contrary in this Article 15, but subject to Section 15.3, the settlement of labour disputes or industrial disturbances in which a Party is involved is entirely within the discretion of that Party, which Party may make settlement of it at the time and on terms and conditions as it may deem to be advisable and no delay in making settlement will deprive the Party of the benefit of Section 15.1.

16. DISPUTE RESOLUTION

16.1 Informal Dispute Resolution

In the event of any dispute that may arise under, out of, in connection with or in relation to this Agreement, the Parties will make commercially reasonable efforts, in good faith, to settle such dispute by amicable negotiations and to reach a fair and equitable solution that is satisfactory to the Parties within 20 Business Days of either Party notifying the other Party of such dispute.

16.2 BCUC Resolution

If a dispute within the jurisdiction of the BCUC remains unresolved within 20 Business Days of either Party requesting that the other Party engage in negotiations to resolve the dispute in accordance with Section 16.1, the dispute may be referred by either Party to the BCUC for resolution.

16.3 Arbitration

(a) If a dispute not within the jurisdiction of the BCUC remains unresolved within 20 Business Days of either Party requesting that the other Party engage in negotiations to resolve the dispute in accordance with Section 16.1, the dispute may be referred to and resolved by arbitration before a single arbitrator.

(b) In the event the Parties cannot agree on the appointment of an arbitrator within five Business Days, either Party may refer the matter to the Vancouver International Arbitration Centre, or such mediation or arbitration centre as may be mutually agreed upon. The arbitration will:

(i) to the extent possible, and with the necessary modifications as determined by the arbitrator, be administered in accordance with the Shorter Rules for Domestic Commercial Arbitration or similar rules; and

(ii) be conducted in Vancouver, British Columbia.

(c) Notwithstanding the above, no one will be nominated to act as an arbitrator who is in any way financially interested in the business affairs of, or is not independent from, TRU or Creative Energy.

(d) The arbitrator will issue a written award that sets forth the essential findings and conclusions on which the award is based.

(e) If the arbitrator fails to render a decision within 30 days following the final hearing of the arbitration, either Party may terminate the arbitration and a new arbitrator will be appointed in accordance with these provisions. If the Parties are unable to agree on an arbitrator or if the appointment of an arbitrator is terminated in the manner provided for above, then any Party to this Agreement will be entitled to apply to a judge of the British Columbia Supreme Court to appoint an arbitrator and the arbitrator so appointed will proceed to determine the matter *mutatis mutandis* in accordance with the provisions of this Article 16.

16.4 Arbitrator's Authority

(a) The arbitrator will have the authority to award:

(i) monetary damages;

(ii) interest on unpaid amounts from the date due;

(iii) specific performance; and

(iv) permanent relief.

(b) The costs and expenses of the arbitration, but not those incurred by the Parties, will be shared equally, unless the arbitrator determines that a specific Party prevailed. In such a case, the non-

prevailing Party will pay all costs and expenses of the arbitration, but not those of the prevailing Party.

16.5 Continuation of Services

Except as otherwise expressly provided herein, each of the Parties will perform all of its respective obligations under this Agreement notwithstanding the existence of any dispute that arises from time to time between the Parties in respect of any matter related to this Agreement or during the resolution of any dispute in accordance with this Article 16 except where to do so would threaten public health and safety or the environment.

16.6 Injunctive Relief

Nothing in this Article 16 will preclude either Party from applying to a court of competent jurisdiction for interlocutory or interim relief.

17. GENERAL

17.1 Notices

Any notice or other communication required or permitted to be given under this Agreement will be effective only if in writing and when it is actually delivered (which delivery may be by same-day courier or by electronic means) to the Party for whom it is intended at the following address or such other address in British Columbia as such Party may designate to the other Party by notice to the attention of the following persons or the successors in title or function of such person from time to time in writing delivered in accordance with this Section 17.1:

(a) if to Creative Energy:

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP
Suite 1 – 720 Beatty Street, Vancouver
BCV6B 2M1

Attention: President
Email: info@creative.energy

(b) if to TRU:

THOMPSON RIVERS UNIVERSITY
805 TRU Way, Kamloops
BC V2C 0C8

Attention: General Counsel
Email: gc@tru.ca

Notwithstanding the foregoing, notices with respect to Force Majeure events will be given in writing by same-day courier or by email, or orally in person, to the person or persons designated from time to time by the Parties as the person or persons authorized to receive such notices.

17.2 Confidentiality

(a) Each Party (the "**Receiving Party**") will treat as confidential the terms of this Agreement and all Confidential Information (as defined below) of the other Party (the "**Disclosing Party**") and will at all times during the term of this Agreement and for a period of two years thereafter hold the same in confidence and will not, without the prior written consent of the Disclosing Party, disclose or divulge to any Person the terms of this Agreement or any Confidential Information of the Disclosing Party, provided that nothing in this Section 17.2 will restrict or prevent any Party from making any disclosure of such terms or any Confidential Information:

(i) that is reasonably necessary or desirable for the Receiving Party to carry out and give full effect to the terms, conditions and intent of this Agreement;

(ii) that is required by any Law or Governmental Authority;

(iii) to an Affiliate of the Receiving Party or to the directors, officers or employees of such Party or its Affiliates;

(iv) to the professional advisors of the Receiving Party;

(v) that the Receiving Party, acting reasonably, determines is required, prudent or necessary to be disclosed by that Party in connection with any prospectus filing, public securities offering or other applicable securities matters or laws; or

(vi) that is already in the public domain, that was in the possession of the Receiving Party prior to its receipt of the information from the Disclosing Party or that was disclosed to the Receiving Party by a third party free of any obligation of confidentiality.

(b) For the purposes of this Section 17.2, "**Confidential Information**" means proprietary information of the Disclosing Party such as data, plans, drawings, manuals, or specifications which have been provided by the Disclosing Party or its employees, contractors, agents, subcontractors or Affiliates to the Receiving Party pursuant to this Agreement, or proprietary information conceived or developed by or for the Disclosing Party concerning construction practices, operation and maintenance practices, agreements, business plans and strategies, marketing plans and strategies, profits, costs, pricing and pricing structures, pro forma statements and systems of procedure, but excluding information developed or conceived by the Receiving Party without using the Confidential Information of the Disclosing Party.

17.3 No Waiver

No waiver by either Party of any default by the other in the performance of any of the provisions of this Agreement will operate or be construed as a waiver of any other or future default or defaults hereunder, whether of a like or different character.

17.4 Enurement

This Agreement will enure to the benefit of and be binding upon the Parties and their respective successors and permitted assigns.

17.5 Entire Agreement

This Agreement, the Customer Service Agreement, the Contribution Agreement and the SRW contain the entire agreement between the Parties in respect of the subject matter hereof and cancel and supersede any prior written or oral agreements or understandings, express or implied, between the Parties. The Term Sheet will be wholly superseded, and of no further force or effect, upon the execution and delivery of this Agreement by the Parties.

17.6 Further Assurances

Each Party will execute and deliver all such further documents and do all such further things as may be reasonably requested by the other Party to give full effect to the intent and meaning of this Agreement.

17.7 Assignment and Subcontracting

(a) TRU will not be permitted to assign this Agreement or any of its rights or obligations hereunder without the prior written consent of Creative Energy, unless such assignment is in respect of the transfer of TRU as a whole and the assignee agrees in writing with Creative Energy to assume the obligations of TRU pursuant to this Agreement.

(b) Creative Energy will not be permitted to assign this Agreement or any of its rights or obligations hereunder without the prior written consent of TRU, unless such assignment is to an Affiliate of

Creative Energy or for collateral security purposes to any lender or lenders providing financing for the DES Assets.

(c) Any purported assignment in violation of this Section 17.7 shall be null and void.

17.8 Term

The term of this Agreement shall commence upon the execution of this Agreement by both Parties and shall expire upon the Service Commencement Date in respect of the final Building to be connected to the DES Assets, unless earlier terminated in accordance with this Agreement.

17.9 Relationship

Nothing in this Agreement will create a partnership or joint venture between TRU and Creative Energy.

17.10 Counterparts

This Agreement may be executed in counterparts and transmitted by electronic means with the same effect as if the Parties had signed the same original document. All counterparts will be construed together and will constitute one and the same agreement and, if transmitted by electronic means, each Party will promptly dispatch an original to the other Party.

[Signature page follows]

IN WITNESS WHEREOF the Parties hereto have executed this Agreement as of the day and year first above written.

THOMPSON RIVERS UNIVERSITY

DocuSigned by:
Brett Fairbairn
8E51FFEE229040C...

Per: _____
Name: Brett Fairbairn
Title: President and Vice-Chancellor

DocuSigned by:
31718A11FD62441...

Per: _____
Name: Matt Milovick
Title VP Administration and Finance

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP by its general partner, CREATIVE ENERGY THOMPSON RIVERS GP INC.

Per: _____
Name: Krishnan Iyer
Title: President and CEO

Per: _____
Name: Diego Mandelbaum
Title: Vice President, Development

SCHEDULE 1

SITE DESCRIPTION

Civic Address:

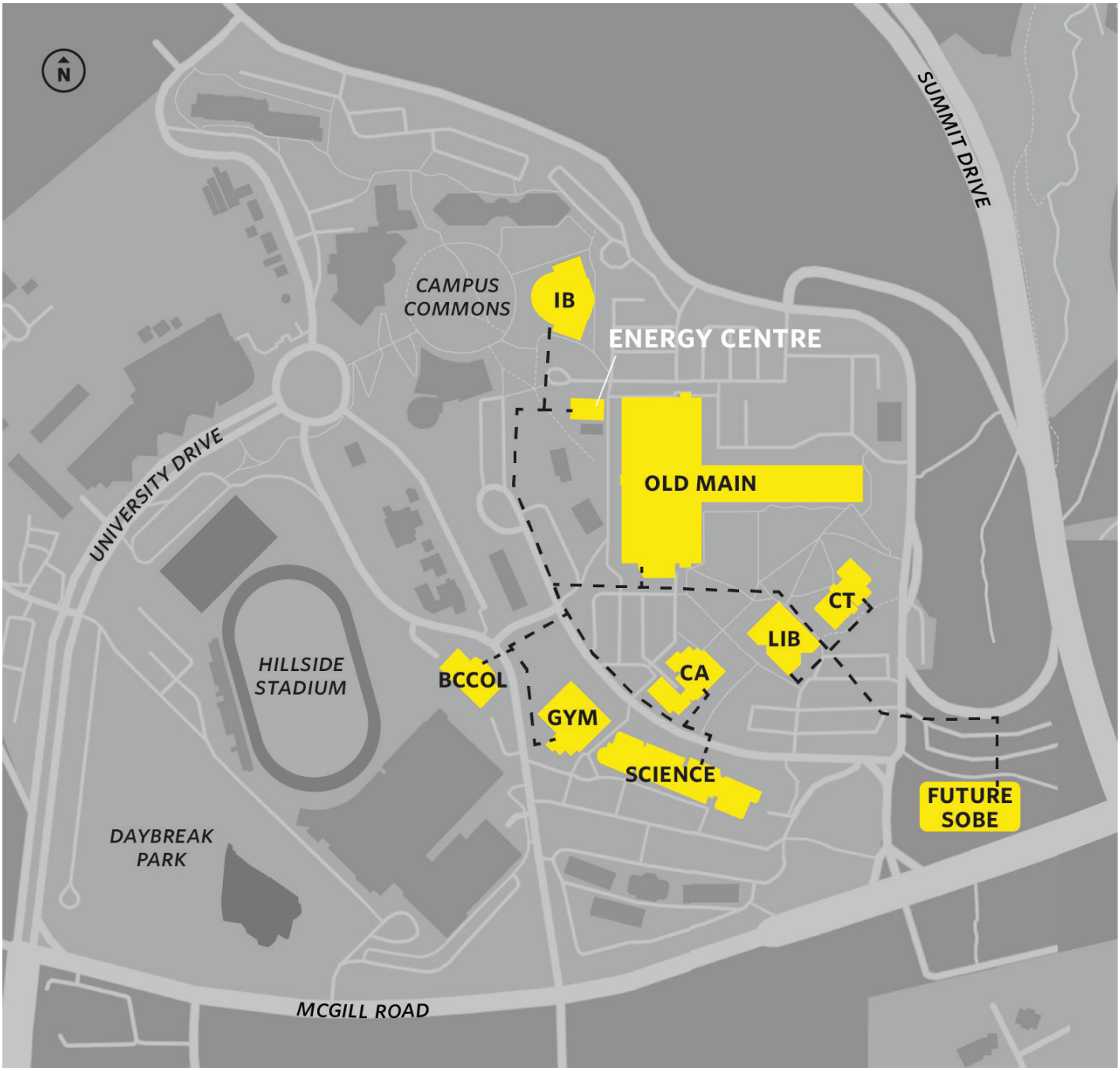
805 TRU Way, Kamloops, British Columbia

Legal Description:

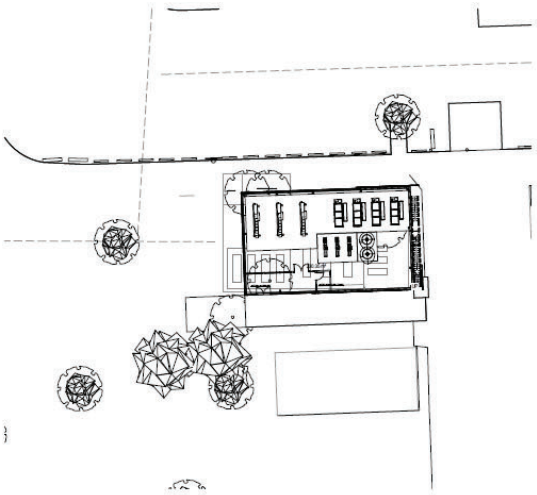
Parcel Identifier: 028-324-757

LOT 1 SECTIONS 1 AND 12 TOWNSHIP 20 RANGE 18 WEST OF THE 6TH MERIDIAN KAMLOOPS DIVISION YALE DISTRICT PLAN KAP91275 EXCEPT EPP60804 AND EPP87212

SITE MAP



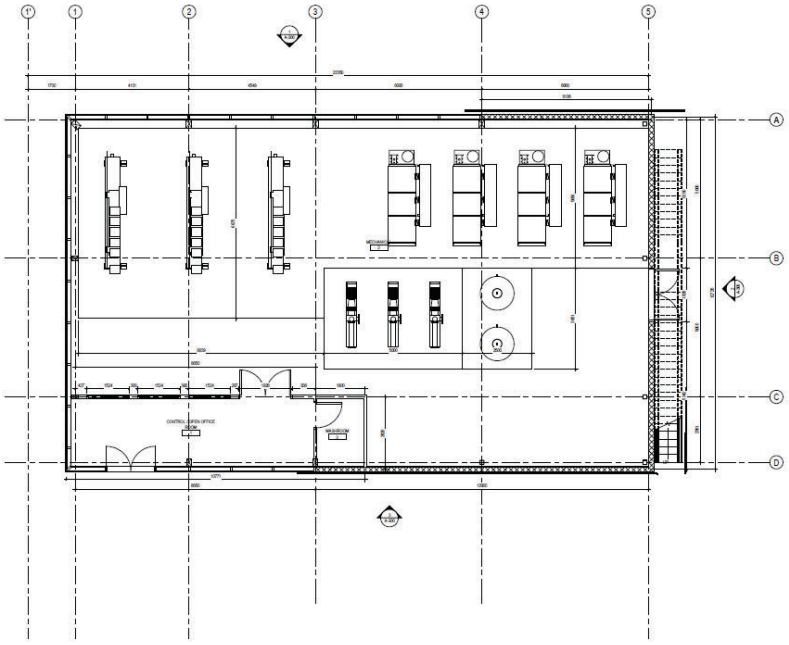
SITE MAP
1:1



1 SITE PLAN
A-000 1:200

115602068

TRU
SITE PLAN
TRU District Energy
2020.10.09



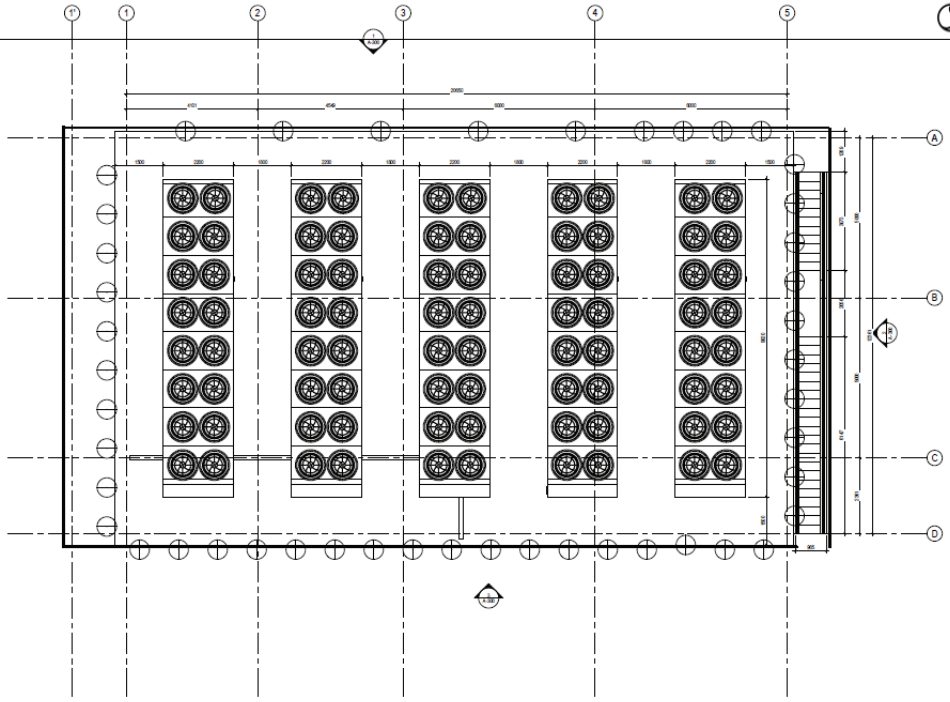
1 MAIN FLOOR
A100 1:50

115602068

TRU

MAIN FLOOR PLAN
TRU District Energy
2020.10.09

Stantec



1 Roof
A-101 1:50

TRU

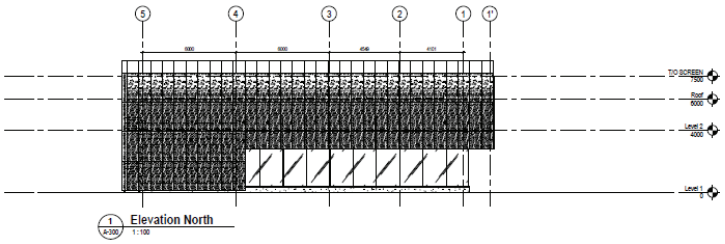
115602068

ROOF PLAN

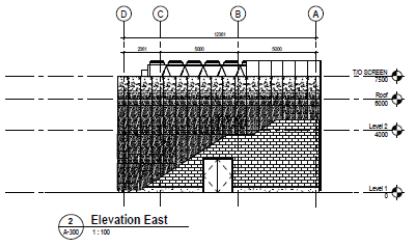
TRU District Energy

2020.10.09

Stantec



1 A-300 Elevation North 1:100



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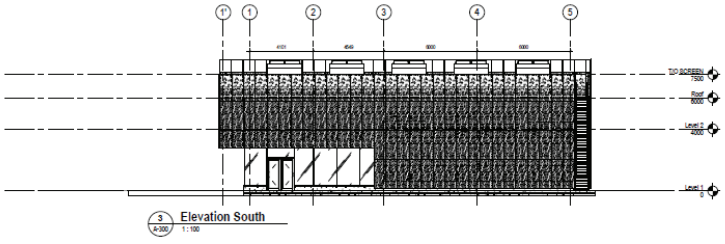
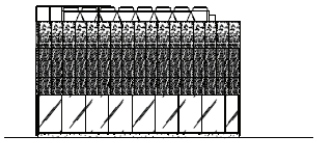


3 A-300 Elevation South 1:100



4 A-300 Elevation West 1:100

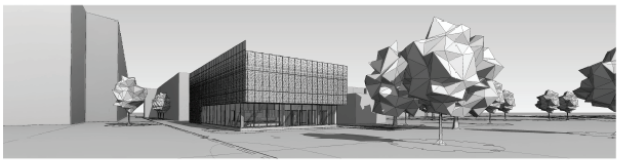
TRU

115602068

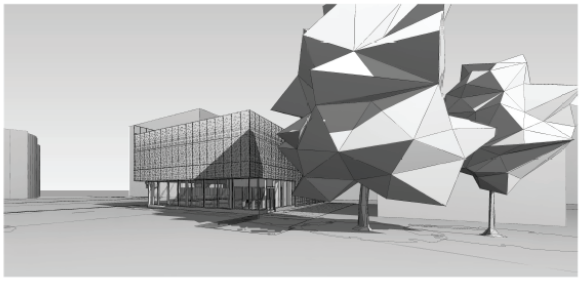
ELEVATIONS

TRU District Energy

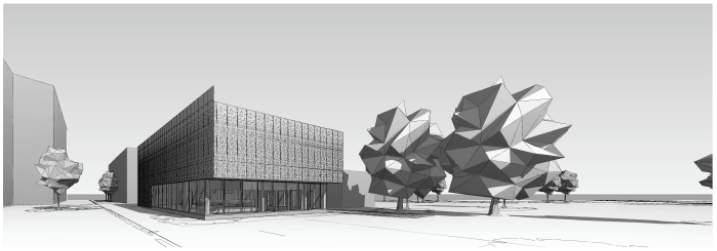
2020.10.09



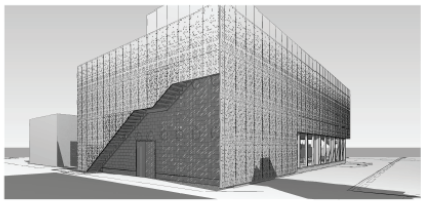
1 A-301 3D Perspective



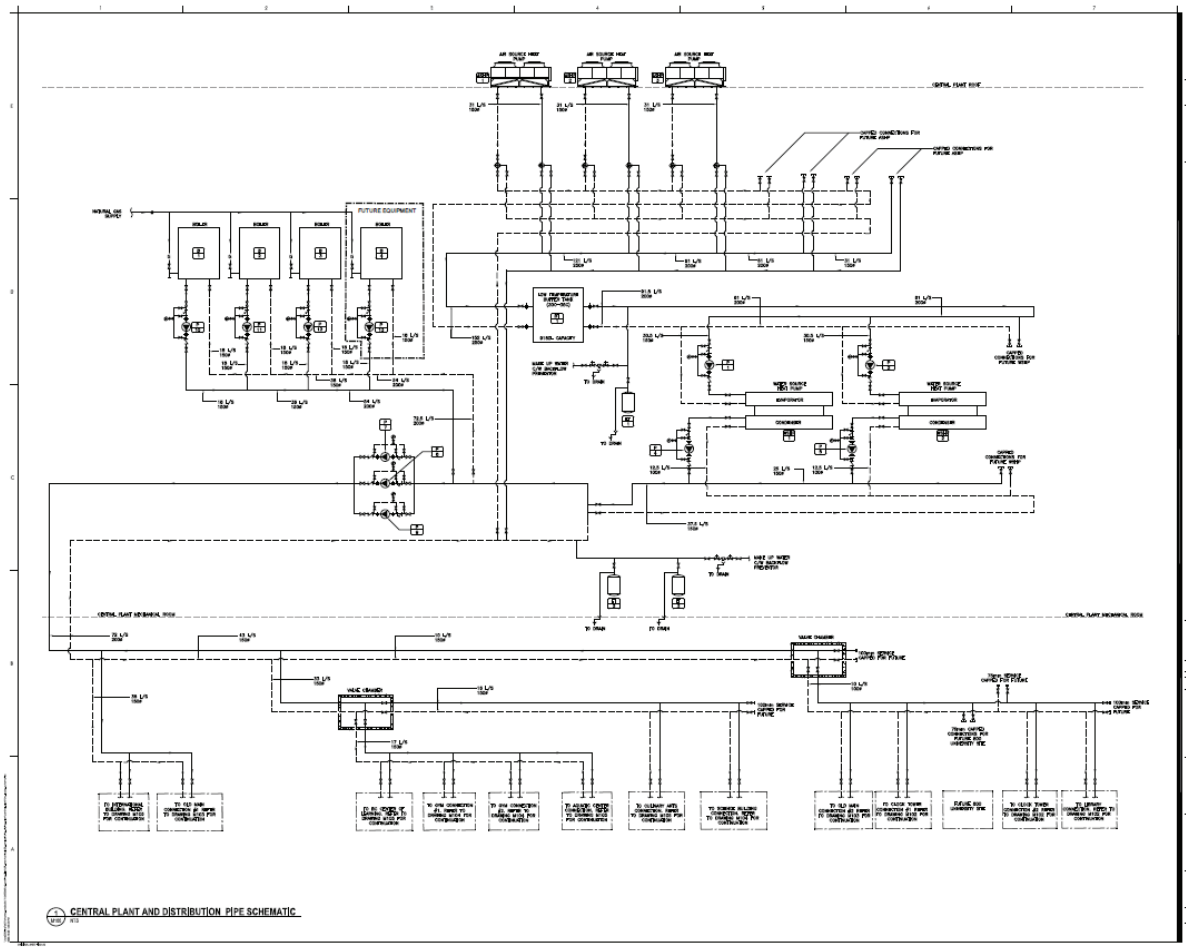
2 A-301 3D Perspective



3 A-301 3D Perspective



4 A-301 3D Perspective



CENTRAL PLANT AND DISTRIBUTION PIPE SCHEMATIC

Stantec

PRELIMINARY
NOT FOR CONSTRUCTION

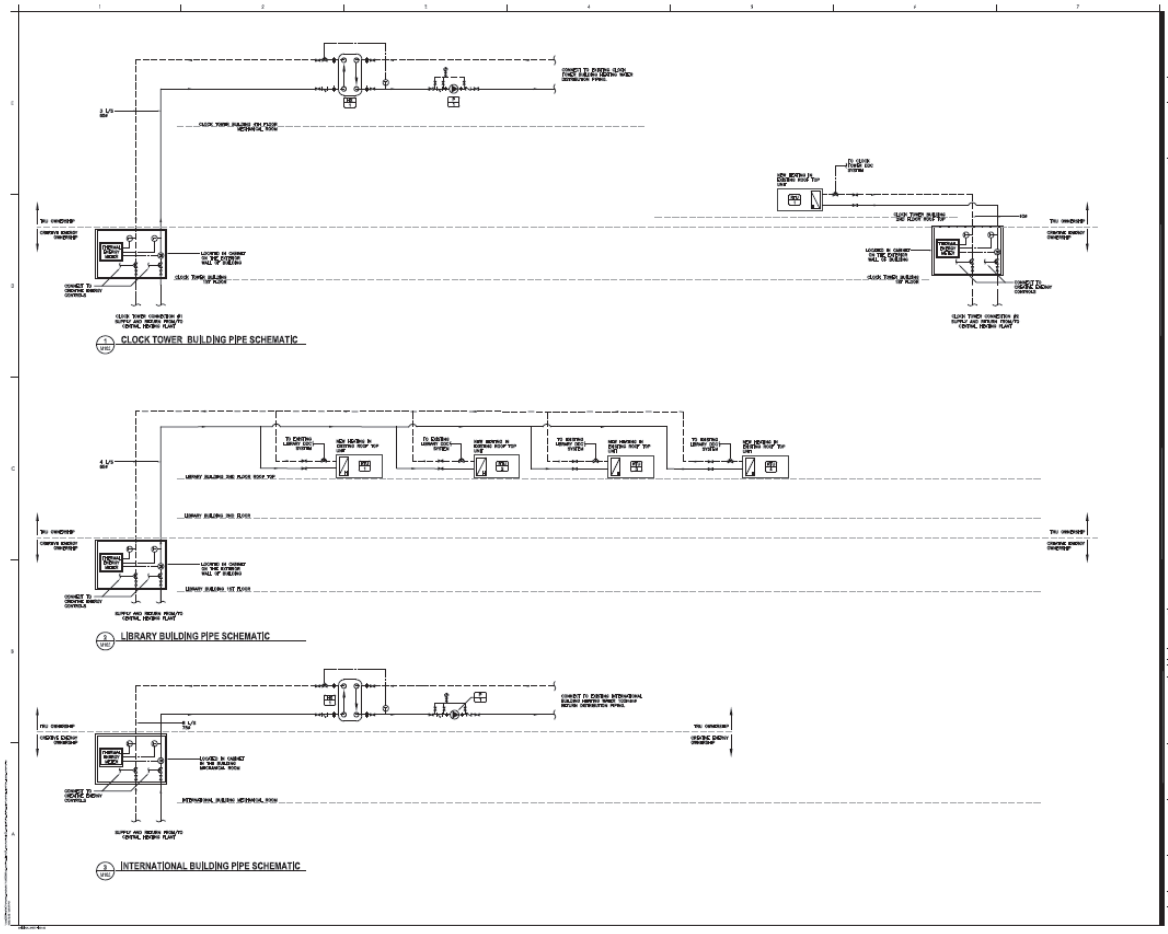
THOMPSON RIVERS UNIVERSITY

LOW CARBON DISTRICT ENERGY SYSTEM

KAMLOOPS, BC

CENTRAL PLANT SCHEMATIC

M101



Stantec

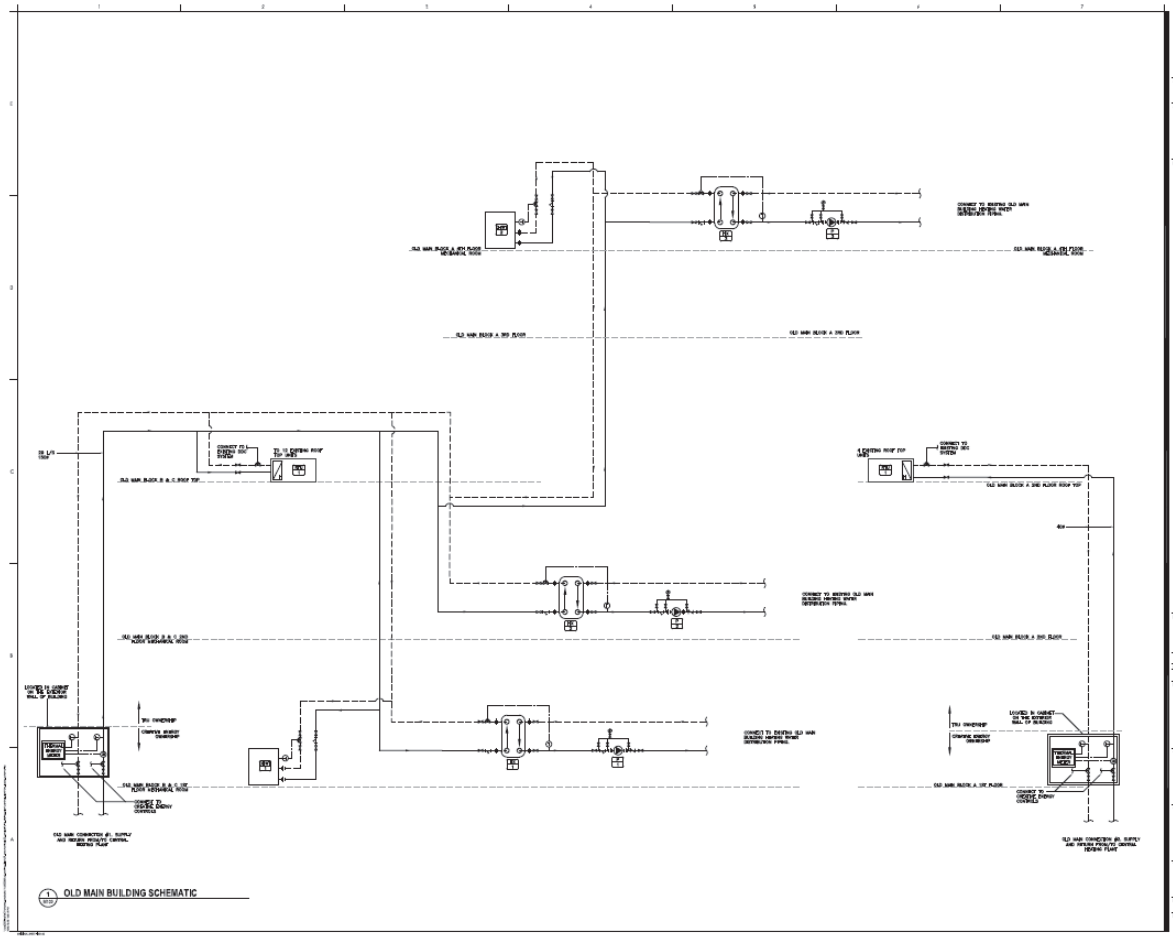
PRELIMINARY
NOT FOR
CONSTRUCTION

THOMPSON RIVER UNIVERSITY

LOW CARBON DISTRICT ENERGY SYSTEM

CLOCK TOWER, LIBRARY AND INTERNATIONAL BUILDING SCHEMATICS

M102



Stantec

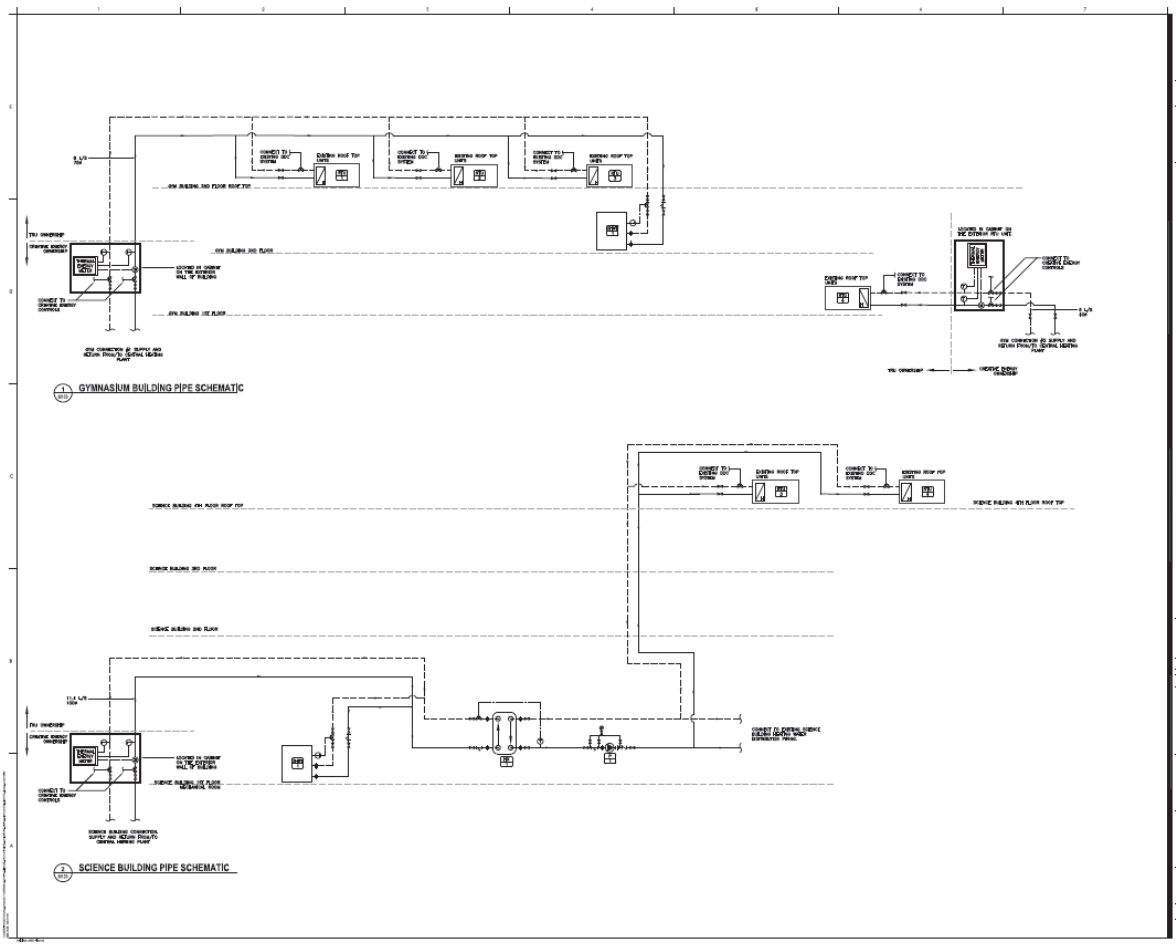
PRELIMINARY
NOT FOR CONSTRUCTION

THOMPSON RIVER UNIVERSITY

LOW CARBON DISTRICT ENERGY SYSTEM

OLD MAIN BUILDING SCHEMATIC

M103



Stantec

PRELIMINARY
NOT FOR
CONSTRUCTION

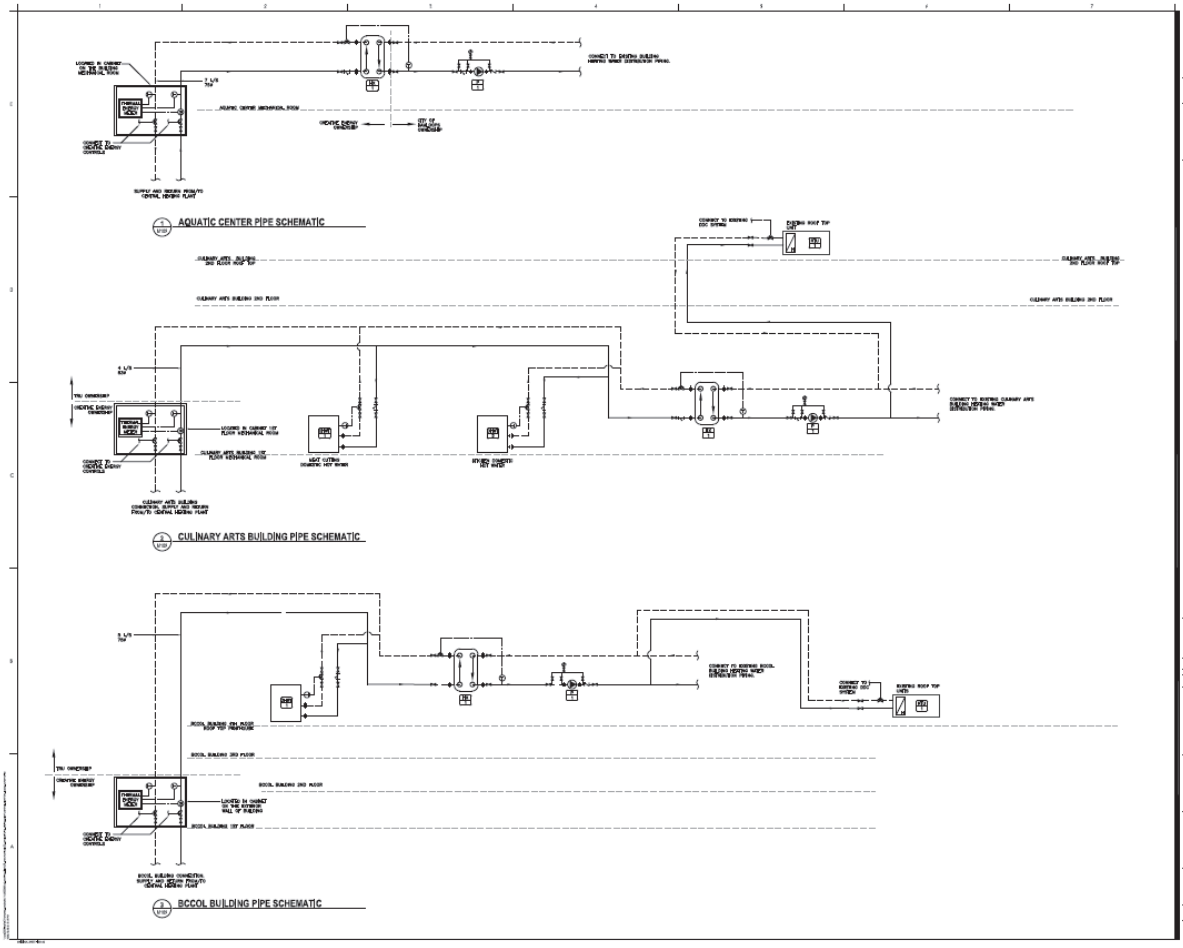
THOMPSON RIVER UNIVERSITY

LOW CARBON DISTRICT ENERGY SYSTEM

KAMLOOPS, BC

GYMNASIUM AND SCIENCE BUILDING SCHEMATICS

M104



Stantec

PRELIMINARY
NOT FOR CONSTRUCTION

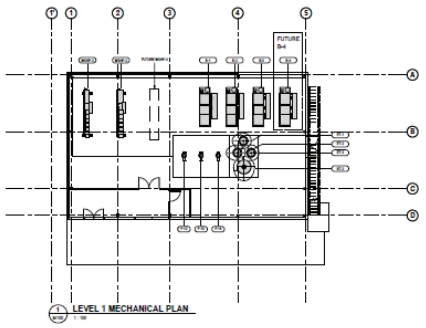
THOMPSON RIVER UNIVERSITY

LOW CARBON DISTRICT ENERGY SYSTEM

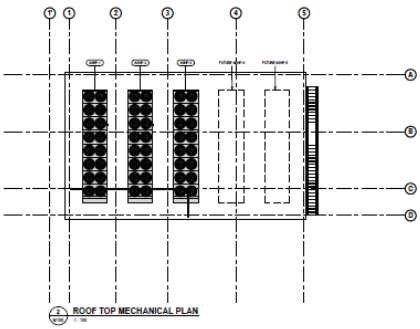
KAMLOOPS, BC

AQUATIC CENTRE, CULINARY ARTS AND BCCOL SCHEMATICS

M105



1 LEVEL 1 MECHANICAL PLAN
1 : 100



1 ROOF TOP MECHANICAL PLAN
1 : 100

BUFFER TANK SCHEDULE

UNIT IDENTIFICATION								
MARK	SYSTEM SERVED	MANUFACTURER	MODEL NO.	VOLUME (L)	DIAMETER (MM)	HEIGHT (MM)	WEIGHT (KG)	NOTES
B-1	LOW TEMPERATURE			750				

NOTES:
1.

