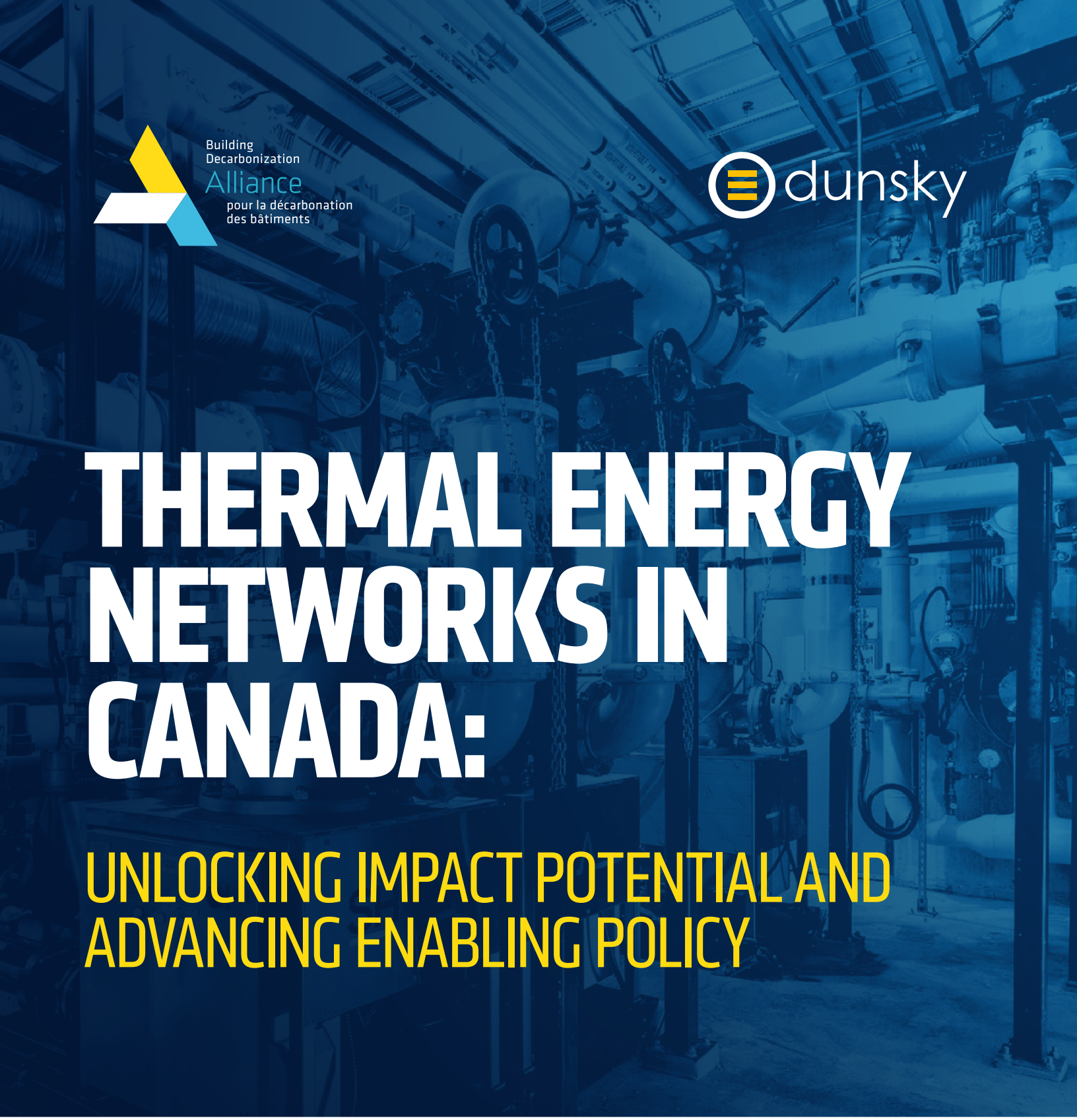

Building Decarbonization Alliance
pour la décarbonation des bâtiments

dunsky

THERMAL ENERGY NETWORKS IN CANADA:

