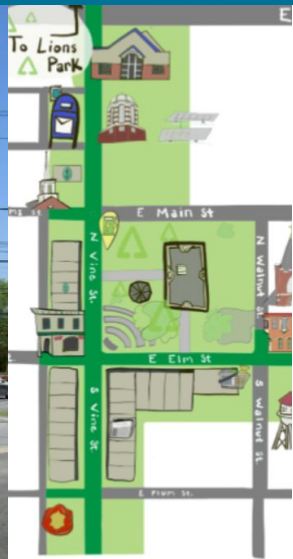




Municipal Thermal Energy Network Accelerator



SUSTAINABLE
WESTCHESTER



THANK YOU TO OUR FUNDER!

*The New York
Community Trust*
of Westchester

A COLLABORATION BETWEEN:



Chatham House Rule

When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.

[Chatham House Rule - Wikipedia](#)

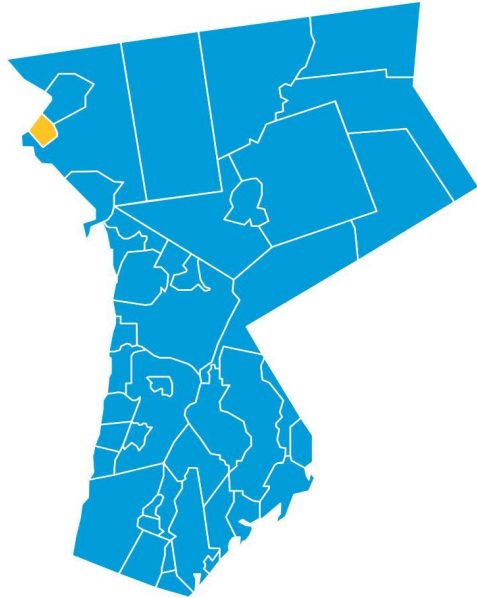


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*SHARED SERVICES & SOLUTIONS:
DOING MORE TOGETHER*



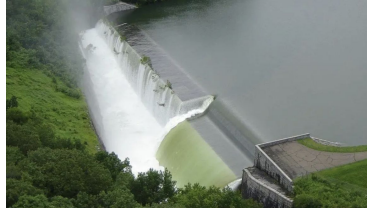
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OUR PROGRAMS

COMMUNITY ENERGY

WESTCHESTER POWER



COMMUNITY SOLAR

ELECTRIFICATION SOLUTIONS

ENERGYSMART HOMES



SUNSHINE TO EV

GRID EFFICIENCY

Shift the Power.
GridRewards

GRID REWARDS™

ZERO WASTE



RECYCLE RIGHT APP

BUILDING DECARBONIZATION



Meet the Team: Sustainable Westchester



Lauren Kroell
Senior Program Manager, Building
Decarbonization (Commercial)

SW Partners

For over 30 years, the **Pace Energy and Climate Change Center** has been a leader working at the intersection of energy and the environment. We engage government decision makers and key stakeholders with robust research and analysis in law and policy. Over time, the Center has grown from its initial focus on energy regulatory law and policies to tackle transportation and fuels, as well as climate change mitigation and resilience.

IGSHPA is a non-profit member-based organization established in 1987 to advance ground source heat pump (GSHP) technology on local, state, national, and international levels. It brings together industry professionals and leading experts to develop standards and accreditation, as well as other geothermal industry resources such as publications that cover industry developments.



Meet the Team: Pace Energy & Climate Center



Emma Lagle

Energy Policy Advisor & Regional Affairs Manager

Introduce Yourself!



Program Objectives

EDUCATE municipalities on thermal energy networks – how do they work, what are the benefits, and what are the barriers to adoption.

PROVIDE the tools necessary for municipal adoption of the ANSI/CSA/IGSHPA 448 Standard (the Standard) to complement the existing code.

DELIVER tailored recommendations for ownership models, financing strategies, and project implementation best practices.

MAINTAIN program flexibility to adapt curriculum based on topics of interest to (and evolving needs of) participants.

INTRODUCTION TO THERMAL ENERGY NETWORKS

THERMAL ENERGY NETWORKS ARE THE KEY TO EQUITABLE BUILDING DECARBONIZATION

“To place the challenge of decarbonizing the building sector into perspective, New York State must fully decarbonize over 400 buildings each day for thirty years to meet the Climate Act’s 2050 mandate.”