EXPANSION TANK SCHEDULE

UNIT IDENTIFICATION								
MARK	SYSTEM SERVED	MANUFACTURER	MODEL NO.	VOLUME (L)	DIAMETER (MM)	HEIGHT (MM)	WEIGHT (KG)	NOTES
EX-1	LOW TEMPERATURE							
EX-2	HIGH TEMPERATURE							
EX-3	DHW TANK							

NOTES:
1.

PUMP SCHEDULE

UNIT IDENTIFICATION				PERFORMANCE				PUMP MOTOR		ELECTRICAL				
MARK	SYSTEM SERVED	PUMP TYPE	CONTROLS	FLUID TYPE	FLUID TEMP (°C)	FLOW (lps)	PUMP HEAD (kPa)	MIN EFFICIENCY (%)	BHP	HP	SPEED (RPM)	VOLTS	PHASE	OPERATING WEIGHT (kg)	MANUFACTURER	MODEL NUMBER	NOTES
P-1	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-2	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-3	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-4	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-5	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-6	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-7	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-8	HEATING HOT WATER CIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-9	DOMESTIC HOT WATER RECIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-10	DOMESTIC HOT WATER RECIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-11	DOMESTIC HOT WATER RECIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		
P-12	DOMESTIC HOT WATER RECIRCULATION PUMP	VARIABLE SPEED IN-LINE CIRCULATOR PUMP	VFD	WATER								208	3		TBD		

NOTES:
1.

GAS BOILER SCHEDULE

UNIT ID	FUEL			FLUID				PHYSICAL CHARACTERISTICS			ELECTRICAL			MANUFACTURER	MODEL NUMBER	NOTES
	FUEL TYPE	INPUT (MBH)	OUTPUT (MBH)	FLUID TYPE	FLOW (lps)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	WEIGHT (kg)	HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)	VOLTS	PHASE	AMP			
B-1	NATURAL GAS	1750	1540	WATER	30.0	71.1	82.2	34.5	1135	1372	686	940	208	3	40	AERCO INTERNATIONAL	BMK 1750 NG LN	

NOTES:
1.

AIR SOURCE HEAT PUMP SCHEDULE

UNIT ID	COMMON DATA		HEATING PERFORMANCE					COMPRESSOR(S)			CONDENSER		ELECTRICAL				PHYSICAL CHARACTERISTICS				MANUFACTURER	MODEL NUMBER	NOTES
	FLUID TYPE	REFRIG TYPE	EWT (°C)	LWT (°C)	MAX WPD (kPa)	POLLING FACTOR	COP	DESIGN AMBIENT (°C)	TYPE	NO OF COMP	NO OF CIRCUITS	NO OF STAGES	NO OF FANS	VOLTS	PHASE	MCA	MOP	OPERATING WEIGHT (kg)	DIMENSIONS HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)			
HEAT PUMP-HEAT 1	WATER	R134A	30.0	35.0	34.5	0.000	3.5	0	SCROLL	4	1	1	6	575	3	362.1	500	1135	1372	686	940	AERMEC	NRA 0252 HSC	

NOTES:
1.

WATER SOURCE HEAT PUMP SCHEDULE

UNIT ID	CAPACITY AND PERFORMANCE					EVAPORATOR WATER					CONDENSER WATER					COMPRESSOR		ELECTRICAL		PHYSICAL CHARACTERISTICS				MANUFACTURER	MODEL NUMBER	NOTES
	COOLING UNIT CAPACITY (kW)	HEAT UNIT CAPACITY (kW)	HEATING C.O.P.	REFRIG TYPE	REFRIG CHARGE (kg)	NPLV	FLUID TYPE	FLOW (lps)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	FLUID TYPE	FLOW (lps)	EWT (°C)	LWT (°C)	MAX WPD (kPa)	TYPE	NO OF COMPRESSOR	NO OF CIRCUITS	VOLTS	PHASE	OPERATING WEIGHT (kg)	DIMENSIONS HEIGHT (mm)	WIDTH (mm)	LENGTH (mm)			
WSHP-1 AND WSHP-2	TBD						WATER					WATER					SCROLL										

NOTES:
1.

Stantec

Stantec Consulting Ltd.
400-1285 Broadway
Kelowna, V1Y 1N1
Tel (250) 860-0029 • www.stantec.com

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Revision/Issue

Notes

Issued/Revision

Permit/Seal

PRELIMINARY
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CONSTRUCTION

Stamped drawings, pending or when affixed with the Professional Seal, are not to be considered as checked and fit for general information or comment only.

Client/Project Logo

Client/Project
Thompson Rivers University

TRU DISTRICT ENERGY ANALYSIS

805 TRU Way, Kamloops, BC V2C 0C8

Title
CENTRAL PLANT LEVEL 1 AND ROOFTOP MECHANICAL PLAN AND EQUIPMENT SCHEDULES

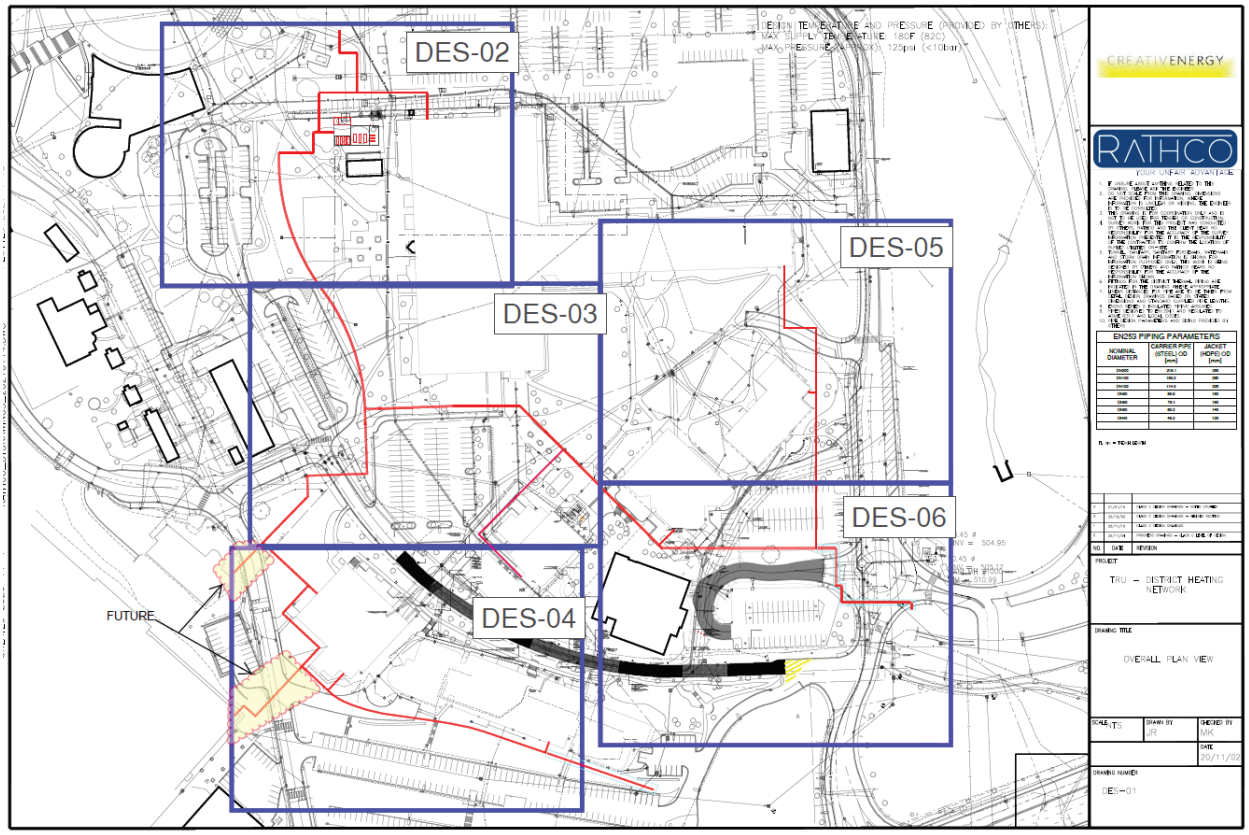
Project No.
114439ab

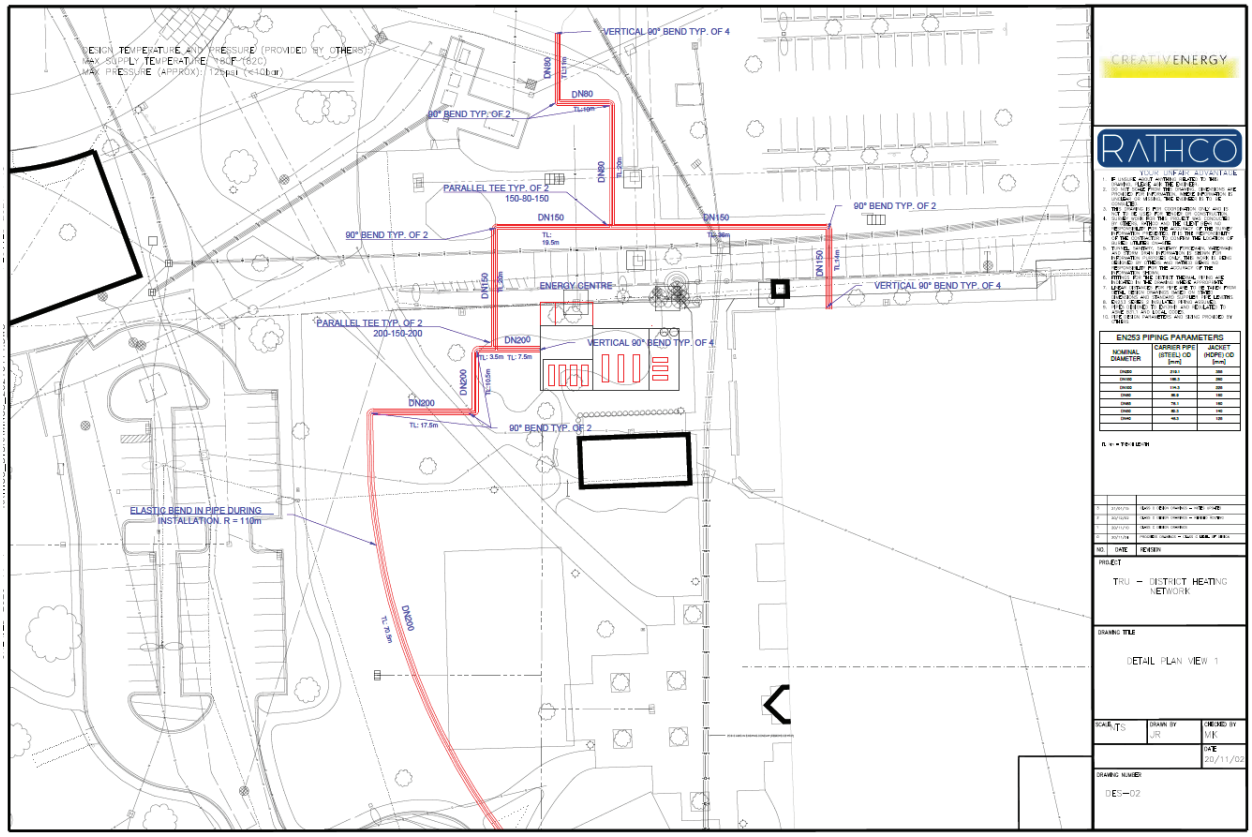
Sheet
1 of 2

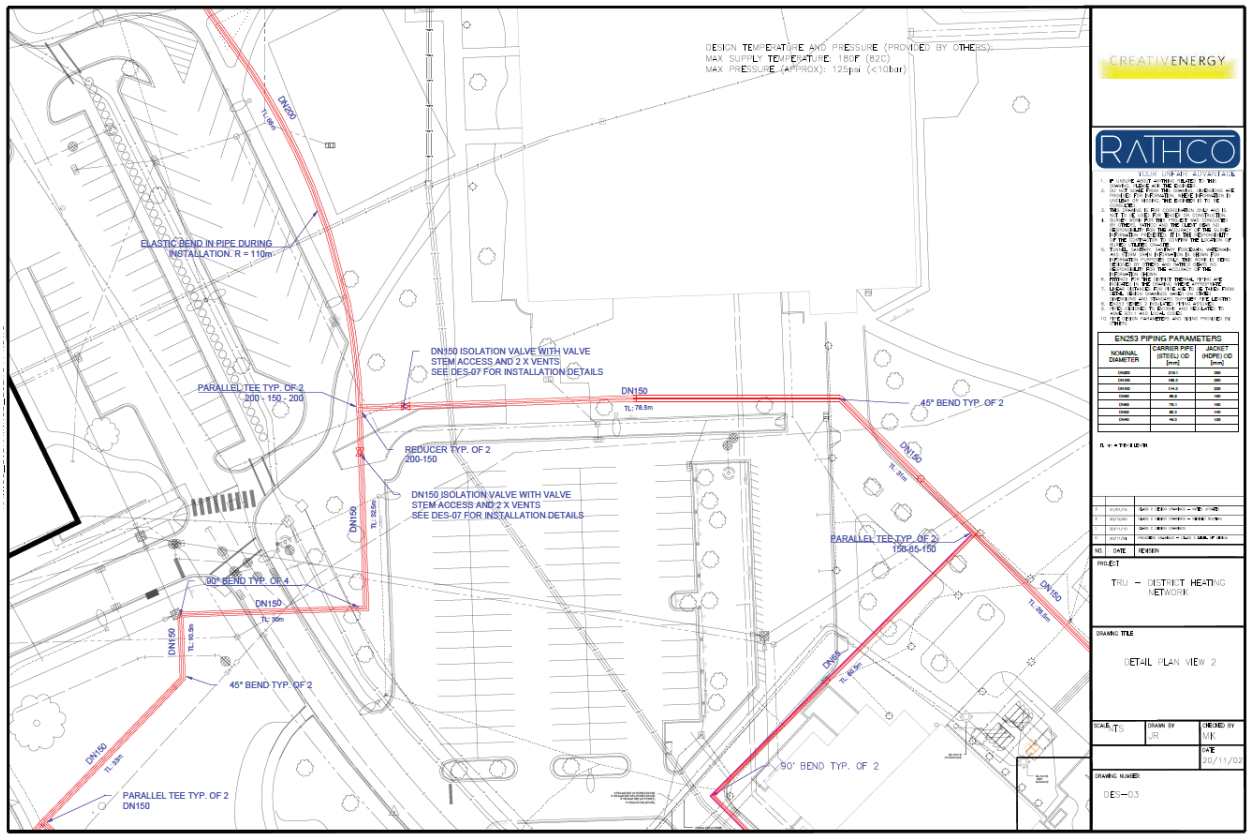
Scale
1 : 100

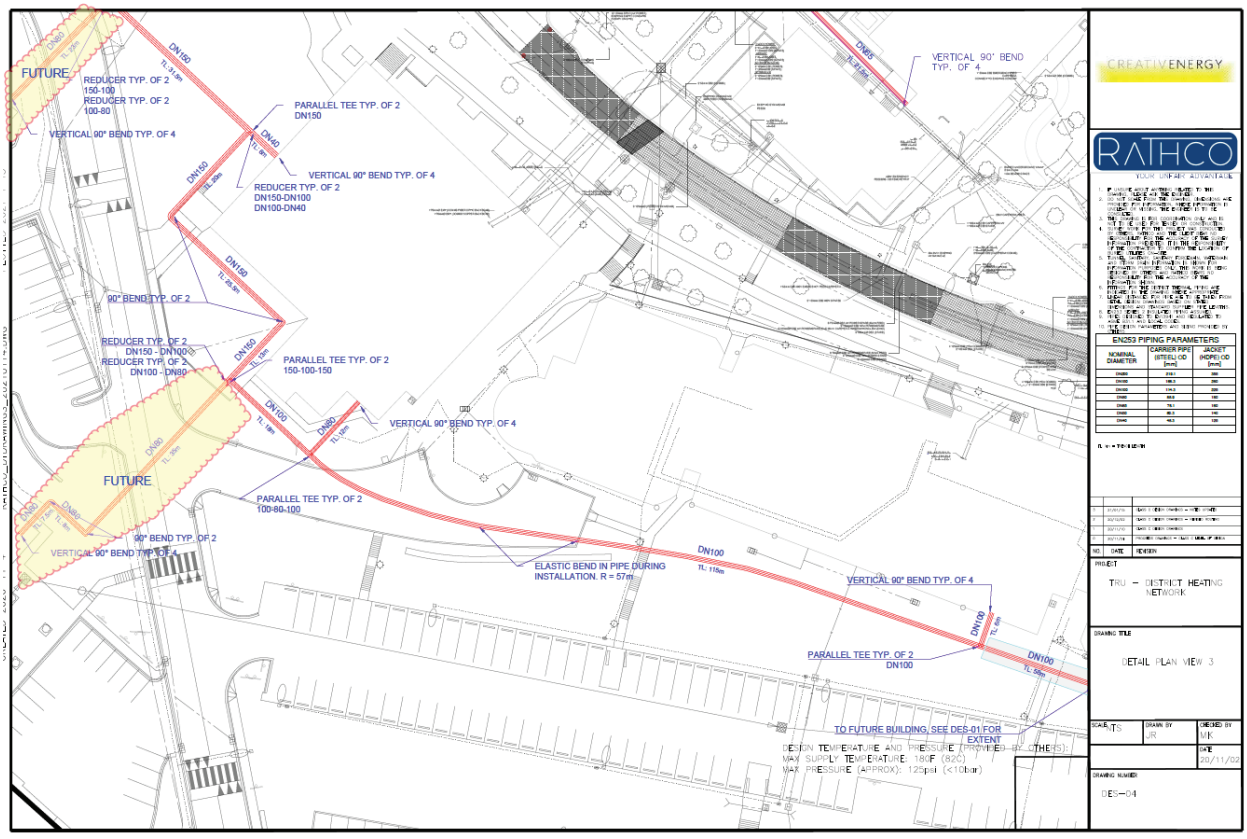
Revision

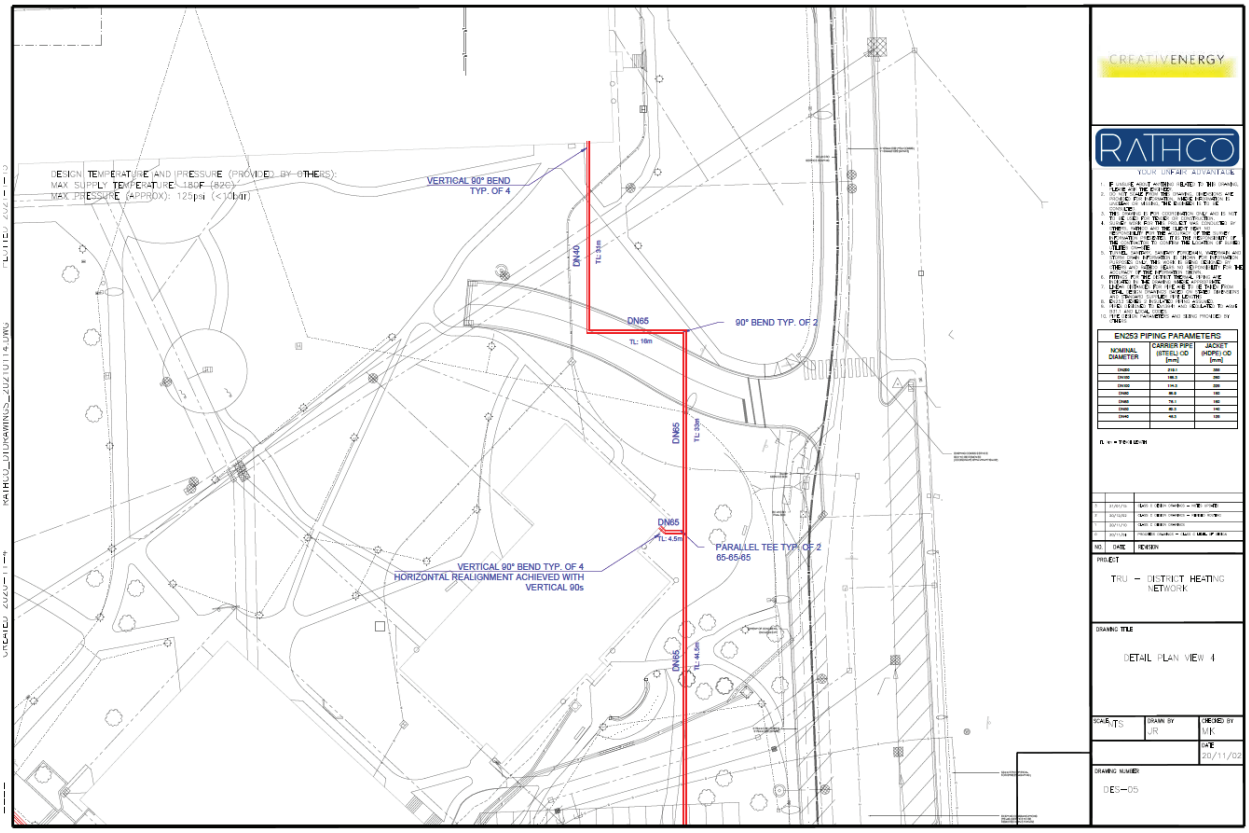
Drawing No.
M100

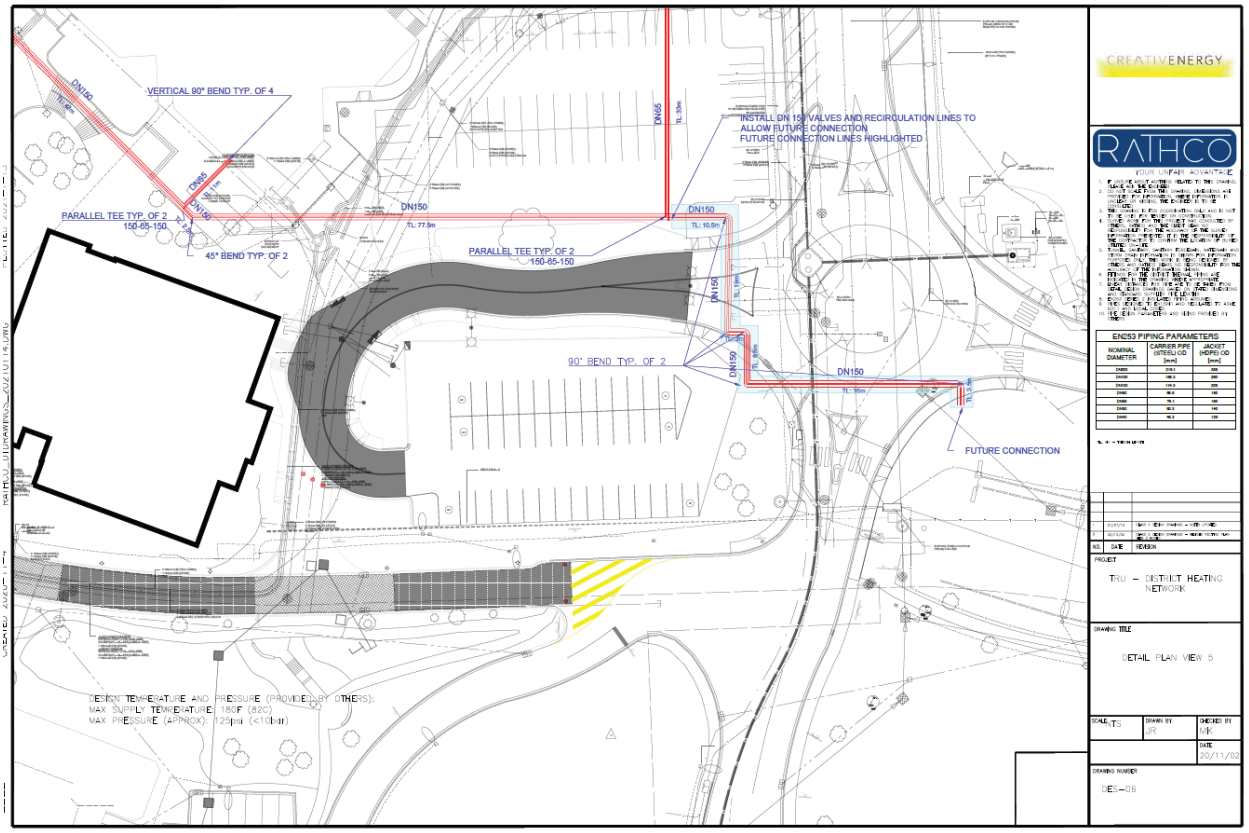


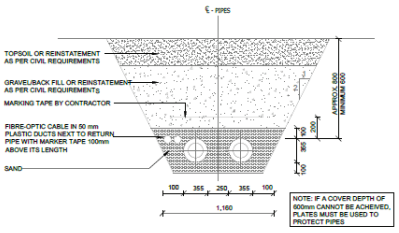




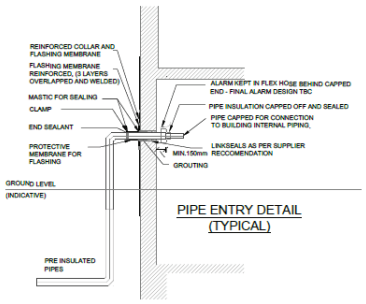




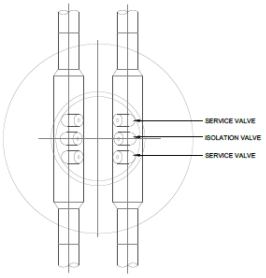




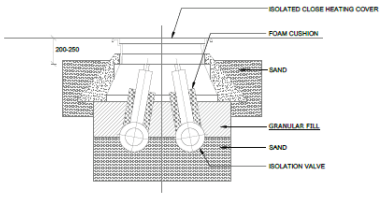
EXCAVATION PROFILE DETAIL (TYPICAL)



PIPE ENTRY DETAIL (TYPICAL)



PLAN



SECTION

VALVE ACCESS DETAIL (TYPICAL)

DESIGN TEMPERATURE AND PRESSURE (PROVIDED BY OTHERS):
MAX SUPPLY TEMPERATURE: 180F (82C)
MAX PRESSURE (APPROX): 125psi (<10bar)

CREATIVENERGY

RATHCO
YOUR UNFAIR ADVANTAGE

NO.	DATE	REVISION

PROJECT
TRU – DISTRICT HEATING NETWORK

DRAWING TITLE
DETAILS

SCALE (T3)	DRAWN BY	CHECKED BY
	VR	MK
		DATE 20/11/02

DRAWING NUMBER
DES-07

SCHEDULE 2
LOAD REQUIREMENTS AND COMPONENTS OF THE DES ASSETS AND DES SPACES

TRU Buildings Estimated Heating Loads (the "**Load Requirements**") are as follows:

Building	Floor area	Estimated peak heating load (kW)	Estimated annual heating load (MWhr)
Old Main	19,800 m^2	1,500 kW	1,485 MWhr
Science	10,800 m^2	700 kW	714 MWhr
SOBE Management Building (Future)	6,500 m^2	250 kW	296 MWhr
Library	2,400 m^2	200 kW	269 MWhr
BC Centre for Open Learning	3,600 m^2	300 kW	327 MWhr
Culinary Arts	1,859 m^2	470 kW	451 MWhr
Clock Tower	2,340 m^2	230 kW	243 MWhr
Gymnasium	3,700 m^2	500 kW	417 MWhr
International Building	5,620 m^2	450 kW	356 MWhr
SUB TOTAL	**56,619 m^2**	**4,140 kW**	**4,558 MWhr**

A diversification factor of 90% has been applied to the total estimated peak heating load; 4,140 KW is the diversified estimated peak heating load.

Components of the DES Assets:

1. Energy Center equipment with associated electrical, controls, piping, and ductwork located at energy center building for the generation of thermal energy (the DES)

2. Distribution System between Energy Center Building and the Buildings

3. Equipment with associated electrical, controls, piping, and ductwork within the Buildings up to Demarcation Point

The DES Spaces

The DES Spaces are to comprise the following spaces:

1. Exclusive use of the Energy Centre Room subject only to TRU's need to enter the Energy Centre Room for inspections and repair of the utility services for the DES or the Energy Centre Building, being: an above grade space and roof area, that is lockable and secure, for the installation of the DES, the controls and additional storage for spare parts and inventory.

2. Non-exclusive use of additional spaces, including:

    a. space in each Building for the DES Assets and associated electrical and controls up to Demarcation Point;

    b. corridors for Distribution Systems;

c. one large parking stall for contractor deliveries, which can be shared with TRU and does not need to be dedicated, and a parking pass or equivalent permission to grant such use to Creative Energy;

d. air intake, exhaust shafts and termination grilles;

e. electricity supply;

f. control panels;

g. floor drains and water access; and

h. space enclosure/security.

All DES Spaces to be accessible twenty-four hours per day, every day of the year, subject only to TRU's safety and security rules that have been provided in writing to Creative Energy.

SCHEDULE 3
TRU-SUPPLIED UTILITIES

For all DES Spaces as required:

1. Electricity supply
2. Natural Gas supply
3. Water supply
4. Sanitary drains/floor drains
5. Floor coating/membrane
6. Ventilation
7. Air intake
8. Combustion Air Supply
9. Acoustic fixtures (Energy Center Building only)
10. Fire Alarm and sprinklers
11. Internet connection with public static IP address
12. Phone connection and service
13. Lighting
14. Emergency lighting
15. Openings on walls, floors, and ceilings for DES Assets
16. Exhaust air shaft, louvers, and openings
17. Aesthetic treatment of boilers stacks termination
18. Coordinated size and location of spaces for DES Assets
19. Minimum floor area required for DES, 220 sq.m. main floor, and 220 sq.m. roof level

SCHEDULE 4

SITE TIMELINE

M#	Milestone (M)	Milestone Target Date	Responsibility
1	Buildings drawings available to Creative Energy	October 2021	TRU
2	Start of Energy Centre Building Construction	March 2022	TRU
3	Start of buildings retrofits for DES connecting buildings	March 2022	TRU
4	Provision of TRU-supplied utilities/services	October 2022	TRU
5	Energy Center Building available for DES Assets fit out	January 2023	TRU
6	Start of construction of DES Assets in Energy Center Building	M5 + 2 months	Creative Energy
7	Start of distribution system construction	M5 + 3 months	Creative Energy
8	Start of construction of DES Assets in the connecting buildings	M3 + 12 months	Creative Energy
9	Completion of Energy Center Building Construction	July 2023	TRU
10	Start of Testing and Commissioning buildings retrofits	November 2023	TRU
11	Start of Testing and Commissioning of DES Assets	M10 + 2 months	Creative Energy
12	Service Commencement Date	M11 + 3 months	TRU and Creative Energy
13	Target Date	M5 + 15 months	TRU and Creative Energy

SCHEDULE 5

MATERIAL PERMITS

Material Permit	**Responsible Party**
Energy Center Building Construction	TRU
Energy Center Building Occupancy	TRU
CPCN	Creative Energy
DES Assets Installation	Creative Energy
DES Assets Operations	Creative Energy

SCHEDULE 6

FORM OF SRW

See attached.

PART 2 - TERMS
STATUTORY RIGHTS OF WAY

TRU

BETWEEN:

THOMPSON RIVERS UNIVERSITY
having an address at 805 TRU Way, Kamloops, B.C.

(the "**Grantor**")

AND:

CREATIVE ENERGY THOMPSON RIVERS GP INC. (INC. NO. BC1320525)
having an address at Suite 1 – 720 Beatty Street, Vancouver, B.C.

(the "**Grantee**")

WHEREAS:

A. The Grantor is the legal and beneficial owner of certain properties presently legally described as:

PID: 028-324-757, LOT 1 SECTIONS 1 AND 12 TOWNSHIP 20 RANGE 18 WEST OF THE 6TH MERIDIAN KAMLOOPS DIVISION YALE DISTRICT PLAN KAP91275 EXCEPT EPP60804 AND EPP87212

(the "**Lands**").

B. The Grantee will own and operate the Energy System in respect of, *inter alia,* the Lands.

C. The right of way granted under this Agreement is necessary for the operation and maintenance of the Energy System and the provision of Energy Services in respect of, *inter alia*, the Lands.

THEREFORE in consideration of the premises, the terms and conditions herein contained, ONE DOLLAR ($1.00) now paid by each of the Grantee and the Grantor to the other and other good and valuable consideration, the receipt and sufficiency whereof are hereby acknowledged by the Grantee and the Grantor, the parties agree as follows:

1. Definitions. In this Agreement:

(a) "**Building**" means the current and proposed buildings on the Lands that will be connected to the Energy System, being namely the buildings named on the Site Plan set out in Schedule B as follows: Old Main, Ken Lepin Building, SOBE Management Building (proposed), Old Library and Administration Building, BC

Centre for Open Learning, Culinary Arts Building, Clock Tower Building, Gymnasium, International Building and Energy Centre Building, together with any other buildings connected to the Energy System.

(b) "**Building Systems**" means the systems of heat and hot water delivery equipment including water pipes, heat pumps and related equipment, components and controls located within the Building and connected to the Energy System at the Demarcation Points and used for distributing the Energy Services within the Building.

(c) "**Business Day**" means any day that is not a Saturday, Sunday, a statutory holiday in British Columbia, Easter Monday or Boxing Day.

(d) "**Consultant**" means a duly qualified and licensed engineer or other professional having expertise in respect of the Works referred to in the applicable Works Plans.

(e) "**Customer Service Agreement**" means any agreement pursuant to which the Grantee provides Energy Services to the Building or to a part of the Building, as such agreement may be amended or restated from time to time.

(f) "**Demarcation Points**" means the points at which the pipes forming part of the Building Systems connect to the Energy System, at each Energy Transfer Station.

(g) "**Distribution System**" means, collectively, the system of pipes, fittings and ancillary components and equipment supplying Energy Services to, *inter alia*, the Demarcation Points.

(h) "**ECR Area"** means those premises to be constructed on the Lands within the building labelled as "ENERGY CENTRE" on the site plan attached hereto as Schedule B, as more particularly described and shown on the plans and the drawings attached hereto as Schedule A, and within which are or will be located the components of the Energy System used for generating the Energy Services, including, without limitation, boilers and related components, equipment and controls.

(i) "**Energy Services**" means space heating and domestic hot water services to be provided through the Energy System up to the Demarcation Points.

(j) "**Energy System**" means the thermal energy system consisting of, *inter alia*, pipes, heat pumps, boilers, meters and related components, equipment and controls used for generating, metering and distributing the Energy Services to the Demarcation Points, and including the Distribution System and the Energy Transfer Stations, and all additions thereto and replacements thereof, but specifically excluding all Building Systems.

(k) "**Energy System Ancillary Spaces**" means those portions of the Building and the Lands, other than the ECR Area, wherein the Energy System is located from time to time, including, without limitation, the rooftop areas of the Building which contain or will contain any portion of the Energy System, the locations in the

Building which house or will house the Energy Transfer Station and the Distribution System and any associated corridors for piping, air intake, exhaust shafts and termination grilles.

(l) "**Energy Transfer Station**" means, in respect of each Building, isolation valves, one or more flow control valves, energy metering equipment including temperature sensors and flow meters, control panel and all pipes, fittings, pressure and temperature gauges, sensors, and other associated equipment and instruments which control the transfer, and measure Energy Services from the Distribution System to the Building System for such Building.

(m) "**Interfere**" means, except as otherwise provided in this Agreement, interfere with, impede, disturb or adversely affect, except in a non-material or temporary way, and "**Interference**" has a corresponding meaning.

(n) "**Lands**" means those lands and premises defined in recital A to this Agreement and set out in Item 2 of the Form C General Instrument Part 1 of which this Agreement forms part.

(o) "**person**" means an individual, corporation, body corporate, partnership, joint venture, association, society or unincorporated organization or any trustee, executor, administrator or other legal representative.

(p) "**Representatives**" means, with respect to either party, any officer, director, governor, employee, agent, contractor, subcontractor, consultant, or advisor of such party, or any person for whom the such party is responsible at law.

(q) "***Strata Property Act***" means the *Strata Property Act* (British Columbia) from time to time in force and all amendments thereto or similar legislation which may hereafter be enacted in its place.

(r) "**Thermal Energy**" means all thermal energy for space heating and for domestic hot water heating purposes.

(s) "**Works**" means any installation, inspection, maintenance, operation, repair, construction, replacement, removal, steps or any other acts contemplated by the Grantee in exercising any of its rights under this Agreement which involves the construction or installation of any improvements, works or structures on the Lands or requires the exclusive use of any Building elevators or requires the interruption of any Building services or utilities in any way or in any way that is likely to cause any material interference in the construction or operation of the Building or any part thereof or access to or egress from the Building or any part thereof or the movement within the Building or any part thereof by the owners, tenants or other occupants of the Building or any part thereof or any of their respective invitees.

(t) **"Works Plans**" means the plans and specifications for any Works intended to be undertaken as identified therein, as prepared by a Consultant, which Works Plans will include:

(i) a schedule for undertaking and completing the relevant Works;

(ii) particulars of anticipated power or other building service or utility interruptions necessitated by the relevant Works; and

(iii) particulars of any restrictions on access to or from or movement within the Building necessitated by the relevant Works.

2. Provision of Service. The Grantor has or will enter into one or more Customer Service Agreements with the Grantee for the connection of the Building to the Energy System. In the event of a conflict between the terms and conditions of any such Customer Service Agreement with respect to the use of and access to the Lands and this Agreement, the terms and conditions of this Agreement shall prevail.