UNLOCKING IMPACT POTENTIAL AND ADVANCING ENABLING POLICY

CASE STUDIES

SEPTEMBER 2025

Building Decarbonization Alliance
pour la décarbonation des bâtiments

Prepared by

The Building Decarbonization Alliance and Dunsky Energy + Climate Advisors

About the Building Decarbonization Alliance

The Building Decarbonization Alliance is a non-partisan and cross-sector coalition working to change the narrative on building heat, inspire and inform industry and government leadership, and accelerate market transformation. We reach beyond rhetoric to engage with evidence and science, helping put in place the conditions for effective policy, change the narrative, and increase awareness of the benefits of decarbonized all-electric buildings.

We've convened over 300 partner organizations and are working hard to expand the reach of our Alliance and proposing an exciting slate of research and initiatives to advance our mission and vision. If you are interested in supporting our work, visit our website or reach out to us at info@buildingdecarbonization.ca to find out how you can help accelerate building electrification.

About Dunsky Energy + Climate Advisors

Dunsky supports leading governments, utilities, corporations and others across North America in their efforts to accelerate the clean energy transition, effectively and responsibly. With deep expertise across the Buildings, Mobility, Industry and Energy sectors, we support our clients in two ways: through rigorous Analysis (of technical, economic and market opportunities) and by designing or assessing Strategies (plans, programs and policies) to achieve success.

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Why Case Studies?

By distributing heating and cooling through shared underground infrastructure, Thermal Energy Networks (TENs) can enable significant emissions reductions over time when paired with clean energy sources.

This set of four case studies – drawn from Vancouver, Richmond, Edmonton, and Sherbrooke – illustrate the diversity and flexibility of TENs. Based on input from local TENs network managers, the studies examine varying ownership and governance model, financing approaches, technologies, and regulatory environments. **They highlight achievements, challenges, and lessons learned, offering practical insights to inform future projects.**

These examples cover both fourth- and fifth-generation networks across three provinces - British Columbia, Alberta, and Québec – each with distinct regulatory and market environments. They include a variety of building types (residential, commercial office, and institutional), and utilize diverse technologies such as sewage waste heat recovery, geoexchange and data centre waste heat recovery. This range underscores TENs' flexibility and ability to adapt to different technical, social, and policy conditions.

- Several common themes emerge:
- Strong policy and regulatory support – such as climate -aligned municipal goals and mandatory connection bylaws – often enables project advancement.
- Most successful projects feature mixed-use developments with diverse thermal loads and key anchor loads.
- Even projects lacking these ideal conditions demonstrate that TENs can benefit from economies of scale.

Persistent challenges include aligning with development timelines, managing construction dependencies, and overcoming risk aversion due to limited market awareness. Nonetheless, all projects are operational and planning expansions – clear evidence of TENs' viability in these settings.

Ultimately, these case studies show that TENs are a flexible, context-specific solution worth considering alongside other low-carbon options. While the technologies are proven, it is governance, policy alignment, and collaboration that unlock their full potential.