– Pace Energy and Climate Center & NYSERDA (June 2021), *Overcoming Legal and Regulatory Barriers to District Geothermal in New York State* ([Link](#))



WHAT IS A THERMAL ENERGY NETWORK?

WHAT DO YOU KNOW ALREADY?

- Have you heard of thermal energy networks?
- Do you know how they work?

IN ONE SENTENCE:

A highly efficient and clean system of underground pipes that provides heating and cooling to a diverse set of buildings, using heat pumps.

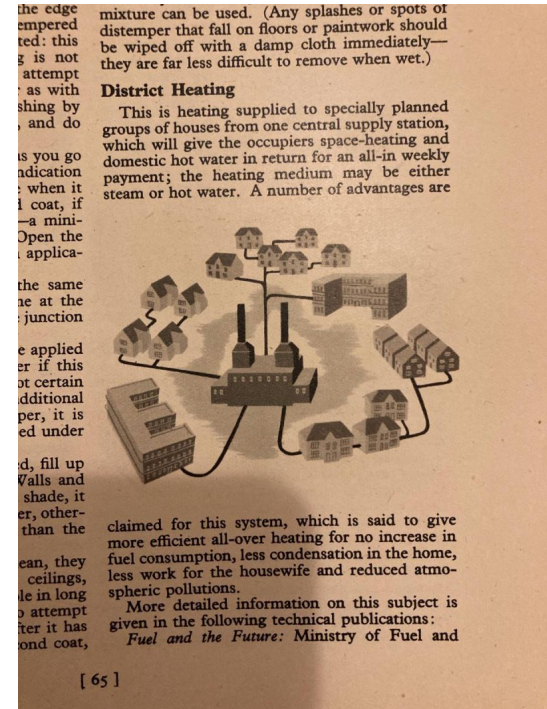
Definitions

- **Heat Pump:** An electric appliance that concentrates and moves heat from one location to another
- **Heat Exchanger:** A device used to transfer heat from one fluid to another
- **Thermal Energy Network:** A heating and cooling delivery system which connects multiple buildings to heat sources or sinks. Also commonly referred to as a District Geothermal* or Community Heat Pump system
- **Heat Source/Sink:** A thermal reservoir for heat from a Thermal Energy Network to be rejected or extracted from a Thermal Energy Network
- **Off-Takers:** Customers connected to a shared Thermal Energy Network
- **Ambient Loop:** A distribution of an ambient temperature solution - typically water and glycol (or alternative Heat Exchange Fluid) - that circulates to transfer heat to and from off-takers
- **Boreholes/Borefield:** Holes drilled into the Earth that transfer heat to and from a building or ambient loop. A borefield is a collection of multiple boreholes
- **Load Profile:** An estimate of or actual energy use over a period of time
- **Load Diversity:** A collection of buildings with different load profiles

*District Geothermal vs. Thermal Energy Networks: these terms are often conflated - more on that later!