3. Statutory Right of Way re: ECR Area. Pursuant to Section 218 of the Land Title Act and subject always to the terms of this Agreement, the Grantor hereby grants to the Grantee for so long as the Grantee is providing Energy Services to any Building, a statutory right of way over the ECR Area to enter, go across, pass over, repass over and remain within, upon and along the ECR Area at any time and from time to time for the following purposes:

(a) constructing, installing, maintaining, operating, altering, reconstructing, repairing, demolishing, replacing, rebuilding, inspecting and removing the Energy System (or any component thereof), and dealing in any other way (unless contrary to or inconsistent with this Agreement) with the Energy System (or any component thereof), within the ECR Area;

(b) clearing the ECR Area of any obstructions which Interfere with any of the rights granted to the Grantee herein;

(c) connecting the Energy System to buildings on properties other than the Lands in order to provide Energy Services to such buildings from the Energy System;

(d) taking such steps as the Grantee deems necessary to protect and secure the Energy System within the ECR Area;

(e) bringing into the ECR Area all machinery, materials and equipment it requires for any of the foregoing purposes; and

(f) generally doing all acts necessary or incidental to the foregoing or to the business of operating, maintaining and repairing the Energy System within the ECR Area.

4. Statutory Right of Way re: Energy System Ancillary Spaces. Pursuant to Section 218 of the Land Title Act and subject always to the terms of this Agreement, the Grantor hereby grants to the Grantee for so long as the Grantee is providing Energy Services to any Building, a statutory right of way over the Energy System Ancillary Spaces, for the Grantee and the Grantee's Representatives to enter onto the Energy System Ancillary Spaces at any time and from time to time to:

(a) construct, install, inspect, maintain, operate, repair, replace and remove the Energy System or any portion thereof;

(b) make, inspect, maintain, remove and repair the Energy System service connections and connect and disconnect the Energy System service lines;

(c) clear the Energy System Ancillary Spaces of any obstructions, including, without limitation, trees or other vegetation, buildings, structures, foundations, pavements, improvements or obstructions, which Interfere with any of the rights granted to the Grantee herein;

(d) install marking posts or other identifiers to mark the location of the Energy System or any portion thereof;

(e) take such steps as the Grantee deems reasonably necessary to protect and secure the Energy System within the Energy System Ancillary Spaces;

(f) bring onto the Energy Systems Ancillary Spaces all machinery, materials and equipment it requires for any of the foregoing purposes;

(g) generally do all acts necessary or incidental to the foregoing or to the business of operating, maintaining and repairing the Energy System within the Energy System Ancillary Spaces; and

(h) exercise any of the Grantee's other rights set out in this Agreement.

5. Statutory Right of Way re: Access. Pursuant to Section 218 of the Land Title Act and subject always to the terms of this Agreement, the Grantor hereby grants to the Grantee for so long as the Grantee is providing Energy Services to any Building, a statutory right of way over the Lands as reasonably required by the Grantee and its Representatives, with or without vehicles or equipment, for the purpose of access to and egress from that portion of the Lands which contains the Energy System.

6. Grantee to Act Reasonably. The Grantee agrees to act reasonably when exercising its rights pursuant to Sections 3 through 5 herein, to exercise such rights in as expedited a manner as reasonably possible and to minimize as much as reasonably possible any disruption or disturbance to the Grantor or its consultants, contractors and subcontractors, the Building, or the tenants, occupants and licensees of the Building in connection with the exercise by the Grantee and the Grantee's Representatives of such rights, and to promptly clean up and restore the Building after having exercised any such rights, to the condition the Building was in prior to the exercise of any such rights, to the extent reasonably possible.

7. Covenants Regarding the Works.

(a) The Grantee hereby covenants and agrees with the Grantor that the Grantee will not carry out any Works except in accordance with the terms of this Section 7.

(b) Prior to undertaking any Works, the Grantee will cause to be prepared and delivered to the Grantor for review and approval the Works Plans, provided that the Grantor's approval rights will be limited to approving those matters referred to in paragraphs (ii) and (iii) of the definition of "Works Plans" and that the Grantor must act reasonably in deciding whether or not to grant its approval.

(c) If applicable laws require that the Works Plans for any Works must be approved by a governmental authority, such Works will not be commenced until the applicable Works Plans have been approved by the applicable governmental authorities having jurisdiction.

(d) The Grantee shall not deviate from any Works Plans in any material respect unless revised Works Plans with respect to any such deviation are submitted to the Grantor for review and approval (on the basis set out in Section 7(b)).

(e) The Grantee's Consultant shall supervise the applicable Works.

(f) The parties agree that the Grantor shall have the right, at its election and at its cost, to appoint its own representative (the "**Grantor's Monitor**") and the Grantee shall permit the Grantor's Monitor, at all reasonable times during the period beginning with such appointment and continuing until the completion of the Works, to monitor the applicable Works.

(g) The Grantee covenants and agrees to use due care and attention to identify, before commencing any Works, the location of all works servicing the Building including, without limitation, utilities and building systems, to ensure that the Grantee does not Interfere (except as may be described in the applicable Works Plans) with the operation of such works in the undertaking of the Works.

(h) After the completion of the applicable Works, the Grantee shall, upon request by the Grantor, promptly provide the Grantor with copies of all professionally signed and sealed drawings, reports, specifications, field reports, site instructions and final as-built drawings with respect to such Works, including surveys, if any, setting out the location of such Works.

(i) If the Grantee, in exercising its rights under this Agreement, causes any damage to the Building or Lands, the Grantee shall promptly advise the Grantor in writing of the nature of such damage and make good any such damage caused to the Building or Lands by restoring such property to a condition at least as good as it or they were in prior to such damage and, if the Grantee does not make good such damage, the Grantor shall have the right to restore the Building and the Lands at the expense of the Grantee and the Grantee will promptly reimburse the Grantor for such expenses upon receipt of an invoice therefor.

8. No Alternate System. During the term of this Agreement, the Grantor will not supply or install nor allow any other person to install any thermal energy system that would supply any Energy Services to the Building. The Grantee acknowledges and agrees that the

foregoing prohibition shall not apply to emergency generators not primarily used for heating the Building.

9. Covenant. The Grantor acknowledges, covenants and agrees with the Grantee:

(a) not to do or permit to be done on the Lands or in the Building anything which Interferes with or damages the Energy System or impairs the operation or otherwise adversely impacts the Energy System and the provision of Energy Services or creates any hazard or adversely impacts the safety or security of the Energy System. Such acts include, but are not limited to, the acts referred to in this Section 9;

(b) not to make, place, erect, operate, use or maintain upon the Energy System Ancillary Spaces any building, structure, foundation, pavement, excavation, well, culvert, swimming pool, open drain or ditch, pond, pile or material, obstruction, equipment or thing, or to plant any vegetation which:

(i) Interferes with or endangers the Energy System or the installation, construction, operation, maintenance, repair, removal or replacement of the Energy System;

(ii) materially obstructs the access granted in accordance with this Agreement to the Grantee or the Grantee's Representatives to the Energy System; or

(iii) adversely impacts the safety or security of the Energy System by its operation, use, maintenance or existence on the Lands;

without the consent of the Grantee, such consent not to be unreasonably withheld or delayed.

(c) not to add or remove ground cover over the Energy System or carry out blasting on or next to the Lands without the prior written consent of the Grantee, which consent will not be unreasonably withheld or delayed, and if such consent is granted, only in accordance with the reasonable written requirements of the Grantee; and

(d) to act reasonably and cooperate with the Grantee (provided that such cooperation does not require the Grantor to incur any cost or expense) in connection with the provision by the Grantee of Energy Services to, *inter alia*, the Lands and, without limiting the generality of the foregoing, the Grantor will ensure the Grantee has reasonable access to the Energy System and any part thereof on the Lands at all reasonable times and in the case of emergency, at any time, subject to the terms and conditions set out in this Agreement.

10. Access to ECR Area.

(a) The Grantee shall have the continuous use of the ECR Area pursuant to the statutory right of way granted to the Grantee under Section 3 and subject to the balance of the terms hereof. The Grantee shall be permitted to install a separate lock or a card

reader or fob locking system at the access points of the ECR Area in order to prevent unauthorized access to the ECR Area.

(b) The Grantor shall be entitled, upon reasonable notice to, and with the consent of the Grantee, which consent will not be unreasonably withheld, delayed or conditioned, and at any time in case of emergency, to access the ECR Area for the purpose of undertaking repairs, maintenance and improvements to the Building or the Building Systems, provided that such works will not Interfere with Grantee's use of the ECR Area or interrupt the operation of the Energy System. In undertaking such works, the Grantor agrees to comply with the reasonable conditions imposed by the Grantee for the protection of the Energy System and the continued operation of Energy Services, including requirements for escorted access (except in cases of a *bona fide* emergency where, under the circumstances, it is not reasonably possible for the Grantor to wait for escorted access, and in which event the Grantor will provide notice of such access forthwith to the Grantee). Prior to undertaking such works and as a condition of the Grantee's consent for access to the ECR Area (except in cases of a *bona fide* emergency where, under the circumstances, it is not reasonably possible for the Grantor to wait for the consent of the Grantee, and in which event the Grantor will provide notice of such access forthwith to the Grantee), the Grantor will submit plans of the proposed work to the Grantee, which plans will include a work schedule for access to the ECR Area and the particulars of any anticipated interruption to power or other service or utility which may impact the operation of the Energy System.

11. Maintenance.

(a) The Grantee, at its sole cost and expense, except as otherwise provided in any agreement between the Grantor and Grantee, is responsible for the maintenance and repair (including cleaning services and painting where required as part of general maintenance) of the non-structural interior components of the ECR Area.

(b) The Grantor, at its cost, is responsible for the maintenance and repair of the Energy System Ancillary Spaces (excluding any components of the Energy System located within the Energy System Ancillary Spaces) and the structural components of the ECR Area (excluding the Energy System).

12. Construction Costs. The Grantor will, at its sole cost, pay all upfront costs to construct the spaces for the ECR Area.

13. Utility and Connection Services. The Grantor will, at its cost, construct the ECR Area to provide to the Grantee the following items of service or connection within or relating to the ECR Area and available to connect to or service the Energy System within the ECR Area:

(a) Metered electricity supply;

(b) Metered natural gas supply;

(c) Metered Water supply;

(d) Sanitary drains/floor drains;

(e) Combustion Air Supply;

(f) Air intake

(g) Exhaust Air Shafts, louvers, and openings;

(h) Openings (on walls, floor, and ceilings) for DES Assets;

(i) Aesthetic treatment of boilers stacks termination;

(j) Floor coating/membrane per industry practice;

(k) Fire alarms and sprinklers;

(l) Static IP Internet connection and phone connection;

(m) Building acoustic fixtures for noise control from ECR;

(n) Lighting, emergency lighting;

(o) Ventilation as per the Grantee's requirements; and

(p) Backup power (if and as required per the building design).

14. Landscaping. Notwithstanding any other terms of this Agreement, the Grantor may landscape that portion of the Lands that is on, over, under any portion of the Energy System Ancillary Spaces with lawns, trees, flowers and shrubs and other surface growth and erect, place, install and maintain concrete or paved driveways, patios, walkways and other surface materials (collectively "**Improvements**"), on, over and under any portion of the Energy System Ancillary Spaces, provided that the Grantor will be solely responsible for any and all damage to, and costs and expenses associated with repairing or replacing the Energy System or any portion thereof caused by or arising from the construction or existence of such Improvements on the Lands. If the Grantee damages any of the Improvements when exercising its rights and obligations under this Agreement, the Grantee, at its cost, will repair and restore such Improvements to their original state as soon as reasonably possible.

15. Environmental Matters.

(a) For the purpose of this Section 15:

"**Environmental Laws**" means any and all statutes, laws, regulations, orders, bylaws, standards, guidelines, permits and other lawful requirements of any federal, provincial, municipal or other governmental authority having jurisdiction over the Lands now or hereafter in force with respect in any way to the environment, health,

occupational health and safety, product liability or transportation of dangerous goods, including the principles of common law and equity;

"**Hazardous Substance**" means any radioactive materials, asbestos materials, urea formaldehyde, underground or aboveground tanks, pollutants, hazardous substances, deleterious substances, dangerous substances or goods, hazardous, corrosive or toxic substances, special waste or waste of any kind or any other substance the storage, manufacture, disposal, bundling, treatment, generation, use, transport, remediation or release into the environment of which is now or hereafter prohibited, controlled or regulated under Environmental Laws; and

"**Pre-existing Hazardous Substances**" means any Hazardous Substance present in, on or under the Lands, including without limitation surface and ground water, as at the date of this Agreement, except for any such Hazardous Substances introduced to the Lands or the Building by the Grantee or any person for whom the Grantee is responsible at law.

(b) For the purposes of applicable Environmental Laws, the Grantor will be deemed to have responsibility for, and control and management of the Lands with respect to their environmental condition except as otherwise expressly provided in this Agreement or any other agreement between the Grantee and the Grantor.

(c) The Grantor covenants and agrees with the Grantee at all times and from time to time as follows:

(i) not to use or permit the Lands to be used for the sale, storage, manufacture, disposal, handling, treatment, use or any other dealing with any Hazardous Substance, except in compliance with Environmental Laws; and

(ii) to comply with and to continue to comply with Environmental Laws and to use its commercially reasonable efforts to cause any tenants or other occupants of the Lands to comply with Environmental Laws in their use and occupancy of the Lands and the Building.

(d) The Grantor will release and indemnify and hold harmless the Grantee, its Representatives and any of its successors and permitted assigns from any and all liabilities, actions, damages, claims (including remediation cost recovery claims), losses, costs, orders, fines, penalties and expenses whatsoever (including all consulting and legal fees and expenses on a solicitor-client basis) and the costs of removal, treatment, storage and disposal of Hazardous Substances and remediation of the Lands and any adjacent property affected by the transmission of Hazardous Substances from the Lands which may be paid by, incurred by or asserted against the Grantee, its Representatives and any of its successors and permitted assigns arising from or in connection with any breach of or non-compliance with the provisions of this Section 15 by the Grantor, except to the extent that such breach or non-compliance was contributed to or caused by any negligent act or omission, or wilful misconduct, of the Grantee or its Representatives.

(e) The Grantee covenants and agrees with the Grantor at all times and from time to time as follows:

(i) not to use the Lands for the sale, storage, manufacture, disposal, handling, treatment, use or any other dealing with any Hazardous Substance, except in compliance with Environmental Laws and then only as required in connection with the exercise by the Grantee of its rights under this Agreement; and

(ii) to comply with and to continue to comply with Environmental Laws in its use and occupancy of the Lands and the Building hereunder.

(f) The Grantee will release and indemnify and hold harmless the Grantor, its Representatives and any of its successors and permitted assigns from any and all liabilities, actions, damages, claims (including remediation cost recovery claims), losses, costs, orders, fines, penalties and expenses whatsoever (including all consulting and legal fees and expenses on a solicitor-client basis) and the costs of removal, treatment, storage and disposal of Hazardous Substances (except any Pre-Existing Hazardous Substance) and remediation of the Lands and any adjacent property affected by the transmission of Hazardous Substances (except any Pre-Existing Hazardous Substance) from the Lands which may be paid by, incurred by or asserted against the Grantor or its Representatives arising from or in connection with any breach of or non-compliance with the provisions of this Section 15 by the Grantee except to the extent that such breach or non-compliance was contributed to or caused by any negligent act or omission of the Grantor or its Representatives or a breach or non-compliance by the Grantor with applicable Environmental Laws.

(g) The obligations of the Grantee under this Section 15 shall survive the registration of this Agreement and the termination and release thereof, if any. The obligations of the Grantee under this Section 15 are in addition to, and shall not limit, the obligations of the Grantee contained in other provisions of this Agreement or otherwise at law.

16. Subdivision / Effect of Agreement. This Agreement and the rights herein granted will run with the Lands and each part into which the Lands may be subdivided, whether by subdivision plan, strata plan or otherwise howsoever, and the term "Grantor" includes the owner of each subdivided portion of the Lands and the successors in title thereof. Despite anything contained in this Agreement, if the Lands are subdivided by subdivision plan, strata plan or otherwise howsoever, a default in respect of any subdivided portion of the Lands, including a default with respect to any amount payable in connection with any subdivided portion of the Lands, will not be a default with respect to any other portion of the Lands for which there has not been a default and the Grantee will not be entitled to exercise any of its rights or remedies under this Agreement except with respect to the subdivided portion or portions of the Lands for which there has been a default. Despite any other provision of this Agreement, in the event that the Lands are subdivided by means of a strata plan pursuant to the *Strata Property Act*:

(a) the "Grantor" under this Agreement shall be the strata corporation created by the filing of such strata plan and the individual owners of the strata lots created by such strata plan shall have no obligations or liabilities under this Agreement other than as members of the strata corporation;

(b) the individual strata lots created by any strata plan in respect of any portion of the Lands will not form part of the "Lands" and will not be subject to this Agreement;

(c) the statutory rights of way and covenants granted pursuant to this Agreement are intended to apply to and burden only the common property created by such strata plan and not at any time to burden any strata lot or the owner of any strata lot; and

(d) upon the request of and at the expense of the Grantor or any strata lot owner, the Grantee will execute and deliver in registrable form a discharge of this Agreement from any such strata lot provided however, that this Section 16(d) will not apply in the case of bare land strata lots.

17. Application to Strata Corporation. Without limiting anything set out in this Agreement, any strata corporation created in respect of any portion of the Lands will be a "Grantor" and will be bound by all of the terms and conditions of this Agreement and any common property created by any strata plan in respect of any portion of the Lands will remain as part of the "Lands" and will be subject to this Agreement.

18. Injunctive Relief. Each of the Grantee and the Grantor acknowledges and agrees that, without limiting any other right or remedy of the other party, the other party may obtain from a court of competent jurisdiction injunctive relief in respect of any breach or anticipated breach by the first party of any of its duties or obligations under this Agreement.

19. Grantor's Indemnity. Subject to Section 21, the Grantor does hereby agree to indemnify and save harmless the Grantee from all liabilities, claims, demands, actions, damages, losses, costs and expenses which the Grantee may suffer or incur arising from or connected to the non-performance of the Grantor's obligations hereunder, save to the extent that such liabilities, claims, demands, actions, damages, losses, costs and expenses which the Grantee may suffer or incur result from the negligence or wilful misconduct of the Grantee. The provisions of this Section shall survive the expiration or termination of this Agreement.

20. Grantee's Liability and Indemnity. The Grantee shall indemnify the Grantor and save it harmless from all loss claims, actions, damages, liability and expense in connection with loss of life, personal injury, damage to property or any other loss or injury whatsoever arising out of the occupancy or use by the Grantee or its Representatives of the Lands or the Building or any part thereof, or any non-performance of the Grantee's obligations hereunder, or occasioned wholly or in part by any act or omission of the Grantee or its Representatives or anyone permitted by the Grantee to be on the Lands or in the Building. If the Grantor shall, without fault on its part, be made a party to any litigation commenced by or against the Grantee, then the Grantee shall protect, indemnify and hold the Grantor harmless in connection with such litigation. The Grantor may, at its option, participate in

or assume carriage of any litigation or settlement discussions relating to the foregoing, or any other matter for which the Grantee is required to indemnify the Grantor under this Agreement. Alternatively, the Grantor may require the Grantee to assume carriage of and responsibility for all or any part of such litigation or discussions. The provisions of this Section shall survive the expiration or termination of this Agreement.

21. Limitation of Liability.

(a) Neither party shall be liable for any indirect, incidental, special or consequential damages or losses, including any loss of profits, loss of business revenue, failure to realize expected savings or any other commercial or economic loss suffer or incurred by the other party or its Representatives, howsoever caused.

(b) Except as otherwise provided in the Customer Service Agreement, the Grantor shall not be liable for any death or injury arising from or out of any occurrence in, upon, at, or relating to the Lands or the Building, or damage to property of the Grantee or of others located on the Lands or the Building, nor shall it be responsible for any loss of or damage to any property of the Grantee or others from any cause, except to the extent that such death, injury, loss or damage directly or indirectly results from the negligence or willful misconduct of the Grantor, its agents, employees, contractors, or others for whom it may, in law, be responsible. The Grantor shall not be liable for any such damage caused by tenants or other persons on the Lands or in the Building or by occupants of adjacent property thereto, or the public, or caused by any public or quasi-public work. All property of the Grantee kept or stored on the Lands or in the Building shall be so kept or stored at the risk of the Grantee only and the Grantee releases and agrees to indemnify the Grantor and save it harmless from any claims arising out of any damage to the same including, without limitation, any subrogation claims by the Grantee's insurers unless such damage results from the negligence or willful misconduct of the Grantor, its agents, employees, contractors, or others for whom it may, in law, be responsible.

(c) Neither the Grantee, nor any of the Grantee's Representatives, is responsible or liable for any loss, injury (including death), damage or expense incurred by the Grantor or any person claiming by or through the Grantor, that is caused by or results from, directly or indirectly, any discontinuance, suspension, or interruption of, or failure or defect in the supply, delivery or transportation of, or any refusal to supply, deliver, or transport Thermal Energy, or provide Energy Services, except to the extent that the loss, injury (including death), damage or expense arises directly from the negligence or wilful misconduct of the Grantee or any of the Grantee's Representatives.

(d) The provisions of this Section 21 shall survive the expiration or termination of this Agreement.

22. Insurance.

(a) The Grantee will, without limiting its liability under this Agreement or its obligations under applicable laws, at its own expense, obtain and maintain in full force and effect throughout the Term, the insurance coverage described in this Section 22 including coverage for their officers, directors and employees and, unless otherwise agreed in writing by the Grantor, will also cause any subcontractors or sub-consultants of the Grantee to obtain and maintain reasonable levels of the relevant types of insurance coverage described in this Section 22, including such coverage for their respective officers, directors and employees:

(i) A. Wrap Up Commercial General Liability (project specific) ("WUL") covering construction of the DES and the DES Assets, insuring against claims for bodily injury, personal injury, death, and property damage, including loss of use, in amounts it deems adequate but in any event, not less than $10,000,000 per occurrence and in the aggregate.

B. Any time not otherwise covered under the WUL, Commercial General Liability Insurance against claims for personal injury, death or property damage, covering its operations, including premises/operations liability and products/completed operations liability, in an amount not less than $5,000,000 per occurrence and in the aggregate, following the commencement date of the Customer Service Agreement.

C. The Commercial General Liability policies shall name the Grantor and its directors, officers, governors, employees and agents as additional insureds in respect of the operations of the Grantee under this Agreement and shall be non-contributory and apply only as primary, and not as excess, to any other insurance available to the Grantor.

(ii) **Automobile Liability Insurance** having a limit of not less than five million dollars ($5,000,000) inclusive per occurrence and insuring against claims for bodily injury, including death, and for property damage arising out of the use of the Grantee's owned, leased and non-owned vehicles if such vehicles are used in the performance of this Agreement.

(iii) **All Risks Property Insurance** (including flood and earthquake) upon all property owned by the Grantee or in their care, custody or control or installed by or on behalf of the Grantee, in an amount not less than the full replacement cost thereof.

(iv) **Boiler and Machinery Insurance** with limits for each accident in an amount not less than the full replacement cost of all boilers, pressure vessels, heating, ventilating and air-conditioning equipment and miscellaneous electrical apparatus owned or operated by the Grantee or by others (other than the Grantor) on behalf of the Grantee.

The policies in (iii) and (iv) above shall name as loss payee the Grantor, and anyone else with an interest in the Building from time to time designated in writing by the Grantor, shall not contain a co-insurance clause and shall contain a waiver of any rights of subrogation which the insurer may have against the Grantor.

(v) **Workers' Compensation Insurance** in compliance with the applicable Laws pertaining to the compensation of injured employees assigned to the operations of the Grantee under this Agreement including voluntary compensation.

(vi) **Errors and Omissions Liability Insurance** for a value of not less than $5,000,000 per claim and in aggregate prior to the commencement date of the Customer Service Agreement and for a period of two years thereafter.

All insurance policies required pursuant to this Section 22(a), with the exception of the policies in Sections 22(a)(ii) and 22(a)(v), will be in accordance with the following requirements:

(vii) The policies will contain a provision obligating the insurer to give the Grantor thirty (30) days advance written notice of policy cancellation.

(viii) Any self-insured retention, deductible, and exclusion in coverage in the policies will be assumed by, for the account of, and at the sole risk of the Grantee and, to the extent applicable, will be paid by the Grantee.

(ix) The Grantee will deliver to the Grantor up-to-date insurance certificates evidencing such required coverage before the commencement of the operations of the Grantee under this Agreement within fifteen (15) days prior to the renewal of any such policy, and otherwise from time to time as is reasonably required by the Grantor, provided that the Grantor has no obligation to examine such certificates or to advise the Grantee in the event its insurance is not in compliance with this Section 22(a).

(x) The insurance shall be placed with reputable insurers which are licensed to provide insurance coverage in the Province of British Columbia.

(xi) Neither the providing of insurance by the Grantee in accordance with the requirements of this Agreement nor the insolvency, bankruptcy or failure of any insurance company to pay any claim accruing shall be held to waive any of the provisions of this Agreement with respect to the liability of the Grantee or otherwise. The presence or absence of such insurance coverage as contemplated by this Agreement does not in any way decrease the Grantee's liability owed to the Grantor.

(xii) The policy limits set out in this Section 22(a) are based on 2021 dollars and market conditions as of such time. The Grantee acknowledges and agrees that the Grantor may from time to time reasonably require that the policy

limits be increased to reflect changes arising from inflation or market conditions.

(b) The Grantor will, without limiting its liability under this Agreement or its obligations under applicable laws, at its own expense, obtain and maintain in full force and effect throughout the Term, the insurance coverage described in this Section 22 including coverage for their officers, directors and employees and, unless otherwise agreed in writing by the Grantee, will also cause any subcontractors or sub-consultants of the Grantor to obtain and maintain reasonable levels of the relevant types of insurance coverage described in this Section 22, including such coverage for their respective officers, directors and employees:

(i) **Commercial General Liability or Wrap-Up Liability Insurance** against claims for personal injury, death or property damage arising out of the Grantor's operations, in amounts it deems adequate but in any event, not less than $5,000,000 per occurrence and in the aggregate.

(ii) **All Risks Property Insurance** (including flood and earthquake) upon all property owned by the Grantor, including the Buildings, in an amount not less than the full replacement cost thereof.

(iii) **Boiler and Machinery Insurance** with limits for each accident in an amount not less than the full replacement cost of all boilers, pressure vessels, heating, ventilating and air-conditioning equipment and miscellaneous electrical apparatus owned or operated by the Grantor or by others (other than the Grantee) on behalf of the Grantor.

All insurance policies required pursuant to this Section 22(b) will be in accordance with the following requirements:

(iv) The Grantor will be responsible for the full amount of all premiums and deductibles required under Section 22(b). All policies required must be effective at the commencement date of this Agreement and must, to the extent obtainable, provide that the insurance will not be cancelled without the insurer giving at least 30 days' written notice to the Grantee. Insurance will be purchased from reputable insurers acceptable to the Grantee.

Notwithstanding the foregoing, the Grantor represents and warrants that it is insured as a covered entity under the provisions of the Universities, Colleges and Institutions Protection Program ("UCIPP") which coverage is equal to or greater than the coverage required under Section 22(b). The Grantor is deemed to be in compliance with the provisions of these insurance requirements provided that the Grantor remains insured under UCIPP (or a successor program that provides substantially the same protection as UCIPP).

(v) Any self-insured retention, deductible, and exclusion in coverage in the policies will be assumed by, for the account of, and at the sole risk of the Grantor and, to the extent applicable, will be paid by the Grantor.

(vi) The Grantor will deliver to the Grantee up-to-date insurance certificates evidencing such required coverage before the commencement of the operations of the Grantee under this Agreement within fifteen (15) days prior to the renewal of any such policy, and otherwise from time to time as is reasonably required by the Grantee, provided that the Grantee has no obligation to examine such certificates or to advise the Grantor in the event its insurance is not in compliance with this Section 22(b).

(vii) Neither the providing of insurance by the Grantor in accordance with the requirements of this Agreement nor the insolvency, bankruptcy or failure of any insurance company to pay any claim accruing shall be held to waive any of the provisions of this Agreement with respect to the liability of the Grantor or otherwise. The presence or absence of such insurance coverage as contemplated by this Agreement does not in any way decrease the Grantor's liability owed to the Grantee.

(viii) The policy limits set out in this Section 22(b) are based on 2021 dollars and market conditions as of such time. The Grantee acknowledges and agrees that the Grantor may from time to time reasonably require that the policy limits be increased to reflect changes arising from inflation or market conditions.

23. Discharge. If this Agreement is terminated for any reason, the Grantee will execute and deliver in registrable form a discharge of this Agreement within 15 days of such termination.

24. Amendment. Except as expressly set out herein, this Agreement may only be amended by an agreement in writing signed by the Grantee and the Grantor. No modification or amendment of any provision of this Agreement will be inferred from anything done or omitted by any of the parties except by an express agreement in writing duly executed and delivered by all of the parties.

25. No Waiver. No condoning, excusing or overlooking of any default nor any delay in proceeding or failure to proceed in the case of any default under this Agreement will operate as a waiver of or otherwise affect in any way any rights or remedies under this Agreement or at law. No waiver of any rights or remedies will be inferred from anything done or omitted to be done by any party except by an express waiver in writing. No waiver in respect of any matter or thing will operate as a waiver in respect of any other matter or thing.

26. Governing Law. This Agreement will be governed by and interpreted in accordance with the laws in force in the Province of British Columbia, which is the proper law hereof, and

the courts of British Columbia will have the exclusive jurisdiction with respect to all matters arising under or in respect of this Agreement.

27. Time is of the Essence. Time is of the essence of this Agreement and will remain of the essence despite any extension of time given under or in connection with this Agreement.

28. Notices. Any notice or other communication required or permitted to be given under this Agreement will be effective only if in writing and when it is actually delivered (which delivery may be by electronic mail transmission) to the party for whom it is intended at the following address or such other address in British Columbia as such party may designate to the other party by notice in writing delivered in accordance with this Section 28:

(a) if to the Grantee:

Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1

Attention: President
Phone: (604) 692-2110
Email: info@creative.energy

(b) if to the Grantor:

805 TRU Way, Kamloops, BC V2C 0C8

Attention: General Counsel
Phone: (250) 828-5002
Email: gc@tru.ca

29. Grantee's Licences and Authorizations. The Grantee may grant to any other person a licence or other agreement, authorizing such person to exercise any right granted to the Grantee pursuant to this Agreement, provided that no such grant will in any way limit or restrict the Grantee's obligations and liabilities contained in this Agreement.

30. Priority. The Grantor will do all acts and things necessary to gain priority for this Agreement over any financial charge registered against title to the Lands or any portion thereof, other than any financial charge consented to in writing by the Grantee in its absolute discretion.

31. Severability. The provisions hereof are severable and if any of them should be found to be void or unenforceable at law, the remaining provisions shall not be affected thereby.

32. Assignment by Grantee/Release. The Grantee may assign this Agreement to any person which is a public utility, provided that the Grantee and its assignee satisfy any requirements set out in Section 218 of the *Land Title Act* (British Columbia), and provided that no such assignment of this Agreement by the Grantee will be effective as against the Grantor unless and until the Grantee causes the assignee to enter into a written agreement in favour of the Grantor pursuant to which the assignee covenants in writing that it shall perform the obligations of the Grantee hereunder and be bound by all of the provisions of this

Agreement, including the provisions of this Section 32, which will apply to each and every subsequent assignment of any interest under this Agreement by such assignee. For greater certainty, the Grantor need not be a signatory to such agreement as long as it is a party to such agreement.

33. Further Assurances. Each party will execute and deliver any further agreement, document or instrument and do and perform any further act or thing as may be required by the other party at any time and from time to time in order to evidence or give full force and effect to the terms, conditions and intent of this Agreement.

34. Ownership of Energy System. Despite any degree of annexation or affixation, or rule of law or equity to the contrary, all components of the Energy System shall not be considered a fixture and will be and remain the property of and vest in the Grantee.

35. Release of Grantor. For greater certainty, no person who has been "Grantor" will be liable for any breach of this Agreement occurring after such person has ceased to be an owner of, or strata corporation with respect to any part of the Lands, provided that the Grantor has obtained from the transferee of the Lands an assumption agreement whereby the transferee covenants and agrees to be bound by the obligations of the Grantor set out in this Agreement from and after the date of such conveyance and transfer.

36. Restriction of Right of Way Area. The Grantee agrees that, once the Energy System is installed on, in and under the Lands, the Grantee shall at its cost prepare one or more reference plans (collectively, the "**Plan**") showing the locations of the right of way areas for the ECR Area on the Lands (the "**Right of Way Area**") and file the Plan, together with a partial discharge (in respect of any areas outside of the Right of Way Area) of the statutory right of way granted to the Grantee under Section 3, in the applicable Land Title Office. Upon registration of the Plan in the applicable Land Title Office, the rights granted to the Grantee under Section 3, will be limited to the Right of Way Area. Concurrently with the preparation of the Plan, the Grantee will prepare and deliver to the Grantor one or more reference plans showing the locations of the right of way areas for the Energy System Ancillary Spaces as at the date of the preparation of such plan, provided that such plan shall be for the Grantor's records, and this Agreement shall not be amended to reflect the area within such plan.

37. Term. The term of this Agreement shall commence upon the registration of this Agreement at the Land Title Office and shall continue for so long as the Grantee provides Energy Services to any Building from the Energy System or until earlier terminated in accordance with the terms of this Agreement (the "**Term**").

38. Default and Termination. Either party may, at its option, terminate this Agreement: (i) upon the material default by the other party in the performance of any of its covenants or obligations under this Agreement, or under any other agreement entered into between the Grantee and the Grantor with respect to the Energy System (including the Infrastructure Agreement, the Customer Service Agreement or the Contribution Agreement) if such default is not remedied within thirty (30) days of the party in default receiving written notice of such default, or within such longer period as is reasonable in the circumstances,

so long as the party in default is diligently and continuously moving to implement remedial action; or (ii) if such other party becomes insolvent, ceases to do business as a going concern, is adjudged bankrupt or made subject to the appointment of a receiver-manager, makes a general assignment for the benefit of creditors, or takes the benefit of any statute in force for the winding up or liquidation of business enterprises.

39. Grantee.

(a) The Grantee is the General Partner of Creative Energy Thompson Rivers Limited Partnership and is entering into this Agreement for and on behalf of Creative Energy Thompson Rivers Limited Partnership.

(b) The term "**Grantee**" when used in this Agreement shall include Creative Energy Thompson Rivers Limited Partnership.

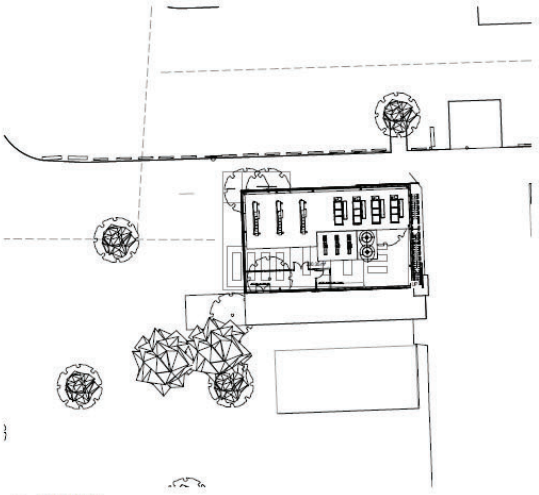
(c) Where the consent of the Grantee is required to any matter, the consent of Creative Energy Thompson Rivers Limited Partnership shall be sufficient to meet that requirement.

IN WITNESS WHEREOF the parties hereto have executed and delivered this Agreement by signing on the *Land Title Act* Form C above.