Overview	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
	 *Figure 1: False Creek Energy Centre*	 *Figure 2: Distribution Infrastructure Inside The Alexandra District Energy Utility*	 *Figure 3: Blatchford Energy Centre One*	 *Figure 4: Humano District's Construction Site*
Location	Vancouver, BC	Richmond, BC	Edmonton, AB	Sherbrooke, QC
Important dates	• **2004**: Feasibility study starts. • **2006**: Vancouver City Council approved the establishment of the NEU. • **2010**: The system became operational.	• **2010**: Feasibility study. • **2012**: Phased expansion begins operational.The City initially completed the construction and commissioned the first phase of the ADEU system, which consisted of the ADEU energy plant and the first geoexchange field, as well as the North loop distribution piping. Other phases were added to the project as it evolved.	• **2014**: The business case to develop on the former municipal airport site was approved one year after the airport's closure. • **2015-2017**: Feasibility studies were conducted for different district energy/thermal energy network concepts. • **2017**: A new municipal utility, Blatchford Renewable Energy, was established to operate the District Energy Sharing System (DESS) . • **2018-2019.** The first phase of the system is constructed. • **2019**: The DESS is operational. • **2020**: The first residents moved into the community. • **2042**: Full development of Blatchford and its utility system is expected to be completed.	• **2019**: Site acquired. • **2022**: Feasibility study started. • **2024**: Loop became operational (first new building connected to the existing retrofitted main building). • **2025**: Offices, sports centre with indoor pool, and 29-unit student residences. • **Future phases**: Around 300 additional units and some commercial/services spaces.
New development or existing	The NEU was implemented to serve a brownfield development area.	New development.	In addition to operating Blatchford Renewable Energy Utility, which builds and operates the new district energy sharing system, the City of Edmonton is also acting as the community's land developer.	Both
Building types connected **Number of supplied customers and buildings**	The utility currently serves 47 buildings, covering 4,920 residential units, along with commercial and institutional premises.	More than 2,200 residential units, 12 buildings, including a Walmart.	• Currently, 149 homes and a newly constructed fire station are connected to the district energy sharing system. The utility will also serve the community's mixed-use commercial and institutional buildings.	Existing, retrofitted: • One former monastery (convent) and its annexes • Daycare • University classes, amphitheater • Sports centre with indoor pool

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Building types connected **Number of supplied customers and buildings**			• Given the large size of the site (536 acres), the land development and utility are being constructed in stages over approximately 25 years. Hundreds of additional homes are planned to be connected to the district energy sharing system in the coming years, including homes in higher density mixed-use buildings. • Planned: 30,000 Edmontonians living, working and learning on 536 acres (216 hectares). • At full build-out, the utility is expcted to connect more than 11,000 homes and buildings, representing more thatn 1.4 million of floor space.	Existing, retrofitted: • Offices • 65 units New MURBs: • 147 units • +300 additional units not developed yet and some commercial/services spaces.
Connected floor space	7.2 million ft^2 serviced by the NEU, as of 2024.	2.3 million ft^2 of floor space, including 1.1 million ft^2 of residential space and 314,000 ft^2 of commercial floor space.		New MURB: 200,000 ft^2 (H2 building), + 650,000 ft^2 in three phases between 2025 and 2027.
Regulation context	The NEU operates under the Energy Utility System By-Law No. 9552, which mandates that all new developments within the service boundary must connect to the City-owned network.	Privately-owned TENs are regulated in BC. Municipally owned systems are excluded from regulation, and as a result ADEU is not regulated by BCUC. The City of Richmond developed and implemented the service area through Bylaw 8641, which requires that all future developments in the area would connect to the Alexandra DEU: "Any building, new or proposed for construction, within the ADEU Service Area will connect to and utilise the ADEU for internal space heating and cooling, and domestic hot water in accordance with the terms of the bylaw."	• District Energy Systems/TENs are not directly regulated in Alberta. • The City of Edmonton owns and operates the Blatchford Renewable Energy utility under provisions in the Municipal Government Act. • Connection to the system is mandatory through a bylaw. There is an exception to connecting to the system if a builder can demonstrate that their building achieves net-zero carbon without connecting to the District Energy Sharing System.	• Nonregulated. • No mandatory connection bylaw.
Total cost and subsidies	• Total capital investment of $85 M ($32 M initially spent in 2010, fully covered through utility customer rates, with upfront financing through city-raised debt.) • $20 M in innovation grant funding was received to help fund this project.	The total capital investment to date has been $24 M.	The federal government is contributing a $23.7 M grant to the project.	• $8.1M total, including $4.7M for a new building, $1.9M for the data centre, and $0.4M for the shared loop infrastructure. • $2.5M covered by incentives (Hydro-Québec, Énergir, MELCCFP).
GHG, energy savings data	By using waste heat, the system avoids around 7,000 tonnes of CO_2 emissions annually as of 2024, compared to a 2007 baseline. Over 60,000 MWh of energy is delivered annually, with 70% coming from renewable sources (as of 2024).	ADEU has delivered more than 41,130 MWh of energy and avoided more than 800 tCO_2e of GHG emissions annually (2021). It is estimated that at full build-out, ADEU will result in reductions of more than 1,200 tCO_2e of GHG emissions every year.	The community also has Green Building Standards in place that builders must adhere to.	For retrofitted site and new H2 building together, simulated (vs a reference): 62% energy reduction, 97% GHG reduction once the data centre is fully operational.
Did the project experience any significant pivots from its original framing due to changing decisions, priorities, or unforeseen challenges?	• The service area has significantly increased compared to the initial plan based on the success of the system, the development rate in this area, and the willingness of the City to expand the system. • The commitment for the City of Vancouver to transition to zero emissions buildings in all new construction by 2030, which drives the decarbonization of the system. • The City of Vancouver's Climate Emergency Action Plan in which the City targets transitioning the NEU to 100% renewable by 2030.	The City has precluded on-site gas boilers in new building based on system reliability and to avoid customers using gas in lieu of DEU.	• Since approving the district energy sharing system as the preferred thermal energy source for the neighbourhood, Edmonton's City Council has continued supporting the community vision, including ongoing development and expansion of the utility. • Partner engagement throughout the project has been crucial to the operational success of this young and growing utility. Key stakeholders include home builders, contractors, other utilities, and customers. Focused communication efforts are critical to educate, engage, and align all partners toward the project's common goals.	