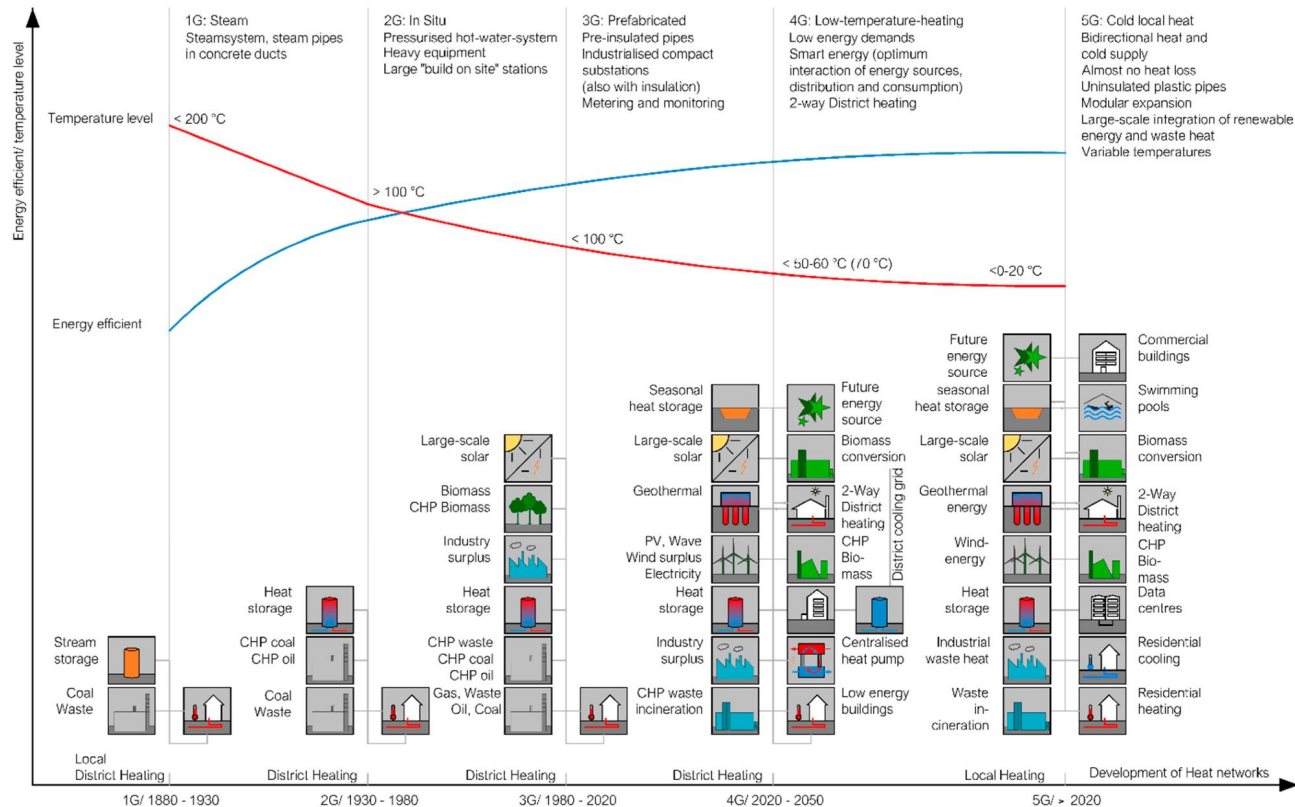
History Lesson!

- The first district heating system as a commercial enterprise is attributed to Birdsell Holly who deployed a system in Lockport, NY in 1877
- 1st generation system used steam to transport heat to individual buildings (NYC is the most common example of a 1st generation district heating and system)
- 2nd and 3rd generation systems – hot water systems
- When we talk about Thermal Energy Networks, we are generally referring to 4th and 5th generation district heating and cooling systems. One important feature of 4th and 5th generation systems is that they are low enough temperature that they can take advantage of shallow geothermal
- Geothermal heat pumps have been around since at least the 1940s



[Source](#): Good Housekeeping, 1951

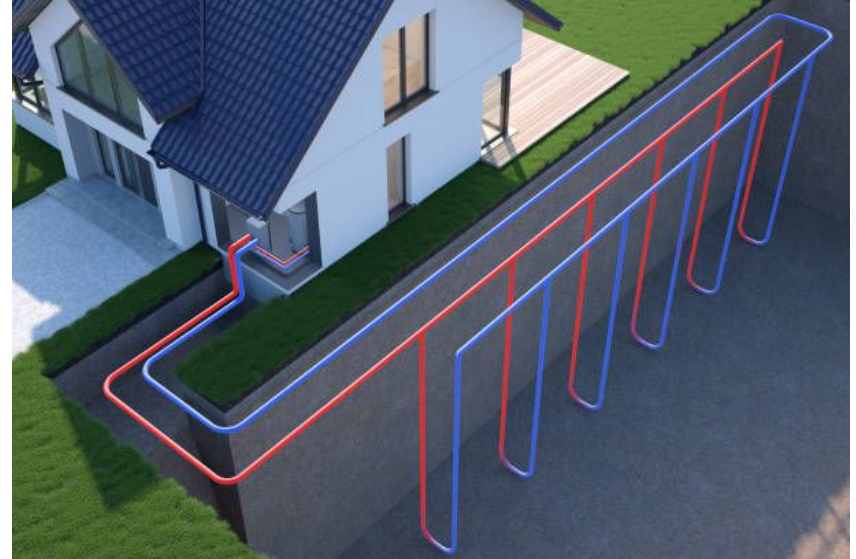
Evolution of District Energy Systems



Source: Zeh, Robin & Ohlsen, Björn & Philipp, David & Bertermann, D. & Kotz, Tim & Jovic, Nikola & Stockinger, Volker. (2021). Large-Scale Geothermal Collector Systems for 5th Generation District Heating and Cooling Networks. Sustainability. 13. 6035. 10.3390/su13116035.

