

# Moving Heat

## *How Thermal Energy Networks recycle the heat we already have*

As Vermonters, we take pride in braving the cold of deep, long winters, but many of us also appreciate the comfort of feeling warm on chilly days and cool in summer heat.

As our climate shifts and we experience more extreme weather, staying comfortable will become more difficult.

### **We have an opportunity to mobilize a local resource to meet this challenge.**

The solution lies in how we think about heat—not only how we use it, but also how we reuse it.

### **Heat is energy. We can capture it, move it, and repurpose it.**

In our colder climate, we already put a lot of time, effort, and money into staying warm in the winter—stacking wood, insulating windows, filling fuel tanks, and paying heating bills.

Meanwhile, heat is purposefully vented from large buildings in our communities such as grocery stores, ice arenas, factories, and data centers.

This waste heat can be recovered in *Thermal Energy Networks* and recycled to keep our homes and communities warm.

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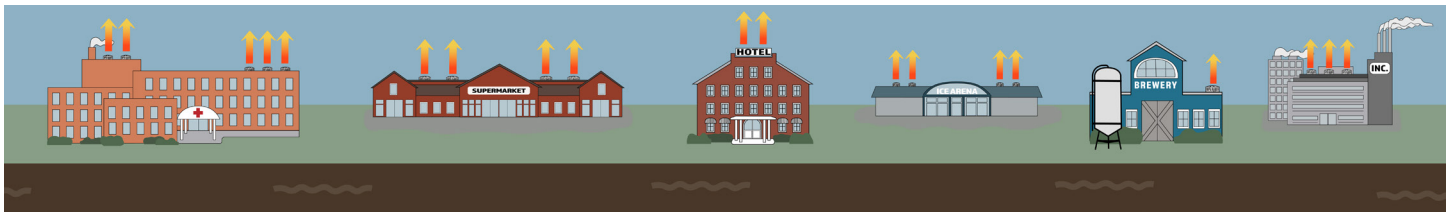
### **How it works:**

Thermal energy can be harvested using standard heat recovery equipment and carried to buildings by water in a network of underground, horizontal pipes that not only share excess heat *among* buildings, but also capture the heat that's venting from buildings, adding it to the network.

These pipes form *closed loops* that move heat where it's needed.

Inside each building, a water source heat pump amplifies that moderate temperature water—about 50°F—to higher temperatures for space heating and hot water.

In the summer, the heat pump makes buildings cooler by rejecting unwanted heat back into the system or storing it underground.



**We can see heat in a whole new way, then move it to where it's needed, and move us closer to our clean energy community goals.**

## WHERE TO FIND WASTE HEAT

To find existing heat in your community, look for:

- **Ventilation systems on larger buildings** such as hospitals, hotels, apartment or office buildings, schools, libraries, stores, bakeries, restaurants, and factories that use heat for production,
- **Large refrigeration or cooling systems** in ice arenas, grocery stores, cold storage facilities, data centers, telecommunications facilities, and manufacturing facilities,
- **Businesses or buildings that generate lots of wastewater** such as wastewater treatment plants, hotels and multi-family buildings, laundromats, large restaurants, and food production or other manufacturing facilities.

## WHERE WE CAN USE WASTE HEAT

Excess heat can be recirculated to buildings within about ¼ mile of where it's vented.

For example, waste heat from a large supermarket refrigeration system could provide heat and hot water to about 15-30 nearby homes.

**Exchanging heat between thermal energy resources and users can start small:**

- An ice arena near a high school,
- A hospital and an adjacent senior housing complex, or
- A telecommunications facility next to an apartment building.

**A Thermal Energy Network can include facilities or equipment that can store heat...**

- Warm or hot water tanks,
- Ice storage,
- High-temperature energy storage, or
- Other advanced heat storage technologies.

**... and incorporate other thermal energy resources:**

- Solar panels—PV Thermal systems—can provide heat or accept rejected heat as well as create electricity needed to operate the network.
- Thermal energy from wastewater and/or geothermal borefields can provide heating, cooling, hot water, and storage, diversifying and stabilizing the network.

### **Thermal Energy Networks are working—saving both energy and money.**

- An ice rink in Vancouver provides heat and hot water to nearby buildings—the equivalent of 43 homes—by sharing heat that's removed during the freezing process. Operating the ice rink refrigeration systems is two to three times more efficient and dramatically reduces fossil fuel use at buildings receiving the recycled heat.
- Another neighborhood in Vancouver is cutting greenhouse gas emissions from buildings in half and meeting about 70% of its heating and cooling needs by recovering heat from a wastewater treatment plant.