PRIMER

Wastewater Energy Transfer

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Overview

Wastewater Energy Transfer (WET) systems use thermal energy contained in raw or treated wastewater to deliver high efficiency, low-carbon heating and cooling to residential and commercial buildings. Since wastewater maintains relatively stable temperatures year-round, it provides a reliable and renewable energy source that can supplement or replace more carbon-intensive heating and cooling systems. As communities look for cost-effective ways to reduce emissions, WET systems present a practical option, especially where sewer infrastructure and nearby heating and cooling demand already exist.

Written by:

Bret Collins
Municipal Decarbonization
Program Advisor
Canadian Water Network (CWN)

Dana Mears
Project Manager, Urban Water
Decarbonization
Canadian Water Network (CWN)

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How WET systems work

WET systems capture and repurpose waste thermal energy from both high- and low-grade sources, including industrial processes, cooling systems, and raw sewage or treated wastewater. While the direct capture of high-grade energy from industrial processes can be used for residential and commercial heating and cooling, the geographic location of industrial complexes in Canada presents technical and logistical challenges for transporting the energy. As a result, this project will focus on the capture of thermal energy stored in both raw sewage and treated wastewater.

When wastewater flows through sewer pipes or into treatment facilities, it carries thermal energy, in the form of heat ranging in temperatures from 10°C to 25°C from showers, dishwashers, commercial buildings, and industrial processes. WET systems capture this heat using specialized equipment and then use it to warm or cool water circulating through local energy networks or individual buildings.

System types

There are two main types of WET systems. Each is suited to different wastewater temperatures and project scales.

- **Passive systems:** These use heat exchangers to transfer heat directly from wastewater to a clean water loop. They are simple, efficient, and work well when the wastewater temperature is already close to the temperature needed on the building side.

- **Active systems:** These include a heat pump that boosts the temperature to a usable level. Active systems are more flexible and can provide higher temperatures, making them useful for district energy systems or larger buildings with varying heating and cooling needs.

Regardless of the system type, WET systems operate based on thermodynamic principles of heat exchange. They use surfaces that transfer heat efficiently and heat pumps designed to handle dirty wastewater, including solids. The technologies described below represent the most commonly deployed configurations across Canadian systems.

- **Plate heat exchangers:** These consist of thin metal plates stacked together to form channels through which fluids flow, allowing heat to be transferred efficiently across the plate surfaces. Due to their design, plate heat exchangers are compact, highly efficient, and well suited for applications with limited space.

- **Shell and tube heat exchangers:** These systems consist of a bundle of tubes enclosed within a cylindrical shell. One fluid flows through the tube bundle, while the other circulates within the shell. Shell and tube designs are very robust and well suited for applications involving high pressures and temperatures, making them common in industrial applications or when utilizing wastewater which is pressurized.

- **Heat pumps:** Heat pumps extract heat by cycling a refrigerant through an evaporator that absorbs thermal energy. The refrigerant is compressed to increase its temperature and release heat using an evaporator. Heat pumps can be integrated with both plate and shell-and-tube heat exchangers, which enables the recovered heat to be upgraded to suitable temperatures for district energy applications (above 60°C).

Pictured: Vancouver, British Coumbia

Adoption of WET systems

WET systems have been deployed in Canada for over a decade, beginning with the False Creek Neighbourhood Energy Utility (NEU) to provide heating solutions for the 2010 Olympic Village in Vancouver. Since then, the adoption of both small-scale and large-scale WET systems has expanded across Canada. This growth has been especially notable in provinces such as British Columbia and Ontario, where deployment has accelerated as communities look for new low-carbon energy solutions.

