FORESIGHT

Schulich School of Business | YORK U

District Energy and Wastewater Energy Transfer Solutions

Adopting Cleantech: The Business Case

Sept 2025

Table of Contents

Acknowledgements

This report was developed in partnership with students from the Schulich School of Business.

Lead Authors

Johan Anish

Jaskaran Singh Bamrah

Noorsia Rahman

Advisors

Aislinn Crawford

Klaudia Watts

Thank you to the **City of Vancouver Neighbourhood Energy Utility**, the **Zero Emissions Innovation Centre (ZEIC)**, **Sharc Energy**, and **Enwave Energy Corporation** for their input.

About Foresight

Foresight Canada helps the world do more with less, sustainably. As Canada's largest cleantech innovation and adoption accelerator, we de-risk and simplify public and private sector adoption of the world's best clean technologies to improve productivity, profitability, and economic competitiveness, all while addressing urgent climate challenges.

Executive Summary

- Each year, a significant amount of excess heat is released into the environment from buildings, urban infrastructure, and industrial processes. This "waste heat" can be captured and utilized to provide a low-cost and low-carbon energy source.
- There are many sources of waste heat; however, this business case study focuses on waste heat capture from sewage and wastewater or Wastewater Energy Transfer (WET) technology.
- As water is heated for domestic and industrial processes, WET technology can capture thermal energy from wastewater, which typically has a temperature range between 10°C and 25°C.
- Urban centres provide further advantages for waste heat utilization as these technologies can be integrated into District Energy Systems (DES). DES are networks that provide heating and cooling from a central plant to multiple buildings, improving efficiency.
- WET can significantly reduce operational costs associated with heating and cooling and can offer attractive **return on investment (ROI) within 3–7 years**, especially in regions with supportive policy frameworks and high energy prices.
- When used in a DES, WET technology can reduce greenhouse gas (GHG) emissions by up to 80-90% compared to traditional HVAC systems that rely on natural gas, especially when combined with a clean electricity grid. The technology can help municipalities, developers and utilities meet climate action goals.
- This analysis uses real data from innovators and secondary research to highlight the potential financial and environmental benefits of deploying cleantech and showcase how the right cleantech solution can also be a beneficial financial decision.
- Barriers to the adoption of district energy and WET systems include high upfront capital costs, retrofitting complexity, and limited awareness among potential adopters, but these can be mitigated through innovative financing, policy integration, and strong engagement.
- Successful implementations include Vancouver's Neighbourhood Energy Utility (NEU), a municipally owned utility sourcing **70% of its energy** from sewage, achieving **over 60% emission reductions.**

The Business Case for Cleantech Adoption

Foresight's Cleantech Adoption Business Case Series is an initiative to demonstrate the business opportunity behind implementing clean technologies. We highlight the financial impact of the adoption of cleantech solutions to justify accelerating investments in and the procurement of technologies across sectors. The goal of these analyses is to prove that, from a financial and operational perspective, **adopting clean technologies improves the bottom line.**

The ultimate objective of this initiative is to catalyze industry adoption of clean technologies by supporting financial decision making. While we acknowledge that financial analysis is not the only answer, it is a critical consideration that is often unclear.

Adopting Cleantech: The Case for Wastewater Energy Transfer Technologies

Municipalities face the dual challenge of meeting growing energy demands while reducing greenhouse gas emissions (GHGs). Buildings are major energy consumers, representing 28% of energy end use and 26% of GHG emissions in Canada. [1] In cities, buildings-related emissions can represent almost 60% of a community's total. [2] Most energy is consumed to support heating and cooling of buildings. DES centralizes the production of heating or cooling for a neighbourhood or community. By generating heat at a central location or extracting heat from other sources, the systems can deliver greater energy efficiencies and lower emissions compared to individual heating systems. [3]

As energy is consumed for industrial and commercial processes, excess heat is released as a byproduct resulting in significant amounts of waste heat. When harnessed, this can provide a low-carbon and low-cost energy source. A 2023 McKinsey [4] study found that the Americas have over 600 terawatt-hours of untapped, usable waste heat, which is equal to the power of more than 100 Site C Dams. To achieve environmental benefits, DES should be integrated with low-carbon energy sources.

Urban heat sources can include wastewater, data centres, supermarkets, arenas, and underground metro stations. These waste heat sources are common in most cities, so strategies for energy recovery can be easily replicated. CanmetENERGY, part of Natural Resources Canada, is developing an urban waste heat map that is expected to be publicly available in 2026.

This report focuses on wastewater energy. In Western countries, the average individual uses approximately 60 gallons of water daily, nearly half of which is heated for domestic activities such as showering, laundry, and dishwashing. In Canada, the thermal energy discharged as heated wastewater is estimated to be equivalent to 52 billion kWh per year. [5] WET systems are technologies that capture and utilize thermal energy in wastewater. They can be a valuable component of DES by providing a renewable energy source and further reducing carbon emissions and costs.

As buildings and other industries transition to electrification to lower carbon emissions, harnessing energy from wastewater offers a sustainable alternative that can reduce demand on the electricity grid. There are additional benefits in more densely populated urban environments where wastewater is a continuous and reliable source of energy.

District Energy and Thermal Energy Networks

DESs are sometimes referred to interchangeably with the concept of Thermal Energy Networks (TENs). TENs and DESs are, in essence, the same: they are centralized systems for distributing heating and cooling to a cluster of buildings. However, TEN is now often being used to specifically refer to DESs that are highly decentralized and “opportunistically to draw from the thermal resources at the location, which may include energy-intensive buildings that shed waste heat, sewer systems, and the subsurface ground temperature” and commonly use significant geothermal heat resources. [6] [7]

Barriers to WET-integrated District Energy Solutions

Key adoption barriers for WET systems include high upfront capital costs, integration complexity with existing infrastructure, and limited awareness among partners.

The following key considerations have been identified:

- **Assessment of viability for success:** Projects must be strategically assessed based on urban density, availability of wastewater resources, and proximity to wastewater treatment plants. The feasibility of implementation and the anticipated ROI significantly depend on these factors. [47] [49]
- **Scalability:** It is crucial to evaluate the potential for phased expansions of the WET technology and systems. Phased implementation can help manage capital costs and reduce operational risks. Scalability is significantly easier to incorporate into the initial building design. [47] [49]
- **Financial viability:** DESs and WET technologies have high upfront capital costs for installation. Retrofitting existing buildings and infrastructure can be more costly than incorporating the systems into the design of new developments. Local utility rates, the availability of governmental policy incentives, and initial infrastructure investment costs can contribute to the financial viability of projects. Systems that leverage substantial wastewater volumes and benefit from supportive regulations and tax credits can deliver attractive ROIs, with payback periods often between 2 to 5 years. [48]
- **Awareness:** Project proponents can be hesitant to incorporate WET technologies due to concerns around costs, ROI, blackwater integration, and the cleanliness of infrastructure. Greater awareness and communication of the technology’s benefits and outcomes can help alleviate these concerns.