SCHEDULE A
PLANS OF ECR AREA

Stantec

SITE MAP
1:1



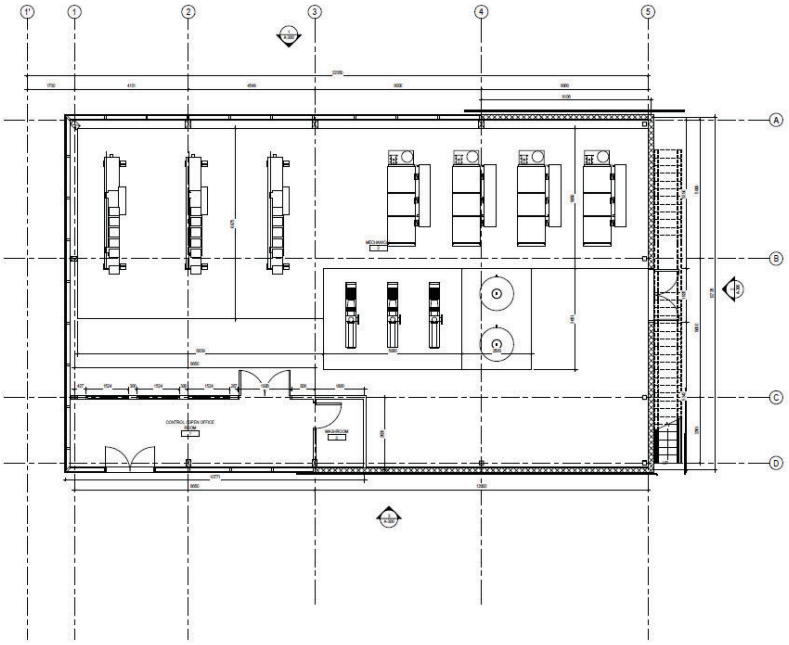
1 SITE PLAN
1:200

TRU

115602068

SITE PLAN
TRU District Energy
2020.10.09

Stantec



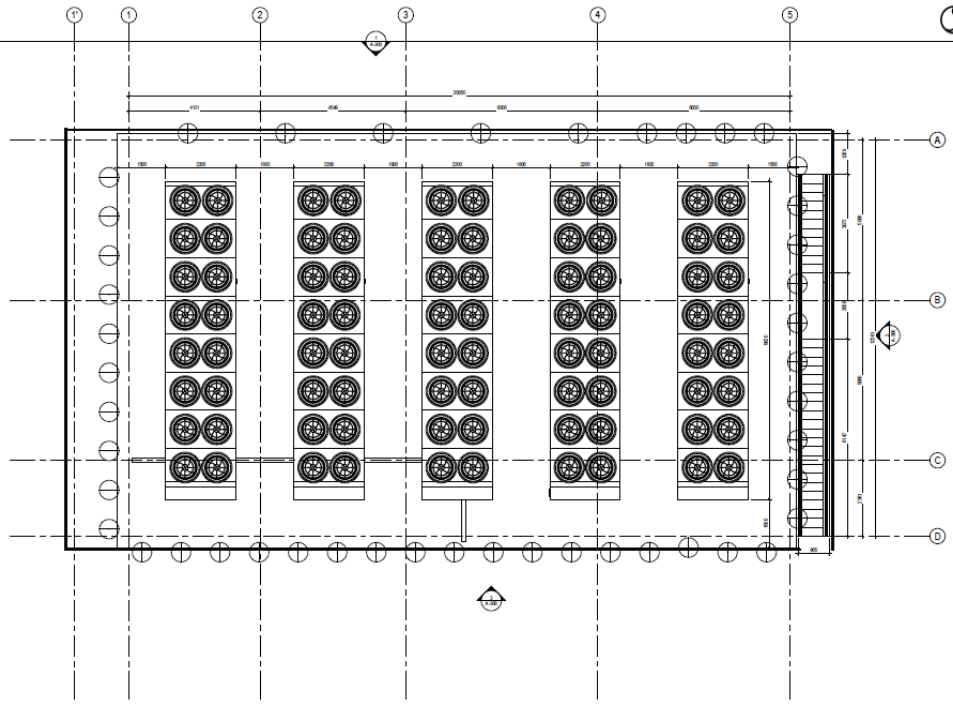
1 MAIN FLOOR
A-102 1:50

115602068

TRU

MAIN FLOOR PLAN
TRU District Energy
2020.10.09

Stantec



1 Roof
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TRU

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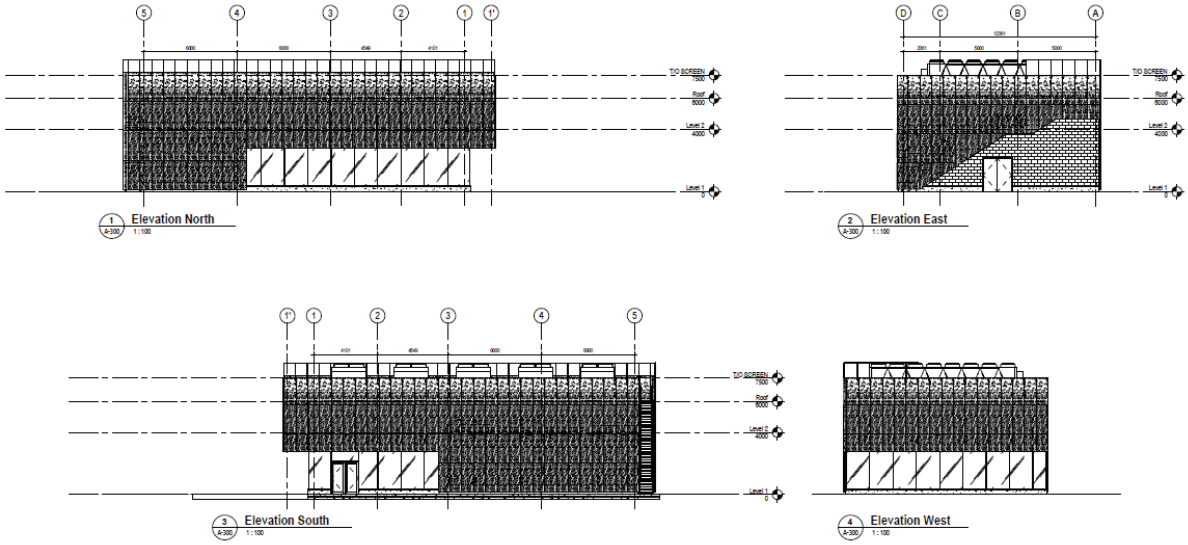
ROOF PLAN

TRU District Energy

2020.10.09

Stantec



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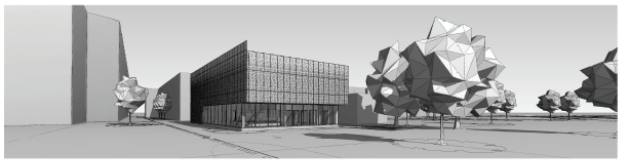
TRU

ELEVATIONS

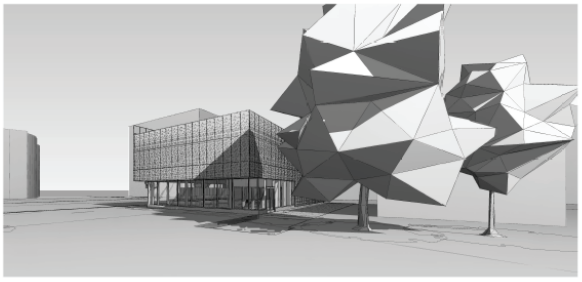
TRU District Energy

2020.10.09

Stantec



1 A-301 3D Perspective



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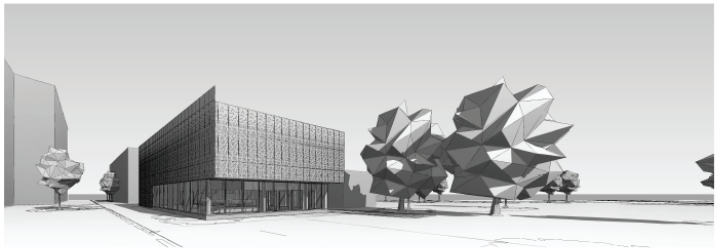

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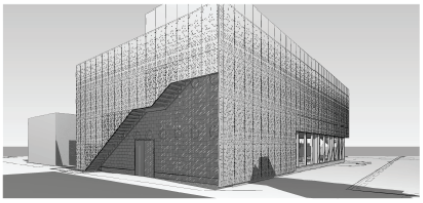

4 A-301 3D Perspective

TRU

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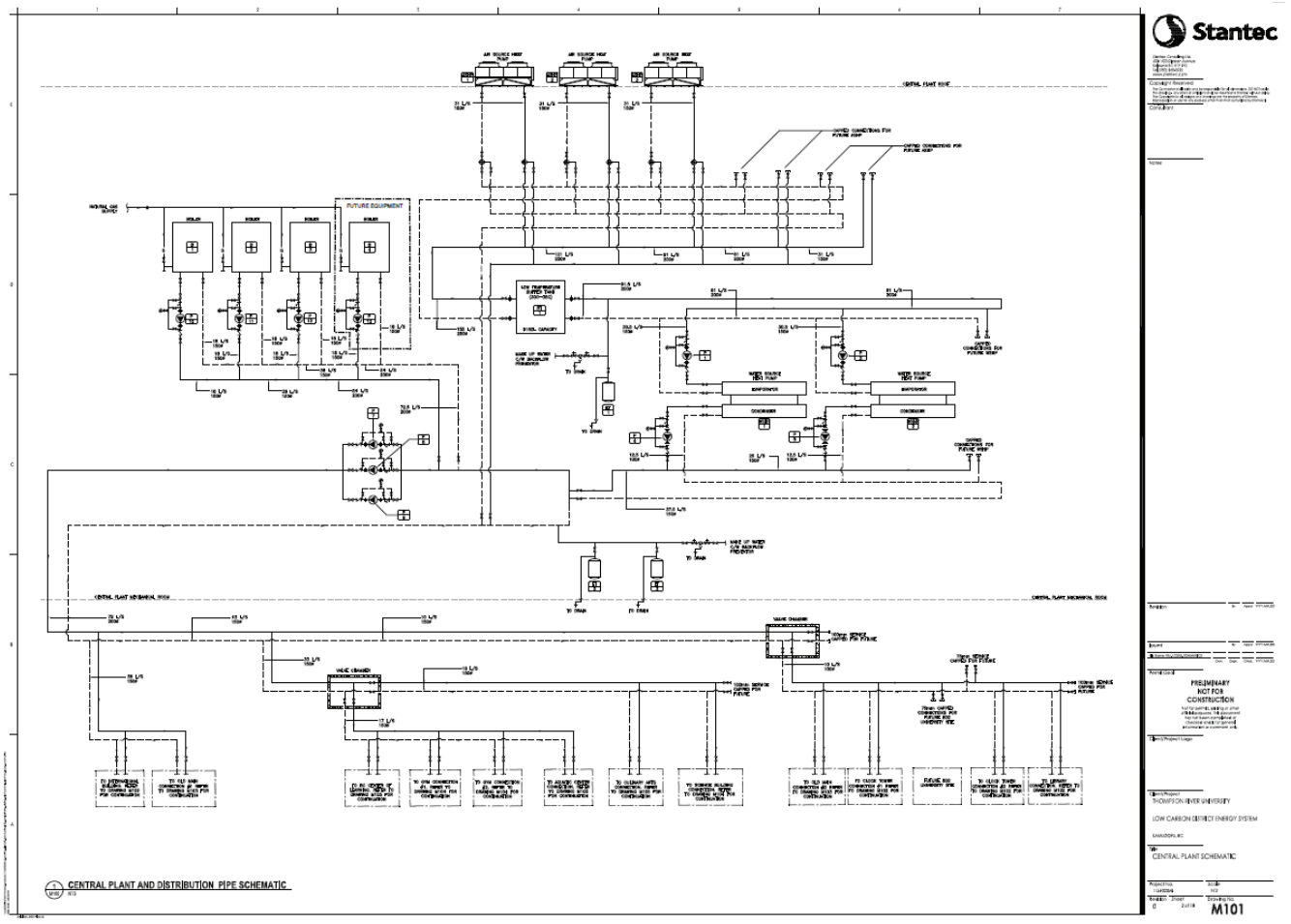
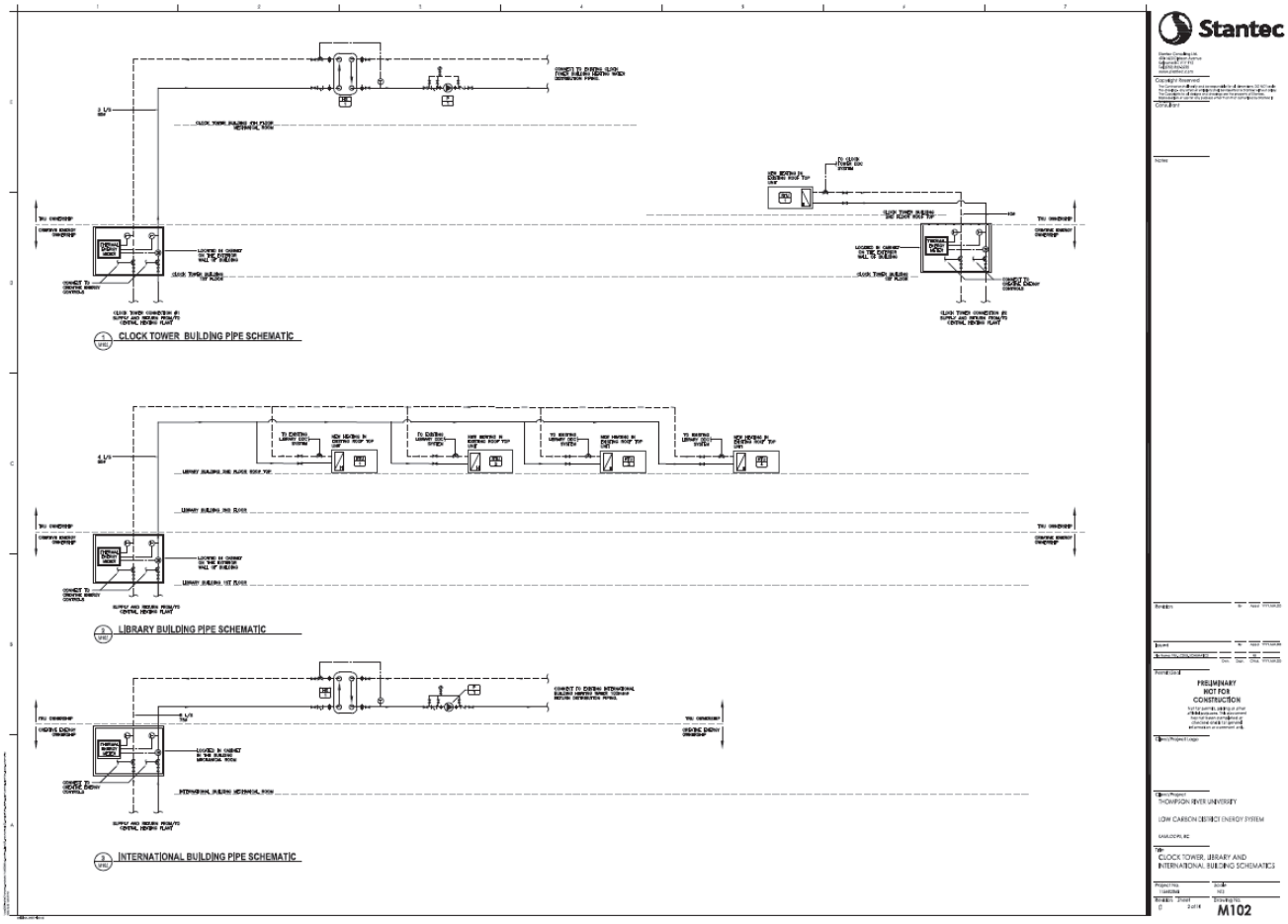
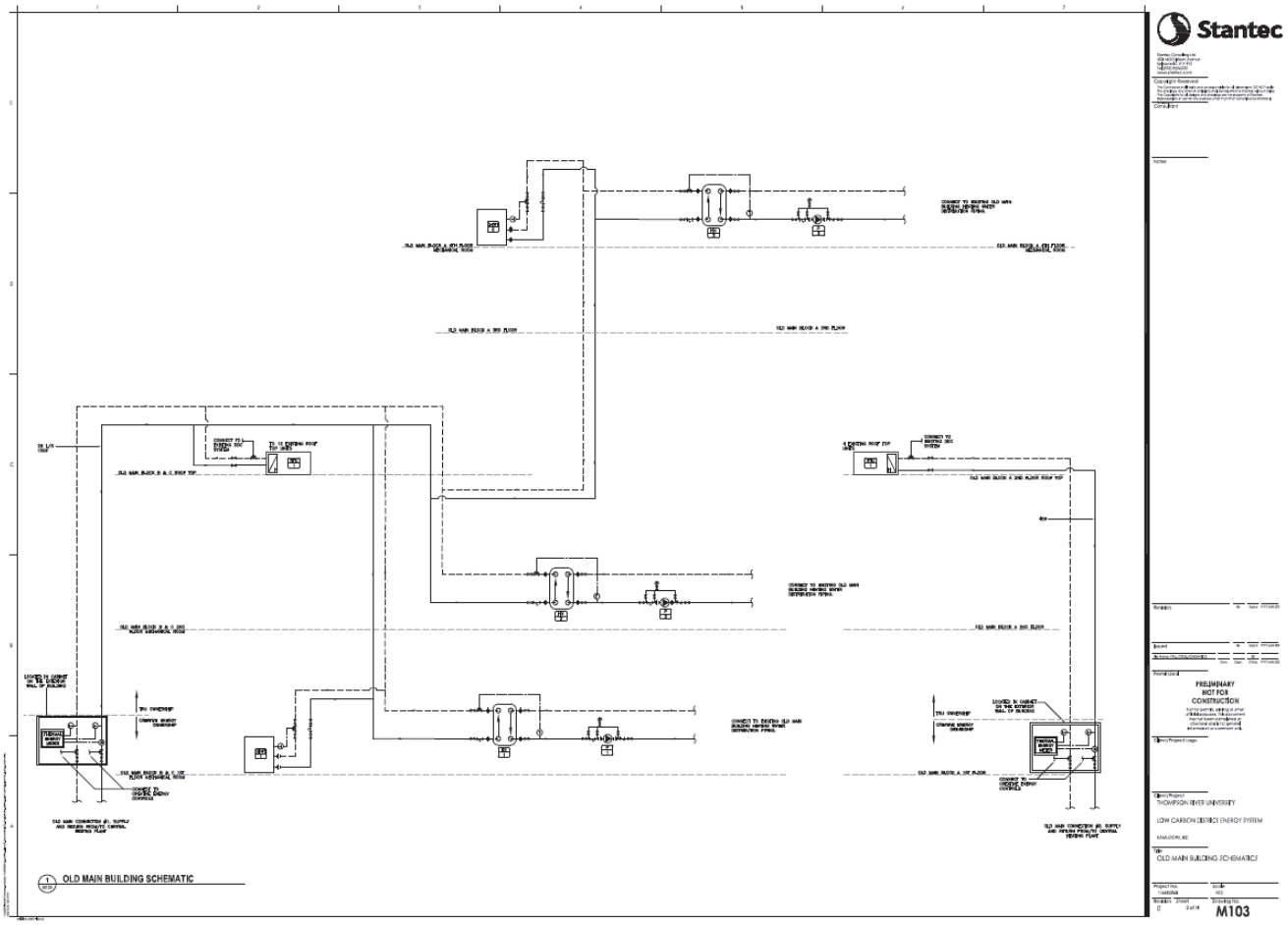
3D PERSPECTIVES

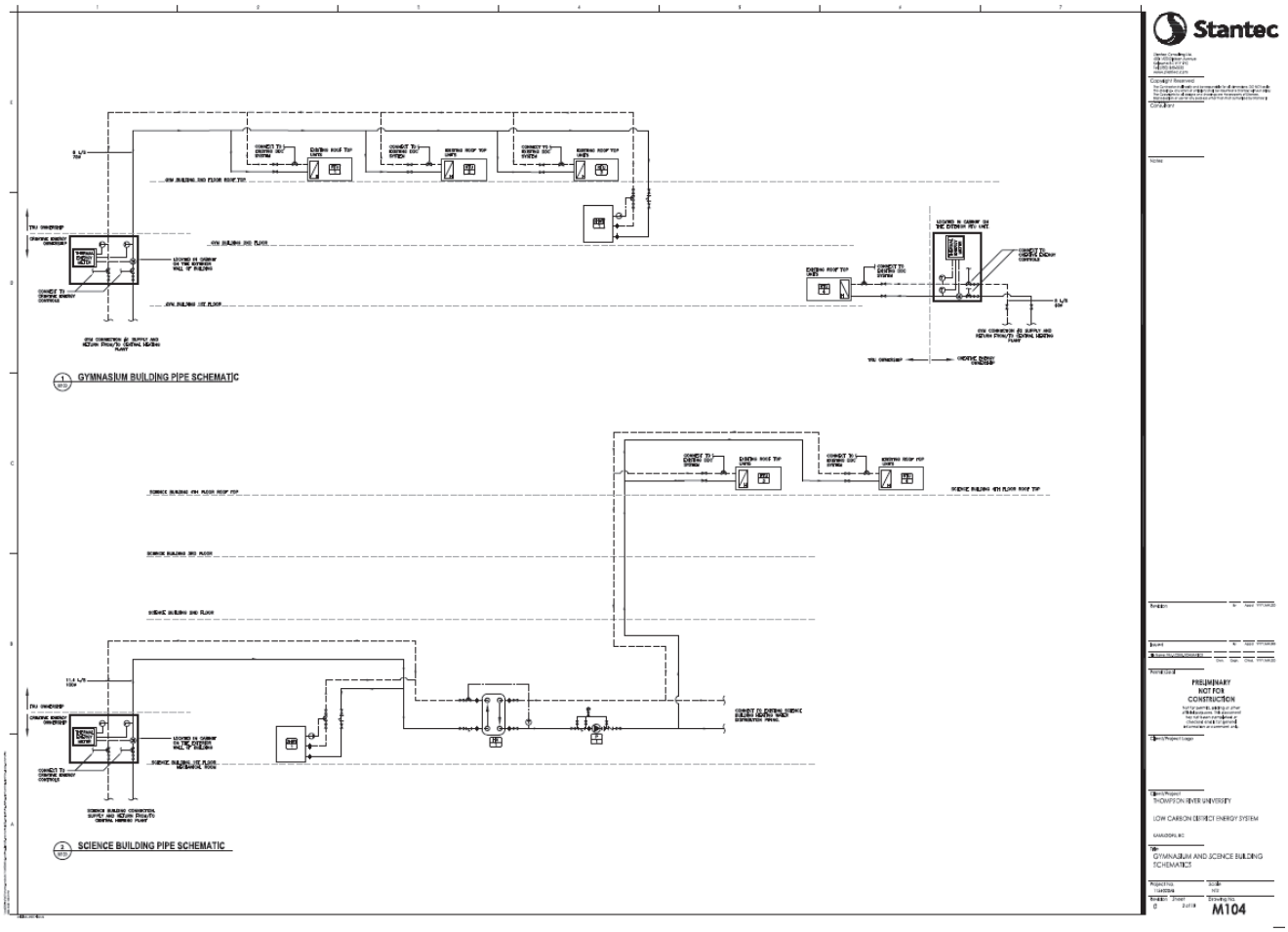
TRU District Energy

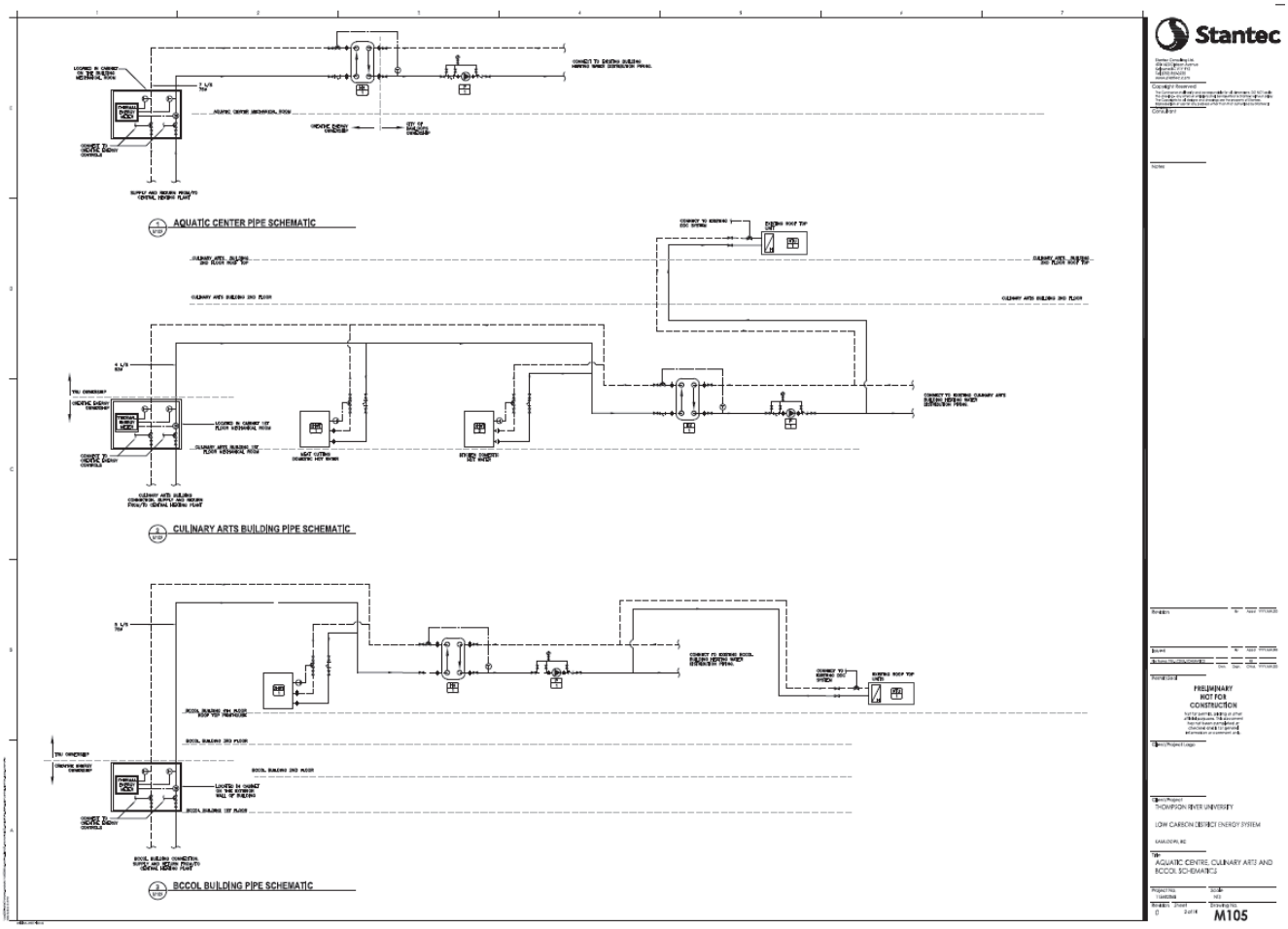
2020.10.09

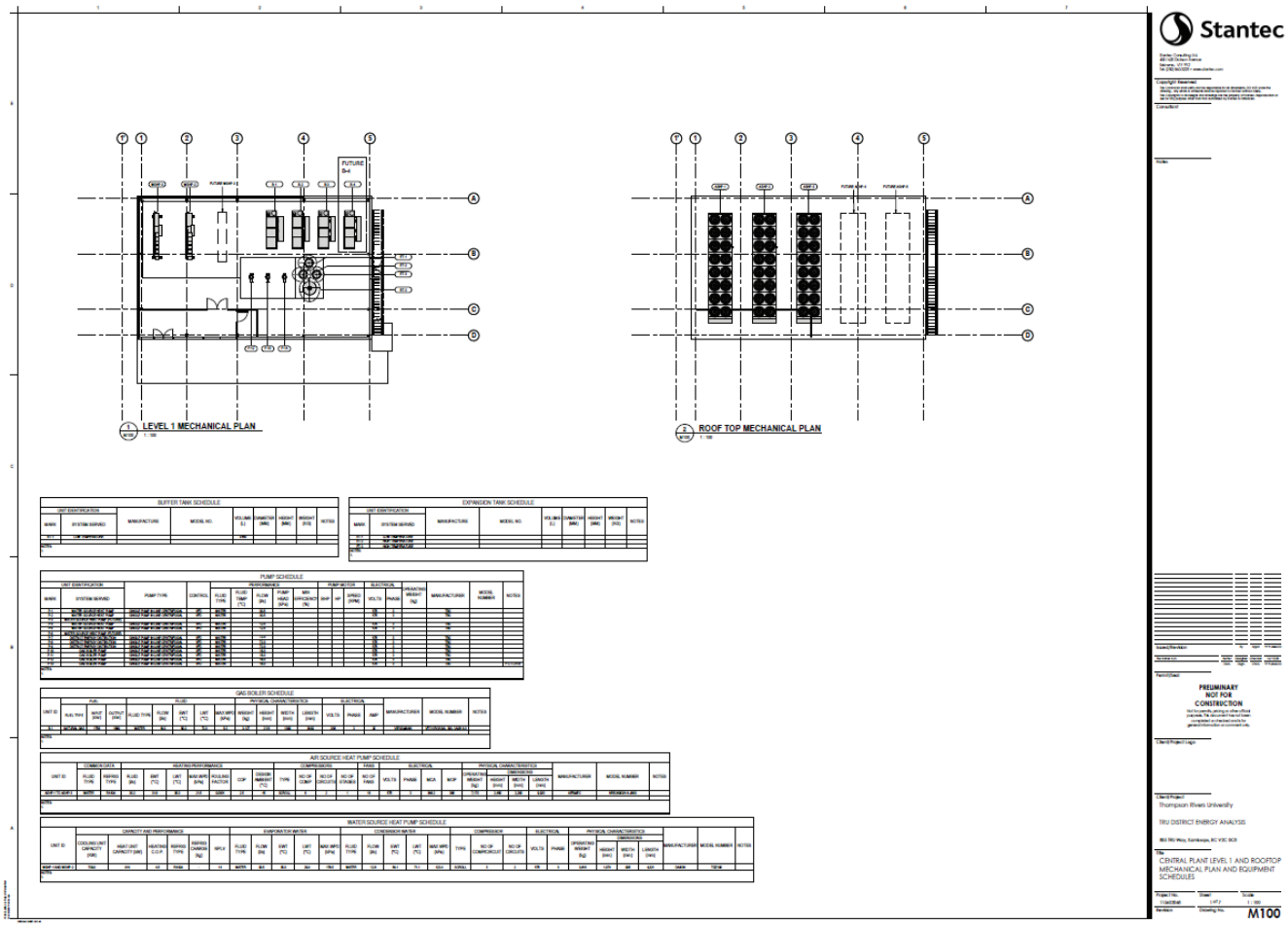






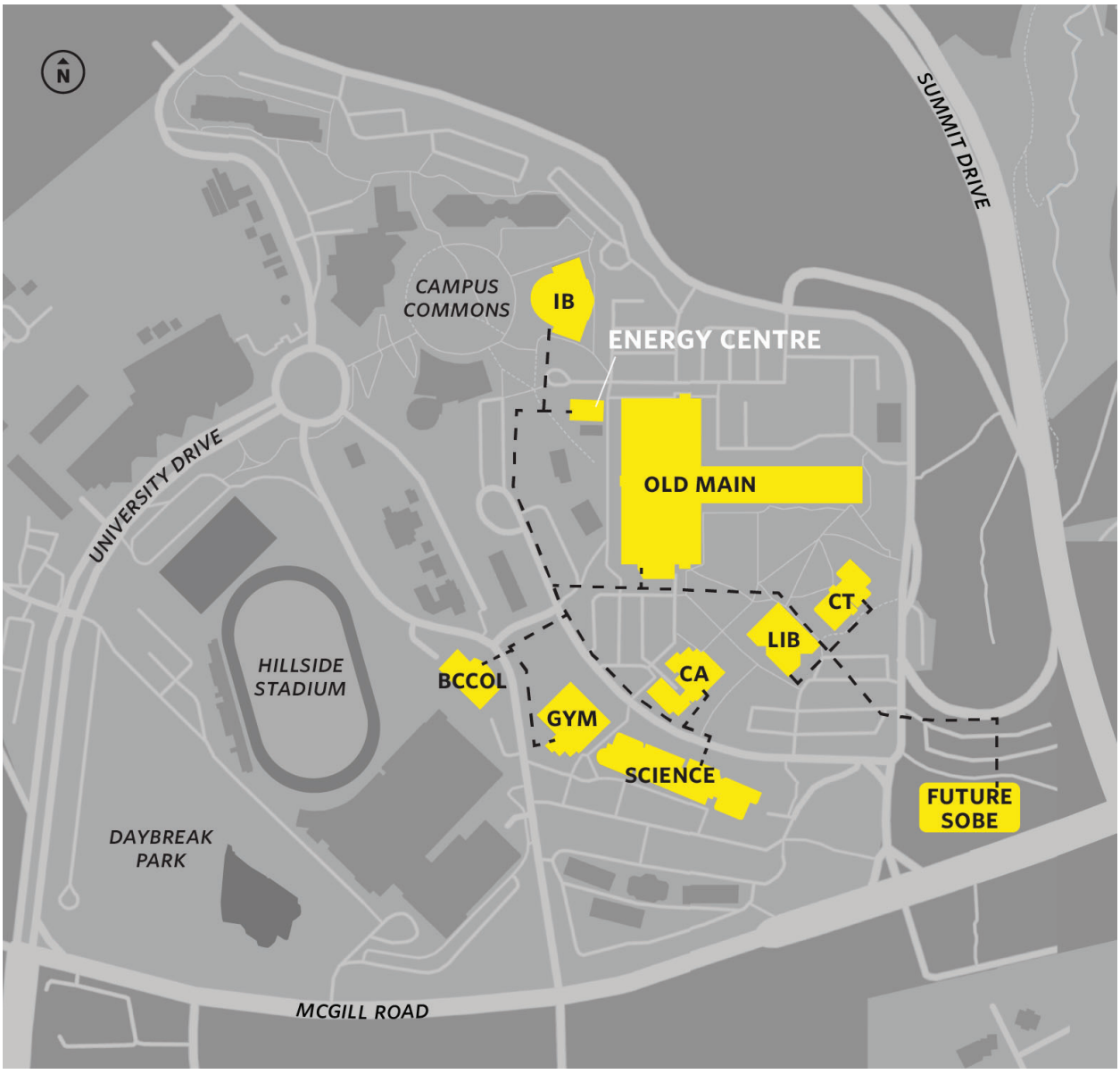






SCHEDULE B

SITE PLAN



SCHEDULE 7
DES COSTS

Maximum of $400,000 inclusive of taxes incurred or expected to be incurred by Creative Energy in respect of the DES Assets, in respect of:

- Design and Engineering
- Legal Fees
- Regulatory Fees
- Management

SCHEDULE 8
CONTRIBUTION AGREEMENT

See attached.

CONTRIBUTION AGREEMENT

THIS AGREEMENT is made effective as of _____, 2021 (the "**Effective Date**")

BETWEEN:

THOMPSON RIVERS UNIVERSITY, a university formed pursuant to the *Thompson Rivers University Act* (British Columbia), with an address at 805 TRU Way, Kamloops, BC V2C 0C8 ("**TRU**")

AND:

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, a limited partnership formed under the laws of British Columbia, with an address at Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1 by its general partner, **CREATIVE ENERGY THOMPSON RIVERS GP INC.** ("**Creative Energy**")

WHEREAS:

A. TRU is the legal and beneficial owner of certain properties located at 805 TRU Way, Kamloops, British Columbia, and presently legally described as:

> PID: 028-324-757, LOT 1 SECTIONS 1 AND 12 TOWNSHIP 20 RANGE 18 WEST OF THE 6TH MERIDIAN KAMLOOPS DIVISION YALE DISTRICT PLAN KAP91275 EXCEPT EPP60804 AND EPP87212
> (the "**TRU Lands**").

B. TRU and Creative Energy have entered into an Infrastructure Agreement dated for reference _____ (the "**Infrastructure Agreement**") with respect to the construction of the Energy System;

C. The Energy System will provide, *inter alia*, the Buildings with heat for space heating and domestic hot water services (the "**Energy Services**");

D. Creative Energy is or will become a public utility as defined in the *Utilities Commission Act* (British Columbia), and has expertise in the design, construction, operation and maintenance of thermal energy delivery systems; and

E. In order to recognize the benefits to Creative Energy associated with Creative Energy's use of the applicable portions of the TRU Lands, including parts of the Buildings located on the TRU Lands, wherein the Energy System is or will be situate, Creative Energy has agreed to make financial contributions to TRU in accordance with the terms and conditions contained in this Agreement.

NOW THEREFORE THIS AGREEMENT WITNESSES THAT, in consideration of the premises and the covenants and agreements set out herein, and other good and valuable

consideration, the receipt and sufficiency of which are hereby acknowledged by each party, the parties covenant and agree as follows:

1. **Definitions –** In this Agreement:

(a) "**Affiliate**" has the meaning set out in the *Business Corporations Act*, S.B.C. 2002, c.57;

(b) "**Applicable Taxes**" has the meaning set out in section 7(b);

(c) "**BCICAC**" has the meaning set out in section 22;

(d) "**BCUC**" has the meaning set out in section 17;

(e) "**Buildings**" means the current and proposed buildings on the TRU Lands that will be connected to the Energy System, being namely the buildings named on the TRU Lands Map set out in Schedule B as follows: Old Main, Ken Lepin Building, SOBE Management Building (proposed), Old Library and Administration Building, BC Centre for Open Learning, Culinary Arts Building, Clock Tower Building, Gymnasium, International Building and Energy Centre Building, together with any other buildings connected to the Energy System.

(f) "**Building Systems**" means the systems of heat and hot water delivery equipment including water pipes, heat pumps and related equipment, components and controls located within the Buildings and connected to the Energy System at the Demarcation Points and used for distributing the Energy Services within the Buildings;

(g) "**Commencement Date**" has the meaning set out in section 2;

(h) "**Contribution Payment**" has the meaning set out in section 4(a);

(i) "**Defaulting Party**" has the meaning set out in section 13;

(j) "**Demarcation Points**" means the points at which the pipes forming part of the Building Systems connect to the Energy System, at each Energy Transfer Station;

(k) "**Dispute**" has the meaning set out in section 22;

(l) "**Distribution System**" means, collectively, the system of pipes, fittings and ancillary components and equipment supplying Energy Services to, *inter alia*, the Demarcation Points;

(m) "**Energy Services**" has the meaning set out in the recitals;

(n) "**Energy System**" means the thermal energy system consisting of, inter alia, pipes, heat pumps, boilers, meters and related components, equipment and controls used for generating, metering and distributing the Energy Services to the Demarcation Points,

and including the Distribution System and the Energy Transfer Stations, and all additions thereto and replacements thereof, but specifically excluding all Building Systems;

(o) "**Energy Centre Room**" means the area marked as such as more particularly shown outlined on the drawing attached as SCHEDULE A;

(p) "**Energy Transfer Station**" means, in respect of each Building, isolation valves, one or more flow control valves, energy metering equipment including temperature sensors and flow meters, control panel and all pipes, fittings, pressure and temperature gauges, sensors, and other associated equipment and instruments which control the transfer, and measure Energy Services from the Distribution System to the Building System for such Building.

(q) "**Force Majeure**" has the meaning set out in section 8;

(r) "**Infrastructure Agreement**" has the meaning set out in the recitals;

(s) "**Non-Defaulting Party**" has the meaning set out in section 13(b);

(t) "**Payment Start Date**" means that date upon which Creative Energy commences the supply of Energy Services from the Energy System to any of the Buildings on the TRU Lands;

(u) "**SRW**" has the meaning set out in section 3;

(v) "**Term**" has the meaning set out in section 11;

(w) "**TRU Lands**" has the meaning set out in the recitals;

(x) "**TRU's Costs**" has the meaning set out in section 3; and

(y) "**Usable Area**" means the internal area in square metres of the Energy Centre Room which Creative Energy is reasonably able to use for the purposes granted within the SRW and which is not encumbered by TRU's equipment, as such area is determined by TRU and Creative Energy from time to time, each acting reasonably.

2. **Commencement of Obligations –** The obligations of the parties to carry out and to otherwise comply with the terms of this Agreement do not arise and are not effective until the date upon which the SRW is executed and delivered by TRU (the "**Commencement Date**"). If the Infrastructure Agreement is terminated for any reason prior to the commencement of the construction and installation of the Energy System on the TRU Lands, then this Agreement will automatically concurrently terminate and be null and void without liability between the parties and neither party will be under any obligation to the other to complete the transactions contemplated by this Agreement.

3. **Acknowledgement re: Costs –** Creative Energy acknowledges and agrees that for the purposes of this Agreement, pursuant to the Infrastructure Agreement and to the right of way to be granted by TRU to Creative Energy pursuant to the Infrastructure Agreement (the "**SRW**"), Creative Energy is and will be the recipient of certain benefits that have a cost implication to TRU, including wear and tear and capital depreciation, similar to those attributable to use of property and facilities within the Energy Centre Room by tenants, licensees, occupiers and others ("**TRU's Costs**").

4. **Contribution Towards Costs** – Subject to section 8, Creative Energy agrees to pay to TRU, commencing on the Payment Start Date and until the end of the Term, as a contribution towards TRU's Costs the following amounts:

   (a) an annual payment equal to $20.00 per square metre multiplied by the total Usable Area of the Energy System Room payable in equal monthly instalments, in advance, which annual payment shall be increased annually on each anniversary of the Payment Start Date in accordance with section 6 (the "**Contribution Payment**"), plus Applicable Taxes; and

   (b) any property taxes (including without limitation those levied, imposed or assessed for education, schools and local improvements) assessed by the City of Kamloops with respect to the Energy Systems on the TRU Lands or Creative Energy's use or occupation of the TRU Lands. For greater certainty, the Contribution Payments will be adjusted as a result of any such increases under this section 4(b).

5. **Determination of Usable Area** – For the purpose of calculating the Contribution Payments, the Usable Area of the Energy Centre Room will be determined upon completion of construction of the Energy Centre Room based on the as-built drawings therefor, and the parties hereby agree to amend this Agreement in writing to replace SCHEDULE A to reflect the actual size and location of the Energy Centre Room as built.

6. **CPI Increase –** The Contribution Payment set out in section 4 will be subject to an annual increase equal to the percentage change in the CPI between the anniversary date of the Payment Start Date and the date twelve months prior to such date, where "**CPI**" means the Consumer Price Index (All Items) for the Province of British Columbia, 2024=100, published by Statistics Canada or its successor, adjusted for any change in base year, or, if Statistics Canada or its successor no longer publishes such index or is no longer operated by the Government of Canada, such other price index as TRU may substitute, acting reasonably, and in the case of such a substitution, TRU shall be entitled to make all necessary conversions for such purposes. For purposes of calculating the amount of the Contribution Payment, the base year will be 2024 and the base amount in 2024 will be $20.00 per square metre of Usable Area even if the Payment Start Date occurs in a year later than 2024. By way of example, the formula for the calculation of the Contribution Payment for the year 2025 is as follows (even if the Payment Start Date occurs in 2025):

   ($20.00 per square metre of Usable Area, as adjusted by any property taxes per section 4(b)), plus such amount multiplied by the percentage increase of CPI 2024 over CPI 2024

= Contribution Payment for the year 2025

7. **Payments Generally –** Each Contribution Payment and all other payments to be made by Creative Energy to TRU hereunder:

   (a) shall be paid when due, without prior demand and without set-off or deduction in lawful money of Canada to TRU at the addresses set out on page 1 or as otherwise directed by TRU from time to time; and

   (b) are exclusive of all tax or duty levied, rated or assessed on account of this Agreement, on the use or occupancy of the Energy Centre Room, or on amounts payable under this Agreement, whether existing at the date hereof or hereafter charged by any governmental authority, including without limitation, goods and services tax, value added tax, business transfer tax, harmonized or retail sales tax, federal sales tax, excise tax or duty or any tax similar to the foregoing, together with any penalty or interest assessed or imposed with respect to the foregoing taxes (collectively, the "**Applicable Taxes**").

   Creative Energy will pay to TRU, at the same time as it makes any Contribution Payment or other payments hereunder, all Applicable Taxes thereon.