Overview	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
Main challenges faced	• Significant dependency on development rate reduces control over system expansion timing, though mandatory connection requirements through the bylaw help mitigate this risk. • Some residents and developers expressed concerns about the unproven sewer heat recovery technology (the first installation of its kind in North America). • Technical challenges included securing adequate sewage supply and limited plant space for generation expansion.	• Developers were anxious about ensuring they could deliver service to their customers on schedule and meet quality standards. • Initially, connected buildings continued using their existing natural gas boilers as the primary energy source instead of switching to the TEN system. Educational programs were conducted to explain how the TEN system works and encourage building operators to use it as their primary energy supplier rather than relying on backup natural gas systems.	Aligning the District Energy Sharing Systems build-out to land development and home construction timelines, which are subject to external market forces.	• Financial risk and sustainable financial model. • Reclassification of a heritage site. • Many involved stakeholders. • Redundancy of HVAC systems for data centre. • HVAC: flexibility and distributed HP positioning. • Heat dissipation in cooling season.
Main lessons learned	• The 2010 Winter Olympics deadline secured strong political and administrative support. • The City's access to low-cost capital and grant funding allowed for a public-first model without needing private investment upfront. • Clear communication and transparency around connection costs and tariff structures helped increase uptake from both private and residential developers.		• The City of Edmonton's ownership and operation of a new renewable energy utility requires close collaboration with other City departments and industry partners/ homebuilders as well as ongoing political support. This strong collaboration has led to the operational success of a young and growing utility. • The importance of engaging various partners during the the project, including home builders, contractors, other utilities, and customers. A focus on communication is critical to educate, engage, and align all partners towards the common goal of the project.	• Cashflow management: Subsidies are important in the financial package, but when they will be disbursed is a key item to consider and manage. Bridge loans whenever necessary to manage that cashflow. • Support the developer: The funding partners will always inquire about payback vs baselines and references. Make sure to quantify it and have it ready for when they eventually ask for it. In this case, the TEN developer has only one intermediary: the site developer. This makes everything easier, would be more complex for situations with more than one owner/developer. • Key Success Factor: Transparent discussions between TEN promoter/designer and site developer, and see what (and how much) the promoter can commit to reduce the risk: Guaranteed costs, guaranteed subsidies, commit on rates, etc.
Next steps	• As outlined in its 2018 expansion plan, the NEU will extend services to new developments in Southeast False Creek, Mount Pleasant, the False Creek Flats, and Northeast False Creek. • The expansion aims to provide 100% renewable energy for approximately 22 million ft^2 of floor area.	It is anticipated that at full build-out, the ADEU will service 4.5 million ft^2 of space, which includes 3,100 units of residential as well as commercial, office, and institutional buildings.	As development in the community increases, the utility is managing this growth by planning, designing, and building additional piping network infrastructure and energy centres. Two more energy centres are currently in the design phase: one based on geoexchange technology and one utilizing sewer waste heat recovery.	• +650,000 ft^2 in three phases between 2025 and 2027 • H1 & H3: +300 additional units and some commercial/ sersvices spaces