Analysis

Solution

WET is a process involving a variety of technologies that captures the latent thermal energy in wastewater and redirects it for heating applications via thermal grids or in-building systems. This process represents circular economy principles, decarbonization strategies, and urban energy efficiency. [8] It is a commercially available solution, but still emergent in terms of its widespread adoption. The technology is increasingly validated as its implementation expands globally.

How the Technology Works

Full System Architecture and Process Flow

1. Wastewater Interception and Collection

WET systems begin by intercepting wastewater flows either at the building level (graywater from sinks, showers, and dishwashers) or through municipal sewer lines (which also include blackwater). The wastewater may be intercepted before it reaches the treatment plant or just downstream from sanitary sewer mains. Sewage pump stations are convenient locations where wastewater can be easily intercepted.

2. Advanced Screening and Filtration

- One of the key technical hurdles is the removal of solids such as grease, rags, wet wipes, and other non-organic materials that could clog heat exchangers. WET systems utilize self-cleaning fine screens, typically filtering down to 2-3mm particle size. [48]
- In newer installations, automated screen rakes and high-pressure backflush cycles are used to minimize manual maintenance and downtime, reducing the risk of clogs. [9]
- Older systems use passive steel mesh that requires frequent manual cleaning and water jetting. The False Creek NEU was able to significantly reduce water consumption and associated costs by upgrading to a newer screen system.

3. **Heat Exchange**
   - After filtration, the wastewater flows through a plate or shell-and-tube heat exchanger, where its thermal energy is transferred to a clean secondary water loop. The wastewater and clean water never mix.
   - This process operates with a minimal temperature drop in the wastewater, typically just 2–3°C, making it environmentally safe to return to the sewer system. [46]
   - Heat exchangers are designed with wide-gap configurations (~10 mm spacing) to avoid the buildup of unwanted deposits in the system, and materials are chosen for corrosion resistance (e.g., stainless steel or titanium). [10]
   - This step can be avoided in some cases. For example, the False Creek NEU system runs filtered sewage directly through a heat pump.
4. **Heat Pump Integration**
   - The warmed, clean water is then fed into water-source heat pumps that raise temperatures from 10–25°C to 60–70°C, suitable for domestic hot water, space heating, or industrial processes. [49]
   - Coefficient of Performance (COP) for these heat pumps typically ranges from 3.0 to 4.5, meaning they deliver 3–4.5 kW of thermal energy for every 1 kW of electricity used. This significantly outperforms conventional electric resistance systems, which have a COP of 1.0. [1]
5. **Thermal Distribution**

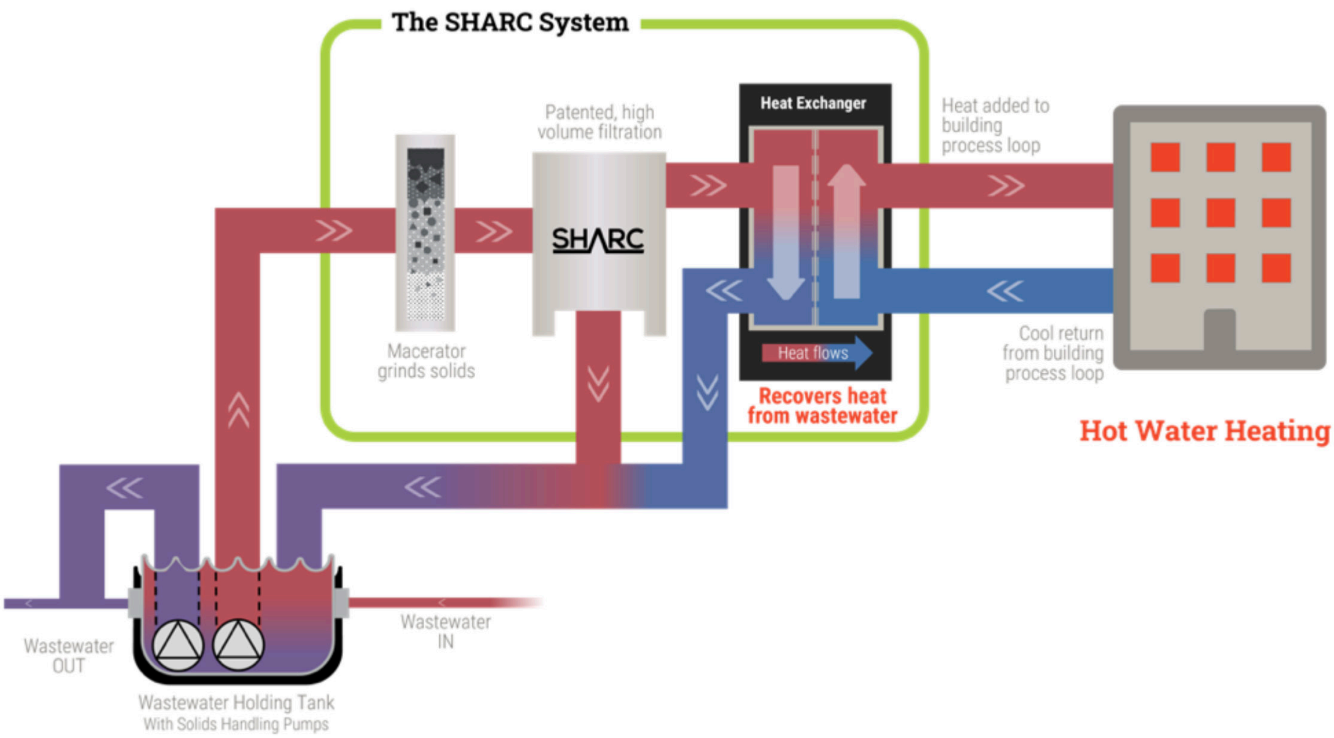
The heated water is distributed through hydronic loops to connected buildings, functioning similarly to other district energy systems. [47] The system may also include thermal storage tanks and backup gas boilers or electric resistance heaters for load balancing and redundancy.

Thermal energy storage addresses the gap between heat demand and availability, allowing for heat recovered from wastewater to be stored when the demand is less. This is key to the effective utilization of WET as demand for heating and cooling in buildings fluctuates.

Integration with Other Technologies

- WET can complement geothermal systems by reducing borehole requirements by up to 40%, as seen in hybrid installations proposed by SHARC Energy. [10]
- Data centres, incinerators, and industrial plants can serve as alternative waste heat sources, expanding the resiliency of thermal networks. [11]

Figure 1. SHARC Energy- How Heat Recovery Works



Source: SHARC Energy **https://www.sharcenergy.com/how-it-works/**

Return on Investment

A comprehensive cost-benefit analysis of WET systems involves evaluating upfront capital investments, operational costs, and long-term financial savings.