Thermal Energy Network Basics

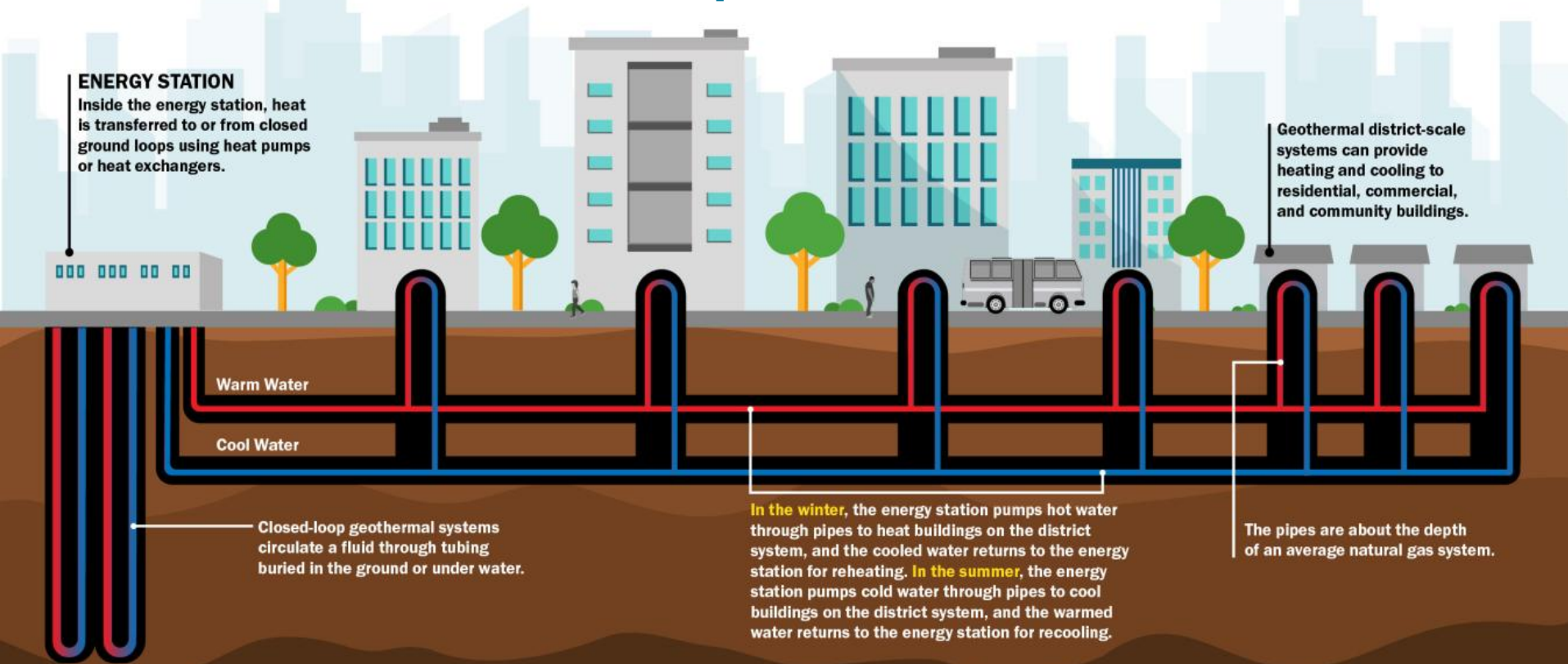
- **Geothermal heat pumps** work by extracting heat from the ground in the winter and rejecting heat to the ground in the summer.
- A **district geothermal system** can utilize the same system to heat and cool multiple buildings.
- A **thermal energy network** may incorporate a district geothermal system but goes further – waste heat is recovered and reused and a separate pipe loop can be used for heating as well as cooling.



Example of a residential geothermal heat pump.