Technical Features	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
4th or 5th generation	• 4th Generation system. • Two-pipe closed loop. • Supply: 65°C (95°C max), Return: 50°C	• The ADEU is an ambient temperature district energy system that delivers heating, cooling, and domestic hot water to connected buildings using a two-pipe system. • Supply/Return temperature: o Heating (min.) -1.1°C (30 °F) / -6.7°C (20 F) o Cooling (max.) 32.2°C (90 F) / 37.8°C (100 F)	• The system uses a 5th generation ambient temperature district energy loop coupled with heat pumps. • Two-pipe system configuration. • Water temperatures range from 10 to 20°C (50–68°F). • The system provides heating, cooling, and domestic hot water.	• 5th generation (ambient loop with distributed HPs) The old monastery's central plant has been retrofitted, acts as the loop's supplementary source/sink, and still directly supplied parts of the old building (high temp hydronic network) • Two-pipe system. • 59-98°F (15-37°C) temperatures.
Main heat sources	• The primary energy source is waste thermal energy recovered from untreated sewage to provide space heating and hot water to buildings. • Four heat pumps totalling 9.6 MW, heating water to between 65–80°C.	• The system is equipped with ground-source heat pumps and geoexchange technology, with two geoexchange fields. • 726 vertical loops of pipe, each of which runs about 76m (250 ft) deep.	• Current main energy source is a geoexchange field with 570 boreholes, each 150 m deep, connected to the first Energy Centre, which includes two 1 MW heat pumps to adjust operating temperatures for the system.	• Data centre: Covers about 90% of annual heating needs for current and future development. Once fully operational, it will be able to cover additional loads for future planned phases.

Technical Features	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
Main heat sources	• Remaining capacity provided by gas boilers using renewable and conventional natural gas. • Each connected building includes an Energy Transfer Station (ETS) housing a heat exchanger. • Excess heat from building-scale solar thermal systems. • Waste heat from commercial cooling.	• Each building is equipped with heat exchanger and a heat pump that utilizes the energy delivered by ADEU. • The ADEU prioritises using geoexchange when possible and only switches to the natural gas boilers as a backup energy source or cooling towers on the coldest and hottest days of the year, through: o Three 1,500 kW condensing, gas-fired boilers o Two 2,550 kW evaporative fluid coolers • The system delivers heating, cooling, and domestic hot water pre-heat services to customers in Richmond's West Cambie neighborhood. • Additionally, an energy transfer station links the mini-plant to the main ADEU system, allowing the ASHPs to send the excess energy produced by the large retail building (Walmart) to other ADEU customers. • The DEU system will provide a minimum of 70% of the collective annual space heating and cooling and domestic hot water thermal energy.	• Additional energy centres and renewable energy sources are planned, including another geoexchange field and a sewer heat exchange system. • The overall system operates as a sharing system, meaning that over the course of a year it is anticipated that up to 20% of energy can be saved just by buildings sharing energy. A peaking energy centre is planned to support the full build out of the community. Natural gas boiler systems serve as backup systems.	• Gas: 25% on annual use, will get down to 5% for the whole development once the data centre is fully operational. o Central plant backup gas boiler. o Backup gas heaters on: ▪ H2 MURB's MUAs: 15% of MUA load. ▪ H2 DHW (full load redundancy). • Backup electric off-peak boiler (for DHW): 15% of annual DHW use, 1% of total annual use.
Heating capacity	25 MW of peak demand.	13.4 MW of heating and 5.8 MW of cooling.	• The current heating and cooling capacities are 4.25 and 4 MW. • At full build-out the heating and cooling peak are expected to be 35 and 46 MW.	• 0.65 MW by fully operational data centre. • 0.88 MW by condensing gas boiler (complete data centre redundancy and winter thermal peak).
KMs of distribution network	7 km total length of distribution system pipe.	3.6 km of underground distribution piping.	Currently the utility has installed and is operating about 7.5 km of distribution network piping in the first stages of the community.	200m to date, 1 km total planned at the end of all phases (distance covered, not pipe length).
Is gas still distributed to all new buildings, or limited to the central plant and some buildings?	Heating capacity is limited to the central plant. Buildings only have gas for cooking.	Heating capacity is limited to the central plant.	Natural gas lines are still being installed to the property lines, but the Blatchford Renewable Energy bylaw restricts the installation of natural gas in homes for non-thermal applications.	• Gas distributed to the main plant as well as the H2 building's MUA units. • No other gas-connected loads. • Most loads were already electrified, so TEN did not create savings in gas piping, but they would have had to create a boiler room in the H2 building, so larger pipe to get to that building.
Is there storage included to optimize load coincidence and peak demand?	There is no thermal storage yet, but this is under active consideration.	No, there is no thermal storage yet.	The ground and distribution piping system is used for thermal storage and is monitored.	No storage (apart from standard DHW tanks).