Return on Investment (ROI):

- **Capital investments:** Initial investments include equipment such as heat exchangers, filtration systems, heat pumps, civil infrastructure (piping, wet wells), and integration with existing building systems.
- **Operational costs:** Key considerations include labour, routine checks/maintenance, and repairs for heat exchangers, heat pumps, pipes, and valves. Electricity for heat pumps is often required as WET systems rely on heat pumps to extract and upgrade the heat from wastewater to a usable temperature for heating and cooling buildings.
- **Potential financial savings:** Long-term savings are realized through reduced energy costs, lower carbon emissions compared to natural gas and electricity grids with a higher carbon intensity, and minimized use of conventional fuel sources.

The costs and savings associated with wastewater heat recovery vary significantly based on the project's scale, the specific technology used, and how it integrates with existing infrastructure. These complexities often lead to multi-phased projects, making it difficult to pinpoint a total cost and identify operational savings. Publicly available information has been used to provide an indicative cost summary of two projects.

Vancouver Neighbourhood Energy Utility (NEU)

Project Overview: The Vancouver NEU is a district energy system incorporating WET technologies that provides space heating and hot water to buildings in False Creek and parts of Mount Pleasant. The project was established in 2010 to support the Winter Olympics and uses waste heat recovered from raw sewage, which is captured by industrial heat pumps at the False Creek Energy Centre.

Technical Information: The NEU began service in 2010, supplying low-carbon heat to the Olympic Village and surrounding neighbourhood of Southeast False Creek. By 2015, the system had grown to serve 24 buildings, representing 350,000 m^2 of floor area. The False Creek Energy Centre had a 3.2 MW sewage heat recovery system supported by a 24 MW boiler plant for peak demand and resiliency. In 2024, the NEU completed a major expansion, adding 6.6 MW of additional sewage heat recovery capacity. [12] As part of this expansion, they incorporated five SHARC 880 systems, two of which were installed to replace the original sewage screening system.

Today, the system supplies low-carbon heat to 47 buildings across 670,000 m^2 (7.2 million ft^2) of floor area. It serves approximately 10,000 residents as well as a community centre, university campus, and a number of offices and businesses. The total build-out is projected to be ~2,000,000 m^2 based on current development forecasts.

Capital investment: An initial investment of $31.6M was made in 2010 which delivered the False Creek Energy Centre, the first 3.1 km of distribution pipe, and the first 11 building connections/energy transfer stations. Additional capital has been invested each year to expand the network to the 47 buildings now connected. The 2024 expansion of the sewage heat recovery system (adding 6.6 MW of capacity) had a capital cost of $20.3M. These investments were partially funded through innovation grant funding as outlined below.

Funding: The NEU is a city-owned and operated utility that uses a commercial model to set customer rates, which are designed to recover all capital and operating costs, including a return on invested capital.

While the NEU is primarily self-funded, the utility received innovation grants at its inception and during the recent expansion of the sewage heat recovery system, this includes:

1. A $10.2 million provincial grant provided by the Government of Canada's federal Gas Tax Fund to support the initial construction of the False Creek Energy Centre.
2. A 20-year loan for $5 million at 1.7% from the Federation of Canadian Municipalities (FCM) Green Municipal Fund (GMF).
3. A $10.2 million CleanBC Communities grant to support the 2024 expansion of the sewage heat recovery system.

Table 1. 2024 NEU revenues and expenses, 2024 budget and 2025 budget based on the commercial utility rate model[13]

	2024 Budget	2025 Budget
Total revenues: capacity levies and energy use charges	$8.5 million	$9.2 million
Operating Expenses		
Natural gas and electricity	$3 million	$2.8 million
Staff, maintenance, overhead and other	$1.8 million	$1.8 million
Total Operating Expenses	$4.8 million	$4.6 million
Financing Expenses		
Interest expense	$1.1 million	$1.4 million
Return on equity	$1.8 million	$2.1 million
Depreciation	$1.6 million	$1.7 million
Total financing expenses	$4.5 million	$5.2 million
Total expenses	$9.3 million	$9.8 million

Operating costs: The City of Vancouver publishes the anticipated customer rates and budgets annually, as shown in Table 1, which provides insight into operating costs and budgets. Key to the cost competitiveness of this system is the high efficiency of the sewage heat recovery heat pumps which operates at an average efficiency exceeding 300%, driving down fuel costs.

Although the figures show an operating shortfall in 2024 and 2025, this is planned into the commercial utility rate model and is discussed further below.

Return on Investment — The NEU has a dual mandate:

4. Provide an ROI to the utility's owners
5. Provide competitive energy rates to NEU customers [14]

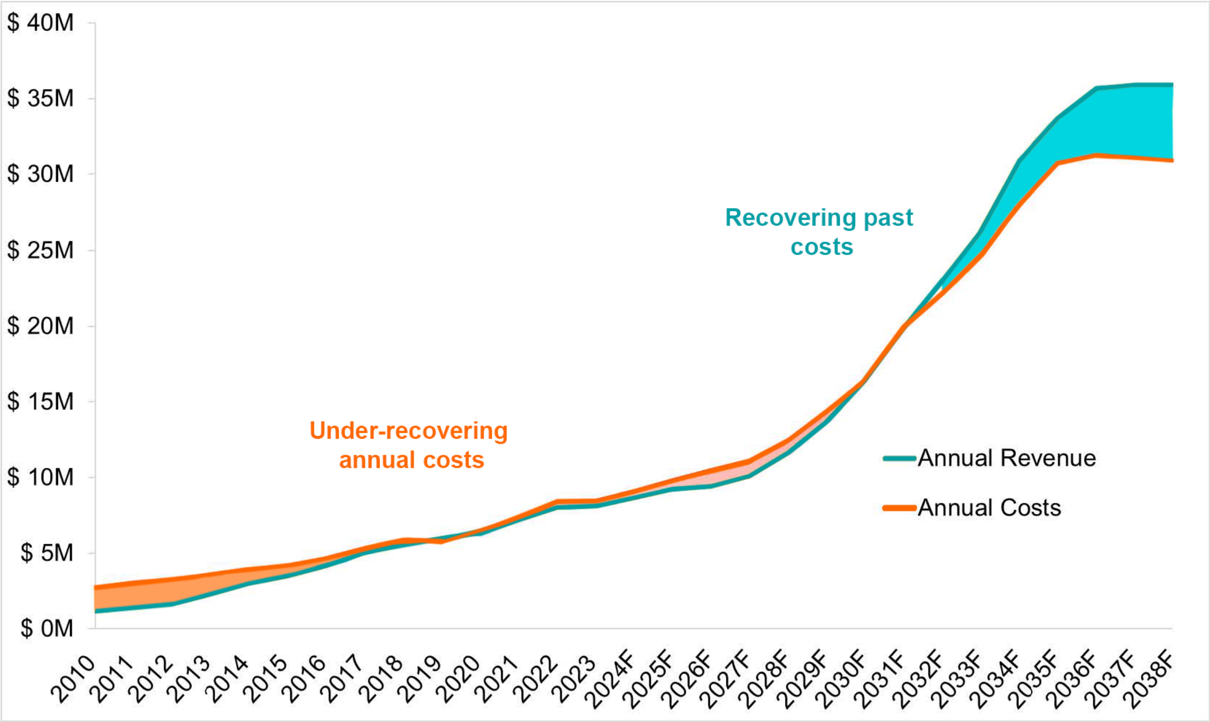
NEU rates are set based on a commercial utility model with an ROI on the city's capital investments included as a revenue requirement. To demonstrate cost competitiveness, the NEU benchmarks its rates and carbon performance against other thermal energy providers annually, with a target of staying within 10% of the BC Hydro residential rate. The NEU has maintained a consistent 3.2% rate increase despite inflation exceeding 2% in recent years. In addition to their customer rates, the NEU recovers costs through a connection levy, introduced in 2018.

