Energy from Wastewater

Capturing and reusing thermal energy from wastewater systems

Considering a wastewater project?

Many Vermont communities are taking advantage of new levels of state and federal funding to install, expand, and/or upgrade local water and wastewater systems.

This is the time to add wastewater heat recovery.

About 50% of the energy we use in our buildings goes to heating, cooling, and hot water. We can provide a lot of that thermal energy by capturing and reusing the heat we currently send down the drain.

A wastewater heat recovery system fits in with other wastewater and water infrastructure, requires minimal space, and provides multiple benefits.

The technology is proven and low maintenance. The heat is free and available all the time.

Wastewater has energy. We can repurpose it.

We can recover heat from wastewater to make potable hot water and to heat and cool buildings.

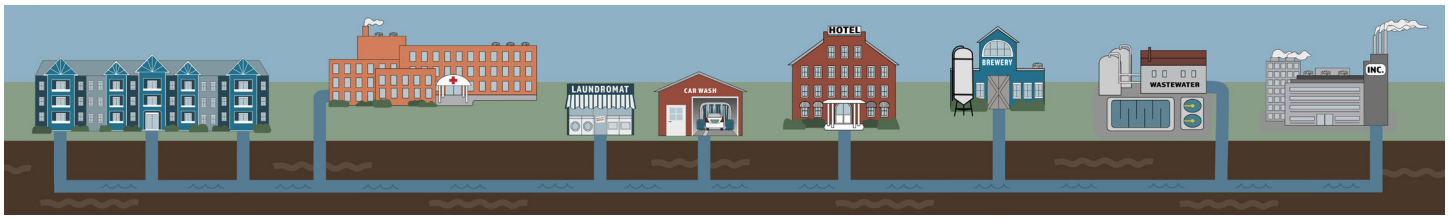
Wastewater can be a heat source or a heat sink, meaning that we can use its thermal energy to make heat and hot water or reject excess heat into the wastewater stream to make buildings cooler.

Wastewater is a continuous source of energy.

We take showers, wash dishes, and do laundry all year round.

- The average person uses 24-30 gallons of hot water per day at 120-140°F.
- Businesses and industries use a lot more water, often at higher temperatures.

That heated water is flowing down drains and out of our buildings as wasted energy and money.



No matter the region or time of year, wastewater exits a building at consistent temperatures.

- The average residential wastewater temperature is 70°F.
- Commercial and industrial wastewater can get up to 140°F or higher.

Even in winter, wastewater in underground sewer pipes carries heat that we can capture and reuse.

Wastewater at volumes we can use for heat can come from a wide range of buildings, including:

- Larger residential buildings such as apartments, student housing, or senior living.
- Commercial buildings such as hospitals, breweries, hotels, and even a car wash or laundromat.
- Industrial facilities that require water in their processes.

This heat can be captured within the building and reused for hot water or building heating and cooling. If it is carried away from the building, it can be captured later in the sewage system.

Tapping local heat

To capture heat from wastewater that enters a sewage system, we can intercept it at a sewer line or as it flows into a wastewater treatment plant.

Getting energy we can use from wastewater

Wastewater heat recovery systems turn a sewer into a heat exchanger.

- The technology is simple, involving pipes, pumps, and holding tanks.
- The system is sealed and odor free, keeping wastewater separate from the water it heats.

How it works:

- Wastewater is routed into a holding tank that acts as a thermal battery and smooths out fluctuations in flow or temperature.
- Solids fall to the bottom and are flushed out.
- The warm sludge flows into a heat exchanger that works like any heat pump, compressing lower temperatures into usable heat.
- The extracted heat—just the heat, not the wastewater itself—is transferred to potable water in pipes for use as domestic hot water or to heat and cool buildings.
- The wastewater is piped back into the sewage system.

Reaping the benefits

While we work hard to improve our buildings, the wastewater line is one place where we consistently lose energy and money. By harnessing heat from wastewater, we can put that energy back into buildings, lowering our overall energy use, costs, and emissions.

- Inflation Reduction Act incentives make the installation of heat recovery systems a valuable addition to wastewater projects.
- The systems are low-maintenance and offer lower, predictable customer heating and cooling bills.
- Greenhouse gas emissions drop dramatically as the system harvests existing thermal energy.
- Highly efficient water source heat pumps use less electricity than other clean energy solutions.

Using heat that has already been produced and paid for reduces energy costs over time and creates overall savings. Some examples:

Neighborhoods

False Creek, a Vancouver community, is reducing emissions by 62% and saving 3,500 tons of CO_2 by repurposing waste heat. A network of underground pipes distributes heat to over 34 buildings and is expanding to serve other neighborhoods.

Leləm Village, an Indigenous-owned development in Canada, uses the municipal sewer line to create a thermal network. Each building uses a ground source heat pump to connect to the loop and provide heating, cooling, and hot water.

Single Buildings

A 247-room hotel in Alberta is cutting energy costs by 60% by recovering heat from wastewater from four industrial laundry machines. The system allows the resort to stop using 6,000 gallons of propane per year, reducing emissions by 35 tons of CO_2 annually.

A 60-unit development of townhomes in North Vancouver is saving homeowners up to 75% in energy costs per year, reducing fossil fuel use by 9,350 therms per year, and cutting emissions by 49.6 tons of CO_2 per year.

Installing or expanding a wastewater system is an opportunity to maximize thermal energy, cut costs, meet climate goals, and use the heat we already have to benefit our communities.