Canadian examples

- **Vancouver – Southeast False Creek NEU:** The NEU supplies most of the neighbourhood's heating needs by recovering heat from wastewater. A 6.6 MW expansion completed in 2024 further increased its capacity, supporting Vancouver's plan for 100 percent renewable energy by 2030. As of 2025, the system offsets 7,070 tonnes of CO_2.
- **Markham District Energy – Low Carbon Energy Centre:** An 18.75 MW WET system is set to reduce emissions while supplementing other low-carbon sources. The system is expected to reduce emissions by more than 30,000 tonnes of CO_2 per year.
- **Toronto Western Hospital:** A 19 MW system meets up to 90 percent of the hospital campus' heating and cooling demand and reduces annual emissions by about 8,400 tonnes of CO_2 per year.

International examples

WET systems have operated internationally for decades, particularly in Scandinavia. Sweden and Norway were early adopters in the 1980s.

- **Hammarbyverket in Stockholm, Sweden:** Built in 1986, this facility uses cleaned wastewater from the Henriksdal wastewater treatment facility to form the base heat production for the city's district energy system. With seven heat pumps that deliver 225 MW of thermal energy into the district energy system, the Hammarbyverkt facility is recognized as the world's largest heat pump plant that extracts heat from wastewater.

Pictured: Oslo, Norway

- **Sandvika Energisentral in Sandvika, Norway:** Developed in 1988, the facility was both the northernmost and the first of its kind in Norway, initially producing 13 MW of thermal energy. An additional 10 MW capacity was added in 2008.
- **Skøyen district in Oslo, Norway:** The Skøyen district is recognized as one of the pioneers of capturing the thermal energy in wastewater to provide urban heating. The facility has a thermal heating capacity of 18.7 MW and supplies 7.8 percent of the district heating energy needs.

Technical drivers and deployment constraints

The use of WET systems in district energy has expanded rapidly in Canada over the past 15 years. This has been driven by the need to meet municipal emission targets through low-cost, low carbon heating and cooling in urban areas. Progress in technology, shifting economic conditions, and supportive policies have all enabled this growth, though each factor also brings implementation challenges.

Technical considerations

Technological improvements in heat pumps and heat exchangers have increased system efficiency and flexibility, allowing both passive and active WET systems to operate effectively in dense urban environments and integrate into existing district energy systems (DESs) and thermal energy networks (TENs). Projects like the Markham District Energy project show that WET can also be paired with other low carbon sources, such as biomass, and legacy infrastructure to provide numerous heating and cooling options for connected buildings.

Economic considerations

The economic feasibility of projects varies widely. It is influenced by project scale, system complexity, and local natural gas prices. Large urban systems can be advantageous due to economies of scale, resulting in shorter payback periods. Smaller communities, especially those without existing district energy networks, face high upfront capital costs that can limit adoption even when long-term benefits are clear. The removal of the Canadian carbon tax program also presents additional financial risk when developing business cases for WET systems. Moving forward, there is a greater need to explore additional grants, tax structures and classifications, and funding programs to reduce the financial risk and improve the business case viability.

Policy and governance

Government policy is a major driver of WET deployment. Regions with strong building performance standards, such as Vancouver and B.C., see higher adoption rates. Municipalities that have established firm goals of achieving carbon emission reduction targets have demonstrated their willingness to support WET projects. Public private partnerships and targeted regulations can further reduce project risk and help align financial and environmental objectives to accelerate implementation.

Join the WET Community of Practice

To accelerate learning and reduce barriers to implementation, Canadian Water Network (CWN) is establishing a Community of Practice (CoP) focused on WET. This CoP will connect municipalities, utilities, and developers eager to explore WET systems with sector leaders who have practical experience in delivering WET projects.

Participants will have opportunities to:

- Learn from real-world WET projects.
- Access technical insights, tools, and best practices.
- Connect with peers facing similar challenges and opportunities.
- Participate in workshops, knowledge exchanges, and project showcases.
- Help shape national dialogue on low carbon thermal energy recovery.

Whether you are exploring WET for the first time or already deploying systems, your experience, and perspective are valuable to the national discussion.

If you're interested in joining the WET Community of Practice, receiving updates when it launches, or accessing case studies that showcase WET projects across Canada and internationally, please contact Dana Mears at dmears@cwn-rce.ca.