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Re: Case No.24-3460-INV, Investigation into Thermal Energy Exchange Networks Pursuant to Act 142 of 2024

Dear Chairman McNamara and Members of the Commission:

We write to you to submit our comments on the report required by Act 142 on thermal energy exchange networks. As the principal authors of the relevant parts of the bills that were adopted as Act 142, we hope that our comments will be useful to the Commission as it prepares its report.

Act 142 exempts municipal thermal energy exchange networks from Commission jurisdiction. After stakeholder vetting of the draft bills that later became Act 142, the following language was developed as a consensus approach to address investor-owned utility thermal energy exchange networks. The consensus language called upon the Commission to commence rulemaking to implement the program. At the Commission's request because of its workload, the bill was changed to strike the consensus language and instead require a report from the Commission. Based on the vetting this language already has undergone, we now respectfully recommend that the report propose that the following consensus language be passed into law.

1. Recommendations

First, amend § 203 of Title 30 by adding a new subsection (7) as follows:

(7) a person or company, other than a municipality or entity otherwise exempted by the Commission under rules promulgated pursuant to section 256 of this title, that owns or operates a thermal energy exchange network as defined in section 201 of this title;

Second, we recommend that the report propose that the following language be added to title 30, section 231:

(e) Any person or company may petition for a certificate of public good pursuant subsection (a) to own or operate a thermal energy exchange network; provided, however,

that any utility with existing authority established prior to [effective date of act], to provide retail electric or natural gas service shall also be authorized to own or operate a thermal energy exchange network subject to the provisions of this title and rules issued by the Commission.

Third, we recommend that the report propose adoption of the following underlined language be added to title 30, section 248(a)(2)(A):

(A) no company, as defined in section 201 of this title, and no person, as defined in 10 V.S.A. § 6001(14), may begin site preparation for or construction of an electric generation station facility, energy storage facility, thermal energy exchange network, or electric transmission facility within the State that is designed for immediate or eventual operation at any voltage;...

We also recommend that the report propose the following addition to Title 30:

§ 256. THERMAL ENERGY EXCHANGE NETWORK DEVELOPMENT

(a) On or before October 1, [year of effective date], the Public Utility Commission shall initiate a proceeding to support the development of thermal energy networks and the permitting of thermal energy network providers.

(b) The Commission shall adopt the rules pursuant to 3 V.S.A. chapter 25 11 governing all aspects of the permitting, construction, operation, and rates as reasonably necessary. The Commission's rules shall facilitate and prioritize establishment of thermal energy networks to serve customers with low income and moderate income, which may include reduced rates if necessary.

(c) The rules shall ensure that:

(1) permitting is simple, economic, and expeditious, and Commission review of proposed thermal energy networks under Section 248 is limited to the process set forth in Section 248(j) unless there is a compelling need for additional process;

(2) permitting, construction, and operation are not limited, legally or by regulatory burden, to existing utilities; and

(3) facts and data submitted to the Commission by permit applicants and permittees are available to the public and to other utilities or potential utilities unless there is an applicable exemption under Section 317 of title and the Commission issues a protective order.

(d) The Commission shall issue an order for an interim process, which may include authorizing pilot projects, and then shall adopt final rules not later than July 1, [year after effective date].

(e) Any right previously obtained by eminent domain, or by deed, to lay, construct, operate, or maintain buried lines or pipes for transmission of electricity or natural gas may also be used for transmission of thermal energy fluids and may be used without additional approval, amended deed, or additional compensation if the change does not significantly increase the burden or significantly alter the environmental impact of the use.

Lastly, in order that the most beneficial energy eco-system for all Vermonters is established and maintained, we recommend that the Commission report to the General Assembly that decisions about open access, whether rate bases should be separate or combined, and other important matters we list below, be delegated to the Commission to address through rulemaking. We believe that the Commission's expertise and its rulemaking process are best suited to developing these standards in accordance with good utility practice.

2. Legislative Background

In 2022-23, we drafted and submitted to stakeholders and then to legislators a bill related to thermal energy networks (TENs)¹ in Vermont to ensure that our state could make best use of networked ground-source heat pump technology as the highest efficiency thermal solution available. In addition to municipal authorization to establish thermal energy network utilities that is now in statute, the bill proposed authorization for regulated investor-owned utilities to implement TENs. The language was vetted by a variety of stakeholders, including the Commission's staff, Vermont Gas Systems, Burlington Electric Department, and many environmental advocates. By the spring of 2024, we had arrived at wording that all agreed to support.

The consensus bill was based on the [recent New York statute](#) but was substantially modified to recognize Vermont's unique situation. The principal change was that the New York statute requires the major gas utilities and electric utilities to commence pilot projects, while the consensus language creates a regulatory structure that authorizes but does not require gas and electric utilities and others to operate as thermal energy exchange network utilities. The bill also differed from the New York statute by authorizing municipalities to operate these facilities without Commission oversight (a path New York is now following).