Development Process	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
Who originated the project? Was it a private-sector initiative, or did the municipality lead the discussion?	Set to the backdrop of the 2010 Winter Olympics, the municipality led discussions. The City owned the land for the Olympic Village and was responsible for planning and securing a developer.	The project was initiated by The City of Richmond and a private developer connecting the first two buildings. The developer already had experience implementing ambient temperature heating and cooling systems using ground source energy.	• Edmonton City Council directed the vision for the community, including the use of a District Energy Sharing System to provide renewable energy for heating, cooling, and hot water to the homes, businesses, and schools in the community. • The City is leading the implementation of Council's vision to redevelop the land, which was formerly an airport, into a sustainable community with a vision to be carbon neutral and use 100% renewable energy.	Private sector initiative, without specific needs in terms of support from the municipality—no bylaw required, no specific involvement required. The project already aligns with the City's development plan, and the whole site is owned and developed by the same developer.
What was the main driver behind choosing a TEN vs distributed heating approaches?	Originally conceived as a demonstration initiative, the NEU aimed to showcase innovative low-carbon infrastructure by harnessing local waste heat in sewage.	The City of Richmond has committed to reduce the community's greenhouse gas emissions by 33% by 2020, and 80% by 2050, relative to 2007 levels. The City identified district energy as a key strategy to achieve its GHG emissions targets.	• As part of Edmonton's Community Energy Transition Strategy, the City set a goal to become carbon neutral in its corporate operations by 2040, and for the entire city to have net-zero GHG emissions by 2050. • The Blatchford vision for sustainable and resilient community design supports these goals.	The existing building required refurbishment, with new large buildings being developed adjacent to it. The developer recognized an opportunity to install a data centre and recover its waste heat. They viewed the TEN as a more resilient infrastructure investment than alternatives, believing it would add long-term value to the site and buildings. This forward-looking investment strategy helps secure future financing opportunities.
Who collaborated? What were their roles?	The project was led by the City's Engineering department, with support from the City's Finance department. Design was completed by external consultants.	The developer had prior experience with ambient temperature heating and cooling systems that use ground source energy, which qualified them to build the system's first phase. The City funded this initial phase and provided land for the geoexchange field installations. The City also enacted a Service Area Bylaw covering the designated neighbourhood. In August 2013, the City established the Lulu Island Energy Company (LIEC) as a municipal corporation to take over ongoing development, maintenance, and operation of the ADEU system.	• The City acts as the land developer, handling rezoning, planning, public infrastructure development, and land sales. • Blatchford Renewable Energy is a municipal-owned utility, which manages the operation of the District Energy Sharing System. • The utility is regulated by Edmonton's City Council.	• Énergère: HVAC design and operation, EPC contract with guaranteed costs and savings. • Funding: Desjardins and Ipso Facto (plus incentives). • Developer: Services Immobiliers First. • PINQ and Exaion (EDF) for data centre. • Sherbrooke municipality: Not much involvement required, but the site's development aligned with the city's development plans.
How does the ownership structure work?	The NEU is a self-funded utility, 100% owned and operated by the City of Vancouver.	• City of Richmond/LIEC: owner and operator of the system (energy plant, distribution piping and energy transfer station (ETS) in the individual buildings). • The customer is responsible for all piping and the HVAC system in the building outside of the ETS.	The Blatchford Renewable Energy is a 100% municipally owned utility, in operation since 2019. It is governed and regulated by Edmonton's City Council.	Immo SIF, the site owner/developer, both owns and operates the TEN with support from Energere, who guaranteed costs and subsidies despite having no formal energy performance contract.
How did phasing happen between the development of the buildings and the loop?	The city strategically phased infrastructure development and plant capacity to align with building construction, reducing upfront capital exposure and supporting gradual revenue growth. Space was reserved to allow for the expansion of the sewage heat recovery system to accommodate future growth.	The primary strategy for construction phasing of ADEU was to match service capacity closely with demand at any given stage.	The utility is built in stages to align with land development and home builder construction. As the development grows, the utility adds distribution piping and energy centres to ensure a reliable source of renewable energy for its customers.	Phase one includes retrofitting the main existing building (which houses the central plant) and the first H_2 building. Although the installed capacities only cover phase one loads, the plant design is future-proofed to accommodate additional loads and connections in later phases.
How have stakeholders addressed the interdependency between developers and TEN proponents in project planning and execution?	When a developer submits a building application, they conduct extension tests to assess how the new connection will affect system performance indicators. Based on these test results, they determine whether the connection is technically viable and economically feasible before approving it.	• There was a commitment through the bylaw that developers would connect and at the same time the service would be provided on time by the ADEU. • The policy was also developed by the City of Richmond to ensure new developments in the service area are TENs ready and have the infrastructure required to get connected to the system.	Managing various partners throughout the project is essential and cannot be overstated. Enhanced communication between builders, contractors, other utilities, and customers has helped educate, engage, and align all stakeholders toward the project's common goals.	