District Geothermal Example

Source: [U.S. Department of Energy](#)

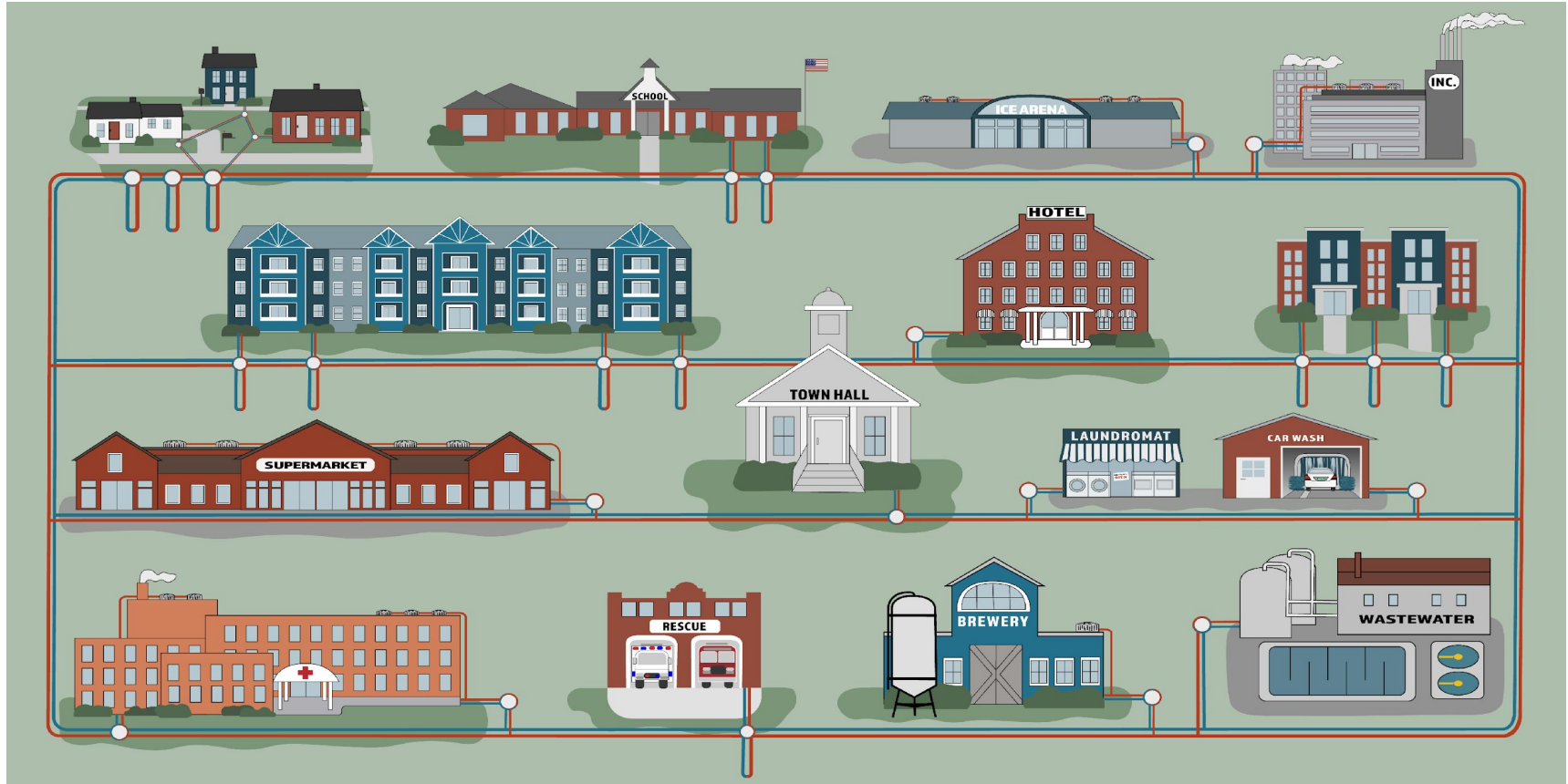


Geothermal District Heating & Cooling 101

This illustration is one configuration of a geothermal district heating and cooling (GDHC) system, in this case using geothermal heat pumps. There are many other GDHC solutions that might also work for your community.

Thermal Energy Network Example

Source: [Vermont Community Thermal Networks](#)



BENEFITS OF A THERMAL ENERGY NETWORK

SAFE & CLEAN

With no oil or gas in the pipes, there's no risk of explosions or hazardous leaks. While emissions reductions vary from one project to another, many existing installations have been shown to reduce emissions by up to 90%.