Table 2. NEU 2024 customer rates [13]

	2024 Rates
Class 1 (Residential and Mixed Use Residential within Southeast False Creek)	
Fixed capacity levy	\$0.653 per m^2 per month
Variable energy use change	\$61.193 per MW.hr
Net effective rate	\$132.8 per MW.hr
Class 2 (Residential and Mixed Use Residential Outside SEFC) and Class 3 (Non-Residential)	
Fixed capacity levy	\$9.827 per KW peak demand per month
Variable energy use change	\$61.193 per MW.hr

Customer rates are established based on a levelized approach to remain competitive and stable. As illustrated below in Figure 2, rates are set to under-recover annual costs in the early years of the NEU's operation when the customer base is small, then gradually recover past costs when the customer base is fully established. This approach ensures that infrastructure costs are more equitably distributed between the initial customers and those who connect in later years. This is a common practice by privately owned utilities regulated by the BC Utilities Commission (BCUC).

Figure 2. Cumulative Balance of Under-Recovered Costs Under Levelized Rate Approach [13]



Source: 2025 False Creek Neighbourhood Energy Utility Customer Rate Report

A study by Quest notes that the total life cycle costs of the NEU system are expected to be equal to or less than the traditional alternative. Energy rates are similar however, buildings operate more efficiently with lower energy use. [14] The key economic benefits are derived from improved energy efficiency and a more diverse energy supply which reduces dependence on the grid.

Environmental Benefits: The project has delivered significant environmental benefits and is successful in providing low-carbon energy and reducing reliance on fossil fuels. In 2024, the NEU was on-track to deliver 70% of its energy from renewable sources. As part of the City's Climate Emergency Action Plan, opportunities are being explored to target 100% of renewable energy sources by 2030. All forecast costs and rate assumptions are currently based on the existing target of 70% renewable energy. The GHG reduction forecast is 7,000 tonnes of CO_2 compared to a 2007 baseline. [13] This is roughly equivalent to taking 1,400 gasoline-powered cars off the road each year. [15]

Other environmental benefits include access to economies of scale and tapping into local renewable heat sources that would otherwise not be available to individual buildings, such as commercial cooling and data centres. Customers can also sell their waste heat to the NEU system for local reuse. The MEC flagship store is an example of this, putting waste heat recovered from the store into the NEU network.

Toronto Western Hospital

Project Overview: Another project example is Toronto Western Hospital, currently the world's largest raw wastewater energy project. The project involves the installation of a WET system that takes thermal energy from Toronto's wastewater and sewer system. The project is anticipated to be commissioned and operational later in 2025. Once fully operational, it is expected to provide up to 90% of the hospital's heating and cooling requirements. Noventa Energy expects to expand the system during future phases.

Technical Information: The system relies on HUBER ThermWin technology, which uses 16 BG8 heat exchangers and 6 pumping station screens. The project is expected to supply 1.8 billion kWh of energy over its lifecycle and has 19 MW of thermal energy capacity with over 2,400 tons of cooling capacity. [16] The unit is being installed in an existing hospital utility building, separate from the main hospital, to minimize construction impacts. [17]

Financial information: The project has been underwritten by the Canada Infrastructure Bank (CIB), with a payback schedule of less than 10 years. CIB contributed $19.3 million with other partners including the University Health Network (UHN), Vancity, Noventa Energy, Enbridge, and the Government of Canada. [18]

Total Project Estimated Capital Cost: $42.9 million [18]

Estimated Annual Operational Savings: $700,000 per year [19]

Environmental Benefits: The UHN Energy Management Plan 2024-2029 notes that the WET system is expected to reduce water consumption by 10% and reduce gas consumption by up to 80%. The only on-site GHG emissions from fossil fuels are expected to be from emergency generators. [20]

Opportunity Area

Regions with higher grid emission intensities stand to gain significantly from WET systems, not only through reduced operational emissions but also by lowering exposure to rising carbon pricing. The table below outlines the most recent GHG emissions factors for electricity consumption across Canada as of 2024: [21]

Table 2. 2024 Greenhouse Gas (GHG) Emissions Factors by Province

Province or Territory	Consumption Intensity (g CO_2e/kWh)
British Columbia	15
Alberta	490
Saskatchewan	670
Manitoba	1.4
Ontario	38
Quebec	1.7
New Brunswick	350
Nova Scotia	700
Prince Edward Island	350
Newfoundland and Labrador	18
Yukon	70
Northwest Territories	190
Nunavut	820

Operational Efficiency

Air-Source Heat Pumps (ASHPs) are an alternative low-carbon heating and cooling solution. In cold climates, ASHPs suffer from efficiency losses due to low ambient temperatures. In contrast, wastewater maintains a stable temperature year-round (typically 10–25°C), making it a more reliable heat source and ensuring efficiency—even during winter conditions. [22] The consistent performance of WET systems reduces the need for supplementary heating equipment or seasonal backup fuels. [9]

The push to decarbonize buildings through electric resistance heating and conventional ASHPs places substantial pressure on peak electricity demand, especially during cold spells. WET systems offer a low-peak-load alternative that eases this burden on urban electricity grids. In collaboration with Vancouver's NEU, BC Hydro's internal modelling showed that using WET in DESs substantially reduces the required peak electric capacity, compared to fully electrified buildings using electric resistance or air-source heating. [23 24 25]

Regulatory and Compliance Landscape

Federal

At the federal level, Canada's energy regulations primarily focus on energy efficiency standards for products and equipment. These standards impact the components used within district energy systems, but they don't directly regulate the systems themselves. [26]

Provincial

- **Alberta:** Municipal utility companies, like certain DESs, are governed by the Alberta Utilities Commission (AUC) and may be exempt from some regulations. However, private district energy suppliers may require AUC permission for some activities. [27]
- **BC:** In BC, DESs are unregulated if they are owned by the municipality. Otherwise, they are regulated by the BC Utilities Commission (BCUC). Utilities under BCUC jurisdiction that wish to construct a DES must file for a Certificate of Public Convenience and Necessity (CPCN) for its construction and operation. [14]
- **Ontario:** DESs are unregulated in Ontario, so adopters must negotiate directly with the suppliers. The absence of regulation can cause variability in customers' experience. [28]

Municipal Regulations

Municipalities play a vital role in regulating and facilitating DES and the implementation of WET technologies.