8. **Relief from Payment –** Creative Energy shall be relieved of its obligations to make any payments hereunder, or be entitled to a reimbursement from TRU for any pre-payments made, as the case may be, for and during any period in which Creative Energy is unable to provide Energy Services from the Energy Centre Room due to an event of Force Majeure affecting the Energy Centre Room. For the purpose of this section "**Force Majeure**" means any event not caused by Creative Energy, which is unavoidable or beyond the reasonable control of the Creative Energy and which, by the exercise of its reasonable efforts, Creative Energy (including all those persons for whom its is responsible at law) is unable to prevent or overcome, including, acts of God, war, riots, intervention by civil or military authority, strikes, lockouts, pandemic or health emergency, accidents, acts of civil or military authority, or orders of government or regulatory bodies having jurisdiction; provided however, a lack of funds or other financial cause shall not be an event of Force Majeure.

9. **Utilities**

   (a) Creative Energy shall directly pay all costs related to all communications (including phone and internet), gas, electricity, water, steam and other utility services consumed in connection with its use of the Energy Centre Room, including as a result of the operation of the portion of the Energy System contained therein, together with all Applicable Taxes thereon; provided that where it is not possible for Creative Energy to directly pay for any communications (including phone and internet), gas, electricity, water, steam and other utility services pursuant to this subsection, any such costs for utilities shall be payable by Creative Energy on a monthly basis at a basic rate as reasonably estimated by TRU's engineers or accountants, as the case may be. At the end of each calendar year, TRU shall reasonably determine the actual costs incurred for such utilities and any resulting

overpayment or underpayment by Creative Energy will be refunded or paid by TRU or Creative Energy, as the case may be and the decision of TRU, acting reasonably, shall be final and binding with respect to any such adjustment.

(b) TRU shall pay the cost of installing, inspecting, verifying, maintaining and repairing any meters or metering system installed at the request of TRU to measure the usage of utilities in the Energy Centre Room.

(c) Creative Energy's obligations to pay for utilities shall not extend to include any water or other utilities flowing through the Energy System to be used or consumed by others.

10. **Insurance –** TRU shall pay all insurance costs relating to the Buildings located on the TRU Lands, excluding insurance for the Energy System as determined in the SRW.

11. **Term** – The term of this Agreement (the "**Term**") shall commence upon the Commencement Date and shall continue for so long as the SRW remains in effect (in whole or in part in accordance with the SRW).

12. **Termination** – This Agreement shall terminate immediately upon Creative Energy or any assignee thereof ceasing to operate the Energy System or the termination of the SRW, whichever first occurs.

13. **Default** – A party (the "**Defaulting Party**") will be in default under this Agreement if:

(a) it is insolvent, commits an act of bankruptcy, has a receiver or liquidator appointed for its assets, or files for protection from its creditors under insolvency legislation;

(b) it fails or refuses to make any payment due under this Agreement to the other party (the "**Non-Defaulting Party**") within thirty (30) days of demand for such payment after the date that payment is due; or

(c) it is in breach of any term, covenant, agreement, condition or obligation imposed upon it under this Agreement or under any other agreement entered into between Creative Energy and TRU with respect to the Energy System (including the Infrastructure Agreement, the Customer Service Agreement or the SRW) and fails to cure such default within thirty (30) days after receipt of written notice thereof from the Non-Defaulting Party or, if such default is not capable of being cured within such thirty (30) day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from the Non-Defaulting Party and to continue to diligently and continuously pursue the curing of such default until cured.

14. **Effect of Default by Creative Energy -** If Creative Energy is a Defaulting Party, TRU may, at its option and without liability therefor or prejudice to any other right or remedy it may have, including specific performance injunctive relief or other legal or equitable

remedies (which are acknowledged by Creative Energy to be reasonable in the circumstances):

(a) undertake the necessary steps to remedy the default at Creative Energy's expense and payable by Creative Energy on demand, and such action shall not relieve Creative Energy from any of its obligations under this Agreement; or

(b) terminate both this Agreement and the SRW (and not either one) by further written notice to Creative Energy.

15. **Effect of Default by TRU -** If TRU is a Defaulting Party, Creative Energy may, at its option and without liability therefor or prejudice to any other right or remedy it may have, including specific performance injunctive relief or other equitable remedies (which are acknowledged by TRU to be reasonable in the circumstances):

(a) undertake the necessary steps to remedy the default at TRU's expense and payable by TRU upon demand, and such action shall not relieve TRU from any of its obligations under this Agreement; or

(b) terminate both this Agreement and the SRW (and not either one) by further written notice to TRU.

16. **No Tenancy -** Despite any other provision herein or any rule of law to the contrary, this Agreement does not create any interest in land passing between TRU and Creative Energy and any inference that the relationship between Creative Energy and TRU hereunder, or arising from or with respect to Creative Energy's use of the TRU Lands, including the Energy Centre Room, is or creates a landlord/tenant relationship is hereby disclaimed by Creative Energy and TRU. No payments made hereunder by Creative Energy to TRU will represent or be construed as rent.

17. **Application of *Utilities Commission Act*** – The parties acknowledge Creative Energy is or will become a "public utility" as defined in the *Utilities Commission Act*, R.S.B.C. 1996, c.473 and this Agreement may be subject to regulation by the British Columbia Utilities Commission ("**BCUC**") under that Act.

18. **Notices** - Any notice or other communication required or permitted to be given under this Agreement will be effective only if in writing and when it is actually delivered (which delivery may be by electronic mail transmission) to the party for whom it is intended at the following address or such other address in British Columbia as such party may designate to the other party by notice in writing delivered in accordance with this Section 18.

(a) If to Creative Energy:

Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1

Attention: President
Phone: (604) 688-9584
Email: info@creative.energy

(b) If to TRU:

805 TRU Way, Kamloops, BC V2C DC8

Attention: General Counsel
Phone: (250) 828-5002
Email: gc@tru.ca

19. **Confidentiality** – The parties will treat this Agreement as confidential and will at all times during the Term of this Agreement hold this Agreement in confidence and neither party will, without the prior written consent of the other party, disclose or divulge the terms of this Agreement to any person, provided that nothing in this section will restrict or prevent either party from making any disclosure of the Agreement:

(a) to any governmental authority, including the BCUC;

(b) to the directors, officers, employees, governors or shareholders of such party or to an Affiliate of such party or to the directors, officers or employees of an Affiliate of such party;

(c) to the professional advisors or lenders of such party;

(d) in connection with legal proceedings or steps being taken to remedy a breach or default under this Agreement by the other party; or

(e) as may be required by law.

20. **Applicable Law, Venue** - This Agreement and all matters arising hereunder will be governed by the laws of British Columbia and the federal laws of Canada applicable in British Columbia. The venue of any proceedings taken in respect of this Agreement shall be Vancouver, British Columbia.

21. **Entire Agreement** –This Agreement and the SRW, together with the Infrastructure Agreement, Contribution Agreement and Customer Service Agreement entered into by the parties dated concurrently herewith, contain the whole agreement between the parties in respect of the subject matter hereof and there are no terms, conditions or collateral agreements express, implied or statutory other than as expressly set forth in this Agreement and such other agreements and this Agreement and such other agreements supersede all of the terms of any written or oral agreement or understanding between the parties.

22. **Arbitration** - The parties will make a *bona fide* attempt to settle any dispute (a "**Dispute**") which may arise under, out of, in connection with or in relation to this Agreement by amicable negotiations and will provide frank and timely disclosure to one another of all relevant facts and information to facilitate negotiations. If the parties are unable to resolve the Dispute, within thirty (30) days, or if the parties agree to waive such discussions in respect of a particular Dispute, then either party may refer the Dispute to a single arbitrator who is appointed and renders a decision in accordance with the then current "Shorter Rules for Domestic Commercial Arbitration" or similar rules of the Vancouver International Arbitration Centre ("**BCICAC**"). The decision of the arbitrator shall be final and binding. The costs and expenses of the arbitration, but not those incurred by the parties, shall be shared equally, unless the arbitrator determines that a specific party prevailed, and in such a case the non-prevailing party shall pay all costs and expenses of the arbitration, but not those of the prevailing party. The arbitration will take place in Vancouver, British Columbia and be conducted in English. Notwithstanding the foregoing, any Dispute that is within the jurisdiction of the BCUC for determination shall be referred to the BCUC for determination.

23. **Amendments in Writing** - Except as set out in this Agreement, no amendment or variation of this Agreement will be effective or binding upon the parties unless such amendment or variation is set out in writing and duly executed by the parties.

24. **Time of Essence** - Time is of the essence of this Agreement and will remain of the essence despite any extension of time given under or in connection with this Agreement.

25. **Assignment**

(a) *Assignment by TRU* - TRU may assign this Agreement without the consent of Creative Energy to any purchaser of the TRU Lands effective on the completion date of the transfer of the TRU Lands. Until Creative Energy receives written notice of such transfer identifying the name of the transferee and the place of payment for any remittances, Creative Energy will not be liable to a transferee for any payments delivered to TRU. If TRU transfers a portion of the TRU Lands not containing the Energy Centre Room to any other person, then, in connection with such transfer, TRU and Creative Energy will enter into a new agreement substantially in the form of this Agreement but applicable only to the remaining TRU Lands (and not to such portion that is sold) and, upon the execution and delivery of such new agreement, this Agreement will terminate.

(b) *Assignment by* Creative Energy - Creative Energy may assign this Agreement without the consent of TRU to any of Creative Energy's Affiliates, to any permitted assignee of the SRW pursuant to the terms thereof, or to any lender(s) providing financing for any assets of Creative Energy, which include the Energy System, for collateral security purposes, provided that any such Affiliate or lender executes and delivers to TRU an agreement in favour of TRU pursuant to which such Affiliate, assignee or lender agrees in writing to be bound by the terms and conditions of this Agreement effective as of the date of such transfer, and any such assignment shall

not release Creative Energy from any of its obligations hereunder. For greater certainty, TRU need not be a signatory to such agreement as long as it is a party to such agreement.

26. **Counterparts and Facsimile** - This Agreement may be executed by the parties and transmitted by facsimile or other electronic transmission and, if so executed, transmitted and received, this Agreement will for all purposes be effective as if the parties had delivered and executed an original Agreement. This Agreement may be executed in counterparts with the same effect as if the parties had signed the same document. All counterparts will be construed together and will constitute one agreement.

[signature page follows]

IN WITNESS WHEREOF the parties hereto have executed this Agreement as of the Effective Date.

THOMPSON RIVERS UNIVERSITY

_____
Name:
Authorized Signatory

_____
Name:
Authorized Signatory

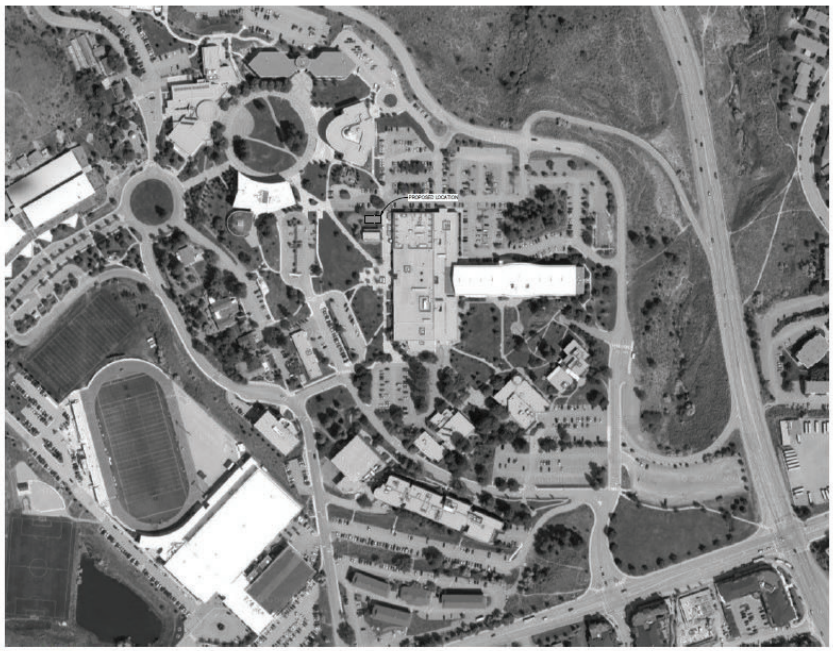
CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, by its general partner, **CREATIVE ENERGY THOMPSON RIVERS GP INC.**

Per: 

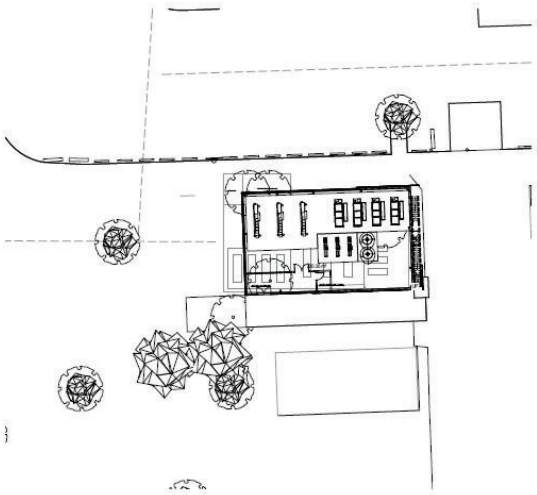
_____
Name: Krishnan Iyer
Title: President and CEO

SCHEDULE A
DRAWINGS OF ENERGY CENTRE ROOM

Stantec



SITE MAP
1:1



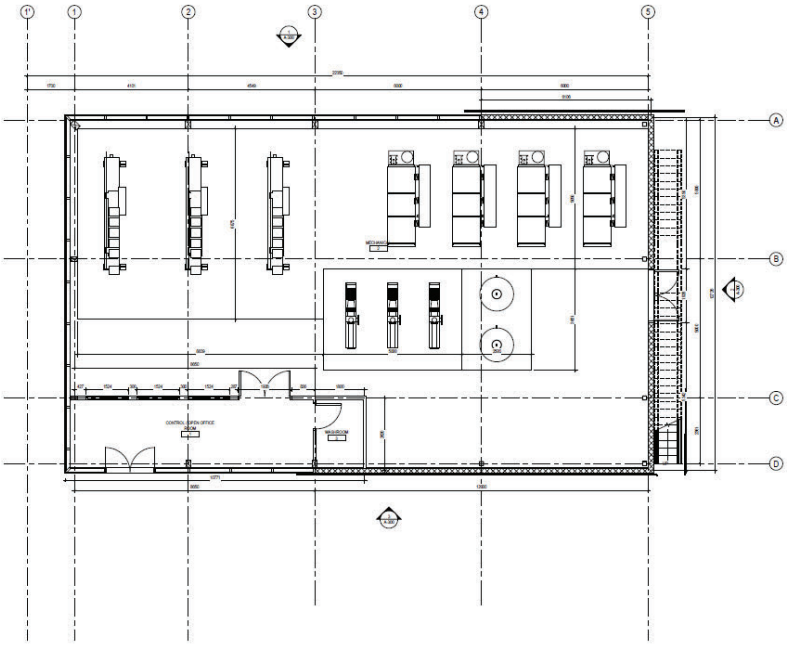
SITE PLAN
1:200

TRU

115602068

SITE PLAN
TRU District Energy
2020.10.09

Stantec



1 MAIN FLOOR
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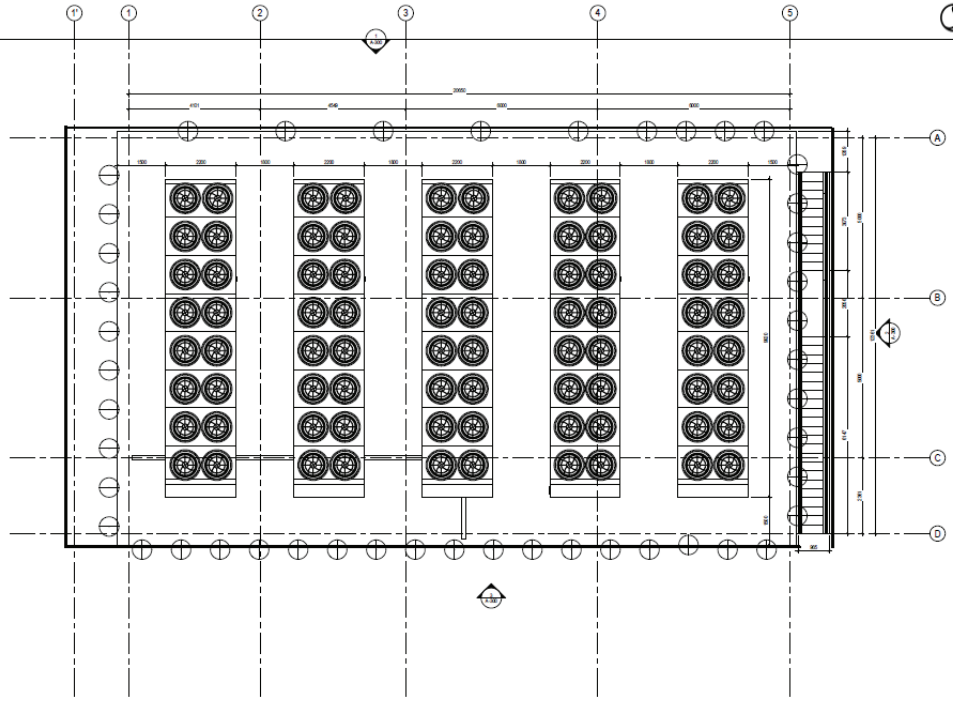
115602068

TRU

MAIN FLOOR PLAN
TRU District Energy
2020.10.09

Stantec



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TRU

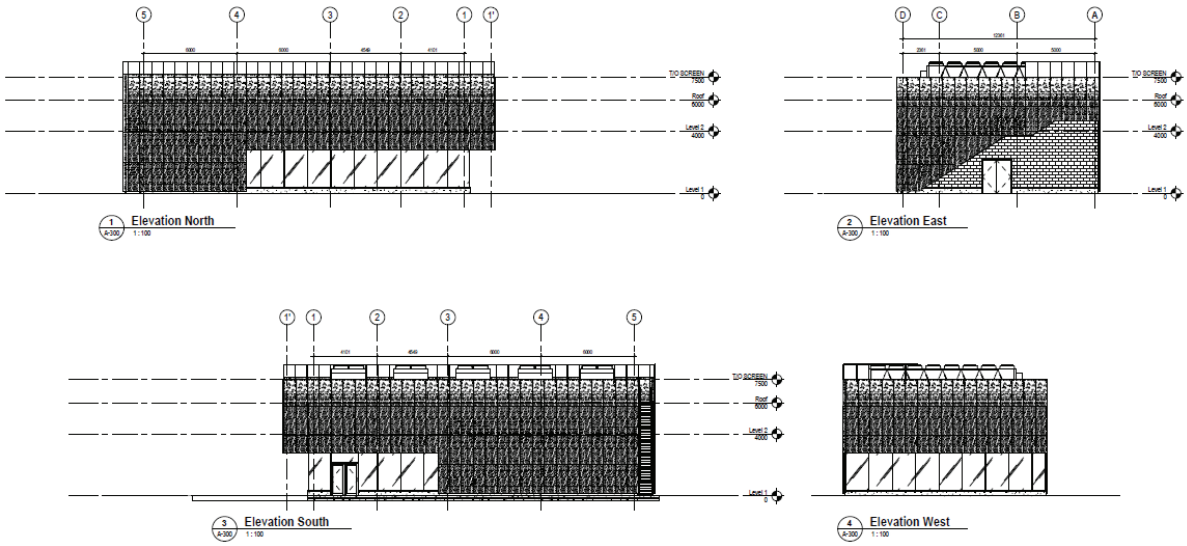
115602068

ROOF PLAN

TRU District Energy

2020.10.09

Stantec



115602068

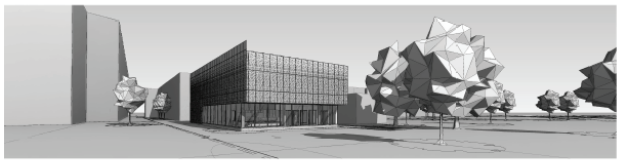
TRU

ELEVATIONS

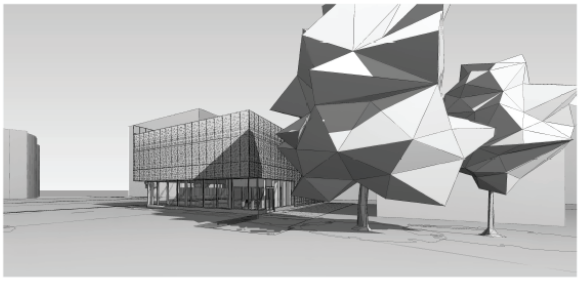
TRU District Energy

2020.10.09

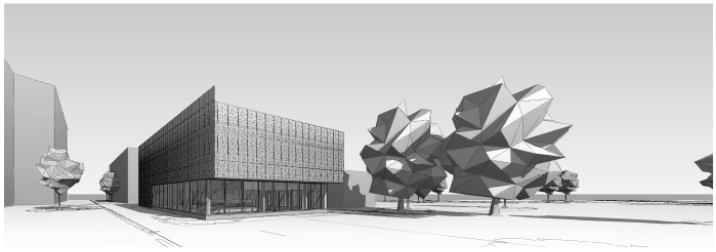
Stantec



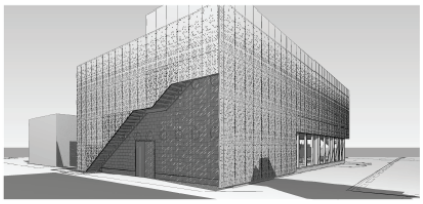
1 A-201 3D Perspective



2 A-201 3D Perspective



3 A-201 3D Perspective



4 A-201 3D Perspective

115602068

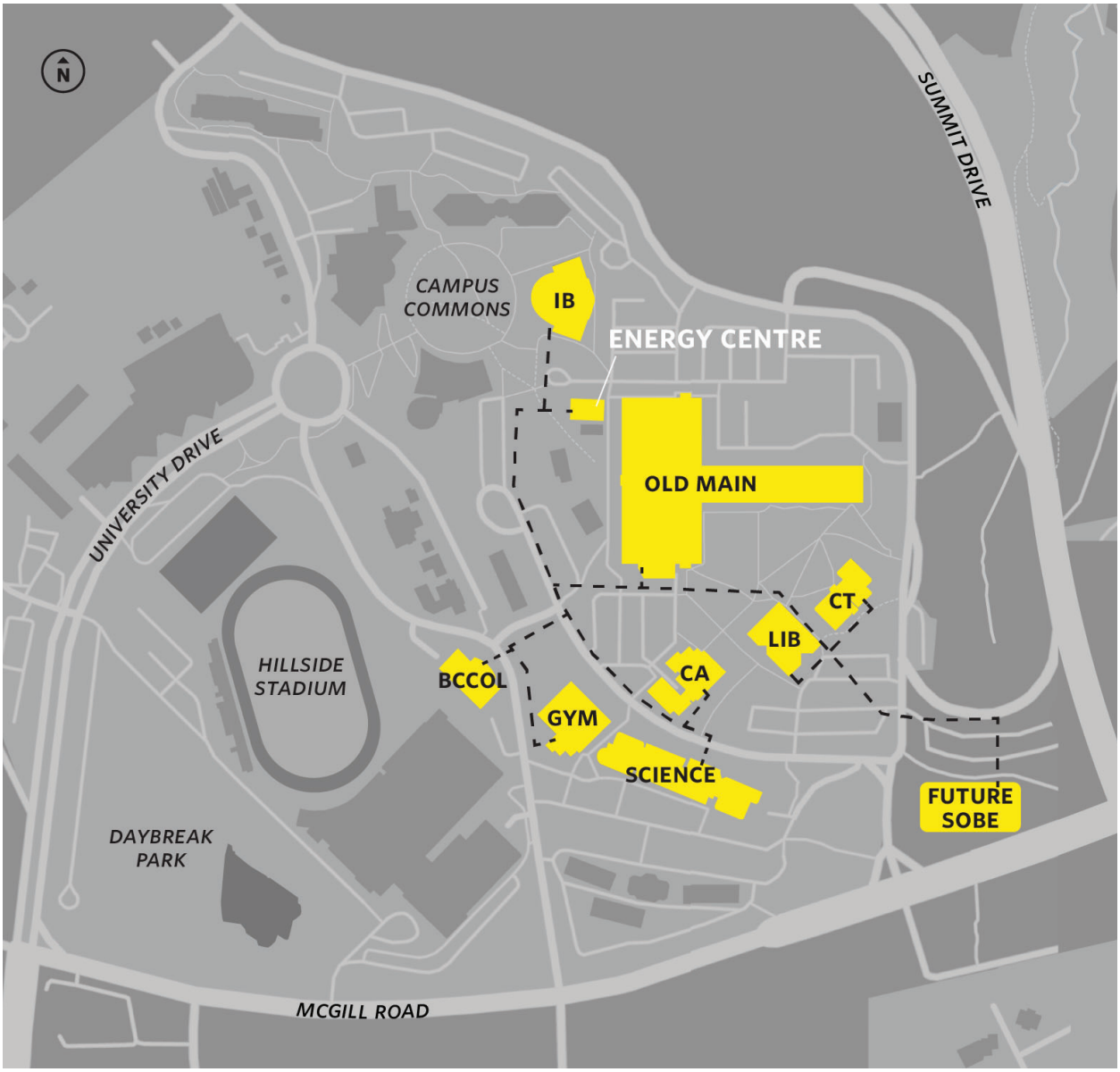
TRU

3D PERSPECTIVES

TRU District Energy

2020.10.09

SCHEDULE B
SITE MAP



SCHEDULE 9
CUSTOMER SERVICE AGREEMENT

See attached.

CUSTOMER SERVICE AGREEMENT

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, by its general partner, **CREATIVE ENERGY THOMPSON RIVERS GP INC.**

DISTRICT ENERGY SYSTEM

THERMAL ENERGY SERVICE

CIVIC ADDRESS: 805 TRU WAY, KAMLOOPS, BRITISH COLUMBIA

LEGALLY DESCRIBED AS:

LOT 1 SECTIONS 1 AND 12 TOWNSHIP 20 RANGE 18 WEST OF THE 6TH MERIDIAN KAMLOOPS DIVISION YALE DISTRICT PLAN KAP91275 EXCEPT EPP60804 AND EPP87212

TERMS & CONDITIONS OF CUSTOMER SERVICE

(FEE FOR SERVICE)

Effective: _____

DISTRICT ENERGY SYSTEM SERVICE AGREEMENT

Customer Information and Billing Address		
Name or company name *(include business registration no. if applicable)*		
Mailing/billing address		
If company, contact name	**Telephone**	**Email**
Property/Service location address (the "Lands")		
Legally described as:		

The Customer, by signing this Agreement, accepts and agrees to be bound by the terms and conditions herein contained, including in Sections A, B, C and D below.

CUSTOMER:		**UTILITY:**	
Signature	Date	Signature	Date
Name	Title	Name	Title

SECTION A - DEFINITIONS

Unless the context otherwise requires, in these Terms and Conditions the following terms have the following meanings:

Affiliate: means, with respect to any Person (i) any entity over which such Person exercises, directly or indirectly, Control, (ii) any entity that is under the common Control of the same entity as such Person, or (iii) any entity which exercises control over such Person by virtue of ownership, financial participation or the rules which govern it.

BCUC: means the British Columbia Utilities Commission and includes any replacement authority, commission or board having similar jurisdictional authority.

Buildings: means the buildings on the Lands that are or will be connected to the District Energy System and are identified in Section D, as amended from time to time.

Building System: means the complete heating and ventilating system and storage equipment to be installed and used for distributing and storing Thermal Energy in a Building, including any Sub-Meters, connected to but downstream of and excluding the Energy Transfer Station and the Demarcation Points located within that Building.

Closing Date: has that meaning ascribed to it in Section 23.1.

Contribution Agreement: means the contribution agreement entered into between the Customer and the Utility dated ♦.

Control: means more than fifty per cent (50%) of the securities having ordinary voting power for the election of directors of such Person or to direct or cause the direction of the management and policies of such Person, whether through the ownership of voting securities, by contract or otherwise.

Costs: means all: (i) actual, documented and/or committed and non-terminable costs reasonably incurred by the Utility in connection with the termination of the Customer Service Agreement and any agreement or arrangement related to the provision of Energy Services, including amounts reasonably payable to contractors or employees due to termination of construction, service, supply or employment agreements entered into by the Utility in connection with such performance; and (ii) reasonable and verifiable fees and expenses incurred by the Utility in connection with the Utility enforcing its rights under the Service Agreement.

Customer: means the Person identified as the Customer on the signature page forming part of this Customer Service Agreement.

Customer Service Agreement: means an agreement between the Utility and a Customer for the provision of Energy Services to a Building or Buildings, which agreement is comprised of a page bearing the information and signature of the Customer and the Utility and these Terms and Conditions.

Customer's Representatives: means any Person who is an officer, director, employee, agent, contractor, subcontractor, consultant or advisor of either the Customer or any Affiliate of the Customer.

Demarcation Points means the Energy Transfer Stations.

Design Capacity: means the load for which the District Energy System has been designed, which is 4,140 kW heating load.

Distribution System: means, collectively, the system of pipes, fittings and ancillary components and equipment supplying Energy Services to, *inter alia*, the Demarcation Points.

District Energy System: means the energy system by which the Utility delivers Thermal Energy to the Customer, including the Distribution System and the Energy Transfer Stations.

ECR Area: has the meaning ascribed to it in the Statutory Right of Way Agreement.

Encumbrance: means any financial encumbrance.

Energy Services: means the supply of thermal energy for space heating and for domestic hot water heating purposes to be provided through the District Energy System.

Energy Transfer Station: means, in respect of each Building, isolation valves, one or more flow control valves, energy metering equipment including temperature sensors and flow meters, control panel and all pipes, fittings, pressure and temperature gauges, sensors, and other associated equipment and instruments which control the transfer, and measure Energy Services from the Distribution System to the Building System for such Building.

Fair Market Value: has that meaning ascribed to it in Section 22.2.

FMV Negotiation Notice: has that meaning ascribed to it in Section 22.5.

FMV Notice: has that meaning ascribed to it in Section 22.2.

First Building: means the first of the Buildings to be connected to the District Energy System.

Governmental Authority: means any federal, provincial, regional, municipal, local or other government, governmental or public department, court, tribunal, arbitral body, commission, board, bureau or agency and any subdivision, agent, commission, board or authority thereof.

Infrastructure Agreement: means the infrastructure agreement entered into between the Customer and the Utility dated ♦.

Initial Term: has that meaning ascribed to it in Section 18.1.

Lands: means those lands and premises situate in Kamloops, British Columbia, more particularly described on the signature page forming part of this Customer Service Agreement.

Meter: means an energy consumption meter owned and operated by the Utility and comprising part of an Energy Transfer Station, excluding any energy consumption meter owned by a Customer or a Person other than the Utility comprising part of a Building System.

Option: has that meaning ascribed to it in Section 22.1.

Option Exercise Notice: has that meaning ascribed to it in Section 22.2.

Person: means an individual or his or her legal personal representative, an unincorporated organization or association, or a corporation, partnership, limited partnership, trust, trustee, strata corporation, syndicate, joint venture, limited liability company, union, Governmental Authority or other entity or organization.

Purchase Confirmation Notice: has that meaning ascribed to it in Section 22.4.

Purchased Assets: has that meaning ascribed to it in Section 22.1.

Standard Fees and Charges: means the standard fees and charges which may be charged to the Customer by the Utility and set out in the Tariff.

Statutory Right of Way Agreement: has that meaning ascribed to it in Section 24.2.

Sub-Meters means an energy consumption meter owned and operated by the Customer to be used to measure individual consumption of the tenants of each Building

Tariff: means Tariff No. ♦, which sets out the rates for Energy Services for the District Energy System approved by the BCUC and certain related terms and conditions, as amended from time to time by the Utility in accordance with the terms and conditions of this Customer Service Agreement with the approval of, and as filed with, the BCUC.

Terms and Conditions: means these Thermal Energy Service Terms & Conditions, including Sections A, B, C and D herein, all as amended from time to time by the Utility with the approval of, and as filed with, the BCUC to the extent required by the BCUC.

Thermal Energy: means all thermal energy for space heating and for domestic hot water heating purposes.

Transfer Approvals: has that meaning ascribed to it in Section 22.5.

Utility: means Creative Energy Thompson Rivers Limited Partnership carrying on the business of a public utility.

Utility's Representatives: means any Person who is an officer, director, employee, agent, contractor, subcontractor, consultant or advisor of either the Utility or any Affiliate of the Utility.

Valuation Process Notice: has that meaning ascribed to it in Section 22.5.

SECTION B – NATURE OF AGREEMENT

1. The Lands

1.1 Under this Customer Service Agreement, the parties are establishing a fee for service arrangement pursuant to which the Utility will provide Energy Services to the Buildings listed in Section D attached hereto and, in return for those Energy Services, the Customer will pay the fees described in this Customer Service Agreement. If the Customer wishes to have the Utility provide Energy Services to any Building other than those initial Buildings set out in Section D as at the date of execution of this Customer Service Agreement, the Customer will complete, execute and deliver to the Utility a Customer Service Agreement in the form approved by the BCUC and the Customer from time to time in respect of any such Building.

1.2 The Customer will cause any Person to whom the Customer transfers or otherwise disposes, whether directly or indirectly, all or any portion of its interest in the Lands to complete, execute and deliver to the Utility a Customer Service Agreement covering the applicable portion of the Lands so transferred or otherwise disposed. To the extent that the purchaser or transferee, enters into a customer service agreement for the applicable portion of the Lands, the Customer will be released from its obligations under this Customer Service Agreement with respect to the applicable portion of the Lands arising or accruing after the effective date of such transfer or disposition.

2. Provision of Energy Services

2.1 The Utility will provide Energy Services to the Customer in accordance with these Terms and Conditions.

2.2 This Customer Service Agreement relates only to the provision of the Energy Services by the Utility to the Customer, upon the Terms and Conditions. The Utility shall not be responsible for the provision of any utility services other than the Energy Services, such as electricity, natural gas and space cooling and the Customer shall be solely responsible for any fees and charges associated with such utility services, in addition to the fees and charges payable to the Utility hereunder.

3. Assignment

3.1 The Customer may not assign this Customer Service Agreement or any of its rights or obligations hereunder without the prior written consent of the Utility, such consent not to be unreasonably withheld. Notwithstanding the foregoing, the Customer may, assign this Customer Service Agreement to any Person together with the transfer of all or substantially all of the assets of the Customer to such Person, without the consent of the Utility but with prior written notice to the Utility, provided that such transferee agrees in writing to assume and be bound by the provisions of this Customer Service Agreement in all respects and to the same extent as the Customer is bound.

3.2 The Utility may, subject to BCUC approval, assign this Customer Service Agreement or any of its rights or obligations thereunder (including, without limitation, by way of the sale of the majority of its shares or business or its material assets or by way of an amalgamation, merger or other corporate reorganization) to any of its Affiliates, or to any other Person approved by the BCUC where such approval is required, without the consent of the Customer, provided such Affiliate or Person is duly qualified to carry out the Customer Service Agreement and agrees in writing to assume and be bound by the provisions of this Customer Service Agreement in all respects and to the same extent as the Utility is bound. For greater certainty, the Customer need not be a signatory to any such agreement as long as it is a party to such agreement.

4. Applicable Rates

4.1 The Utility will provide the Customer with a copy of this Customer Service Agreement and of the Tariff page(s) setting out the applicable rates as agreed to by the parties and as approved and endorsed by the BCUC from time to time in effect. The rates will be comprised of a fixed rate based on subscribed capacity (kW) of the Buildings and a variable rate based on the monthly energy used (MWh) in the Buildings. The approved and endorsed Tariff page(s) will also be available for review at the Utility's office in Vancouver, British Columbia.

4.2 The Customer must not significantly change its connected load without the prior written approval of the Utility, such approval not to be unreasonably withheld, delayed or conditioned.

4.3 *Intentionally Deleted.*

4.4 The Utility shall not be required to provide Thermal Energy for any Building at a level of demand that exceeds the Design Capacity for such Building.

5. Ownership and Care of District Energy System

5.1 Notwithstanding any degree of annexation or affixation, or rule of law or equity to the contrary, the Utility owns all components of the District Energy System and all additions or extensions thereto will be and remain the property of and vest in the Utility, whether located inside or outside of any Building. No component of the District Energy System shall be moved or removed from the Lands (whether located inside or outside of any Building) without the advance written permission of the Utility.

5.2 Other then with respect to the equipment in the ECR Area the Customer will take reasonable care of and protect all components of the District Energy System in, on or under the Lands (whether located inside or outside of any of the other Buildings) against damage and must advise the Utility promptly of any damage to or disappearance of the whole or part of any such component. Subject to Section 8.1, the Customer will pay to the Utility promptly upon request the reasonable and verifiable cost of any broken, missing or damaged component of the District Energy System (or part thereof), except to the extent that such component (or part thereof) is located in the ECR Area or was broken, missing

or damaged due to a defect therein or to any act or omission of the Utility or any of the Utility's Representatives.

6. Meter Reading

6.1 The amount of Thermal Energy registered by a Meter during each billing period will be converted to megawatt-hour.

6.2 The Utility will have the discretion as to the frequency of each Meter reading, and it is currently anticipated that the Meter will be read at monthly intervals.

7. Meter Testing

7.1 If the Customer doubts the accuracy of a Meter, then the Customer may request to have the Meter tested by an independent qualified third party.

7.2 If the testing indicates that the Meter is recording accurately, then the Customer must pay the Utility for the cost of testing the Meter as set out in the Standard Fees and Charges and the reconnection charge as set out in Section 10.

7.3 If the testing indicates that the Meter is recording inaccurately, then the Utility will incur the cost of removing, replacing and testing the Meter.

8. Maintenance

8.1 The Utility will repair, maintain and replace all components of the District Energy System in, on or under the Lands (whether located inside or outside of the Buildings or any of them), from time to time at its own cost to keep the same in good working order. For greater certainty, except for the Utility's obligation to repair, maintain and replace such components of the District Energy System as aforesaid, the Utility is not, and will not be, responsible for repairing, maintaining or replacing any Building System or part thereof or other facility or equipment in, on or under the Lands (whether located inside or outside of the Buildings or any of them).

8.2 The Customer shall not make any alterations to any Building System which may impact the provision of the Energy Services by the Utility without the prior written approval of the Utility, such approval not to be unreasonably withheld, delayed or conditioned.

8.3 The Customer will repair, maintain and replace the Building Systems from time to time at its own cost to keep the same in good working order.

9. Connections and Disconnections

9.1 No connection, disconnection, reconnection, extension, installation, replacement or any other change is to be made to any component of the District Energy System by anyone except by the Utility's Representatives authorized by the Utility.

10. Energy Services Reconnections

10.1 If:

(a) Energy Services are discontinued to the Customer for any of the reasons specified in Section 15 or any other provision of this Customer Service Agreement; or

(b) a Building System is disconnected from the District Energy System or Energy Services are discontinued to the Customer:

(i) at the request of the Customer with the approval of the Utility; or

(ii) to permit a test of a Meter at the request of the Customer, which Meter is subsequently determined to be accurate,

and the Customer re-applies for Energy Services for the same Building within 12 months of such discontinuance or disconnection (as applicable), then if the Building's Building System is reconnected to the District Energy System or if Energy Services are restored to the Customer, then the Customer will pay, as part of fees owing for the first month of Energy Services, a reconnection charge equal to the sum of:

(c) the reasonable and verifiable costs that the Utility will incur in reconnecting the Building's Building System to the District Energy System or restoring Energy Services to the Customer; and

(d) the fixed rate (as set out in the Tariff being the fixed rate based on subscribed capacity kW), excluding any fuel costs, that the Customer would have paid had Energy Services continued during the period between the date of discontinuance or disconnection (as applicable) and the date of such re- application.

10.2 If a Building System is disconnected from the District Energy System or Energy Services are discontinued to the Customer for public safety or repairs or maintenance by the Utility, there will be no reconnection charge to reconnect the Building's Building System to the District Energy System or to restore Energy Services to the Customer.