Just before the vote on the bill by the House Natural Resources and Energy Committee, the Commission informed the Committee that the Commission opposed imposition on it of the responsibility to start rulemaking in this area because of the enormous workload the legislature had already imposed on it in other areas. This, of course, was entirely the Commission's decision to make, and one that was perfectly understandable. The Committee, therefore, amended the consensus bill to require the report you are now preparing.

¹ When not directly referring to Vermont statute that uses the term "thermal energy exchange networks," we use "thermal energy networks" and "TENs" to be consistent with general usage.

Over the nearly a year since the consensus language was drafted, the need for Commission recognition and supervision of investor-owned thermal energy exchange network utilities has become more compelling. These networks will make heating and cooling more affordable while reducing demand on the electric grid—as well as reducing greenhouse gas emissions. They will do so regardless of the outcome of pending state and federal decisions on energy issues.

3. Issues for Subsequent Rulemaking

A. Open Access. An important issue to address in rulemaking is the need to ensure that regulatory frameworks impose open access common carrier principles. For example, the following measures that have been developed for thermal energy networks (TENs) in the New York rulemaking²:

- a. Establish a clear legal and regulatory classification for TEN distribution operators to ensure standardization and oversight, and interaction with entities exempt from regulatory oversight such as municipalities.
- b. Require TEN infrastructure to operate on a non-discriminatory basis, allowing third-party thermal energy providers and customers to connect freely.
- c. Create a thermal energy tariff structure by developing standardized pricing models that ensure fair access to TEN infrastructure while promoting cost recovery and investment.
- d. Enable market competition to allow independent third-party thermal energy providers (e.g., waste heat recovery facilities and geothermal operators) to sell thermal energy to customers through TENs.
- e. Permit and support infrastructure cost-sharing and develop shared financing mechanisms to distribute infrastructure costs fairly among utilities, third-party providers, and customers.
- f. Establish interconnection standards by defining technical requirements for third-party thermal energy resource providers to connect to TENs.
- g. Ensure that TENs function similarly to open-access electric and gas grids, allowing multiple providers, marketers, and off-takers to use the network.
- h. Set quality and reliability standards by requiring TENs operators to maintain reliable temperature and pressure levels, similar to how electric and gas utilities ensure supply and delivery (voltage and pressure) stability for customers and suppliers.
- i. Ensure cost transparency and mandate clear and public pricing for access to TEN infrastructure and services.
- j. Facilitate Public-Private Partnerships and encourage collaboration between utilities, private developers, and municipalities to expand TEN deployments.

B. Rate base issues. The question of whether, and in what circumstances, to allow an existing utility to fund TEN investment using their preexisting rate base is an important but complicated one that has direct impact on TEN best practices, least-cost TEN development, and energy affordability. This requires

² New York State Department of Public Service. (2024). *Staff proposal for initial utility thermal energy network rules* (Case 22-M-0429). <https://www.dps.ny.gov>.

careful examination during rulemaking conducted within the principles of good utility practice around conventional rate-making principles.

C. Integration into Least Cost Planning. Rules should address how TENs are incorporated into least-cost planning, including but not limited to incorporation into utility Integrated Resource Plans (IRPs).

D. Incentives for Demand Response and Grid Interactivity. Rules may address whether and how TENs providers are compensated by electric utilities, transmission providers, or the ISO for reduced peak power consumption, demand, and other ancillary services.

4. Background on Thermal Energy Exchange Networks

We include as an Appendix some edited text excerpted from a forthcoming report for the Building Electrification Institute on the value of TENs as a decarbonization tool in Vermont in order to underscore the importance of this proven technology and neighborhood-scale approach to meeting the state's climate and energy goals. As the Appendix sections explain, TENs can also support other priorities such as housing and economic development, affordability, and resilience while also mitigating demand on the electric grid.

5. Conclusion

As with our work on the relevant bills that led to the passage of Act 142, we submit these comments as individuals in order to share with the Commission the consensus language, its background, and our recommendation of issues to reserve for rulemaking.

March 3, 2025

/s/ Deborah New

/s/ James A. Dumont

APPENDIX – EDITED EXCERPTS FROM FORTHCOMING REPORT FOR BUILDING ELECTRIFICATION INSTITUTE

... TENs are systems that transfer thermal energy through a network of pipes to provide heating and cooling to multiple buildings via shared infrastructure. Under Act 142 of 2024, Vermont defines a "thermal energy exchange network" as³:

"... all real estate, fixtures, and personal property operated, owned, used, or to be used for or in connection with or to facilitate distribution infrastructure project that supplies thermal energy to more than one household, dwelling unit, or network of buildings that are not commonly owned."