- **Municipal Strategies:** Some municipalities have strategies for implementing district energy or reaching decarbonization goals. For example, the City of Edmonton has developed a District Energy Strategy with a vision for a city-wide decarbonized system to provide zero-emission thermal energy. [29]
- **Ownership Structure:** DESs may be publicly or privately owned, and the ownership can determine the degree of regulatory control. Publicly owned systems may have some exemptions to suit them, and private operators can be subject to tighter controls. [30]
- **Bylaws for Mandatory Connection:** Certain municipalities, like the Vancouver NEU, require buildings in specific areas to connect to DESs. This supports the growth and efficiency of the system and can support capital costs through development cost charges and levies. [31,32]
- **Environmental Considerations:** Projects need to adhere to environmental impact assessments and bylaws to minimize environmental harm.

As part of Foresight's research, interviews with industry leaders revealed that a challenge with adoption of WET technologies is a lack of awareness. Some pilot projects have faced skepticism regarding blackwater integration and the cleanliness of infrastructure. Educational initiatives and self-funded installations build trust and demonstrate technology reliability, helping to overcome these challenges.

Variable regulations can increase challenges to adoption due to the need to tailor designs to suit unique building layouts and mechanical systems. The City of Vancouver's NEU serves as a leading example of how regulatory foresight can promote adoption. By integrating WET into a municipally owned DES, the City secured an amendment to the Vancouver Charter, enabling it to mandate building connections through a designated service area bylaw.

Funding and Incentives

The successful deployment of WET systems hinges on the availability of tailored incentives, innovative funding models, and supportive policy frameworks. Early-stage projects benefit from a blend of financial de-risking tools, such as grants, incentives, and federal tax credits.

Federal Programs

Canada offers a range of federal programs to support DESs and WET technologies.

- **The Clean Technology Investment Tax Credit (ITC)** provides a refundable tax credit of up to 30% for investments in eligible clean technology properties, including renewable thermal systems, acquired and available for use between March 28, 2023 and December 31, 2033. [33]
- **The Decarbonization Incentive Program (DIP)** provides grants to industrial facilities that reduce emissions under the Output-Based Pricing System. [34]
- **The GMF**, administered by the FCM, supports municipalities and their partners with loans and grants up to 80% of project costs, including a 15% grant portion, for community energy systems that use recovered or renewable thermal energy. [35]

Despite access to financial supports such as the Low Carbon Economy Fund (LCEF) and the Investment Tax Credit (ITC), in many cases, a technical feasibility study is required for securing funding. This dual-track process, where regulatory and financial planning occur separately, underscores the challenges inherent in retrofitting existing buildings.

Provincial Programs

Alberta: The Renewable and Alternative Energy Program by Alberta Innovates provides funding to support the research, development, and demonstration of renewable and alternative energy technologies in Alberta. [36]

British Columbia: The BC Housing Energy Efficiency Retrofit Program supports housing providers with retrofitting upgrades to improve energy efficiency. The program provides technical guidance and potential funding incentives to facilitate retrofits, ultimately benefiting both housing providers and residents. [37]

Quebec: The Hydro-Québec Innovative Projects Program provides funding and technical support to advance energy efficiency and green technology projects, with a particular emphasis on innovative solutions for district energy systems. [38]

Ontario: The Save on Energy initiative, led by the Independent Electricity System Operator (IESO), includes the Energy Affordability Program for low-income households and a Local Initiatives Program for custom efficiency solutions. [39]

Case Study: SHARC's Financial Alignment and Adaptability

SHARC Energy has leveraged LEED certification pathways, carbon pricing policies, and utility-backed rebate programs like FortisBC's Custom Performance Program to improve project ROI and adoption viability, especially in BC.

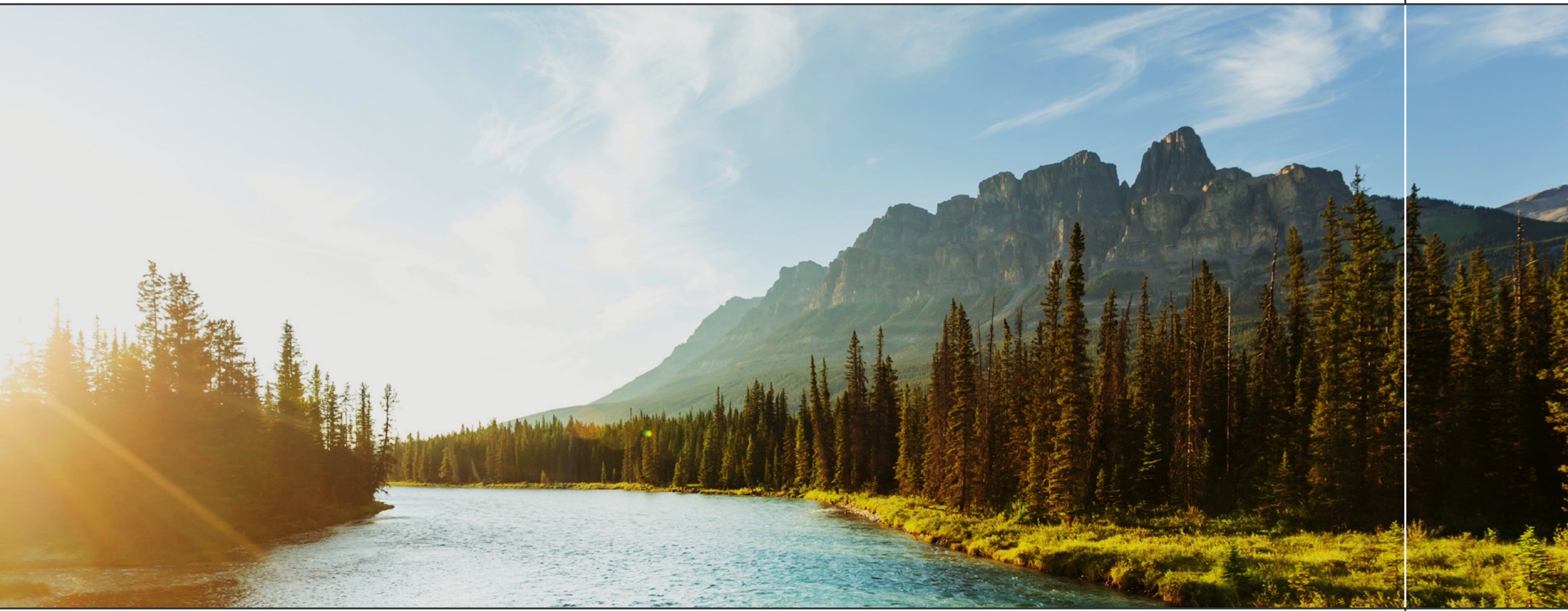
In contrast, Ontario presents different challenges due to low natural gas costs and high electricity rates, pushing SHARC toward energy-as-a-service models to unlock financing and scalability. This offers clients heating and cooling with no upfront cost through a fixed-fee, long-term contract.[10]

Project examples demonstrate the importance of structured capital layering and financial alignment, securing support from multiple programs such as the CIB, GMF, and CTIC to fund large-scale developments.