11. Billing

11.1 The Utility will render bills to the Customer in accordance with this Customer Service Agreement and the Tariff.

11.2 Subject to Section 11.4 below, if Meter readings cannot be obtained for any reason, consumption may be estimated on a fair and reasonable basis by the Utility for billing purposes and the next bill that is based on actual Meter readings will be adjusted for the difference between estimated and actual use over the interval between Meter readings.

11.3 If any Meter fails to register or registers incorrectly, the consumption may be estimated on a fair and reasonable basis by the Utility for billing purposes, subject to Section 12.

11.4 If the Customer terminates this Customer Service Agreement, then the final bill rendered to the Customer will be based on an actual Meter reading.

11.5 Bills will be rendered by the Utility to the Customer on a monthly basis for the immediately preceding calendar month. The due date for payment of bills shown on the face of the bill will be the first business day after:

(a) the 30th calendar day following the date the bill is delivered to the Customer; or

(b) such other longer period, as may be otherwise agreed in writing by the Customer and the Utility.

11.6 Bills will be paid in the manner specified therein, which may include payment by regular mail, payment at a designated office of the Utility and/or payment by on-line banking or electronic funds transfer.

11.7 If the Customer requests historic billing information then the Utility may charge the Customer the reasonable and verifiable cost of processing and providing this information.

12. Back-billing

12.1 Minor adjustments to a Customer's bill, such as an estimated bill or an equal payment plan billing, do not require back-billing treatment.

12.2 Back-billing means the re-billing by the Utility for Energy Services rendered to the Customer because original billings were discovered to be either too high (over-billed) or too low (under-billed). The discovery may be made by either the Customer or the Utility. The cause of the billing error may include any of the following non-exhaustive reasons or combination thereof:

(a) stopped Meter;

(b) metering equipment failure;

(c) inaccurate Meter, as determined pursuant to Section 7;

(d) switched Meters;

(e) double metering;

(f) incorrect Meter connections;

(g) incorrect use of any prescribed apparatus respecting the registration of a Meter;

(h) incorrect Meter multiplier;

(i) the application of an incorrect rate;

(j) incorrect reading of Meters or data processing; or

(k) tampering, fraud, theft or any other criminal act.

12.3 Where the Customer requests that the Meter be tested, the provisions of Section 7 will apply in addition to those set forth in this Section 12.

12.4 Where metering or billing errors occur and the Customer does not request that the Meter be tested, the consumption and demand will be based on the records of the Utility for the Customer or on the Customer's own records to the extent they are available and accurate or, if not available, on reasonable and fair estimates made by the Utility. Such estimates will be on a consistent basis within the class of customer of which the Customer is a member or according to the provisions of this Customer Service Agreement, as applicable.

12.5 In every case of under-billing or over-billing, the cause of the error will be remedied without delay, and the Customer will be promptly notified of the error and of the effect on the Customer's ongoing bill.

12.6 In every case of over-billing, the Utility will refund to the Customer money incorrectly collected, with interest computed at the short-term bank loan rate applicable to the Utility on a monthly basis thereon, for the duration of the error.

12.7 Subject to paragraph 12.11 below, in every case of under-billing, the Utility will back-bill the Customer for the duration of the error.

12.8 Subject to paragraph 12.11 below, in every case of under-billing, the Utility will offer the Customer reasonable terms of repayment. If requested by the Customer, the repayment term will be equivalent in length to the back-billing period. The repayment will be interest free and in equal instalments corresponding to the normal billing cycle. Delinquency in payment of such instalments will be subject to the usual late payment charges.

12.9 Subject to paragraph 12.11 below, if the Customer disputes a portion of a back-billing due to under-billing based upon either consumption, demand or duration of the error, the Utility will not threaten or cause the discontinuance of Energy Services for the Customer's failure to pay that portion of the back-billing, unless there is no reasonable ground for the Customer to dispute that portion of the back- billing. The undisputed portion of the bill will be paid by the Customer and the Utility may threaten or cause the discontinuance of Energy Services in accordance with article 15 if such undisputed portion of the bill is not paid.

12.10 Subject to paragraph 12.11 below, in all instances of back-billing where changes of ownership have occurred, the Utility will make a reasonable attempt to locate the former customer. If, after a period of one year, such former customer cannot be located, the over-billing or under-billing applicable to them will be cancelled.

12.11 Notwithstanding anything herein to the contrary, if there are reasonable grounds to believe that the Customer or the Utility has tampered with or otherwise used the Thermal Energy or any component of the District Energy System in an unauthorized way, or there is evidence of fraud, theft or another criminal act, by either the Customer or the Utility then back-billing will be applied for the duration of the unauthorized use, and the provisions of paragraphs 12.6, 12.7, 12.8, 12.9 and 12.10 above will not apply.

12.12 Under-billing or over-billing resulting from circumstances described in paragraph 12.11 will bear interest at the rate specified in the Tariff on unpaid accounts from the date of the original under-billed or over-billed invoice until the amount under-billed or over-billed is paid or refunded, as the case may be, in full. In the event of over-billing, the Utility will have the right to apply any over-billed amount as one or more credits against future payments owing to the Utility by the Customer pursuant to the terms of this Customer Service Agreement.

12.13 In addition, the Customer is liable for the reasonable and verifiable third party out of pocket costs incurred by the Utility in the investigation of any incident of tampering by the Customer, including the direct costs of repair, or replacement of equipment, provided that the Customer will only be liable for such costs when there is a reasonable basis for the Utility to believe that there has been an incident of tampering by the Customer.

13. Late Payment Charge and Collection Charge

13.1 If the amount due on any bill has not been paid in full on or before the due date shown on such bill, a further bill will be rendered to include the overdue amount plus a late payment charge as set out in the Standard Fees and Charges. Notwithstanding the due date shown, to allow time for payments made to reach the Utility and to co-ordinate the billing of late payment charges with scheduled billing cycles, the Utility may, in its discretion, waive late payment charges on payments not processed until a number of days after the due date. If the Customer's account is overdue and requires the Utility to incur out of pocket costs to collect, the Utility may charge the Customer a reasonable collection charge as set out in the Standard Fees and Charges.

14. Dishonoured Payments Charge

14.1 If a cheque received by the Utility from the Customer in payment of any account is returned by the Customer's bank, trust company or financial institution because of insufficient funds (NSF), or any reason other than clerical error, a returned cheque charge as set out in the Standard Fees and Charges will be added to the amount due and payable by the Customer whether or not the applicable Building System has been disconnected from the District Energy System or Energy Services have been discontinued to the Customer.

15. Refusal to Provide Energy Services and Discontinuance of Energy Services

15.1 The Utility may, after following the billing and the back-billing processes in Sections 11 and 12, respectively, and after having given 20 business days' prior written notice, discontinue providing Energy Services to the Customer if the Customer:

(a) fails to fully pay for any Energy Services provided to any Building(s) on or before the due date for such payment and the Customer fails to remedy such non-payment within five business days after written notice from the Utility; or

(b) *Intentionally Deleted.*

15.2 The Utility may, after having given 10 business days' prior written notice (except in the case of (b) and (c) below where no further notice is required), discontinue providing Energy Services to the Customer if the Customer:

(a) breaches any material terms and conditions of this Customer Service Agreement and any such breach on the part of the Customer continues for 30 days after written notice thereof to the Customer (or if such breach cannot reasonably be remedied within 30 days, the Customer fails to commence to remedy the breach within such 30 days and thereafter fails to proceed diligently to remedy such breach);

(b) uses the provided Thermal Energy in a manner that will, in the opinion of the Utility acting reasonably:

(i) lead to a dangerous situation; or

(ii) have a material negative impact on the District Energy System, or any components thereof,

and the Customer continues such use for five business day after written notice thereof to the Customer;

(c) fails to make modifications or additions to the Customer's equipment as required by the Utility to prevent a danger or material negative impact described in paragraph (b) above, and such failure on the part of the Customer continues for five business days after written notice thereof to the Customer (or if such failure cannot reasonably be remedied within five days, the Customer fails to commence to remedy such failure within such five days and thereafter fails to proceed diligently to remedy such failure);

(d) negligently or fraudulently misrepresents to the Utility its use of Thermal Energy or the Thermal Energy load requirements of, or Thermal Energy volume consumed within and by, any Building; or

(e) terminates this Customer Service Agreement pursuant to Sections 19 or 20 or causes the termination of this Customer Service Agreement for any reason.

15.3 The Utility may, on not less than 30 days' prior written notice, discontinue providing Energy Services to the Customer if the Customer:

(a) refuses to provide reference information and identification acceptable to the Utility acting reasonably when applying for Energy Services or at any subsequent time on request by the Utility, and the Customer fails to provide such information or identification within 30 days after written notice thereof to the Customer;

(b) has defective pipes, appliances, or Thermal Energy fittings in any part or parts of Building(s) which will materially adversely impact the provision of the Energy Services by the Utility and the Customer fails to remedy the same within 30 days after written notice thereof to the Customer (or if such cannot reasonably be

remedied within 30 days, the Customer fails to commence to remedy the defective item within such 30 days and thereafter fails to proceed diligently to remedy such defective item); or

(c) makes any alterations to any Building System which will, in the opinion of the Utility acting reasonably materially adversely impact the provision of the Energy Services by the Utility without the prior written approval of the Utility, such approval not to be unreasonably withheld, delayed or conditioned.

15.4 *Intentionally Deleted.*

15.5 The Utility will not be liable for any loss, injury or damage suffered by the Customer by reason of the discontinuation of or refusal to provide Energy Services in accordance with this Section 15.

16. Security for Payment of Bills

Intentionally Deleted.

17. Account Charge

17.1 When a change of customer occurs for a Building, then an account charge, as set out in the Standard Fees and Charges, will be paid by the new customer with respect to each account in that new customer's name for which a separate bill is rendered by the Utility.

18. Term of Customer Service Agreement

18.1 The initial term of this Customer Service Agreement is 30 years (the "**Initial Term**") from the date on which the Utility commences delivery of the Energy Services to the First Building.

18.2 The Customer has the option to extend the term of this Customer Service Agreement for a period of 20 years, by giving no less than 5 years' written notice to the Utility at the address specified in accordance with this Customer Service Agreement that the Customer so elects to renew this Customer Service Agreement. The rates for such extension period shall be determined as follows:

(a) the Utility will, within 6 months following the receipt of notice from the Customer that the Customer so elects to renew this Customer Service Agreement, provide the Customer with the proposed indicative rates to be submitted to the BCUC for approval in respect of such extension period, which rates will be comprised of a fixed rate based on subscribed capacity (kW) of the Buildings and a variable rate based on the monthly energy used (MWh) in the Buildings;

(b) the Customer will, within 30 days following the receipt of such proposed rates, advise the Utility as to whether or not the Customer approves such proposed rates; and

(c) each of the Utility and the Customer will act in good faith to finalize and approve the indicative rates to be submitted to the BCUC for approval in respect of such extension period by the date which is four years prior to the expiry of the Initial Term; and

(d) the Utility will apply to the BCUC for the approval of the agreed upon indicative rates.

The Customer acknowledges and agrees that the BCUC may approve rates to be charged during such extension period that differ from the indicative rates submitted for approval in accordance with Section 18.2(d) above.

18.3 If the Customer does not elect to extend this Customer Service Agreement in accordance with Section 18.2 by the date that is 5 years prior to the expiry of the Initial Term or if the Customer does elect to extend this Customer Service Agreement but the parties cannot agree on the indicative rates to be submitted to the BCUC for approval for the extension period by the date that is four years prior to the expiry of the Initial Term, then this Customer Service Agreement shall automatically terminate upon the expiry of the Initial Term.

19. Early Termination

19.1 Either the Customer or the Utility may terminate this Customer Service Agreement at any time after the date on which the Utility commences delivery of the Energy Services in connection with a default by the other party under this Customer Service Agreement that is continuing beyond any applicable cure period (including with respect to any default by the Customer, the applicable cure period set out in Article 15). A default under any other agreement entered into between the Utility and the Customer with respect to the District Energy System, including the Infrastructure Agreement, the Contribution Agreement, or the Statutory Right of Way Agreement, shall constitute a default under this Customer Service Agreement and a default under this Customer Service Agreement shall constitute a default under such other agreements.

19.2 If the defaulting party under Section 19.1 is the Customer, then the Customer shall pay to the Utility (without any further liability) an early termination payment (the "**Early Termination Payment**") equal to the sum of:

(a) the net present value of the remaining fixed rates, excluding any fuel costs or any operation and maintenance costs, for Energy Services as set out in the Tariff for the balance of the Initial Term utilizing a discount rate of 6.3%; and

(b) without duplication, all Costs incurred by the Utility.

Provided the Customer is not in default in respect of any of its obligations pursuant to this Customer Service Agreement, within 30 days following the commencement of each calendar year during the Initial Term, the Utility will deliver to the Customer a letter signed by a senior officer of the Utility confirming that the Customer is not in default in respect of its obligations pursuant to this Customer Service Agreement and is current in respect of the payment of all amounts owing to the Utility hereunder.

19.3 If the defaulting party under Section 19.1 is the Utility, then the Utility shall be responsible for all costs, expenses, damages and liabilities incurred by the Customer in connection with the termination of this Customer Service Agreement.

20. Effect of Termination

20.1 Subject to the cross-default clause set out in Section 19.1 above, neither party will be released from any obligations to other party previously existing as at the effective date of termination as a result of either party terminating this Customer Service Agreement.

20.2 Upon the expiration or earlier termination of this Customer Service Agreement:

(a) if the Customer has not exercised the Option, the Utility shall at the direction of the Customer remove all components of the District Energy System from the Lands other than the Distribution System, and, in respect of the Distribution System, the Utility may at its option remove all or any component thereof, provided that any components of the Distribution System that are not so removed shall be decommissioned and capped, as applicable; and

(b) the Statutory Right of Way Agreement and the Contribution Agreement will cease and terminate.

20.3 Notwithstanding any termination by the Customer pursuant to this Section, and without derogating from the generality of Section 5, all components of the District Energy System will remain the property of and vest in the Utility upon the termination of this Customer Service Agreement, unless the Customer exercises the Option to purchase the Purchased Assets.

21. Liability

21.1 Neither the Utility, nor any of the Utility's Representatives, is responsible or liable for any loss, injury (including death), damage or expense incurred by the Customer or any Person claiming by or through the Customer, that is caused by or results from, directly or indirectly, any discontinuance, suspension, or interruption of, or failure or defect in the supply, delivery or transportation of, or any refusal to supply, deliver, or transport Thermal Energy, or provide Energy Services, except to the extent that the loss, injury (including death), damage or expense arises from the negligence or wilful misconduct of the Utility or any of the Utility's Representatives.

21.2 Subject to Section 25.1, from May 1 to October 31 in any year, the Utility may, on five business days' prior written notice to the Customer, suspend Energy Services temporarily to make repairs or improvements to the District Energy System. The Utility will, as soon as reasonably possible, restore Energy Services. The Utility in exercising its rights hereunder will proceed to the extent reasonably possible so as to minimize interference with the Customer's and any of its tenants, licencees, guests or invitees' use and occupancy of the Buildings and the Lands, and will repair any damage to the Buildings or the Lands caused by such exercise of its rights.

21.3 Other than with respect to equipment in the ECR Area, the Customer shall bear and retain the risk of, and hereby indemnifies and holds harmless the Utility and all of the Utility's Representatives from, all loss and damage to all components of the District Energy System in, on or under the Lands (whether located inside or outside of any of the other Buildings), subject to Section 8.1 and except to the extent any loss or damage arises from the negligence or wilful misconduct of the Utility or any of the Utility's Representatives, or arises from a defect in the District Energy System or such components of the District Energy System.

21.4 Except to the extent arising from the negligence or wilful misconduct of the Utility or any of the Utility's Representatives, or from a defect in the District Energy System or such components of the District Energy System, the Customer agrees to indemnify and hold harmless the Utility and all of the Utility's Representatives from all claims, losses, damages, liabilities, costs, expenses and injury (including death) whatsoever which the Utility may suffer, sustain, pay or incur caused by or resulting from the use of Thermal Energy by the Customer or the presence of Thermal Energy on or in any part of the Building(s) or from the Customer or the Customer's employees, contractors or agents damaging any component of the District Energy System. This paragraph will survive any termination of the Customer Service Agreement.

21.5 Except to the extent arising from the negligence or wilful misconduct of the Customer or any of the Customer's Representatives, the Utility agrees to indemnify and hold harmless the Customer and all of the Customer's Representatives from all claims, losses, damages, liabilities, costs, expenses and injury (including death) whatsoever which the Customer may suffer, sustain, pay or incur caused by or resulting from any breach of or non performance by the Utility of any covenant or condition in this Customer Service Agreement. This paragraph will survive any termination of the Customer Service Agreement.

21.6 The Customer acknowledges and agrees that the Utility will not in any way be responsible for any aspect of the design, engineering, permitting, construction or installation of any Building System.

21.7 In no event will either party or any of its officers, directors, employees, contractors or agents be liable to the other party for any indirect or consequential loss, damage, cost or expense whatsoever, including any loss of profits, revenues or other economic loss, suffered by the other party or its officers, directors, employees, contractors or agents.

22. End of Term Purchase Option

22.1 Upon the termination of this Customer Service Agreement following the expiration of the Initial Term (or any renewal term pursuant to Section 18) the Customer shall have the option to purchase from the Utility all (but not less than all) equipment forming part of the District Energy System up to the Demarcation Points (the "**Purchased Assets**") upon the termination of this Customer Service Agreement following the expiration of the Initial Term (or any renewal term pursuant to Section 18), for the Fair Market Value, on the terms set out in Section 22 and Section 23 (the "**Option**").

22.2 Customer shall notify Utility of Customer's intent to exercise the Option (the "**Option Exercise Notice**") not less than two (2) years prior to the expiration of the Initial Term (or renewal term, as the case may be). No later than two (2) months following receipt of an Option Exercise Notice, Utility shall deliver to Customer a notice (the "**FMV Notice**") containing Utility's determination of the fair market value of the Purchased Assets (the "**Fair Market Value**"). The Fair Market Value will be determined on the basis of the Purchased Assets being sold as a going concern, with no discount by reason of the fact that the Customer is the only customer of the Utility.

22.3 If the Customer is of the view, in its sole discretion, that the Fair Market Value is lower than the value set out in the FMV Notice (or if Utility has failed to deliver a FMV Notice in accordance with Section 22.2), the Customer may so notify the Utility within 30 days of either receiving the FMV Notice or of the Utility's failure to deliver the FMV Notice by the deadline, as applicable (the ("**FMV Negotiation Notice**"). Following delivery of the FMV Negotiation Notice, representatives of each of the Customer and the Utility will, acting reasonably, meet and attempt to agree on the Fair Market Value. If the parties are unable to agree on the Fair Market Value within 30 days following delivery of the FMV Negotiation Notice and if Customer still wishes to purchase the Purchased Assets the Customer may so notify the Utility within 45 days following delivery of the FMV Negotiation Notice (the "**Valuation Process Notice**"). In such case, the Fair Market Value will be determined as the average of two appraisals as to the Fair Market Value obtained from two different, certified business valuation firms, one designated by each of Utility and Customer. Each party must designate its chosen valuation firm in writing within 15 days following delivery of the Valuation Process Notice, and each valuation firm shall deliver its final appraisal to both parties and to the other valuation firm within a further 30 days after the designation deadline. If a party fails to designate a certified business valuation firm within the 15 day period described above, then it shall forfeit its right to designate a valuation firm, and the Fair Market Value shall be determined exclusively by the other party's designated valuation firm. If a designated valuation firm fails to deliver its appraisal within the 30 days period described above, then the Fair Market Value shall be determined exclusively by the other party's designated valuation firm. If the Fair Market Value so determined is at least 2% lower than the figure stated in the FMW Notice, then the Utility shall pay all of the appraisal firms' fees; otherwise Customer shall pay all of such fees.

22.4 Upon the Fair Market Value being determined, whether by acceptance of the FMV Notice, the negotiation process or by appraisal, Customer may within three (3) months of such determination notify Utility of its intent to proceed with the purchase of the Purchased Assets at the Fair Market Value on the terms described in Section 22.2 ("**Purchase Confirmation Notice**"). If Customer does not deliver a Purchase Confirmation Notice, then Customer is deemed to have revoked its exercise of the Option. If Customer notifies Utility it will not exercise the Option or the Option period expires without an election by Customer, the Option will automatically expire and be of no further effect.

22.5 Upon the delivery of a Purchase Confirmation Notice by Customer, Customer will apply (or cause an application to be made) to the BCUC for any approvals required to allow for the purchase and sale of the Purchased Assets and the operation of the District Energy

System by the Customer or such other person as the Customer intends to take ownership of the Purchased Assets (the "**Transfer Approvals**") and both Customer and Utility agree to cooperate and take all steps reasonably required to obtain such approvals, including assisting with the procedural steps related to filing the necessary documents, and providing arguments and witnesses in support of the applications. If for any reason the Transfer Approvals are not obtained, then the Option will automatically terminate and be of no further effect.

22.6 Upon the Customer having delivered the Purchase Confirmation Notice, Customer shall have the right to assign its right to acquire the Purchased Assets in accordance with this Section 22 and Section 23.

23. Transfer of Ownership

23.1 If Customer has delivered an Option Exercise Notice and a Purchase Confirmation Notice in accordance with Section 22, then on the first business day immediately following the later of: (i) the termination of this Customer Service Agreement; and (ii) 30 days following the receipt of the Transfer Approvals ("**Closing Date**"), Utility shall sell and Customer shall purchase the Purchased Assets for a purchase price determined pursuant to Section 22, on the following terms and conditions:

(a) this Customer Service Agreement and all other Customer Service Agreements made with respect to the Lands will terminate effective the Closing Date;

(b) between the date of the Option Exercise Notice and the Closing Date, Utility shall continue to operate and maintain the Purchased Assets in the same manner and with the same frequency and to the same standard as it had preceding the Option Exercise Notice and in accordance with the terms of this Customer Service Agreement; provided, however, such maintenance shall not include any expenditure properly characterized as a capital expense in accordance with generally accepted accounting principles unless the parties agree acting reasonably on who should bear the expense and whether the Fair Market Value should be adjusted accordingly;

(c) Customer shall pay the purchase price to Utility by wire transfer or solicitor's trust cheque;

(d) Utility shall deliver, or cause to be delivered, to Customer a bill of sale conveying the Purchased Assets, together with all intellectual property rights associated therewith, to Customer (or as Customer may further direct). Such bill of sale shall not contain any warranties other than a warranty against any defects in title arising through Utility, and a warranty as to the Customer's ownership of the Purchased Assets;

(e) Utility shall use all reasonable efforts to transfer any remaining manufacturer's warranties on the Purchased Assets, or portions thereof, to Customer;

(f) Utility shall use all reasonable efforts to transfer to Customer any permits, licenses and approvals that are transferrable and associated solely with the ownership or operation of the Purchased Assets and no other property or business of Utility;

(g) Utility shall deliver to Customer all existing operating manuals for the Purchased Assets or any parts thereof, together with any other copies in Utility's possession or control;

(h) Utility shall deliver to Customer all keys, codes, software systems, performance and maintenance logs and records, designs, as-built drawings, and other ancillary assets associated with or necessary for the proper operation of the Purchased Assets; and

(i) the Purchased Assets and all ancillary assets shall be transferred by Utility free and clear of any liens, charges, financing statements or encumbrances against any component of the Purchased Assets.

24. Access to Buildings and Equipment

24.1 The Utility's Representatives will have, at all reasonable times, reasonable access to all components of the District Energy System in, on or under the Lands (whether located inside or outside of Building(s)) to ascertain the quantity or method of use of Energy Services, as well as for the purpose of reading, testing, repairing or removing the whole or any such component (or part thereof), turning Thermal Energy on or off, conducting system leakage surveys, stopping leaks, and examining pipes, fittings, connections and appliances. Utility shall act reasonably in connection with having access to the Lands or Buildings and take all reasonable steps not to disturb or interfere with the use and occupancy of the Lands or Buildings by Customer and any of its tenants, licencees, guests or invitees.

24.2 In furtherance of the above in Section 24.1, the Customer and the Utility acknowledge and agree they have or will enter into a separate statutory right of way agreement (the "**Statutory Right of Way Agreement**") that will be registered in the applicable Land Title Office with respect to, among other things, access to, on, over and under the Lands for the purposes of the Utility performing its obligations under this Customer Service Agreement.

24.3 *Intentionally Deleted.*

24.4 *Intentionally Deleted.*

25. Curtailment of Energy Services

25.1 The parties agree and acknowledge that during winter months in Kamloops, there are occasions when cold outdoor temperatures can cause severe damage to buildings that are not adequately heated. If there is an emergency caused by a breakdown or failure of any component of the District Energy System, when unsafe conditions prevent the operation of the District Energy System, or if required at any time to comply with the requirements of any law, the Utility will have the right to temporarily interrupt or reduce the provision of Energy Services. Utility shall act reasonably in connection with such interruption or

reduction and will minimize the risk to, and interference with, the use and occupancy of the Lands or Buildings by Customer and any of its tenants, licencees, guests or invitees.

26. Disturbing Use

26.1 The Customer will take and use the Thermal Energy supplied by the Utility so as not to endanger or materially negatively impact the District Energy System.

27. Taxes

27.1 The rates and charges set out in these Terms and Conditions do not include social services tax, goods and services tax, harmonized sales tax or any other tax that the Utility may be lawfully authorized or required to add to its normal rates and charges, provided that the Utility shall be responsible to pay to the applicable authority any property taxes payable in respect of the District Energy System.

28. Special Contracts and Supplements

28.1 In unusual circumstances, special contracts and supplements to these Terms and Conditions may be negotiated between the Utility and the Customer and submitted for approval by the BCUC where a minimum rate or revenue stream is required by the Utility to ensure that the provision of Energy Services to the Customer is economic.

29. Conflicting Terms and Conditions

29.1 Whenever anything in these Terms and Conditions is in conflict with any special terms or conditions provided in the Tariff, the terms or conditions provided in the Tariff will prevail and whenever anything in these Terms and Conditions or in the Tariff is in conflict with the terms of any special contract the terms of such special contract will prevail.

30. Entire Agreement

30.1 No promise, representation or agreement not incorporated in this Customer Service Agreement will be binding upon the parties unless made in writing and signed by the parties.

31. Utility Contact Information

31.1 Section C attached to and forming part of these Terms and Conditions sets out the contact information and hours of operation for the Utility in the event of an emergency or in the event the Customer has any inquiries with respect to the Energy Services or the fees and charges payable by the Customer to the Utility hereunder or in the event of any disputes.

32. Collection and Use of Data

32.1 The Customer acknowledges and agrees that the Utility may, in accordance with any requirement of a Governmental Authority, from time to time collect and provide to any Governmental Authority data regarding the performance of the District Energy System on

a system-wide basis or on the basis of a specified area. The Utility acknowledges that the Customer is subject to the B.C. *Freedom of Information and Protection of Privacy Act* and that under that Act the Customer has obligations with regard to applications for access to information that may include releasing portions or all of this Customer Service Agreement.

33. Notices

33.1 Any notice, request, consent or demand to be given pursuant to this Customer Service Agreement will be in writing and will be addressed to the relevant party at the address set out on the signature page for the Customer and in Schedule C for the Utility.

33.2 A notice will be sufficiently given if delivered:

(a) personally or by registered mail, postage prepaid, to the person to whose attention such notice is addressed or a responsible person at the address of the recipient party, in which event it will be deemed to be received by the recipient 2 hours after such delivery, provided that if delivery is not effected prior to 5:00 p.m. P.S.T. on any business day, then such notice will be deemed received by 9:00 a.m. P.S.T. on the next business day; or

(b) transmitted by email, in which event it will be deemed to be delivered 2 hours following the time of transmission, provided that, if such time period is after 5:00 p.m. P.S.T. on any business day, then such notice will be deemed received by 9:00 a.m. P.S.T. on the next business day. Any notice delivered by email will be confirmed by prepaid registered mail.

33.3 The provisions of this Section will apply to notices of a change in address for either party.

SECTION C - UTILITY CONTACT INFORMATION

In the case of an Emergency (at any time):

Telephone: 604-688-9584

For all general inquiries:

Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1

Telephone: 604-688-9584
Fax: 604-688-2213
Email: Info@creative.energy

Hours of Operation: Monday – Friday 9 a.m. to 5 p.m. (closed on statutory holidays)

SECTION D – BUILDINGS

List of buildings that will be first connected

1. Old Main
2. Science
3. Library (LIB)
4. BC Centre for Open Learning (BCCOL)
5. Culinary Arts (CA)
6. Clock Tower (CT)
7. Gymnasium (GYM)
8. International building (IB)
9. SOBE [future building]

Appendix G

Contribution Agreement

CONTRIBUTION AGREEMENT

THIS AGREEMENT is made effective as of November 8, 2021 (the "**Effective Date**")

BETWEEN:

THOMPSON RIVERS UNIVERSITY, a university formed pursuant to the *Thompson Rivers University Act* (British Columbia), with an address at 805 TRU Way, Kamloops, BC V2C 0C8 ("**TRU**")

AND:

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, a limited partnership formed under the laws of British Columbia, with an address at Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1 by its general partner, **CREATIVE ENERGY THOMPSON RIVERS GP INC.** ("**Creative Energy**")

WHEREAS:

A. TRU is the legal and beneficial owner of certain properties located at 805 TRU Way, Kamloops, British Columbia, and presently legally described as:

> PID: 028-324-757, LOT 1 SECTIONS 1 AND 12 TOWNSHIP 20 RANGE 18 WEST OF THE 6TH MERIDIAN KAMLOOPS DIVISION YALE DISTRICT PLAN KAP91275 EXCEPT EPP60804 AND EPP87212
> (the "**TRU Lands**").

B. TRU and Creative Energy have entered into an Infrastructure Agreement dated for reference November 8, 2021 (the "**Infrastructure Agreement**") with respect to the construction of the Energy System;

C. The Energy System will provide, *inter alia*, the Buildings with heat for space heating and domestic hot water services (the "**Energy Services**");

D. Creative Energy is or will become a public utility as defined in the *Utilities Commission Act* (British Columbia), and has expertise in the design, construction, operation and maintenance of thermal energy delivery systems; and

E. In order to recognize the benefits to Creative Energy associated with Creative Energy's use of the applicable portions of the TRU Lands, including parts of the Buildings located on the TRU Lands, wherein the Energy System is or will be situate, Creative Energy has agreed to make financial contributions to TRU in accordance with the terms and conditions contained in this Agreement.

NOW THEREFORE THIS AGREEMENT WITNESSES THAT, in consideration of the premises and the covenants and agreements set out herein, and other good and valuable

consideration, the receipt and sufficiency of which are hereby acknowledged by each party, the parties covenant and agree as follows:

1. **Definitions –** In this Agreement:

(a) "**Affiliate**" has the meaning set out in the *Business Corporations Act*, S.B.C. 2002, c.57;

(b) "**Applicable Taxes**" has the meaning set out in section 7(b);

(c) "**BCICAC**" has the meaning set out in section 22;

(d) "**BCUC**" has the meaning set out in section 17;

(e) "**Buildings**" means the current and proposed buildings on the TRU Lands that will be connected to the Energy System, being namely the buildings named on the TRU Lands Map set out in Schedule B as follows: Old Main, Ken Lepin Building, SOBE Management Building (proposed), Old Library and Administration Building, BC Centre for Open Learning, Culinary Arts Building, Clock Tower Building, Gymnasium, International Building and Energy Centre Building, together with any other buildings connected to the Energy System.

(f) "**Building Systems**" means the systems of heat and hot water delivery equipment including water pipes, heat pumps and related equipment, components and controls located within the Buildings and connected to the Energy System at the Demarcation Points and used for distributing the Energy Services within the Buildings;

(g) "**Commencement Date**" has the meaning set out in section 2;

(h) "**Contribution Payment**" has the meaning set out in section 4(a);

(i) "**Defaulting Party**" has the meaning set out in section 13;

(j) "**Demarcation Points**" means the points at which the pipes forming part of the Building Systems connect to the Energy System, at each Energy Transfer Station;

(k) "**Dispute**" has the meaning set out in section 22;

(l) "**Distribution System**" means, collectively, the system of pipes, fittings and ancillary components and equipment supplying Energy Services to, *inter alia*, the Demarcation Points;

(m) "**Energy Services**" has the meaning set out in the recitals;

(n) "**Energy System**" means the thermal energy system consisting of, inter alia, pipes, heat pumps, boilers, meters and related components, equipment and controls used for generating, metering and distributing the Energy Services to the Demarcation Points,

and including the Distribution System and the Energy Transfer Stations, and all additions thereto and replacements thereof, but specifically excluding all Building Systems;

(o) "**Energy Centre Room**" means the area marked as such as more particularly shown outlined on the drawing attached as SCHEDULE A;

(p) "**Energy Transfer Station**" means, in respect of each Building, isolation valves, one or more flow control valves, energy metering equipment including temperature sensors and flow meters, control panel and all pipes, fittings, pressure and temperature gauges, sensors, and other associated equipment and instruments which control the transfer, and measure Energy Services from the Distribution System to the Building System for such Building.

(q) "**Force Majeure**" has the meaning set out in section 8;

(r) "**Infrastructure Agreement**" has the meaning set out in the recitals;

(s) "**Non-Defaulting Party**" has the meaning set out in section 13(b);

(t) "**Payment Start Date**" means that date upon which Creative Energy commences the supply of Energy Services from the Energy System to any of the Buildings on the TRU Lands;

(u) "**SRW**" has the meaning set out in section 3;

(v) "**Term**" has the meaning set out in section 11;

(w) "**TRU Lands**" has the meaning set out in the recitals;

(x) "**TRU's Costs**" has the meaning set out in section 3; and

(y) "**Usable Area**" means the internal area in square metres of the Energy Centre Room which Creative Energy is reasonably able to use for the purposes granted within the SRW and which is not encumbered by TRU's equipment, as such area is determined by TRU and Creative Energy from time to time, each acting reasonably.

2. **Commencement of Obligations –** The obligations of the parties to carry out and to otherwise comply with the terms of this Agreement do not arise and are not effective until the date upon which the SRW is executed and delivered by TRU (the "**Commencement Date**"). If the Infrastructure Agreement is terminated for any reason prior to the commencement of the construction and installation of the Energy System on the TRU Lands, then this Agreement will automatically concurrently terminate and be null and void without liability between the parties and neither party will be under any obligation to the other to complete the transactions contemplated by this Agreement.

3. **Acknowledgement re: Costs –** Creative Energy acknowledges and agrees that for the purposes of this Agreement, pursuant to the Infrastructure Agreement and to the right of way to be granted by TRU to Creative Energy pursuant to the Infrastructure Agreement (the "**SRW**"), Creative Energy is and will be the recipient of certain benefits that have a cost implication to TRU, including wear and tear and capital depreciation, similar to those attributable to use of property and facilities within the Energy Centre Room by tenants, licensees, occupiers and others ("**TRU's Costs**").

4. **Contribution Towards Costs** – Subject to section 8, Creative Energy agrees to pay to TRU, commencing on the Payment Start Date and until the end of the Term, as a contribution towards TRU's Costs the following amounts:

   (a) an annual payment equal to $20.00 per square metre multiplied by the total Usable Area of the Energy System Room payable in equal monthly instalments, in advance, which annual payment shall be increased annually on each anniversary of the Payment Start Date in accordance with section 6 (the "**Contribution Payment**"), plus Applicable Taxes; and

   (b) any property taxes (including without limitation those levied, imposed or assessed for education, schools and local improvements) assessed by the City of Kamloops with respect to the Energy Systems on the TRU Lands or Creative Energy's use or occupation of the TRU Lands. For greater certainty, the Contribution Payments will be adjusted as a result of any such increases under this section 4(b).

5. **Determination of Usable Area** – For the purpose of calculating the Contribution Payments, the Usable Area of the Energy Centre Room will be determined upon completion of construction of the Energy Centre Room based on the as-built drawings therefor, and the parties hereby agree to amend this Agreement in writing to replace SCHEDULE A to reflect the actual size and location of the Energy Centre Room as built.

6. **CPI Increase –** The Contribution Payment set out in section 4 will be subject to an annual increase equal to the percentage change in the CPI between the anniversary date of the Payment Start Date and the date twelve months prior to such date, where "**CPI**" means the Consumer Price Index (All Items) for the Province of British Columbia, 2024=100, published by Statistics Canada or its successor, adjusted for any change in base year, or, if Statistics Canada or its successor no longer publishes such index or is no longer operated by the Government of Canada, such other price index as TRU may substitute, acting reasonably, and in the case of such a substitution, TRU shall be entitled to make all necessary conversions for such purposes. For purposes of calculating the amount of the Contribution Payment, the base year will be 2024 and the base amount in 2024 will be $20.00 per square metre of Usable Area even if the Payment Start Date occurs in a year later than 2024. By way of example, the formula for the calculation of the Contribution Payment for the year 2025 is as follows (even if the Payment Start Date occurs in 2025):

   ($20.00 per square metre of Usable Area, as adjusted by any property taxes per section 4(b)), plus such amount multiplied by the percentage increase of CPI 2024 over CPI 2024

= Contribution Payment for the year 2025

7. **Payments Generally –** Each Contribution Payment and all other payments to be made by Creative Energy to TRU hereunder:

   (a) shall be paid when due, without prior demand and without set-off or deduction in lawful money of Canada to TRU at the addresses set out on page 1 or as otherwise directed by TRU from time to time; and

   (b) are exclusive of all tax or duty levied, rated or assessed on account of this Agreement, on the use or occupancy of the Energy Centre Room, or on amounts payable under this Agreement, whether existing at the date hereof or hereafter charged by any governmental authority, including without limitation, goods and services tax, value added tax, business transfer tax, harmonized or retail sales tax, federal sales tax, excise tax or duty or any tax similar to the foregoing, together with any penalty or interest assessed or imposed with respect to the foregoing taxes (collectively, the "**Applicable Taxes**").

   Creative Energy will pay to TRU, at the same time as it makes any Contribution Payment or other payments hereunder, all Applicable Taxes thereon.

8. **Relief from Payment –** Creative Energy shall be relieved of its obligations to make any payments hereunder, or be entitled to a reimbursement from TRU for any pre-payments made, as the case may be, for and during any period in which Creative Energy is unable to provide Energy Services from the Energy Centre Room due to an event of Force Majeure affecting the Energy Centre Room. For the purpose of this section "**Force Majeure**" means any event not caused by Creative Energy, which is unavoidable or beyond the reasonable control of the Creative Energy and which, by the exercise of its reasonable efforts, Creative Energy (including all those persons for whom its is responsible at law) is unable to prevent or overcome, including, acts of God, war, riots, intervention by civil or military authority, strikes, lockouts, pandemic or health emergency, accidents, acts of civil or military authority, or orders of government or regulatory bodies having jurisdiction; provided however, a lack of funds or other financial cause shall not be an event of Force Majeure.

9. **Utilities**

   (a) Creative Energy shall directly pay all costs related to all communications (including phone and internet), gas, electricity, water, steam and other utility services consumed in connection with its use of the Energy Centre Room, including as a result of the operation of the portion of the Energy System contained therein, together with all Applicable Taxes thereon; provided that where it is not possible for Creative Energy to directly pay for any communications (including phone and internet), gas, electricity, water, steam and other utility services pursuant to this subsection, any such costs for utilities shall be payable by Creative Energy on a monthly basis at a basic rate as reasonably estimated by TRU's engineers or accountants, as the case may be. At the end of each calendar year, TRU shall reasonably determine the actual costs incurred for such utilities and any resulting

overpayment or underpayment by Creative Energy will be refunded or paid by TRU or Creative Energy, as the case may be and the decision of TRU, acting reasonably, shall be final and binding with respect to any such adjustment.

(b) TRU shall pay the cost of installing, inspecting, verifying, maintaining and repairing any meters or metering system installed at the request of TRU to measure the usage of utilities in the Energy Centre Room.

(c) Creative Energy's obligations to pay for utilities shall not extend to include any water or other utilities flowing through the Energy System to be used or consumed by others.