TENs often rely on thermal energy resources such as stable temperatures underground or waste heat from industrial processes. The network of underground pipes circulates water or another fluid to transfer heat. Heat is extracted from the ground or other thermal energy resource via heat pumps. Buildings connect to the TEN to exchange thermal energy as needed, creating an efficient, low- or zero-carbon emissions system. This system operates efficiently because the circulating fluid is much closer to the desired indoor temperature than the ambient air under either cold or hot weather conditions. The temperature differential between the required indoor air temperature and the temperature of the circulated fluid can be minimized, improving operation. This is achieved by rejecting from or injecting heat into the TEN via a diversity of thermal energy resources. Additionally, the temperature of the circulating fluid can be altered to optimize heat pump performance under various weather conditions or to support the grid by reducing demand quickly and in a sustained manner. For example, heat stored at a higher temperature in an insulated tank can be injected into the TEN to raise the circulating fluid temperature, improve connected heat pump performance, and reduce electric demand. In this way, thermal energy is dispatchable to a TEN thereby making the TEN itself a dispatchable Distributed Energy Resource (DER) for the electric grid.

TENs represent a transformative solution in addressing emissions reductions affordability, public health and public health.

Emissions Reductions

TENs substantially reduce greenhouse gas (GHG) emissions by electrifying heating and cooling systems and by utilizing thermal energy resources such as geothermal energy and waste heat. Many installations report emissions reductions of up to 90%. Key mechanisms for these reductions include:

- **Efficient Use of Resources:** By consolidating heating and cooling into neighborhood-scale systems, TENs leverage existing, local thermal energy resources while decreasing reliance on emissions-intensive electricity generation.

³ Vermont General Assembly. (2024). *An act relating to thermal energy networks and other matters (Act 142)*. Sections 15-17. Montpelier, VT: Author. Retrieved from <https://legislature.vermont.gov/Documents/2024/Docs/ACTS/ACT142/ACT142%20As%20Enacted.pdf>.

- **Scalable Decarbonization:** A TEN's adaptability and applicability to dense urban, moderate density suburban patterns of development and town centers, and campus environments allows for swift deployment and accelerated progress toward meeting state emissions reductions targets.

Energy Efficiency

Networked thermal systems are inherently more efficient than individual building HVAC systems. Centralized infrastructure reduces energy waste and provides the opportunity to balance heating and cooling among buildings that have different thermal energy requirements at different times. They also offer flexible integration of renewable energy technologies, including geothermal, solar thermal, and energy storage solutions. This efficiency contributes to both emissions reductions and cost savings, satisfying state affordability and decarbonization goals.

Affordability and Predictable Costs

TENs minimize and stabilize customer costs by avoiding fossil fuel costs. Local renewable energy sources protect customers from global fuel price fluctuations, eliminating reliance on volatile markets and providing predictable year-round energy rates.

- **Energy Independence:** By harnessing local thermal energy resources, TENs help avoid importing fuels and sending money out of state. With TENs, energy dollars can be retained and invested within Vermont's communities. Because less electricity is consumed to operate a highly efficient TEN, less electricity is needed for import during peak periods. At scale, TENs can dramatically alter peaking load growth, reducing the need for additional transmission from out of state.
- **Economic Development:** TENs offer a key economic development opportunity in Vermont. Communities, including local businesses, residents, and municipal leaders can come together to plan and implement TENs projects, growing local wealth by harnessing local resources. The deployment of TENs also creates local jobs and enhances community wealth through planning, project development, and construction. Side-by-side comparisons of job descriptions for fossil fuel workers and TEN projects show almost identical skills, so minimal retraining is required, and jobs for this skilled labor are maintained. Pipefitters and gas workers are already constructing TENs in other states.

Health and Safety

As a non-combustion solution, TENs contribute to protecting public health and safety.

- **Improved Air Quality:** The elimination of fuel combustion reduces pollutants⁴ associated with respiratory, cardiovascular, and other illnesses.⁵

⁴ Environmental Health and Engineering, Inc. (2016). *Wood Smoke and Health: Exposure of New England Residents to Wood Smoke Pollution*. Retrieved from <https://www.ehhi.org/woodsmoke-exposures.pdf>.

⁵ Michanowicz, D. R., et al. (2022). *Natural gas used in homes contains hazardous air pollutants*. Harvard T.H. Chan School of Public Health. Retrieved from <https://www.hsph.harvard.edu/news/press-releases/natural-gas-used-in-homes-contains-hazardous-air-pollutants/>.

- **Enhanced Safety:** With no oil or gas pipelines or associated infrastructure, the risk of explosions or toxic leaks is eliminated.⁶

Resilience and Flexibility

TENs enhance energy system resilience, a critical consideration given Vermont's susceptibility to extreme weather events:

- **Durable Infrastructure:** Unlike above-ground fuel storage and outside compressors, underground pipes and interior heat pumps are shielded from storms, flooding, and other environmental disruptions.
- **Grid Support:** By reducing peak energy loads, TENs alleviate strain on Vermont's electric grid, not only by extending renewable energy capacity, but also through increasing overall system reliability.