Environmental Impact

- **Emissions Reductions:** By reducing reliance on fossil fuels, WET technology can cut building heating and cooling-related GHG emissions by 80–100%, particularly when connected to a clean electricity grid. [40]
- **Improved Energy Efficiency:** Harnessing waste energy significantly improves overall energy efficiency, particularly when incorporated into DESs that provide economies of scale and greater optimization than heating individual buildings.
- **Potable Water Conservation:** WET contributes to urban water resilience by reducing demand on treated water for non-potable uses as traditional cooling systems and towers, which consume large amounts of potable water. [41]
  This has the following benefits:
  - Reduces the annual water consumption by thousands of gallons in large buildings or campuses.
  - Eliminates risk of Legionella outbreaks and other microbial hazards associated with cooling tower drift and stagnant water.
  - Cuts cooling tower maintenance costs, including chemical treatments and labour.

There are further opportunities for enhancing the positive environmental impact of DESs and wastewater energy transfer technologies. Examples include harnessing alternative waste heat sources from commercial buildings, data centres or underground transportation, and incorporating biodiversity and green spaces into retrofits and new infrastructure.



Risk Assessment

Operational and Technology Risks

- **Operational Complexity:** Integrating WET systems into existing infrastructure requires compatibility with current heating and cooling systems. Incompatibility can result in increased costs and extended project timelines. [47] This can be addressed by conducting thorough feasibility studies. [42]
- **Dependence on Wastewater Volume:** The efficiency of WET systems is contingent on the volume and temperature of wastewater available. A minimum flow of approximately 1.5–2 litres per second and a wastewater temperature above 10°C is generally required to operate the system effectively and justify the capital costs. To ensure viability, perform detailed assessments of wastewater flow and temperature in the target area.
- **Emerging Technology Perception:** WET is still considered an emerging technology with some skepticism among industry partners. Pilot projects and case studies can demonstrate effectiveness.

Financial Risks

- **High Initial Capital Expenditure (CAPEX):** Implementing WET systems involves significant upfront investment in equipment and installation, which can be a barrier for many organizations. Exploring financing options can offset initial costs. [41]
- **Uncertain ROI:** The financial benefits of WET systems depend on factors like energy prices, system efficiency, and maintenance costs. Uncertainty in these areas can affect the projected ROI. [47] Financial modelling and sensitivity analyses can improve understanding of potential ROI scenarios. [43]

Regulatory and Policy Risks

- **Regulatory Uncertainty:** The regulatory landscape for WET systems is evolving, leading to potential compliance challenges and delays. [48] This can be mitigated by early engagement with policymakers and industry groups.
- **Permitting and Approval Delays:** Securing necessary permits for WET projects can be time-consuming, especially if the technology is unfamiliar to local authorities. [47] Working closely with relevant parties can streamline the process.

Environmental and Social Risks

- **Environmental Impact of Installation:** The installation of WET systems may involve construction activities that can temporarily disrupt local ecosystems or communities. [48] Ensure that environmental management plans are implemented to minimize impacts.
- **Community Acceptance:** Local communities may have concerns or misconceptions about WET technology, leading to opposition. [47] Engage in transparent communication and community outreach to educate and address concerns.

There are also risks associated with the status quo and continuing to use existing energy systems.

- **Aging Infrastructure:** Traditional energy systems may rely on aging infrastructure prone to inefficiencies and failures, leading to increased maintenance costs and potential system downtimes. [44] This may also result in technological obsolescence and stranded assets as newer, more efficient systems become standard. [45]
- **Rising Operational Costs:** Traditional energy systems are subject to fluctuating fuel prices and increasing carbon taxes, leading to unpredictable and potentially higher operational expenses. [44]
- **Stricter Environmental Regulations:** Governments are implementing increasingly stringent environmental policies. Facilities relying on traditional energy systems may face challenges in meeting new standards, leading to potential fines or required upgrades. Continued use of traditional energy systems can also contribute to GHG emissions.
- **Incentive Missed Opportunities:** Organizations that do not adopt clean technologies may miss out on government incentives, grants, or tax benefits designed to encourage sustainable practices. [42]

Conclusion

Municipalities stand at the forefront of Canada's clean energy transition, and the adoption of WET systems presents a powerful opportunity to lead by example. With proven reductions of up to 80–100% in GHG emissions and operational cost savings, WET offers a compelling environmental and financial solution. Successful implementations in cities like Vancouver demonstrate the scalability, reliability, and ROI of these systems. However, realizing these benefits requires municipalities to act decisively.

Recommended Next Steps for Municipalities

- **Feasibility Studies:** Conduct targeted feasibility studies and heat planning in high-density residential, commercial, and institutional zones to analyze heating needs and assess local opportunities for WET systems.
- **Funding and Financial Incentives:** Integrate federal and provincial funding opportunities, including GMF and LCEF. Many existing projects leverage public and private funds.
- **Innovative Governance Models:** Scale and streamline governance structures to reduce investment risk and accelerate adoption, such as municipally owned utilities (e.g., Vancouver's NEU model) or public-private partnerships.
- **Regulatory and Policy Support:** Establish municipal bylaws or zoning regulations that mandate or incentivize connection to WET infrastructure, ensuring consistent system uptake. Municipalities also need to develop a regulatory environment that addresses cost and access to the use of sewage heat. Examples include the City of Richmond district energy utility bylaws and the City of Burnaby's District Energy Policy.
- **Strategic Partnerships and Collaboration:** Foster strategic partnerships with technology providers, infrastructure developers, and industry experts to optimize project implementation and performance.
- **Community Engagement and Education:** Prioritize early engagement through transparent communication, partner consultations, and educational initiatives to identify opportunities and adopt WET technologies and DESs.

Taking Action

Despite the available technology and potential ROI, there are still barriers to cleantech adoption. We cannot point to one reason why adoption is not happening at scale or to one clear mechanism for making it happen.