AFFORDABLE & RELIABLE

Customer bills can be low and predictable year-round. Geothermal and other kinds of thermal energy are readily available locally and aren't subject to market changes, so rates for consumers on a network can be stable.

HEALTHY

Burning fuels—whether gas, oil, coal, or wood—creates air pollution that can cause and worsen respiratory and other health conditions. Thermal Energy Networks don't involve any combustion, so indoor and outdoor air is safer to breathe.

FLEXIBLE

Once installed, most of the infrastructure for a Thermal Energy Network is underground, so streets, parks, and natural areas remain unobstructed. As each network is designed for a unique location, systems can fit into Vermont's landscape, protecting sensitive ecosystems.

RESILIENT & SECURE

Durable plastic pipes underground are protected from disruption. Unlike above-ground fuel storage and outside compressors, Thermal Energy Networks are able to withstand extreme weather like storms and flooding.

EQUITABLE

Most people know geothermal energy as a single-home solution available to those who can afford the upfront cost. A Thermal Energy Network can be available to everyone in a neighborhood. Low and moderate income communities can be prioritized, and all can benefit from lower energy bills.

JUST

Side-by-side comparisons of job descriptions for fossil fuel and Thermal Energy Network installations show almost identical skills, so minimal retraining is required and jobs for this skilled labor are maintained. Pipefitters and gas workers are already constructing Thermal Energy Networks in other states.

LOCAL

We can build our own energy systems in our communities. Local businesses, residents, and municipalities can come together to plan and implement Thermal Energy Networks, growing local wealth by harnessing local resources.

Credit: Vermont Community Thermal Networks (www.vctn.org)

Where and When a TEN Makes Sense

- Concurrent local infrastructure projects (water, wastewater, or street repairs)
- The TEN includes new developments that could include geothermal borefields and compatible HVAC equipment
- Potential thermal energy resources (large refrigeration or cooling systems, industrial or manufacturing facilities, data centers, bodies of water)
- Open land or space for geothermal borefield installations



ConEd Pilot UTEN (Chelsea Project) w/ Data Center Waste Heat

How to Identify Potential TEN Opportunities

1. **Inventory thermal energy resources** – waste heat from buildings, waste heat from wastewater, thermal load diversity through mixed-use buildings, municipal land available for geothermal borefields, industrial or process heat, bodies of water
2. **Inventory potential TEN customers** – identify building types, including municipal buildings, hospitals, schools, campuses, or large multifamily housing buildings in dense neighborhoods with significant thermal loads. Prioritize inclusion of affordable housing developments with fossil fuel systems and large buildings with planned envelope upgrades (or compatible HVAC systems)
3. **Identify any projects in development** – private, municipal, and/or infrastructure, to maximize synergies
4. **Create a simple map connecting the identified components of the TEN** – minimized distance between buildings and geothermal installations, as well as reduced disturbance from installation, will have the lowest installation cost. For example – a TEN connecting buildings along a single street

Example: Troy, NY

Figure 4. Phase 3 Proposed Site Plan



What are some barriers to TEN adoption?

1. **High upfront costs** – feasibility study (~\$100k), design (3-10% of construction), and construction costs. Construction includes geothermal drilling, trenching for the ambient temperature pipe loop, may include energy efficiency and interior retrofits for participating buildings
 - Incentives and funding may be able to offset some costs, though some uncertainty to be aware of (e.g. IRA tax incentives)
2. **Requires long-term cooperation and planning ahead** – can involve multiple land or building owners which may be municipalities, individuals, large national corporations, etc.
 - Need to consider how to keep projects moving through changes in leadership
3. **Challenging legal and regulatory environment** – Public Service Commission, NY State and local laws
4. **Forthcoming IGSHPA design standards** – anticipated release in May 2025, statewide efforts to promote adoption to follow

Example project: Troy Riverfront Plaza

Riverfront Plaza at 1 Monument Square

Coming 2025-2026!



Project: Demo and construction of new, signature public plaza, parking garage and grand connection to riverfront park. Creation of an iconic civic space in the heart of downtown Troy.

Sponsors: City of Troy, TLDC, Hoboken Brownstone Co.