Additionally, TENs integrate seamlessly into Vermont's natural and built environments, preserving the state's unique landscape, protecting sensitive ecosystems, and respecting the historic character of many downtowns. This flexibility and minimal impact make them suitable for urban redevelopment, campus settings, and more rural applications where building proximity permits.

Equity and Accessibility

As a neighborhood-scale solution, TENs prioritize energy equity by providing accessible, affordable heating and cooling solutions to underserved communities. Unlike traditional geothermal systems, which are typically cost-prohibitive for individual households, TENs distribute infrastructure costs across multiple users, making it possible for smaller businesses to connect, supporting affordable housing development, and ensuring that low- and moderate-income households can enjoy clean, lower cost energy. As shared infrastructure, upfront project costs are amortized and recovered over time through rates, allowing highly efficient TENs to yield an immediate reduction in customer operating expenses.

Load Shifting and Peak Demand Reduction

TENs reduce reliance on electric heating and cooling systems, such as air-source heat pumps, during peak demand periods. By using centralized geothermal or waste heat sources, they lower the need for electricity at critical times:

- **In winter**, heating loads are met by circulating thermal energy rather than running electric resistance heaters or heat pumps.
- **In summer**, cooling demands are met efficiently through thermal storage or shared cooling systems, reducing air conditioning-related peak loads.

This capacity reduction acts as a buffer for the electric grid, freeing up resources for other uses during high-demand periods, particularly during prolonged periods of cold weather or extreme heat. This is

⁶ Pipeline and Hazardous Materials Safety Administration. (n.d.). *Pipeline failure causes*. U.S. Department of Transportation. Retrieved from <https://www.phmsa.dot.gov/incident-reporting/accident-investigation-division/pipeline-failure-causes>

highly relevant for Vermont heating electrification growth and the increasing need for cooling as the climate warms.

Integration with Thermal Energy Storage

TENs often incorporate thermal energy storage systems that use various technologies and a diversity of energy storage media. Thermal energy storage can be achieved in a variety of ways including but not limited to storing heat in various solid or liquid materials (e.g. ice, sand, hot water) within insulated tanks or containment facilities at varying temperatures, through thermochemical means, or within underground geological formations or geothermal boreholes.⁷ These systems:

- Store excess heat or cooling when electricity demand is low (off-peak periods).
- Release the stored thermal energy during peak demand, reducing strain on the electric grid.
- Complement intermittent renewable generation (e.g., wind or solar) by storing surplus energy as heat or cooling.
- Enhance waste heat recovery efforts by improving utilization rates, particularly when waste heat resources are available and demand for heat is limited.

Demand Response Capabilities

TENs are flexible and can participate in demand response programs:

- During periods of high grid stress, TEN operators can reduce electric loads by adjusting heat pump operation or drawing from thermal storage.
- This flexibility helps stabilize the grid and avoids the need for expensive peaking power generation plants.

Decentralized and Resilient Energy

By providing heating and cooling through independent thermal infrastructure, TENs reduce reliance on centralized electric systems for thermal energy needs. This systems decentralization enhances energy resilience in two ways:

- **Localized Supply:** TENs draw from on-site or nearby thermal energy resources, reducing the need for long-distance electricity transmission to supply heating- or cooling-related energy demand during peak periods. These beneficial characteristics pair well and integrate with other DERs like solar and battery electric storage.
- **Grid Independence:** Buildings connected to a TEN can maintain thermal comfort even during electrical outages primarily with systems which are more readily backed up given their ability to perform at very high rates of efficiency with lower power demand than traditional heating and

⁷ U.S. Department of Energy. (2023). *Technology strategy assessment - Thermal energy storage* (Report No. DOE/EE-XXXX). U.S. Department of Energy. https://www.energy.gov/sites/default/files/2023-09/9_Technology%20Strategy%20Assessment%20-%20%239%20Thermal%20Energy%20Storage_508.pdf

cooling systems. Less back-up generation capacity is needed to support system operation during grid outages.

Enabling Renewables and Electrification

As the grid incorporates more variable renewable energy, TENS provide firm capacity by:

- Storing excess renewable power generation as thermal energy, which can be used later to meet demand without adding to the electric load. Such thermal energy storage is readily integrated with TENS and can perform critical grid balancing services as the generating fleet becomes more and more intermittent.
- Facilitating the electrification of heating and cooling in a way that avoids grid congestion during peak times.
- Incorporating forms of renewable thermal energy like geothermal, solar thermal, and waste heat from various sources enables further integration of renewable energy into the existing building stock and reduces overall reliance on renewable power generation, transmission, and distribution.