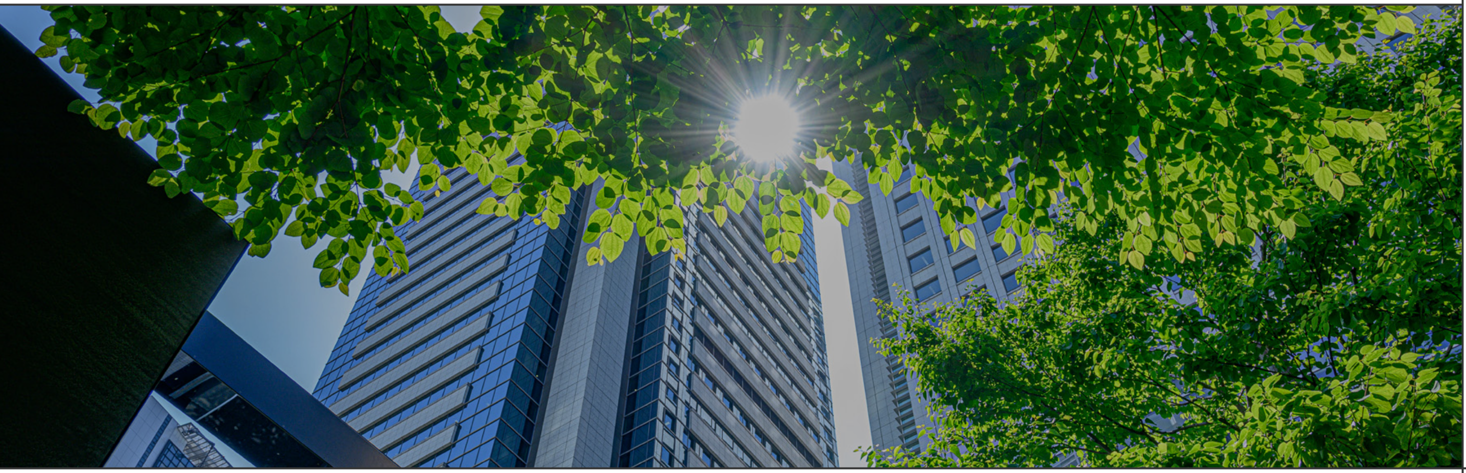
So how can we catalyze cleantech adoption?

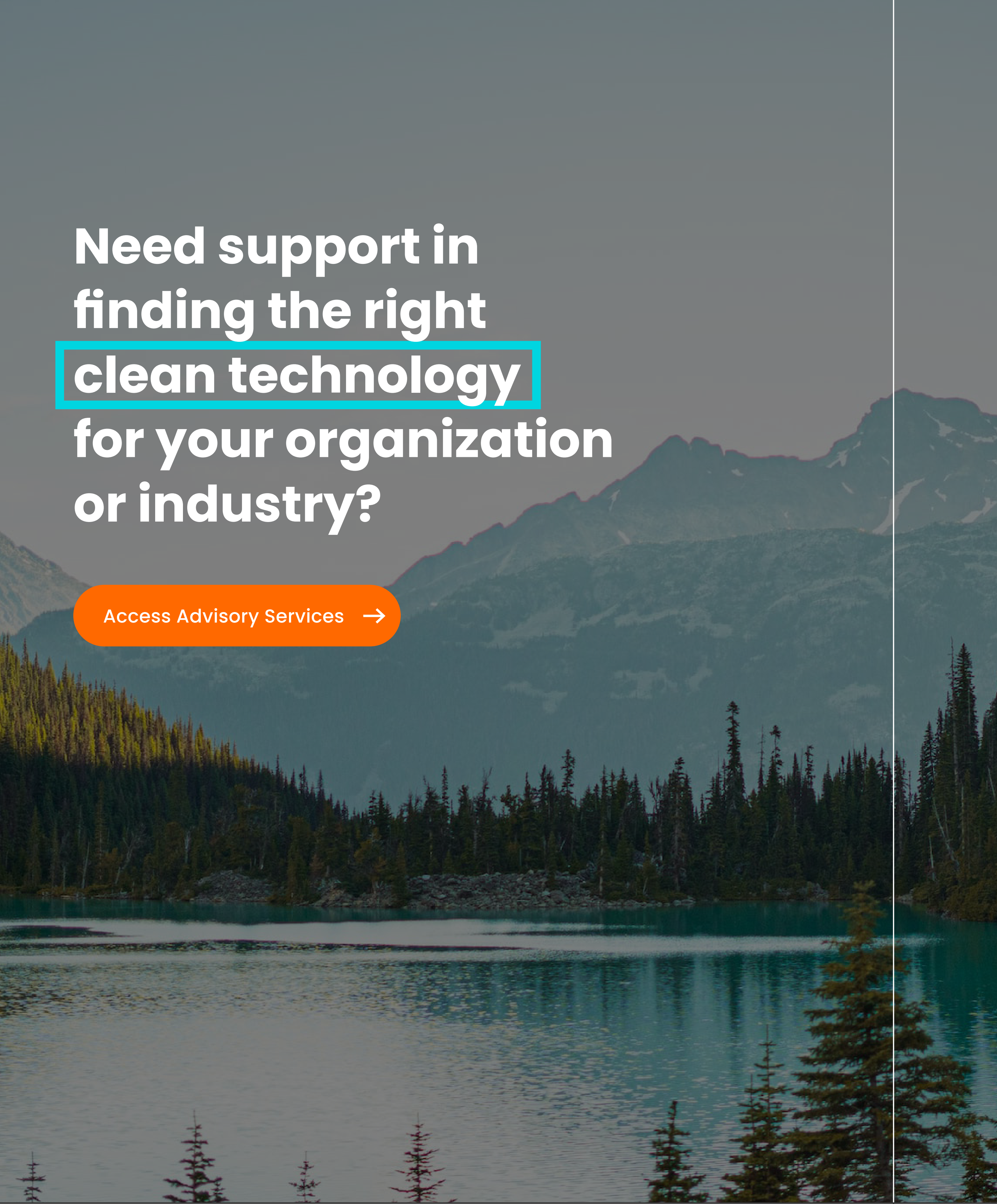
1 **First, acknowledge that despite the risk of adopting new technology, following the status quo in today's environment is riskier. There is an opportunity ready to be taken.**

2 **Evaluate your capacity. Can the integration of new technology be handled by internal staff, or do you need external advisors?**

3 **What barriers exist? What buy-in is needed?**

4 **Look for resources. Explore available funding or partnership opportunities.**





Need support in finding the right clean technology for your organization or industry?

Access Advisory Services →

References

1. Natural Resources Canada. Renewable heating and cooling systems. https://natural-resources.canada.ca/science-data/science-research/research-centres/renewable-heating-cooling-systems (2022).
2. https://council.vancouver.ca/20240723/documents/r3_CEAP_2024_Annual_Report.PDF.
3. District Energy Systems. *BC Climate Action Toolkit* https://toolkit.bc.ca/tool/district-energy-systems-2/ (2021).
4. Hajłasz, M., Helmcke, S., Liebach, F., Schleyer, T. & Somers, K. Waste not: Unlocking the potential of waste heat recovery. https://www.mckinsey.com/capabilities/sustainability/our-insights/waste-not-unlocking-the-potential-of-waste-heat-recovery (2023).
5. Turns, A. The neglected clean heat we flush down the drains. *BBC* (2024).
6. Camargo, A. M., Silber-Byrne, B. D. C., Schulman, B. D. C. & Magavi, H. Z. The future of heat: Thermal energy networks as an evolutionary path for gas utilities toward a safe, equitable, just energy transition. https://www.aceee.org/sites/default/files/proceedings/ssb24/assets/attachments/20240722163127593_770c2285-1b3b-4b4c-a1ed-09d4a7ad7e28.pdf.
7. Benson, G. The Confusion, Brilliance, and Optimism of Thermal Energy Networks. *George Patrick Richard Benson* https://georgeprbenson.com/the-confusing-and-brilliant-world-of-energy-networks/ (2025).
8. City of Vancouver. Climate Emergency Plan. https://vancouver.ca/green-vancouver/vancouvers-climate-emergency.aspx.
9. Sharc energy. Why Sharc. https://www.sharcenergy.com/why-sharc/ (2024).
10. Sharc Energy. SHARC Energy and Subterra Renewables Partner to Deliver $200M in Thermal Energy Solutions. https://www.sharcenergy.com/news/press-release/sharc-energy-and-subterra-renewables-partner-to-deliver-200m-in-thermal-energy-solutions/ (2023).
11. European Heat Pump Association. heat to save energy - and the EU policy that matters. https://www.ehpa.org/wp-content/uploads/2024/12/Waste-into-wealth-through-industrial-heat-pumps-report_EHPA_December-2024.pdf.
12. City of Vancouver. False Creek Neighbourhood Energy Utility (NEU). https://vancouver.ca/home-property-development/southeast-false-creek-neighbourhood-energy-utility.aspx#:~:text=Low%20carbon%20expansion,to%20more%20homes%20and%20businesses.
13. City of Vancouver. 2025 False Creek Neighbourhood Energy Utility Customer Rates. Preprint at https://council.vancouver.ca/20241203/documents/spec1e.pdf (2024).
14. https://questcanada.org/wp-content/uploads/2018/08/2011_SouthEast-False-Creek-Neighbourhood-Energy-Utility.pdf.
15. Us Epa, O. Greenhouse Gas Equivalencies Calculator. *US EPA* https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results (2015).