Total Public Costs: Approx. \$19.3m

Total Public Awarded: \$4.4m

Total Public Needed: \$14.9m

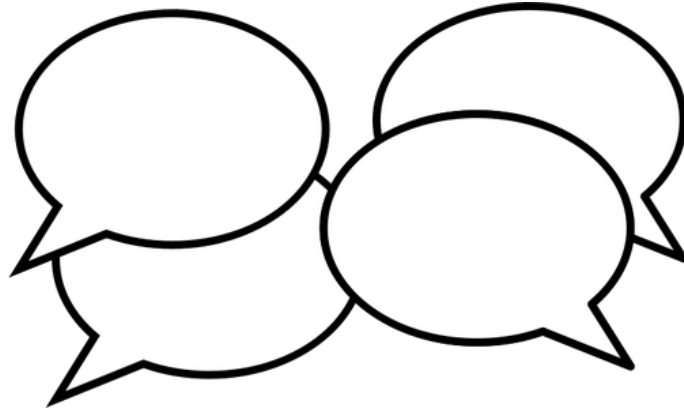
Public Sources: ARPA, DRI, URI, National Grid, Tax-exempt and taxable bonds backed by parking revenue, PILOT payments, and City lease.

- Ambitious plans and ideas for leveraging concurrent infrastructure projects, utilizing proximity to thermal resources
- Projects can still get caught up in delays - some problem solving will be needed

Discussion:

What jumps out to you as a reason thermal energy networks could be good fit for your community?

What's the biggest challenge you anticipate when it comes to implementing thermal energy networks in your community?



Thermal Energy Network Development Lifecycle



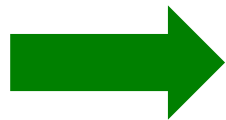
PHASE 0: PRE-FEASIBILITY

Site identification, pre-feasibility
check, municipal TEN accelerator



PHASE 1: FEASIBILITY STUDY

NYSERDA FlexTech Large
Thermal Feasibility Study



PHASE 2: DESIGN

Building the capital stack

PHASE 0: PRE-FEASIBILITY

KEY QUESTIONS TO ASK – RECAP:

- Are there a **range of different building types** in the area?
 - Best to include a mix of building types, with *different load profiles / energy consumption patterns* (restaurants, housing, laundromats, office spaces...)
- Are there **thermal energy resources** (i.e. water bodies, wastewater treatment plants) in the area?
- Are there any **existing (or planned) projects** that would help cut down on implementation costs?
 - Anything involving excavation → reduced costs for boreholes / borefields
- Is there **open space** for borefields?

OTHER PRIORITIES:

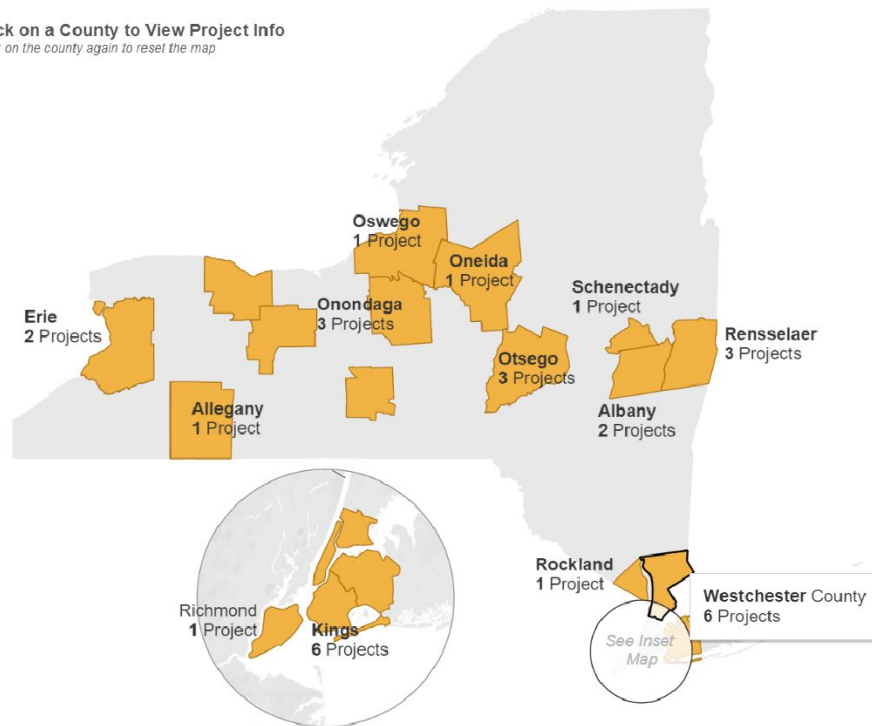
- **Connect with building owners** to gauge interest, assess pre-TEN needs (i.e building envelope improvements), request letters of support
- **Map out** potential sites, minimizing distance between buildings
- **Prepare legislative bodies** to learn about TENs, consider planning needs and key components of the implementation process (i.e. codes, standards, zoning)