Development Process	False Creek Neighbourhood Energy Utility (NEU)	Alexandra District Energy Utility (ADEU)	Blatchford District Energy Sharing System (DESS)	Humano District
How do ratemaking and billing work?	There are two components to NEU rates: • A fixed monthly capacity charge. • A variable charge based on energy usage. Rates are reviewed annually by an independent expert panel and approved by the City Council. This structure aligns with conventional utility practices, ensuring predictability and fairness for users.	Tariffs consist of two components: • Volumetric Charge, based on thermal energy use in the period. • Capacity Charge, based on the heating capacity required by the customer. • The ADEU service rate is reviewed annually and is subject to City of Richmond Council's objective to keep the annual energy costs for ADEU customers competitive with conventional energy costs. 2024 District Energy Utility Rates.	• The utility's revenue comes from two main sources: o Connection fees: One-time charges based on building size and number of units. o Rates: A blend of fixed and variable consumption charges. • Fees and rates are set annually by Edmonton's City Council.	• Single entity (Immo SIF) owns the site, develops it, and owns and operates the TEN system. • First phases were planned collaboratively with close involvement between TEN promoter and site developer, using a single HVAC engineer for both the loop and building HVAC retrofit/new construction design with guaranteed costs (though not an ESCO energy performance contract). • Current plant capacity covers only existing loads, but the design is future-proofed to accommodate additional loads and connections. • Since the same entity owns the buildings and operates the TEN, energy and all services are included in rent.
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Other details	• North America's first TEN to utilize waste heat from untreated sewage. • Presence of net metering of build-side solar thermal and waste heat from cooling.	The City offered additional density bonuses to the developments that were already in the process.		