10. **Insurance –** TRU shall pay all insurance costs relating to the Buildings located on the TRU Lands, excluding insurance for the Energy System as determined in the SRW.

11. **Term** – The term of this Agreement (the "**Term**") shall commence upon the Commencement Date and shall continue for so long as the SRW remains in effect (in whole or in part in accordance with the SRW).

12. **Termination** – This Agreement shall terminate immediately upon Creative Energy or any assignee thereof ceasing to operate the Energy System or the termination of the SRW, whichever first occurs.

13. **Default** – A party (the "**Defaulting Party**") will be in default under this Agreement if:

(a) it is insolvent, commits an act of bankruptcy, has a receiver or liquidator appointed for its assets, or files for protection from its creditors under insolvency legislation;

(b) it fails or refuses to make any payment due under this Agreement to the other party (the "**Non-Defaulting Party**") within thirty (30) days of demand for such payment after the date that payment is due; or

(c) it is in breach of any term, covenant, agreement, condition or obligation imposed upon it under this Agreement or under any other agreement entered into between Creative Energy and TRU with respect to the Energy System (including the Infrastructure Agreement, the Customer Service Agreement or the SRW) and fails to cure such default within thirty (30) days after receipt of written notice thereof from the Non-Defaulting Party or, if such default is not capable of being cured within such thirty (30) day notice period, fails to commence in good faith the curing of such default forthwith upon receipt of written notice thereof from the Non-Defaulting Party and to continue to diligently and continuously pursue the curing of such default until cured.

14. **Effect of Default by Creative Energy -** If Creative Energy is a Defaulting Party, TRU may, at its option and without liability therefor or prejudice to any other right or remedy it may have, including specific performance injunctive relief or other legal or equitable

remedies (which are acknowledged by Creative Energy to be reasonable in the circumstances):

(a) undertake the necessary steps to remedy the default at Creative Energy's expense and payable by Creative Energy on demand, and such action shall not relieve Creative Energy from any of its obligations under this Agreement; or

(b) terminate both this Agreement and the SRW (and not either one) by further written notice to Creative Energy.

15. **Effect of Default by TRU -** If TRU is a Defaulting Party, Creative Energy may, at its option and without liability therefor or prejudice to any other right or remedy it may have, including specific performance injunctive relief or other equitable remedies (which are acknowledged by TRU to be reasonable in the circumstances):

(a) undertake the necessary steps to remedy the default at TRU's expense and payable by TRU upon demand, and such action shall not relieve TRU from any of its obligations under this Agreement; or

(b) terminate both this Agreement and the SRW (and not either one) by further written notice to TRU.

16. **No Tenancy -** Despite any other provision herein or any rule of law to the contrary, this Agreement does not create any interest in land passing between TRU and Creative Energy and any inference that the relationship between Creative Energy and TRU hereunder, or arising from or with respect to Creative Energy's use of the TRU Lands, including the Energy Centre Room, is or creates a landlord/tenant relationship is hereby disclaimed by Creative Energy and TRU. No payments made hereunder by Creative Energy to TRU will represent or be construed as rent.

17. **Application of *Utilities Commission Act*** – The parties acknowledge Creative Energy is or will become a "public utility" as defined in the *Utilities Commission Act*, R.S.B.C. 1996, c.473 and this Agreement may be subject to regulation by the British Columbia Utilities Commission ("**BCUC**") under that Act.

18. **Notices** - Any notice or other communication required or permitted to be given under this Agreement will be effective only if in writing and when it is actually delivered (which delivery may be by electronic mail transmission) to the party for whom it is intended at the following address or such other address in British Columbia as such party may designate to the other party by notice in writing delivered in accordance with this Section 18.

(a) If to Creative Energy:

Suite 1 – 720 Beatty Street, Vancouver, BC V6B 2M1

Attention: President
Phone: (604) 688-9584
Email: info@creative.energy

(b) If to TRU:

805 TRU Way, Kamloops, BC V2C DC8

Attention: General Counsel
Phone: (250) 828-5002
Email: gc@tru.ca

19. **Confidentiality** – The parties will treat this Agreement as confidential and will at all times during the Term of this Agreement hold this Agreement in confidence and neither party will, without the prior written consent of the other party, disclose or divulge the terms of this Agreement to any person, provided that nothing in this section will restrict or prevent either party from making any disclosure of the Agreement:

(a) to any governmental authority, including the BCUC;

(b) to the directors, officers, employees, governors or shareholders of such party or to an Affiliate of such party or to the directors, officers or employees of an Affiliate of such party;

(c) to the professional advisors or lenders of such party;

(d) in connection with legal proceedings or steps being taken to remedy a breach or default under this Agreement by the other party; or

(e) as may be required by law.

20. **Applicable Law, Venue** - This Agreement and all matters arising hereunder will be governed by the laws of British Columbia and the federal laws of Canada applicable in British Columbia. The venue of any proceedings taken in respect of this Agreement shall be Vancouver, British Columbia.

21. **Entire Agreement** –This Agreement and the SRW, together with the Infrastructure Agreement, Contribution Agreement and Customer Service Agreement entered into by the parties dated concurrently herewith, contain the whole agreement between the parties in respect of the subject matter hereof and there are no terms, conditions or collateral agreements express, implied or statutory other than as expressly set forth in this Agreement and such other agreements and this Agreement and such other agreements supersede all of the terms of any written or oral agreement or understanding between the parties.

22. **Arbitration** - The parties will make a *bona fide* attempt to settle any dispute (a "**Dispute**") which may arise under, out of, in connection with or in relation to this Agreement by amicable negotiations and will provide frank and timely disclosure to one another of all relevant facts and information to facilitate negotiations. If the parties are unable to resolve the Dispute, within thirty (30) days, or if the parties agree to waive such discussions in respect of a particular Dispute, then either party may refer the Dispute to a single arbitrator who is appointed and renders a decision in accordance with the then current "Shorter Rules for Domestic Commercial Arbitration" or similar rules of the Vancouver International Arbitration Centre ("**BCICAC**"). The decision of the arbitrator shall be final and binding. The costs and expenses of the arbitration, but not those incurred by the parties, shall be shared equally, unless the arbitrator determines that a specific party prevailed, and in such a case the non-prevailing party shall pay all costs and expenses of the arbitration, but not those of the prevailing party. The arbitration will take place in Vancouver, British Columbia and be conducted in English. Notwithstanding the foregoing, any Dispute that is within the jurisdiction of the BCUC for determination shall be referred to the BCUC for determination.

23. **Amendments in Writing** - Except as set out in this Agreement, no amendment or variation of this Agreement will be effective or binding upon the parties unless such amendment or variation is set out in writing and duly executed by the parties.

24. **Time of Essence** - Time is of the essence of this Agreement and will remain of the essence despite any extension of time given under or in connection with this Agreement.

25. **Assignment**

(a) *Assignment by TRU* - TRU may assign this Agreement without the consent of Creative Energy to any purchaser of the TRU Lands effective on the completion date of the transfer of the TRU Lands. Until Creative Energy receives written notice of such transfer identifying the name of the transferee and the place of payment for any remittances, Creative Energy will not be liable to a transferee for any payments delivered to TRU. If TRU transfers a portion of the TRU Lands not containing the Energy Centre Room to any other person, then, in connection with such transfer, TRU and Creative Energy will enter into a new agreement substantially in the form of this Agreement but applicable only to the remaining TRU Lands (and not to such portion that is sold) and, upon the execution and delivery of such new agreement, this Agreement will terminate.

(b) *Assignment by* Creative Energy - Creative Energy may assign this Agreement without the consent of TRU to any of Creative Energy's Affiliates, to any permitted assignee of the SRW pursuant to the terms thereof, or to any lender(s) providing financing for any assets of Creative Energy, which include the Energy System, for collateral security purposes, provided that any such Affiliate or lender executes and delivers to TRU an agreement in favour of TRU pursuant to which such Affiliate, assignee or lender agrees in writing to be bound by the terms and conditions of this Agreement effective as of the date of such transfer, and any such assignment shall

not release Creative Energy from any of its obligations hereunder. For greater certainty, TRU need not be a signatory to such agreement as long as it is a party to such agreement.

26. **Counterparts and Facsimile** - This Agreement may be executed by the parties and transmitted by facsimile or other electronic transmission and, if so executed, transmitted and received, this Agreement will for all purposes be effective as if the parties had delivered and executed an original Agreement. This Agreement may be executed in counterparts with the same effect as if the parties had signed the same document. All counterparts will be construed together and will constitute one agreement.

[signature page follows]

IN WITNESS WHEREOF the parties hereto have executed this Agreement as of the Effective Date.

THOMPSON RIVERS UNIVERSITY

DocuSigned by:
Brett Fairbairn
8E51FFEE229040C...

Name: Brett Fairbairn
Authorized Signatory

DocuSigned by:
31718A11FD62441...

Name: Matt Milovick
Authorized Signatory

CREATIVE ENERGY THOMPSON RIVERS LIMITED PARTNERSHIP, by its general partner, **CREATIVE ENERGY THOMPSON RIVERS GP INC.**

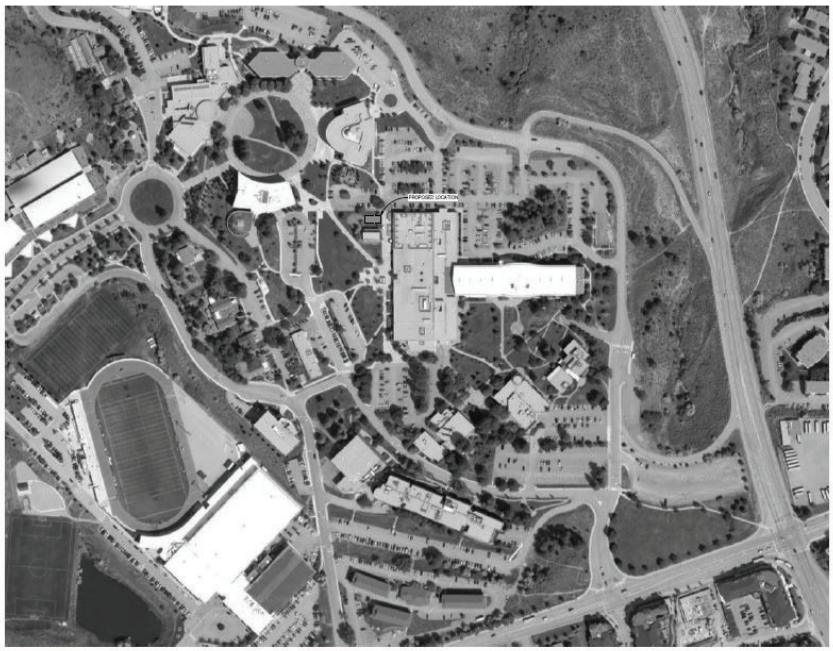
Per: _____

Name: Krishnan Iyer
Title: President and CEO

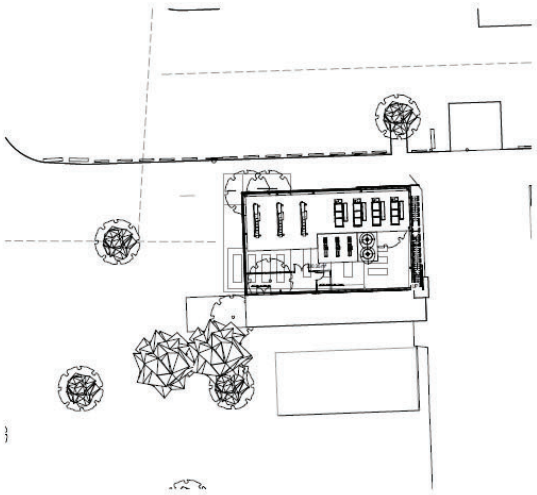
Name: Diego Mandelbaum
Title: Vice President, Development

SCHEDULE A
DRAWINGS OF ENERGY CENTRE ROOM

Stantec



SITE MAP
1:1



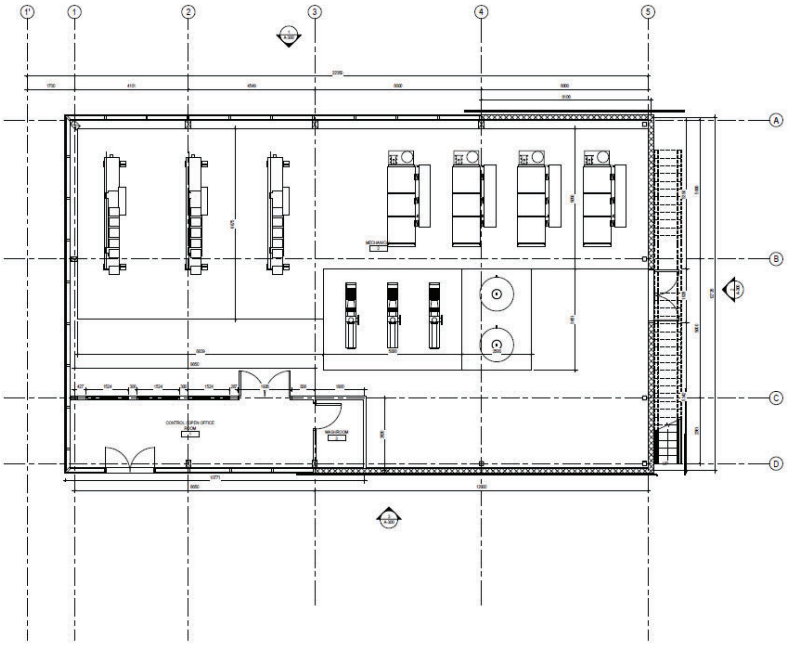
SITE PLAN
1:200

TRU

115602068

SITE PLAN
TRU District Energy
2020.10.09

Stantec



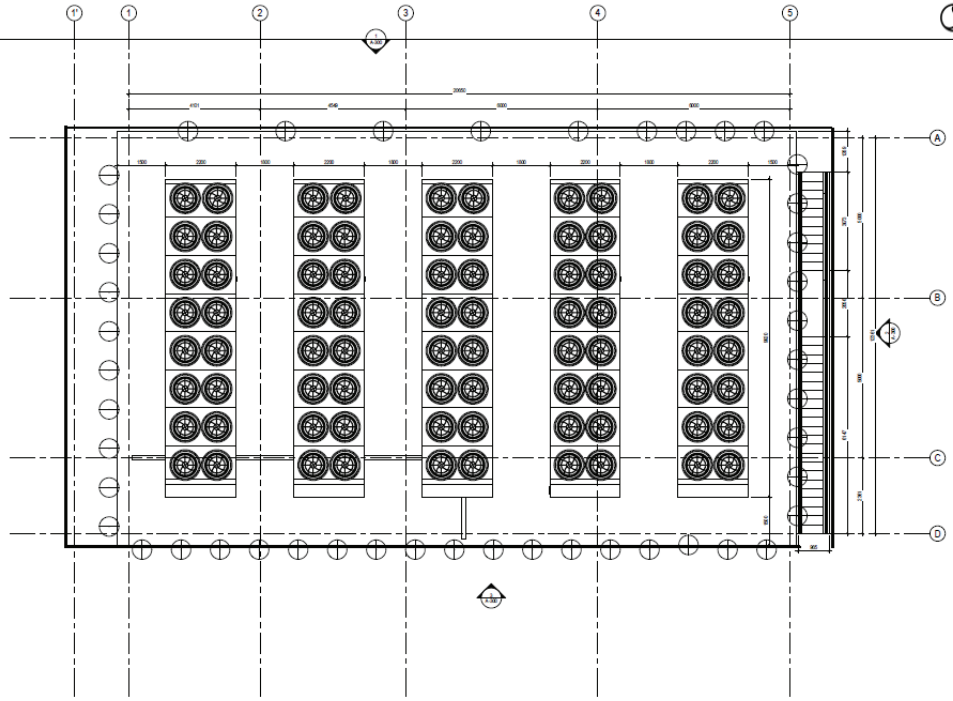
1 MAIN FLOOR
A-100 1:50

115602068

TRU

MAIN FLOOR PLAN
TRU District Energy
2020.10.09

Stantec



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TRU

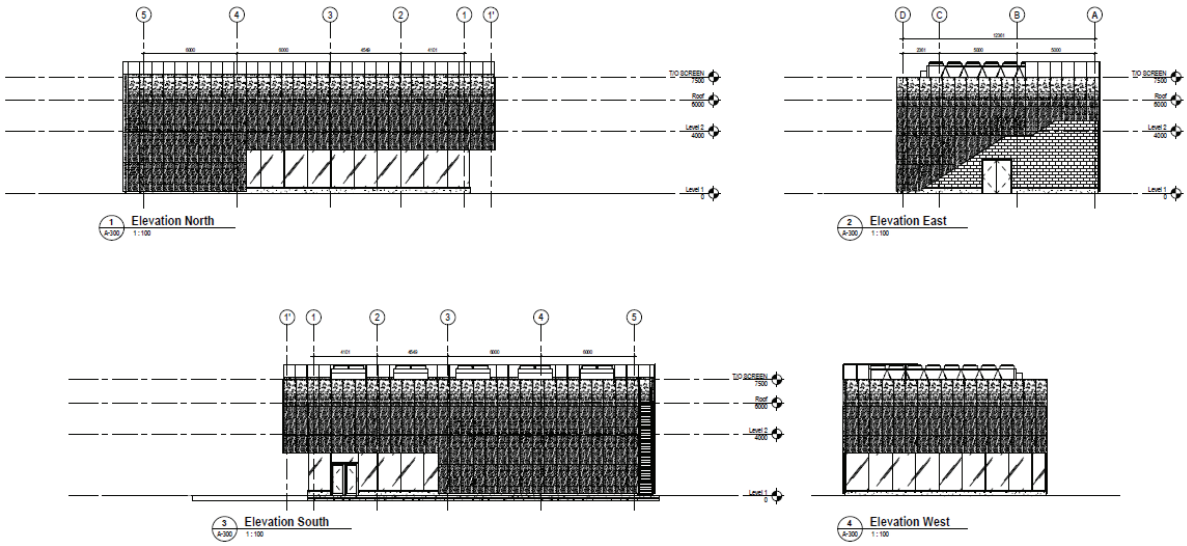
115602068

ROOF PLAN

TRU District Energy

2020.10.09

Stantec



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TRU

ELEVATIONS

TRU District Energy

2020.10.09

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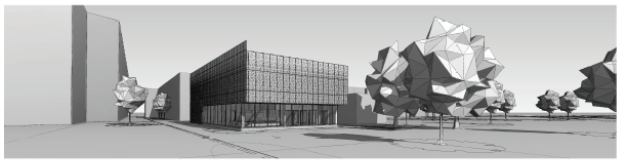
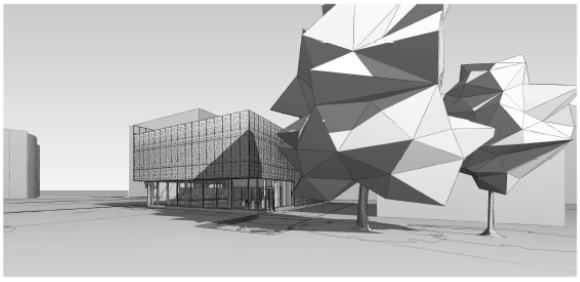
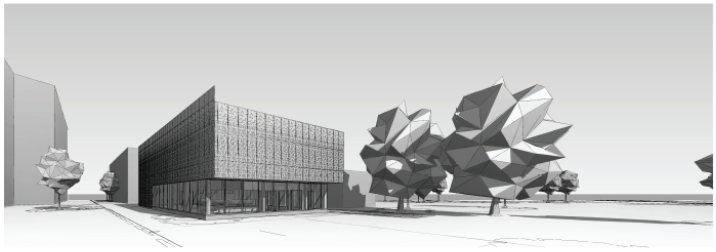


1 A-201 3D Perspective



2 A-201 3D Perspective



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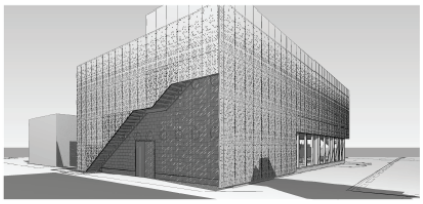

4 A-201 3D Perspective

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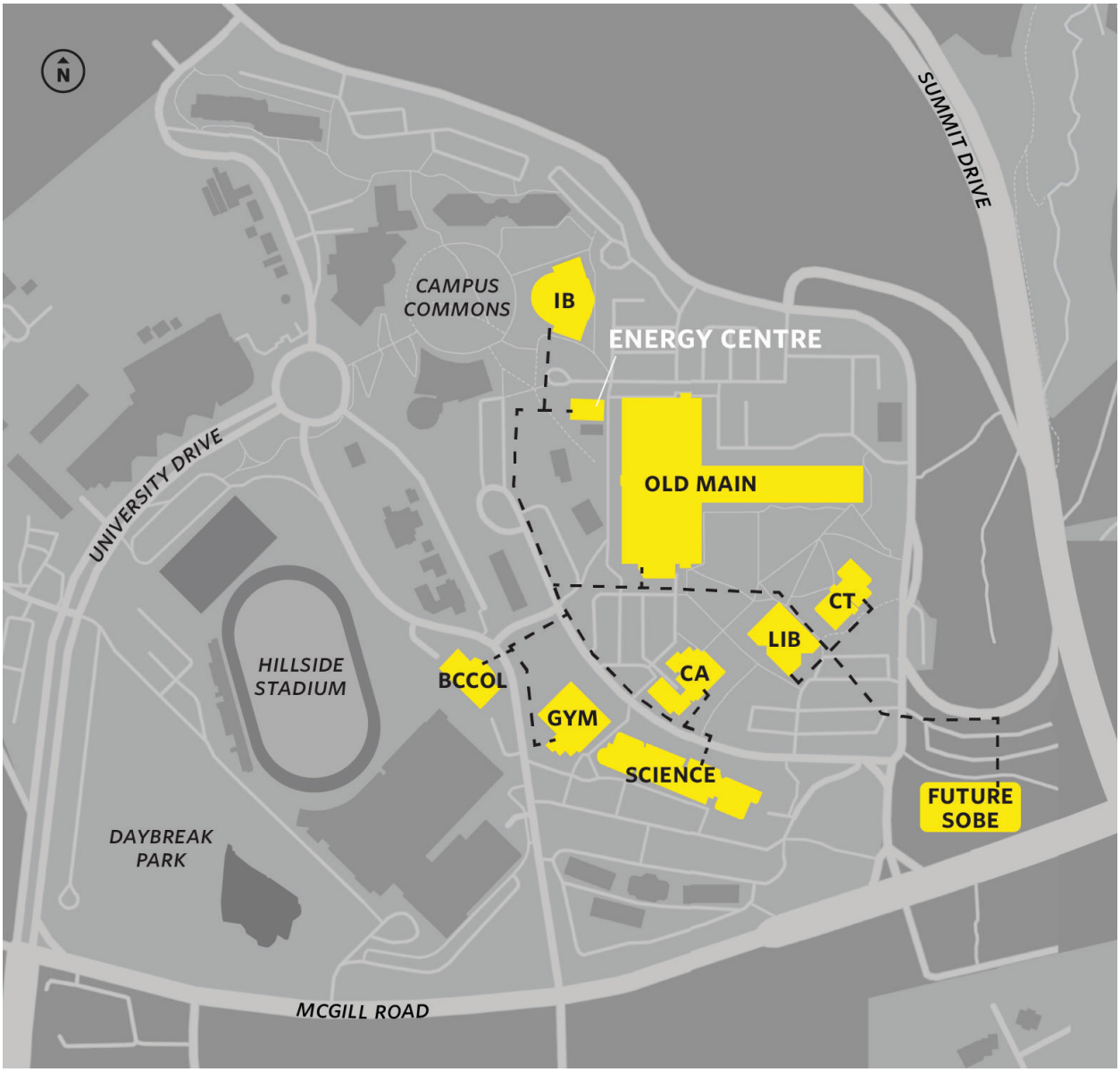
TRU

3D PERSPECTIVES

TRU District Energy

2020.10.09

SCHEDULE B
SITE MAP



Appendix H

First Nations Engagement Record

Thompson Rivers University Low Carbon District Energy System Project

Record of First Nations Engagement

Virtual Meeting via Microsoft Teams
Microsoft Teams meeting arranged and recorded by the TteS
Date: Tuesday April 6, 2021
Start: 10:45 a.m.
Ended: 11:15 a.m.
Meeting Notes by (CE - AH)

Attendees:

Tk'emlúps te Secwepemc (TteS) – Secwepemc band governments representative

Council: https://tkemlups.ca/chief-council/councillors/
Chief: https://tkemlups.ca/chief-council/kukpi7/

- Chief Rosanne Casimir (TteS - RC)
- Councillor Marie Baptiste (TteS - MB)
- Councillor Thomas blank (TteS - TB)
- Councillor Justin Gottfriedson (TteS - JG)
- Councillor Sonny Leonard (TteS - SL)
- Councillor Jeanette Jules (TteS - JJ)
- Councillor Katy Gottfriedson (TteS - KG)
- Crystal Amut (TteS - CA)

Thompson Rivers University (TRU)

- Matt Milovick (TRU - MM), Vice President, Administration and Finance
- Warren Asuchak (TRU - WA), Associate Vice President, Campus Infrastructure, Sustainability, & Ancillary Services
- Tina Matthew (TRU - TM), Executive Director Office of Indigenous Education

Creative Energy (CE)

- Diego Mandelbaum (CE - DM), Vice President, Development
- Amin Hassanshahi (CE - AH), Senior Manager, Projects and Construction

Introductions

TteS Chief and Council members introductions followed by TRU and CE attendees

Background

(TRU – MM)

- Before the pandemic TRU updated TteS on future capital developments and TRU commitment to archeological studies of all lands to be developed

- In 2018, TRU was awarded the highest sustainability rating in the world from the Association for the Advancement of Sustainability in Higher Education

- We want to introduce a project that TRU is considering with our partner Creative Energy. The project creates the path for TRU to become carbon neutral by 2030.

- Hope you had a chance to review the provided information
  (i.e. referring to TRU's LCDES capital update letter for board of governors dated Nov 27, 2020 and LCDES Workshop 3 dated July 9, 2020 sent via email on March 31, 2021)

- Diego from Creative Energy will provide an overview of the project.

Discussion

(CE – DM)

- Creative Energy (CE) is a public utility owner and operator established in 1968 servicing downtown Vancouver with primarily heating services to over 45 million sq.ft. of real estate through a network of underground piping.

- CE started focusing on low-carbon district energy systems development about 5 years ago, and now have 12 new low carbon district energy systems in development across North America.

- CE have been working with TRU for over a year and studied various solutions for achieving TRU's carbon neutrality by 2030.

- CE's low carbon solution for TRU is the installation of a central plant using air-source and water-source heat pumps technology that would replace existing boilers in the connected buildings. This is essentially extracting heat from air using the air-source heat pumps and re-heat as required using water-source heat pumps.

- The primary fuel source for heat generation is electricity.

- The proposed low-carbon solution will result in lower greenhouse gas emissions. TRU will reduce 950 tons of carbon dioxide equivalent representing approximately 90% reduction in GHG emission to connected buildings.

- Small gas fired boilers will be installed as well, but only for peaking and backup.

(TteS – RC)

- The project sounds very exciting and aligns with a more environmentally friendly system.

- We looked through the provided documents. We also have old boilers that we've been thinking of replacing over the years. The provided information is a good source of information for our own future green energy plans.

- We're open to environmentally friendly opportunities.

(TRU – MM)

- Thanks for the comments and positive feedback.

- TRU started looking into electricity as the low carbon source of energy a few years back. TRU Installed electric boilers in a couple of the buildings and had success.

- Initially, looked at biomass but there is a lot of constraints with biomass and wood burning in City of Kamloops. TRU made the shift from biomass to electricity.

- We have found the right partner with Creative Energy and would be happy to provide information that you require and answer any questions.

- Creative Energy is hosting a public consultation session early May that we can share with you if desired.

- We are interested in hearing your thoughts and how you would like to stay informed.

(TteS – JG)

- We find predominantly with first nations that green and environmentally friendly initiatives are desired.

- TteS have very old buildings that are not efficient. Very interested in being kept informed and how your green energy project being progressed.

- In planning and engineering department, we're making a few initiatives for upgrades and perhaps we can find synergies with your project in what will be happening in future.

(TRU – MM)

- If you are interested in seeing what TRU have done to date, we can host the tour.
- We also had success in qualifying for incentives from BC Hydro for this project which we can share with you.

(TteS – TB)

- We're interested in touring the campus and seeing the upgrades.
- We have upgraded some boilers in our buildings. A couple of years ago, there were some old boilers that needed to be decommissioned and now required huge efforts for their removal.
- We look forward to mentorship and partnership in this green energy initiative.

(TRU – MM)

- Seeing the potential in horizon; looking forward to mentorship and partnership

(TteS – KG)

- Always excited about green energy. We are interested in Creative Energy providing inputs for our current low efficient buildings. Looking forward to updates on your project.

(CE – DM)

- Creative Energy is more than pleased to provide help. I'm planning a trip in May. We can join to review your facilities.

(TteS – SL)

- Are you installing air-source heat pump?
  (CE – DM) yes

- Is it possible to install a turbine to generate electricity?
  (CE – DM) Yes, it's possible but we didn't find it to be economical for this project.
  Since this is a decarbonization project, the focus was transitioning away from gas rather than looking at alternative electricity resources.

- What if there is power disruption? Will there be any improvements using wind energy?
  (CE – DM) Currently, there is no power backup plans for the district energy system, because the current buildings aren't on emergency power. In case of power outage, the existing buildings won't have heat as they're not on emergency power. There is a potential that power backup is provided using TRU's existing diesel generator. As for wind energy, we think the electricity generated by wind technology will not satisfy the required kilowatt for the campus and isn't a viable solution economically for the project.

(TteS – JG)

- Residents of Kamloops may disagree on the state of wind here (joking).

- Thanks for the presentation.

(TteS – RC)

- We looked at windmill technology about 10 years ago and didn't have favorable outcome; it likely needs re-evaluation in future.

- Thanks for the presentation.

- It would be great to have a tour of TRU and see their upgrades; however, compliant with current provincial health orders (i.e. COVID-19)

- Interested in having Creative Energy provide a presentation for TteS building and see how our carbon footprint and facilities can benefit from green energy and how we can be creative of a solution.

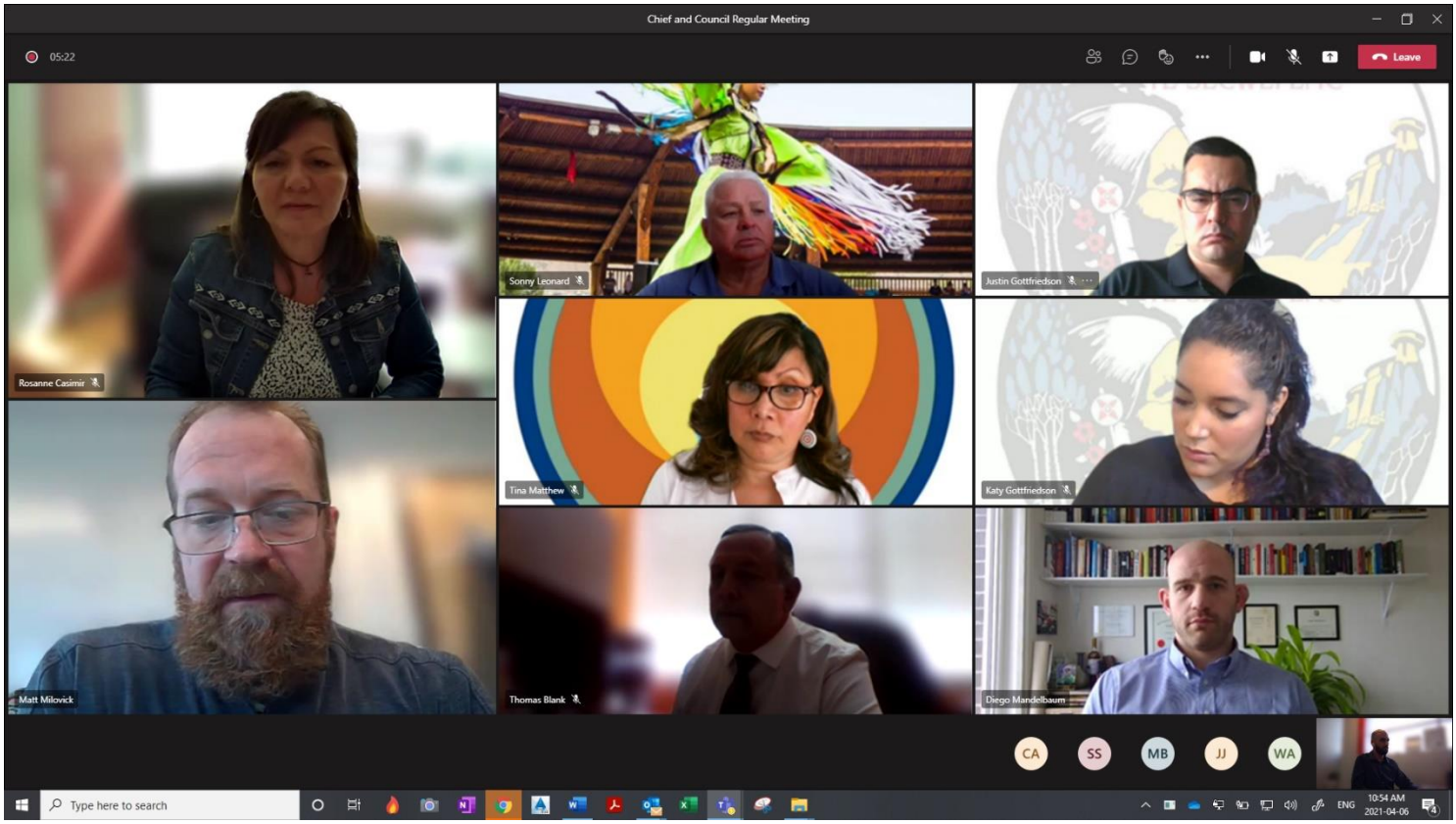
- keep us informed with your progress.

Closing

(TRU – MM)

- We are also working with City of Kamloops and they might be connecting the pool. We can share the MOU with you, if desired.

- Thank you chief and councillors. We hope you found this session informative.
- Let us know if you may have further questions.



Appendix I

Open House Summary Report

Kirk&Co.

610 – 999 West Hastings Street
Vancouver, B.C. V6C 2W2

604.688.7220
kirkandco.ca

Thompson Rivers University Low-Carbon District Energy System

Meeting Notes – virtual information session

Date Tuesday, May 4, 2021
Time 1:00 p.m.–2:30 p.m.
Location Teams online
Facilitator Matt Milovick, Thompson Rivers University (TRU)
Attendees ~ 20 participants

Welcome

- Matt Milovick, VP, Administration and Finance, TRU
- Territorial acknowledgement
- Overview of commitment to sustainability at TRU and the aspiration to be carbon neutral by 2030

Introductions

- TRU: Warren Asuchak
- Creative Energy: Amin Hassanshahi, Diego Mandelbaum, Rob Gorter

Presentation from Creative Energy – Diego Mandelbaum
Review of Discussion Guide and Feedback Form document

- Overview of start of Creative Energy in Vancouver and low-carbon district energy systems
- Synopsis of what district energy is; background on TRU's energy planning
- Introducing the project: what the TRU low-carbon district energy system project is; how it works
- Project benefits and potential impacts: GHGs and air quality, lower cost compared to alternatives, construction activities, noise considerations
- Regulatory review process: application to the BCUC, timeline overview
- We want to hear from you: feedback form

Questions from attendees

What is the electrical / electrification part of this project?

- Creative Energy explained that electricity is used purely to drive the heat pumps. The answer included an explanation of how a heat pump moves energy from one source to another and is used to drive a compressor to enable a heat pump to work. An example was given of other electrification projects, such as geothermal energy or

geoexchange, which use electricity to drive heat pumps and sewer-heat recovery projects.
- It was described that it is a viable strategy in provinces that have access to a clean electricity grid, such as in British Columbia, which is 97% carbon neutral electricity, mostly from hydroelectricity, as well as Manitoba, Quebec, and Ontario. Provinces that have a more carbon-intensive grid, it would be less effective.

What will happen if there's a power outage or a problem to the supply?

- Creative Energy explained that the proposed plant is next to the Thompson Rivers University generator and can tie the project into the generator source to continue operations. In a power outage, they would run the gas boilers at that time, not the heat pumps, since a gas boiler requires very little electricity and uses natural gas as its main source.
- They noted that currently the connecting buildings are not on emergency/back-up power; therefore, having the central plant on back-up power to generate heat while the connecting buildings' equipment is unable to operate in case of a power outage isn't reasonable. They explained that they have the ability to ensure this continues during outages because of the proximity to the emergency generator but further discussions need to be undertaken to see if it makes sense to put the system on emergency back-up.

Is the 950-ton CO2 GHG reduction taking into consideration times where you have to use the NG boilers when you can't use the heat pumps?

- Creative Energy confirmed that it does.

Do you foresee the heat pump technology continuing to improve and maybe dealing with temperatures below -10C and therefore not requiring the gas boiler back up? What would be the implications and/or ability to pivot in this situation? e.g cost/benefit of upgrading the heat pumps originally installed?

- Creative Energy explained that heat pump technology has improved over the years and will likely continue to do so. They discussed alternative refrigerants and an example of a system using a CO natural refrigerant heat pump that produces ice or steam. They mentioned that those heat pumps currently aren't economical to scale and there are operational challenges with them. It was explained that with the district-energy system, if it becomes economical and commercially available, then it could be installed at the plant, to the benefit of the whole system, by using the same distribution network.

What's the capacity of renewable energy vs natural gas for peaking?

- Creative Energy explained that it is approximately 2-to-1, a 6-megawatt plant capacity. It was estimated the output on the low-carbon side is approximately 3 megawatts and the gas-fired boilers are aside for full back-up, so if the power goes out or can't run the heat pumps, there is no disruption in service to the university.

What are the comparative lifecycle costs?

- Creative Energy explained that the costs were approximately 20-30% less expensive compared to the next best alternative. The answer included information about why geoexchange is costly including a description of having to overbuild the fields and increased expense.

Can you add geoexchange or sewer heat recovery in the future if the costs come down in the future?

- Creative Energy noted that they do have that ability but it is purely economical and explained they didn't anticipate the cost of the geoexchange going down unless a cooling-centric load comes up and there is an opportunity to sell cooling energy as well.

Once the phase 1 system is done, do you think this will be one of the most advanced systems in BC, in Canada or in the world?

- Creative Energy noted they were hopeful it would be but cautious to be too committal at this point.

When looking at expanding this system, what's the rough economies of scale gained? What does the spend-gain curve look like when you begin to expand this system?

- Creative Energy explained that the marginal cost of expansion is considerably lower than the initial cost of building, so is a huge economy of scale and improves as the system gets bigger, which is typical of district energy systems. TRU noted the conceptual design for the energy centre anticipates future expansion and any upgrades would occur in the building, as opposed to a separate construction project.

What would the electrical service be or would it be independent or adding to the existing?

- Creative Energy noted the electrical service would be added to the existing after reviewing current feeders and the contract with Hydro, and allowances to reserve for non-thermal use. It was explained that it would be sub-metered, downstream to the current BC Hydro connection, as part of TRU's micro-grid for electrical distribution. If there was expansion, it would be evaluated further, but not for this current phase.

Is there a plan to combine solar PV in the DES?

- Creative Energy noted that if it makes economic sense, they would be interested, but from a carbon calculus perspective, there is not a huge benefit. The solar would be offsetting 95-97% of carbon-neutral electricity, so from a decarbonization perspective, it doesn't advance, but if the numbers showed a positive net present value of solar, then they would evaluate that as part of a future expansion.

Will the Reach buildings be worked into this system over time?