PHASE 1: FEASIBILITY STUDY

FEASIBILITY STUDY

- NYSERDA FlexTech Study meeting requirements of [PON 5614 Attachment C](#)
- Project site and building characteristics, system design overview, economic analysis, anticipated challenges to project success
- Many completed feasibility studies for community level projects throughout NY State
 - [PON 4614 Winners](#) (see Final Reports)
- Cost share requirement is 50% with FlexTech
 - Can explore grant opportunities

Click on a County to View Project Info
Click on the county again to reset the map



PHASE 2: Design

FORMAL DESIGN

- [NYSERDA PON 5614](#): Round 3 open until 07/31/2025
- Funding for design of a large-scale thermal project with a 50% cost share (up to \$500k)
- **Needs to have previously completed a feasibility study**

WHAT STEPS CAN YOUR MUNICIPALITY TAKE RIGHT NOW?

CONSIDER AN ENERGY STUDY FOR POTENTIAL ENERGY EFFICIENCY UPGRADES

- Subsidized energy studies are available through NYSERDA (GJGNY, FlexTech)
 - Different options depending on building type
- Advocate: encourage building owners in potential TEN sites to get an energy study
- Efficient buildings will save money, reduce emissions, and allow for right-sizing heat pump equipment in preparation for a TEN connection

THINK ABOUT POSSIBLE FEASIBILITY STUDY TEN LOCATIONS

- New construction or major infrastructure projects planned?
- Thermal resources?
- Municipally-owned buildings?

Where can I find more information?

VERMONT COMMUNITY THERMAL NETWORKS (Vermont Community Thermal Networks, vctn.org)

- Excellent resource with fact sheets, case studies, videos, and a “How-to” thermal energy network toolkit

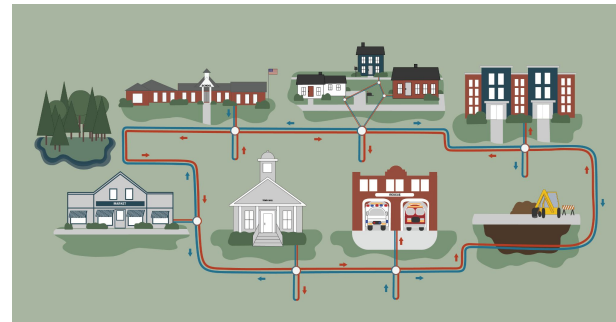
ASHRAE/NYSERDA Community Heat Pump Webinar Series

- More technical resource for those that are interested ([Link](#))

NYSERDA Large Scale Thermal Page

- [PON 5614](#) – Large Scale Thermal: Round 3 of funding open now!
- [PON 4614](#) – Community Heat Pump Systems: awarded projects, factsheets, and reports

FURTHER READING: [Building Decarbonization Coalition](#), [UpgradeNY](#), other advocacy and research organizations



Credit: Vermont Community Thermal Networks

Next Up:

1. Take our post-workshop survey

- **Provide feedback** for our first session
- **Start thinking ahead** about thermal energy network potential in your community
- **Link to survey:** <https://forms.gle/pwQ2JTgC4Frgz4JK6>

2. Scheduling future meetings:

- **Poll: what is your preference?**
 - Option #1: Same day and time of the month, for the whole 12 months of the curriculum (i.e. based on first session, every 2nd Monday from 11:00am - 12:00pm)
 - Option #2: Same day and time of the month, for the first 3 months of the curriculum
 - Send out Doodle poll / revisit schedule every 3 months to determine if it still works

THANK YOU!

Questions?

Contact:

laurenk@sustainablewestchester.org