16. The Toronto Western Hospital WET™ Project —. *Noventa Energy* **https://www.noventaenergy.com/toronto-western-hospital**.

17. Harvey, I. Toronto Western Hospital dives into $43 million WET project. *Daily commercial news* (2022).

18. Toronto Western Hospital Retrofit. **https://cib-bic.ca/en/projects/green-infrastructure/toronto-western-hospital-retrofit/**.

19. Dodge, D. Toronto Western Hospital to get 90% of its Heat from the Sewer and Heat Pumps. Preprint at **https://greenenergyfutures.ca/episode/toronto-hospital-gets-90-percent-of-its-heat-from-sewer-heat-pumps#:~:text=If%20you%20think%20this%20sounds,%2443%20million%20wastewater%20heating%20system.** (2025).

20. **https://www.uhn.ca/corporate/AboutUHN/Greening_UHN/Documents/UHN-Energy-Plan-2024-2029.pdf**.

21. Canada's Greenhouse Gas Offset Credit System Emission Factors and Reference Values Version 2.0. *Environment and Climate Change Canada* **https://publications.gc.ca/collections/collection_2024/eccc/En84-294-2024-eng.pdf** (2024).

22. Renewable heat – Renewables 2022 – Analysis. *IEA* **https://www.iea.org/reports/renewables-2022/renewable-heat**.

23. Parkinson, L. City of Vancouver neighbourhood energy utility. **https://council.cleanairpartnership.org/wp-content/uploads/2021/12/Linda-Parkinson-_Presentation.pdf**.

24. Riehl, J. P. A. M. Can Canada's electricity systems handle the electrification of buildings? **https://www.naviusresearch.com/wp-content/uploads/2024/04/Navius-Report-Impact-of-building-electrification-on-canadas-electricity-systems-2024-04-08.pdf**.

25. Hydro, B.C. Energizing the economy report. **https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-matters/2025-05-05-Energizing-economy-report.pdf** (2025).

26. Government of Canada, Innovation, Science, Economic Development Canada & Canada, I. Funding and support opportunities. **https://ised-isde.canada.ca/site/clean-growth-hub/en/funding-opportunities** (2025).

27. Home. *Alberta Utilities Commission* **https://www.auc.ab.ca/** (2021).

28. Ontario Energy Board. Ontario energy board. **https://www.oeb.ca/**.

29. City of Edmonton. District Energy Strategy. **https://www.edmonton.ca/sites/default/files/public-files/District-Energy-Strategy.pdf?cb=1756275319**.

30. Talukder, S. Climate Briefing: A Smart Heating Solution For Canada's Fiscally-Strained Municipalities. *RBC* **https://www.rbc.com/en/thought-leadership/climate-action-institute/building-reports/climate-briefing-a-smart-heating-solution-for-canadas-fiscally-strained-municipalities/** (2024).

31. Ministry of Energy and Climate Solutions. **https://www2.gov.bc.ca/gov/content/governments/organizational-structure/ministries-organizations/ministries/energy**.

32. City of Vancouver. Neighbourhood Energy Utility Connectivity Guidelines and Requirements **https://guidelines.vancouver.ca/guidelines-neighbourhood-energy-utility-connectivity-requirements.pdf**.

33. Canada Revenue Agency. Clean Economy investment tax credits. **https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/business-tax-credits/clean-economy-itc/multimedia-gallery/ceitc.html** (2025).

34. Environment & Canada, C. C. Output-based pricing system proceeds fund: Decarbonization Incentive Program. **https://www.canada.ca/en/environment-climate-change/services/climate-change/carbon-pollution-pricing-proceeds-programming/output-based-pricing-system-proceeds-fund/decarbonization-incentive-program.html** (2022).

35. Funding opportunities. **https://greenmunicipalfund.ca/funding**.

36. Renewable and alternative energy program. *Alberta Innovates* **https://albertainnovates.ca/funding/renewable-and-alternative-energy-program/** (2023).

37. Energy Efficiency Retrofit Program. *BC Housing* **https://www.bchousing.org/projects-partners/asset-management-redevelopment/energy-efficiency-retrofit-program**.

38. Hydro Quebec. Innovative Projects Program. **https://www.hydroquebec.com/business/energy-savings-business/innovative-projects-program.html**

39. IESO launches two new save on energy programs. **https://www.ieso.ca/en/Sector-Participants/IESO-News/2024/09/IESO-Launches-Two-New-Save-on-Energy-Programs**.

40. Wastewater energy transfer flush with potential - REMI Network. REMINET **https://www.reminetwork.com/articles/wastewater-energy-transfer-flush-with-potential/** (2025).

41. Federation of Canadian Municipalities. **https://fcm.ca/en**.

42. Natural Resources Canada. Spotlight on energy efficiency. **https://natural-resources.canada.ca/stories/spotlight-energy-efficiency** (2019).

43. Canadian Climate Institute. Mobilizing Private Capital for Climate Adaptation Infrastructure. **https://climateinstitute.ca/wp-content/uploads/2023/05/mobilizing-private-capital-climate-adaptation-infrastructure.pdf**.

44. District Heating. *IEA* **https://www.iea.org/energy-system/buildings/district-heating**.

45. City of Vancouver. 2022 False Creek Neighbourhood Energy Utility Customer Rates **https://council.vancouver.ca/20211201/documents/1e.pdf**.

46. IEA, Improving industrial waste heat recovery – Analysis **https://www.iea.org/articles/improving-industrial-waste-heat-recovery**

47. Enwave Interview 2025

48. SHARC Interview 2025

49. Vancouver NEU Interview 2025