- Matt Milovick of TRU provided clarity that this is in context to the existing Trust Reach buildings that have been built behind Old Main versus the ones being contemplated elsewhere. He noted that in discussions with the Trust as they examine future parcels, they would want developers to build in the capacity to connect to the district energy system, noting the recently built ones likely don't have that connection.
- Creative Energy explained that they haven't explored this yet and noted that without reviewing, they wonder if it would work with the existing ones. The intent is they can serve the new Reach buildings, but it is still being reviewed from a technical and economic analysis perspective, and working through the Reach, as well as prospective developers who may show up there.

Was using geothermal considered for this system?

- Creative Energy noted they did study geothermal and one reason it didn't work on this project was that there wasn't a balanced load for geothermal to work well. They explained that you need on an annual basis approximately the same amount of energy put into the earth as being taken out and since the district energy system is a heating system, the energy flow is always going in one direction (taking heat out of the earth to put into pipes in the buildings). To ensure the field doesn't saturate over time or reduce in temperature, the field would need to be significantly overbuilt and the capital costs would be expensive and uneconomical.

Will gas boilers be totally disconnected from each building? Running and glycol water to each building?

- Creative Energy confirmed that the gas boilers would be disconnected from each connected building and not needed. They noted that there is a gas boiler in the central plant for resiliency and peaking purposes. As well, they confirmed they are not contemplating glycol water; it will be treated water in the system.

How does air conditioning for cooling fit into the system?

- Creative Energy noted the cooling doesn't fit into the system and is not the primary focus of the project. They explained there would be a limited cooling load that would be beneficial to connect to this and when evaluated, it is mostly heating dominated. It is also a decarbonization project that transitions away from natural gas.

Concluding remarks

- Creative Energy noted the process for approval from the BC Utilities Commission could be 9-12 months away. They explained that the district energy system has been planned for a long time and they are looking forward to it. They also mentioned it will serve as a demonstration project that can be replicated elsewhere. They also reminded attendees that the feedback form is available online until May 21 and encouraged any participants to email questions directly to them as well.

- TRU shared that the equipment would be exposed to the community and would be a hallmark of sustainability initiatives and that it would be very public-facing, including providing tours, working with students and any research opportunities.

Meeting concluded at 1:48 p.m.

Appendix J

Public Consultation Summary Report

CREATIVE ENERGY THOMPSON RIVERS UNIVERSITY LOW-CARBON DISTRICT ENERGY SYSTEM

Community Engagement Summary Report

April 20–May 21, 2021

1. BACKGROUND

Creative Energy is proposing to design, build, and operate a Low-Carbon District Energy System (LCDES) to provide reliable low-cost and low-carbon heating while reducing Thompson Rivers University's (TRU) greenhouse gas emissions by 90% for the connected buildings.

The project would provide low-carbon energy for approximately 56,600 square meters of development at TRU, with the potential for further expansion to serve most of TRU's existing major academic buildings and campus development in the future, as well as the City of Kamloops' neighbouring Canada Games Pool and Tournament Capital Centre. The project would support TRU's commitment to achieving carbon neutrality by 2030, as defined in the 2020 Campus Strategic Sustainability Plan.

TRU has been considering their energy usage and systems through a lens of sustainability, reduction of GHGs and cost savings for nearly a decade. In early 2020, Creative Energy was brought in to evaluate if electrifying via district energy was more economical than the building-by-building alternative. Based on alternative testing and strategic assessment, Creative Energy and TRU are proposing a two-stage air-source/water-source heat pump system with high-efficient boilers, housed in a new building on campus constructed by TRU.

Subject to regulatory approvals and construction, the project could be operational by April 2024.

ABOUT CREATIVE ENERGY

Creative Energy is the owner and operator of one of the largest district energy systems in North America. Creative Energy's plant in downtown Vancouver provides space heating and water heating for over 200 buildings across more than 45 million square feet of connected real estate.

2. ENGAGEMENT OVERVIEW

From April 20 to May 21, 2021, Creative Energy provided information about the proposed Thompson Rivers University Low-Carbon District Energy System and sought input from the community.

Due to restrictions related to the COVID-19 pandemic, engagement was undertaken virtually. Engagement materials including a discussion guide and online feedback form were available online at creative.energy/TRU, and there was an opportunity to provide email submissions and to participate in a virtual information session.

The input you provide during this engagement process will be summarized and considered as Creative Energy develops the project and prepares to apply to the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) for the project.

3. NOTIFICATION

Notification of the opportunity to participate in the engagement period included:

Project webpage

A project webpage at creative.energy/TRU included information about the proposed project and opportunities to engage with the project team and provide input.

Social media

Social media posts were developed and shared on TRU social media channels on April 21 and April 27 to create student awareness of the engagement opportunity and with information on how to participate.

Newsletter

A section of the TRU employee newsletter was dedicated to advertising the engagement opportunity and registration.

Stakeholder letters

Letters were sent to TRU on-campus operators and external stakeholder groups inviting them to participate in the engagement opportunity.

Copies of the notification materials can be found in Appendix A.

4. ENGAGEMENT METHODS

Virtual information session

A virtual information session was hosted by Creative Energy on May 4, 2021, from 1:00–2:30 p.m. Three Creative Energy team members attended and provided a presentation about the Low-Carbon District Energy System. Following the presentation, a question-and-answer period between attendees and the project team was facilitated by a member of TRU administrative leadership.

Project webpage

Engagement materials were available on the project webpage, including the discussion guide and feedback form. A link to register for the virtual information session was available on the project website along with a dedicated project email address to accept submissions.

Discussion guide

A community engagement discussion guide was provided on the project webpage and included information about the proposed Thompson Rivers University Low-Carbon District Energy System, including information about district energy, TRU's energy planning, project technology and locations details, project benefits, potential project impacts, relevant regulatory processes, and how to provide input.

A presentation was developed using content from the discussion guide and was delivered at the virtual information session.

Feedback form

A feedback form was available on the project webpage and was hosted through Civil Space, an online engagement platform. The feedback form asked for input regarding TRU's role in decarbonization strategies in the community, project benefits and potential impacts, level of support for the project, as well as an opportunity to provide open-ended feedback.

First Nations

Creative Energy and TRU met with 8 representatives from the Tk'emlúps te Secwépemc First Nation in a virtual meeting on April 6, 2021. The session included an overview of the project, discussion with participants, and an opportunity for questions and feedback.

5. PARTICIPATION

There was a total of 31 interactions during the engagement period from April 20 to May 21, 2021.

- 20 people attended the virtual information session
- 11 feedback forms were completed

6. WHAT WE HEARD

Virtual Information Session

The following are the key themes that emerged during the virtual information session on May 4, 2021 from 1:00–2:30 p.m.

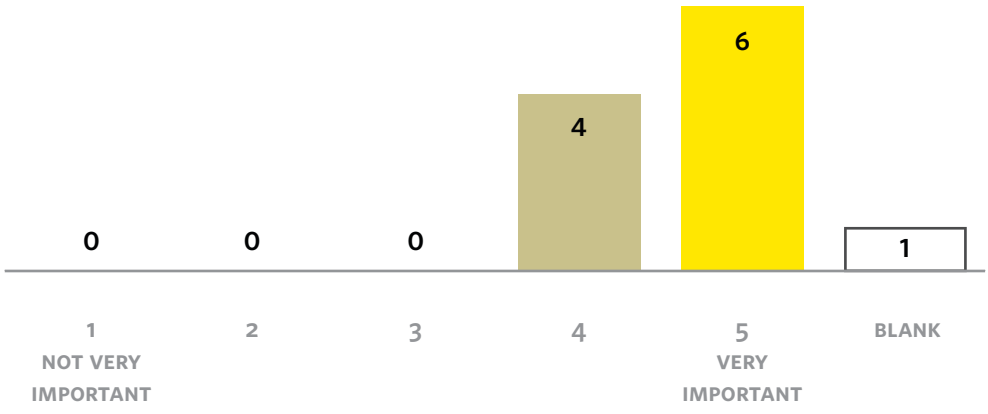
THEME	FREQUENCY
– Participants were interested in the impact of a power outage or supply issue at TRU and the contingency of how operations would continue	**2**
– Participants asked about the comparative costs of the project compared to other alternatives and economies of scale	**2**
– Participants asked for more information about future alternative considerations for the system, including using geothermal, geoexchange, sewer heat recovery, solar PV, and heat pump technology	**4**
– Participants expressed an interest in the electrification of the low-carbon district energy system and the possible addition of electrical service	**2**
– Participants wondered about TRU buildings, requesting more information about disconnecting gas boilers in current facilities, and about the Reach buildings and their role in the system	**2**
– Participants were interested in the low-carbon technology, asking about CO2 GHG reductions in relation to using natural gas boilers instead of heat pumps, the capacity of renewable energy for peaking, and if air conditioning fit into the system	**3**

Feedback Form

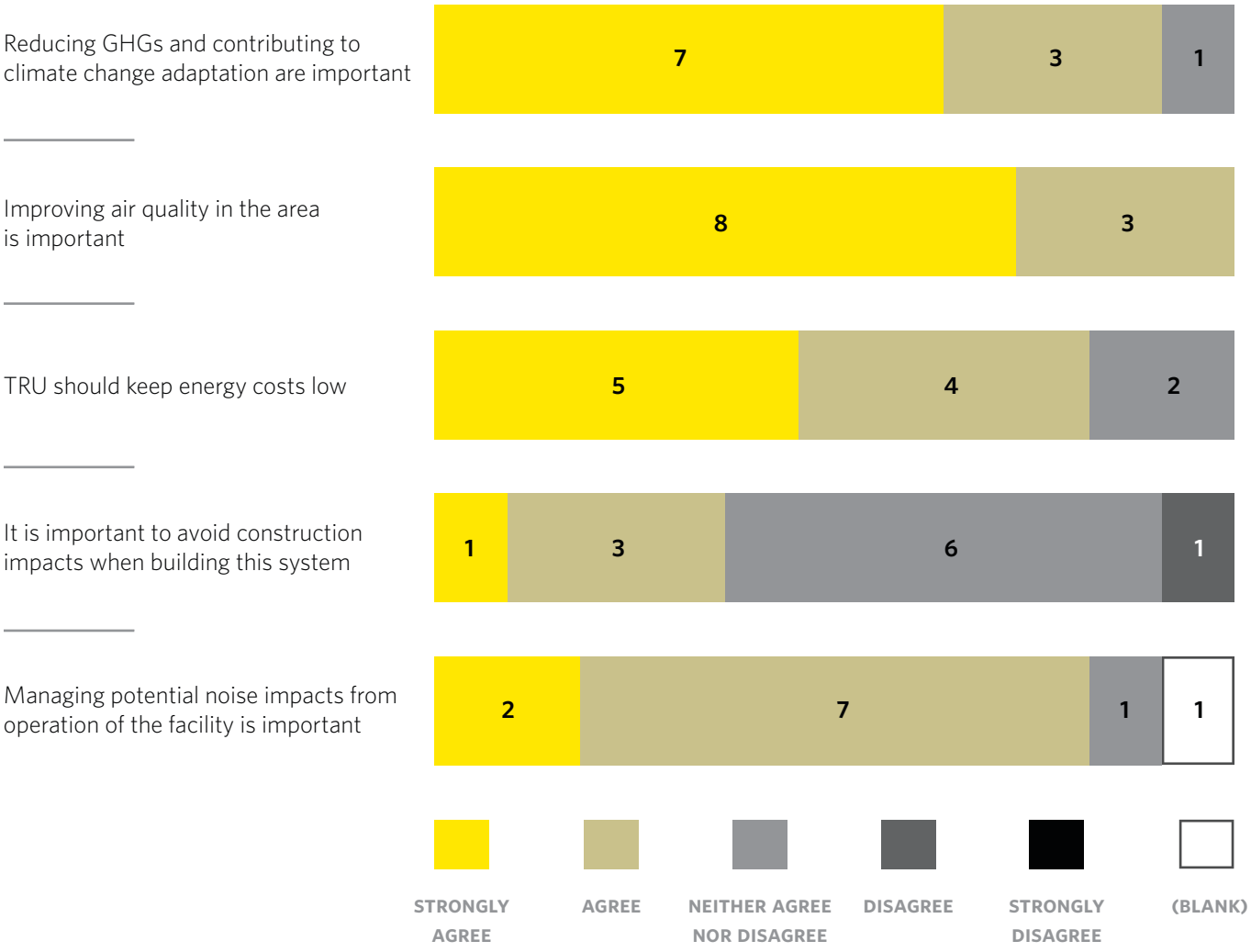
The following are the results from the 11 completed feedback forms.

1. How important is it to you that TRU be a leader in decarbonization strategies in the community?

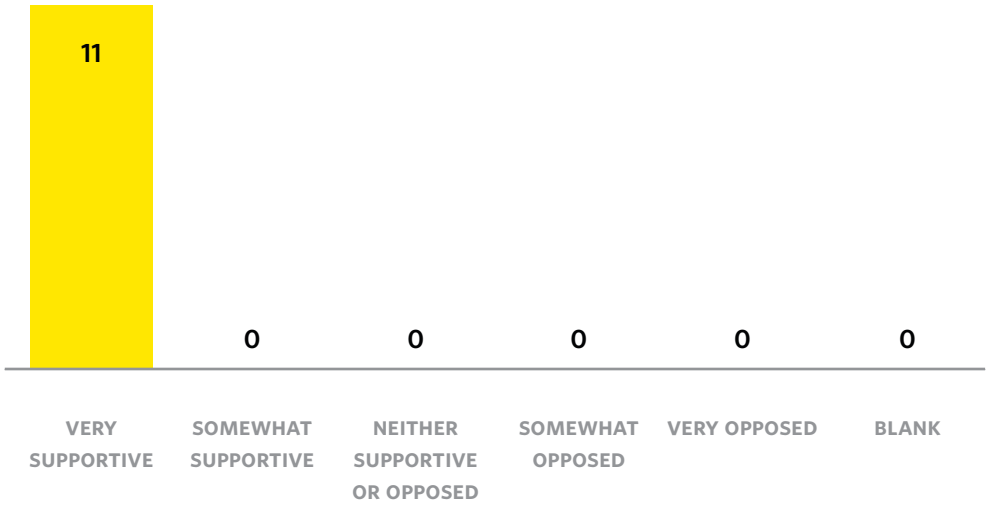
Please respond on a scale between 1 to 5 (5 being Very important, and 1 being Not very important)



2. Please rate your level of agreement with each of the following value statements.



3. After reading the discussion guide, would you say that you support the proposed LCDES project?



4. Do you have any additional questions or comments about the proposed LCDES project?

THEME	FREQUENCY
– Questions and comments about engagement opportunities, including how to get involved and how engagement opportunities are being promoted	**2**
– Comments about the project being consistent with TRU's mission and values, commitment to sustainability and aspiration to be carbon neutral by 2030	**2**
– Questions about the proposed project's technology, including questions about the inner-workings of the energy centre and reliability of the system	**2**
– General support for the project, including that the project makes sense for the conditions at TRU, that it could act as a model for future similar projects in the area and that any short-term disruption from construction is worth the long-term benefits	**2**

9 respondents indicated that they would like to receive project updates.

7. NEXT STEPS

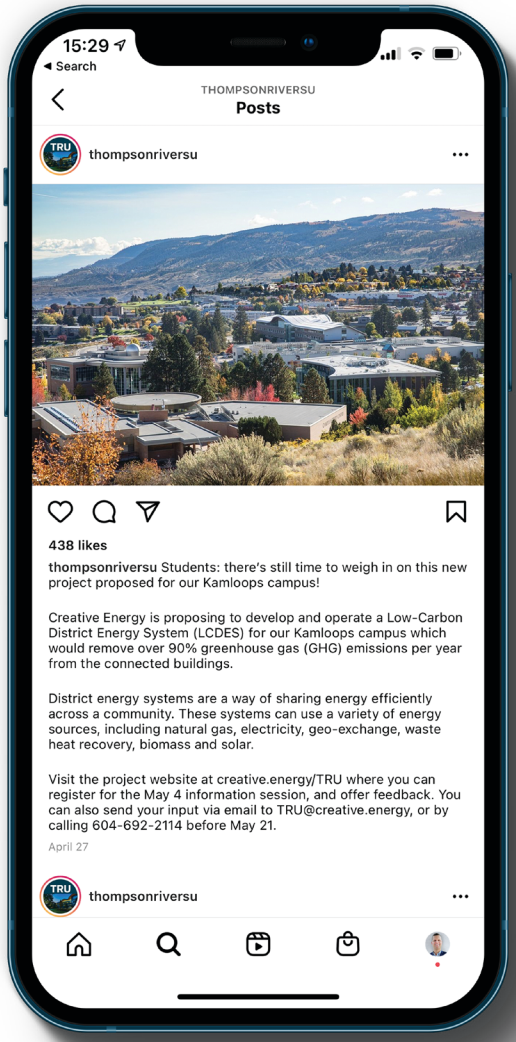
The input received from the community that is summarized in this report will be considered as Creative Energy develops the project and prepares to submit an application to the British Columbia Utilities Commission for a Certificate of Public Convenience and Necessity for the project.

Creative Energy plans to submit its application to the BCUC.

For more information, please visit **creative.energy/TRU**.

APPENDIX A: NOTIFICATION MATERIALS

Instagram post



Facebook posts

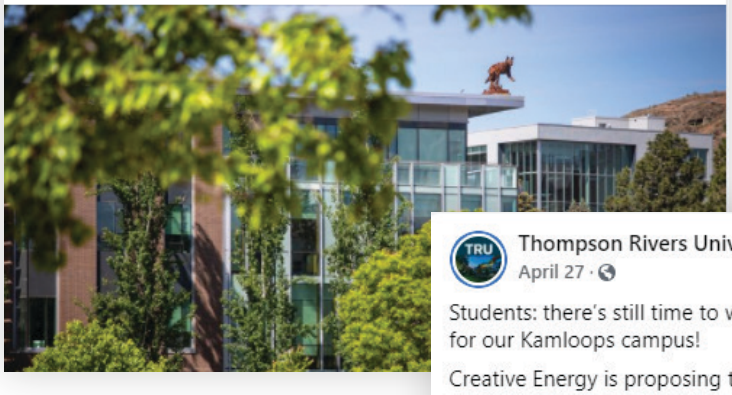
Thompson Rivers University
April 21 ·

Part of our plan to become fully carbon-neutral by 2030 includes considering more sustainable ways of heating both new and existing spaces on campus. Creative Energy is proposing to develop and operate a Low-Carbon District Energy System (LCDES) for our Kamloops campus, which would remove over 90% greenhouse gas (GHG) emissions per year from the connected buildings.

District energy systems are a way of sharing energy efficiently across a community. These systems can use a variety of energy sources, including natural gas, electricity, geo-exchange, waste heat recovery, biomass and solar.

We want to hear what our students think about this. Visit the project website at http://creative.energy/projects/tru-project where you can learn more, register for a virtual information session (May 4), read the engagement discussion guide, and submit an online feedback form.

Be sure to give your input before May 21!



Thompson Rivers University
April 27 ·

Students: there's still time to weigh in on this new project proposed for our Kamloops campus!

Creative Energy is proposing to develop and operate a Low-Carbon District Energy System (LCDES) for our Kamloops campus which would remove over 90% greenhouse gas (GHG) emissions per year from the connected buildings.

District energy systems are a way of sharing energy efficiently across a community. These systems can use a variety of energy sources, including natural gas, elec... See More

Consultation email invitation

THOMPSON RIVERS UNIVERSITY

Community consultation – we want to hear from you

As part of Thompson Rivers University's (TRU) plan to be carbon neutral, Creative Energy is proposing to develop and operate a Low-Carbon District Energy System (LCDES) project for TRU's Kamloops campus. Along with providing information about this project, we are seeking your input between April 20 to May 21, 2021.

You can learn more and participate by visiting the project website where you can:

- Read the engagement discussion guide
- Submit an online feedback form
- Register for a virtual information session that will be hosted by Creative Energy. This will be an opportunity to ask questions or provide comments. The session will be held Tuesday, May 4, 2021 from 1 – 2:30 p.m.

You can also provide your feedback by visiting the project website and completing a feedback form by Friday May 21, 2021. You can also send an email to TRU@creative.energy or call 604-692-2114.

How input will be used

The input that you provide during this engagement process will be summarized and considered as Creative Energy develops the project and prepares to apply to the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) for the project.

About Creative Energy

Creative Energy is the owner and operator of one of the largest district energy systems in North America. It is a public utility established in 1968 and is regulated by the BCUC. Creative Energy has 12 district energy projects in development ranging from ocean-exchange to geo-exchange. Through collaboration and partnerships, Creative Energy designs, builds, owns, operates, and maintains sustainable neighbourhood scale energy systems that support responsible development, business value, community growth, and shaping great cities. Its system in Vancouver provides space and water heating to over 200 customers across more than 45 million square feet of connected real estate. With 53 years of operation in downtown Vancouver and a 99.99% reliability record, Creative Energy contributes to Vancouver as an environmental leader in energy efficiency.

Sincerely,

Matt Milovick
Vice-President Administration and Finance
Thompson Rivers University

www.creative.energy

Locations

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V6B 2M1

Toronto
600–3250 Bloor St. West
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CREATIVE ENERGY

THOMPSON RIVERS UNIVERSITY LOW-CARBON DISTRICT ENERGY SYSTEM

Community Engagement: Discussion Guide and Feedback Form

Provide your feedback from April 20–May 21, 2021.

CREATIVE ENERGY | creative.energy/TRU
TRU@creative.energy

WE WANT TO HEAR FROM YOU

We are providing information about our proposed Thompson Rivers University (TRU) Low-Carbon District Energy System (LCDES) project and are seeking your input from April 20, 2021 to May 21, 2021.

You can learn more and participate by visiting the project website at **creative.energy/TRU** to:

- Read the community engagement discussion guide
- Submit an online feedback form
- Register for an information session, with an opportunity to ask questions or provide comments, to be held on **Tuesday, May 4, 2021** 1:00–2:30 p.m.

You can also send us an email with your feedback to **TRU@creative.energy** or call 604-692-2114.

Please provide your feedback by visiting our website at **creative.energy/TRU** and completing a feedback form by Friday, May 21, 2021.

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ABOUT CREATIVE ENERGY

Creative Energy is the owner and operator of one of the largest district energy systems in North America. It is a public utility in BC established in 1968 and is regulated by the BCUC.

Creative Energy has 12 district energy projects in development across Canada ranging from ocean-exchange to geo-exchange. Through collaboration and partnerships, Creative Energy designs, builds, owns, operates, and maintains sustainable neighbourhood scale energy systems that support responsible development, business value, community growth, and shaping great cities. Its system in Vancouver provides space and water heating to over 200 customers across more than 45 million square feet of connected real estate.

With 53 years of operation in downtown Vancouver and a 99.99% reliability record, Creative Energy contributes to Vancouver as an environmental leader in energy efficiency.

DISTRICT ENERGY SYSTEMS

What is a district energy system?

District energy systems are a way of sharing energy efficiently across a community. They typically use a central energy plant to produce both hot water and/or chilled water, which are then distributed through a network of pipes to heat exchangers located in each building. The heat exchangers, in turn, provide space heating, space cooling and domestic hot water for customers. The water in the system is then returned to the central energy plant to be re-heated/re-cooled and recirculated.

District energy systems are generally one of the most reliable and environmentally friendly sources of energy available to urban communities and campus environments. District energy systems are able to use a variety of energy sources, including natural gas, electricity, geo-exchange, waste heat recovery, biomass and solar. On a life-cycle basis, district energy systems tend to deliver thermal energy at a lower cost than traditional individual building or residential methods.

Background on TRU's energy planning

TRU has been considering their energy usage and systems through a lens of sustainability, reduction of GHGs (greenhouse gases) and cost savings for nearly a decade. District heating was first discussed as part of the Campus Master Plan and Energy Management Plan in 2013, where a central natural gas heating plant was considered instead of building-by-building natural gas boilers.

Since 2013, other concepts were studied and explored, including various iterations of a biomass district heating system which were ultimately abandoned due to public concern on air quality. Once biomass was taken off the table, TRU shifted their strategy to decarbonize via electrification, and in 2018 TRU commissioned the Industrial Technology and Training Centre (ITTC) electric boiler system, which provided low-carbon heating to the new ITTC, as well as to the existing Trades & Technology building to offset existing gas use. In 2019, TRU built their first major academic building without a natural gas connection: the Chappell Family for Nursing and Population Health Building.

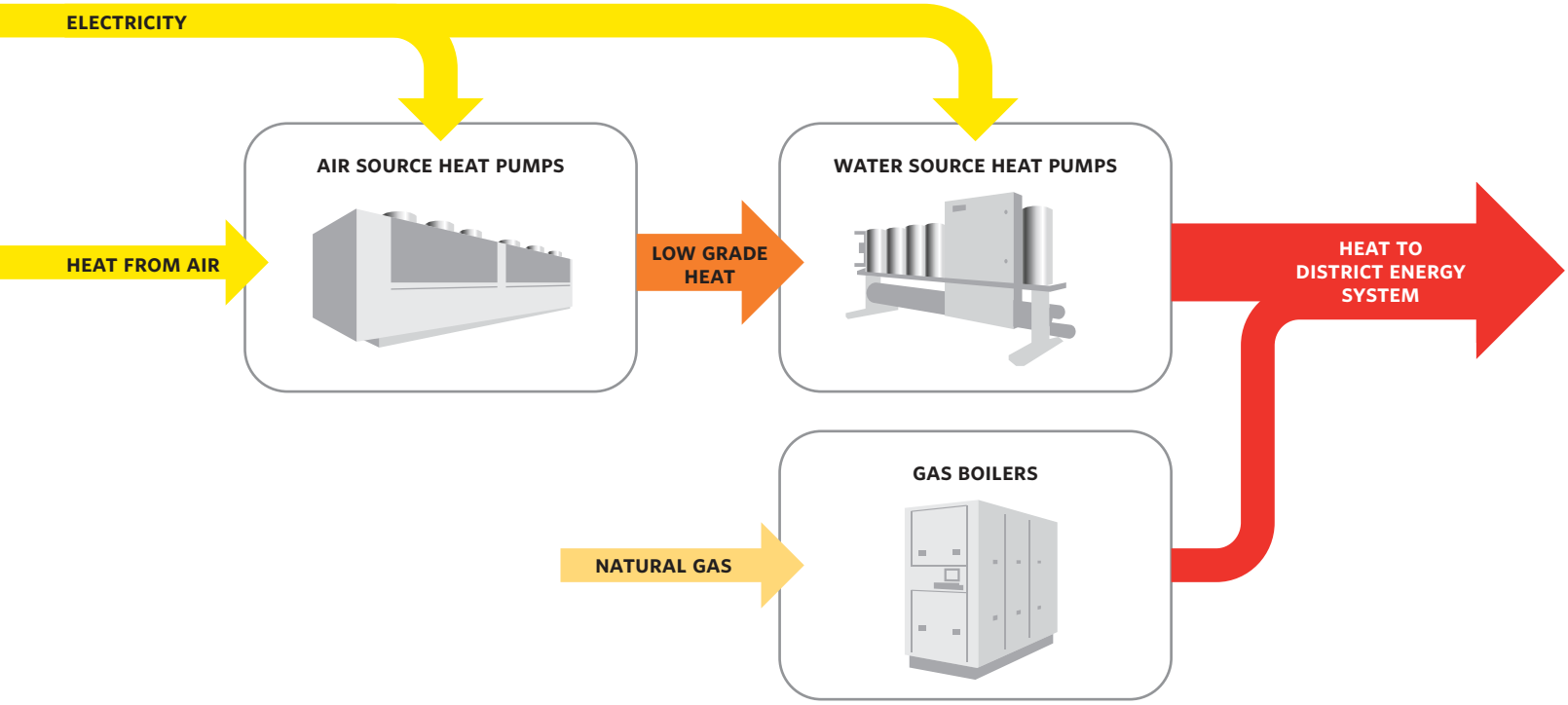
Efforts to minimize TRU's carbon footprint continued with a study in 2019 to better understand the efforts needed to electrify the heating of eight of TRU's academic buildings through a building scale solution that used air-source heat pumps and geo-exchange. In early 2020, Creative Energy was brought in to evaluate if electrifying via district energy was more economical than the building-by-building alternative. Based on alternative testing and strategic assessment, the two-stage air-source/water-source heat pump approach was selected and found to be the most economical electrification approach. Creative Energy and TRU also considered electric boiler, geo-exchange, biomass, sewer heat recovery, building retrofits with air source heat pumps, and building retrofits with geo-exchange.

INTRODUCING THE PROJECT

What is the TRU Low-Carbon District Energy System project?

Creative Energy is proposing to design, build, and operate a Low-Carbon District Energy System (LCDES) to provide reliable low-cost and low-carbon heating while reducing TRU's GHG emissions by 90% for the connected buildings.

Creative Energy and TRU are proposing a two-stage air-source/water-source heat pump system with high-efficient boilers, housed in a new building on campus constructed by TRU.



Example of two-stage air-source/water-source heat pump system with high-efficient boilers.

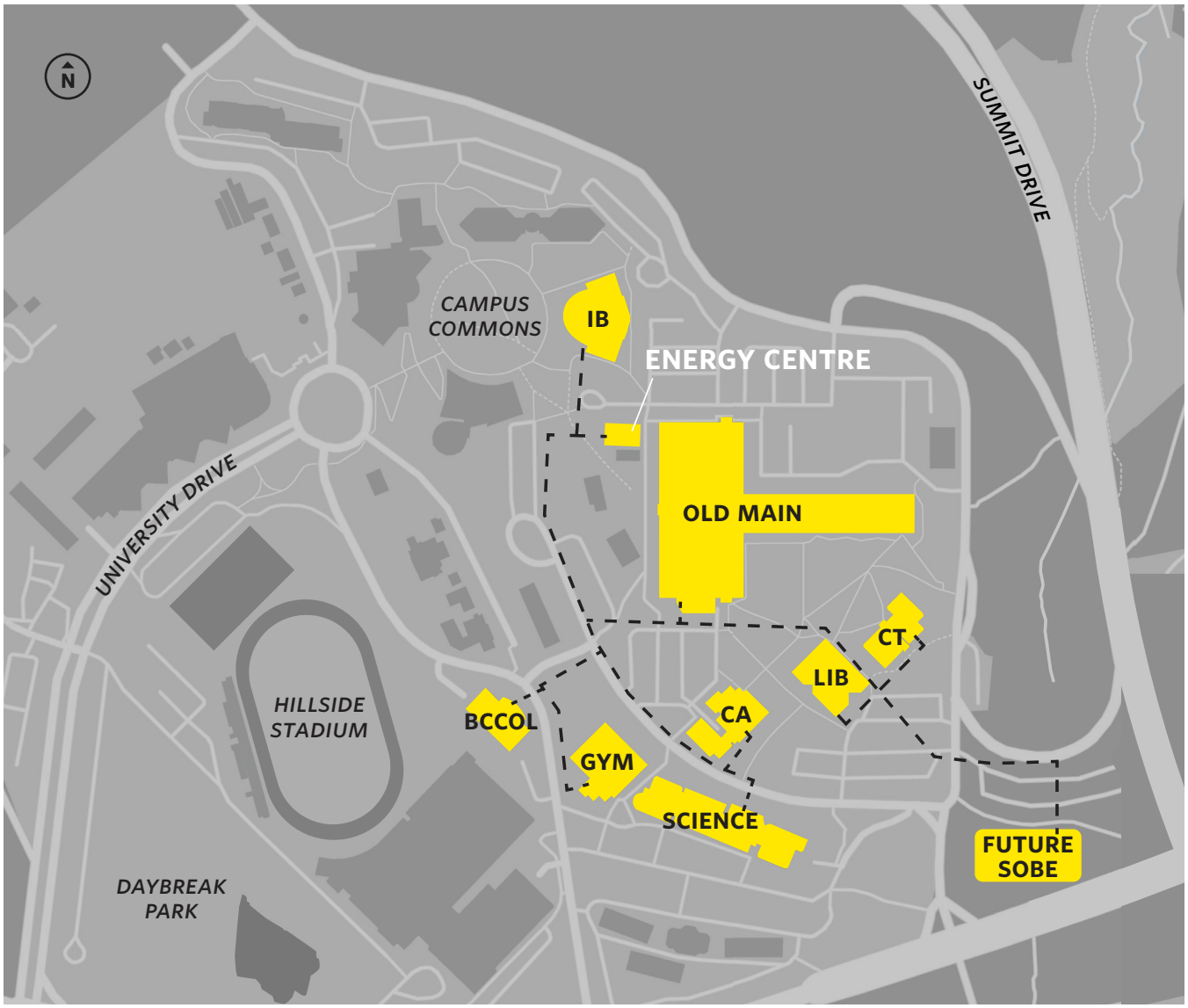
INTRODUCING THE PROJECT

How it works

The Energy Centre would include air-source heat pumps, water-source heat pumps, and high-efficient boilers. Powered through electricity, the air-source heat pumps extract heat from outdoor air for heating the connected building. Water-source heat pumps reheat the generated thermal energy from the air-source heat pumps to increase the temperature to the required level for the connected buildings. The natural gas boilers would be for backup and peaking during winter. The generated heat would be delivered from the Energy Centre to each connected building through an underground piping network.

Subject to regulatory approvals and construction, the project could be operational by April 2024. The proposed LCDES would remove over 90% of GHG emissions per year from the following buildings on campus:

- Old Main
- Ken Lepin building
- SOBE Management building (future building)
- Old Library and Administration building
- BC Centre for Open Learning
- Culinary Arts building
- Clock Tower building
- Gymnasium
- International building



PROJECT BENEFITS AND POTENTIAL IMPACTS

GHGs and air quality

The project would reduce existing GHGs by approximately 950 tons of carbon dioxide equivalent emissions (CO2e) per year, representing approximately a 90% reduction/ avoidance from the current baseline. According to Natural Resources Canada's Greenhouse Gas Equivalencies Calculator, this is the equivalent of removing approximately 300 gas-powered vehicles off the road each year.

The project would provide low-carbon energy for approximately 56,600 square metres of development at TRU, with the potential for further expansion to serve most of TRU's existing major academic buildings and campus development in the future, as well as the City of Kamloops' neighbouring Canada Games Pool and Tournament Capital Centre. The project would support TRU's commitment to achieving carbon neutrality by 2030, as defined in the 2020 Campus Strategic Sustainability Plan.

In addition, the project would help improve air quality in the area by virtually eliminating the use of natural gas to heat the connected buildings.

Lower cost compared to alternatives

The proposed project would result in approximately 20-30% savings in life-cycle costs to TRU compared to achieving similar carbon outcomes through building-by-building electrification. Other alternatives that were considered, such as electric boilers, geo-exchange, sewer heat recovery, building retrofits with air source heat pumps, and building retrofits with geo-exchange, would all have been more expensive than the electrification solution being proposed.

Construction activities

Should the project be approved, construction activities would include:

- Construction of the new Energy Centre (built by TRU, not subject to BCUC approval)
- Excavation between the Energy Centre and the connecting buildings for installation of underground pipes
- Road surface restoration after installation of underground pipes
- Installation of piping and equipment within the Energy Centre and the connecting buildings

Creative Energy will work with TRU staff to develop a plan to ensure access to all areas of the campus is maintained during construction work. The plan would include creating safe pathways with proper signage. Creative Energy will also coordinate with TRU staff to keep building doors and windows closed during construction to lessen the noise impact from construction activities. The dust arising from excavation will be controlled by watering excavated material.

Noise considerations

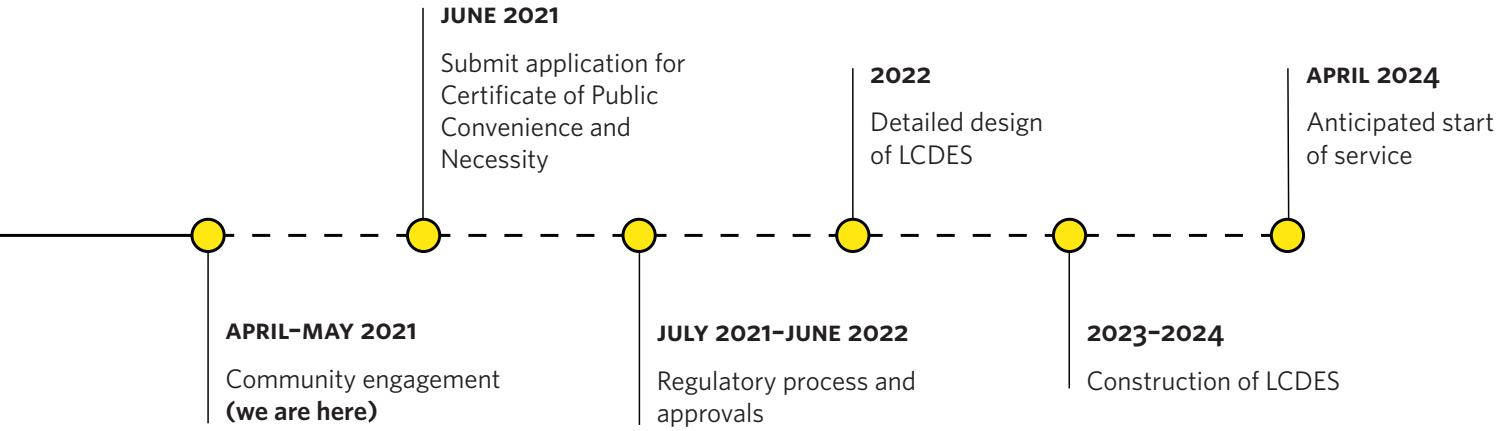
To better understand potential noise concerns during operation of the Energy Centre, TRU has engaged an acoustic consultant to evaluate potential noise effects. Working with the acoustic consultant, TRU will implement the appropriate mitigation measures to include as part of the project. The expected strategy, if any treatment is required, would be to have acoustic screens or louvers on the sides of the Energy Centre building facing the residential units to help reduce any noise produced from the system equipment. Acoustic louvers are pieces of equipment that are added to the air system of buildings or structures to help reduce noise produced by the system equipment.

REGULATORY REVIEW PROCESS

Application to the BCUC

Public utilities in British Columbia like Creative Energy are regulated by the BCUC pursuant to the Utilities Commission Act. Public utilities must obtain a Certificate of Public Convenience and Necessity (CPCN) from the BCUC prior to beginning the construction or operation of a public utility plant or system, or an extension of either.

Creative Energy will be applying to the BCUC to obtain a CPCN for the Project. This application will include a description of the project, information about the need for the project and alternatives being considered, a summary of engagement and feedback received, and a cost estimate.



WE WANT TO HEAR FROM YOU!

Please provide your feedback by visiting our website at **creative.energy/TRU** and completing a feedback form by Friday, May 21, 2021.

You can also email us with additional feedback and questions at **TRU@creative.energy**.

FEEDBACK FORM

1. How important is it to you that TRU be a leader in decarbonization strategies in the community? Please respond on a scale between 1 to 5 (5 being Very important, and 1 being Not very important)

1 – NOT VERY IMPORTANT	2	3	4	5 – VERY IMPORTANT
○	○	○	○	○

2. 2. Please rate your level of agreement with each of the following value statements.

	STRONGLY AGREE	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	STRONGLY DISAGREE
Reducing GHGs and contributing to climate change adaptation are important	○	○	○	○	○
Improving air quality in the area is important	○	○	○	○	○
TRU should keep energy costs low	○	○	○	○	○
It is important to avoid construction impacts when building this system	○	○	○	○	○
Managing potential noise impacts from operation of the facility is important	○	○	○	○	○

3. After reading the discussion guide, would you say that you support the proposed LCDES project?

VERY SUPPORTIVE	SOMEWHAT SUPPORTIVE	NEITHER SUPPORTIVE OR OPPOSED	SOMEWHAT OPPOSED	VERY OPPOSED
○	○	○	○	○

4. Do you have any additional questions or comments about the proposed LCDES project?

FEEDBACK FORM

Tell us about yourself (optional)

NAME: _____

ORGANIZATION NAME (IF APPLICABLE): _____

ADDRESS: _____

EMAIL: _____

PHONE: _____

WOULD YOU LIKE TO RECEIVE PROJECT UPDATES?

◯ YES ◯ NO

www.creative.energy

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600–3250 Bloor St. West
M8X 2X9