STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. 24-3460-INV

Public Utility Commission investigation into thermal energy exchange networks pursuant to Act 142 of 2024	

COMMENTS OF THE VERMONT DEPARTMENT OF PUBLIC SERVICE

On November 19, 2024, the Vermont Public Utility Commission ("Commission") issued an Order Opening Investigation and Requesting Comments ("Order") pursuant to Act 142 of 2024. In the Order the Commission requested comments specifically seeking "information or suggestions regarding the permitting, construction, operation, and rates of thermal energy exchange networks."[1] With this filing the Vermont Department of Public Service ("Department") offers information and suggestions on the topic of Thermal Energy Networks ("TEN") in response to the Commission's Order.

Background

In 2021, Vermont's Residential, Commercial and Industrial ("RCI") thermal sector was the second largest source of Greenhouse Gas ("GHG") emissions in the state, accounting for 31% of statewide GHG emissions.[2] One tool Vermont can utilize to decarbonize the thermal sector is highly efficient heat pump technology. TEN infrastructure is built and maintained for the purpose of delivering heat and domestic hot water to end-users connected to the network. They have the potential to leverage heat pump technology at the community scale to decarbonize entire neighborhoods in a comprehensive and expedient manner.

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[1] *Order Opening Investigation and Requesting Comments*, Case No. 24-3460-INV, Order of 11/19/24.
[2] Vermont Greenhouse Gas Emissions Inventory and Forecast, Climate Change in Vermont, https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/1990-2021_GHG_Inventory_Uploads/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2021_Final.pdf?_gl=1*1eq4c3r*_ga*MTcxMDc1MDkxMS4xNzEzMTg1MzQ1*_ga_V9WQH77KLW*MTc0MDY3NTczNC4xNzAuMC4xNzQwNjc1NzM3LjAuMC4w. Page 8.

A building-by-building or appliance-by appliance approach, however, has traditionally been and is currently the primary strategy for decarbonizing Vermont's buildings. This approach impacts a spectrum of individual consumers, varied technologies, energy efficiency network contractors and incentives, and involves participants that have uneven access to capital. However, in areas where TENs are viable, the traditional building-by-building approach may not be the most cost-effective strategy for efficiently heating a home over the long-term or reducing its environmental impact. Developing TENs may present an opportunity to reduce costs, save money for ratepayers, safeguard energy reliability and safety, and encourage an equitable distribution of clean energy benefits. The Department observes that an impactful deployment of TENs in Vermont requires that stakeholders design support that encourages use of TENs technology such that it maximizes benefits even as it advances climate equity and environmental justice. In addition, the Department acknowledges different possible ownership structures will require varying levels of regulatory oversight and complexity. The following comments describe different ownership structures and broad factors for regulation development considerations, before next discussing general information on TENs construction with specific examples of TENs initiatives and programs the learnings of which may assist the Commission.

Municipally Owned

Section 16 of Act 142 grants authority to municipalities "to construct, operate, set rates for, finance, and use eminent domain for a TEN utility without a certificate of public good or approval by the Commission."[3] This is similar to the existing authority that municipalities have to own, operate, maintain and set rates for shared infrastructure such as water and sewer

[3] Act 142 at § 16(d).

systems.[4] Other thermal energy systems such as Montpelier's district heat system follow this paradigm. Rate design and structure for TENs owned and operated by municipalities would be managed at the local level. Any changes in rates would be made by locally elected officials and local customers would have the ability to provide input via the electoral process. Therefore, the Department suggests that public TENs should be regulated in a similar manner as Vermont's public water and sewer services.

Privately Owned

Section 15 of Act 142 explicitly excludes the inclusion of a "mutual benefit enterprise, cooperative or common interest community that is owned by the persons it serves…" from the definition of a TEN. Similar to a municipally owned system, the customers of the system have the ability to provide input into the management of the system.

In addition, the Department observes that municipalities (or any other group of customers) may wish to enter into a contract with a third-party organization to own, operate, maintain, and manage a TEN(s) within the municipality. This third-party organization could be a for profit or non-profit organization that would provide an essential utility service within the community. Unless customers of a TEN network have alternative heating sources, a TEN would operate as a de facto monopoly for its customers' heating. Currently, a hypothetical TEN customer would have the option to switch to another fuel. As the transition to a cleaner energy market advances, however, the options for a fossil-fuel backup could become more restricted or too prohibitively capital intensive, thus creating a barrier to switch. Moreover, depending on the terms of the customer agreement, a private entity could require long-term commitments from

[4] 24 V.S.A. Chapter 95.

customers. Establishing appropriate pricing guidelines, as well as performance requirements for system quality and reliability of service should be considered for regulation of privately owned TENs. This would better ensure sufficient management resources, including access to the capital necessary for reliable operations, maintenance and system longevity. As we've learned in other similar settings, an appropriate regulatory balance will need to be struck so as not to unintentionally create barriers to private investment in potentially beneficial technology. Regulation of private entities should therefore at a minimum be considered by the Commission.

Regulated Distribution Utility Owned

The Commission noted in its Order issued on November 15, 2022, in Case No. 22A-4238, "It is one role of regulators to ensure that utilities and private entities can compete toe-to-toe in a fair market for non-monopoly services and products within a monopoly energy-delivery territory." The Department agrees that allowing regulated monopolies into a competitive marketplace should be approached with care. That said, there has been very little development of TENs in Vermont and throughout the region due to the capital-intensive nature of such systems. Traditionally regulated utilities are familiar with a business model involving constructing capital-intensive systems whose costs are recovered over a long period of time, which may make such entities well suited to development of TENs. As more investments are made toward the development of TENs around Vermont, it will be important to set rules and regulations for TENs that encourage innovation and healthy competition for all stakeholders.

Existing regulated utilities who wish to engage in a competitive marketplace of development and deployment of TENs may be able to do so efficiently, yet additional considerations regarding regulation and rate-setting for these owner-types must be considered.

An existing regulated utility generally must demonstrate that investments made with ratepayer dollars provide a net benefit to their customers; investments must be least cost considering a range of factors including both economic and environmental variables. While the issues are different if the TEN serves a utility's existing customers (acting more like an efficiency measure) or new customers (acting like a system expansion), distribution utilities investing in TENs risk cross subsidizing TENs customers with monies collected from traditional service ratepayers if rates are not set in a fair manner. There is likely to be tension between offering attractive rates for TENs customers that don't put undue cost burden on traditional utility customers. TENs have the potential to reduce both thermal demand from buildings connected to a TEN and demand on the electric grid as a result of the utilization of more efficient HVAC and Domestic Hot Water ("DHW") equipment within TEN infrastructures when compared to air-source heat pumps. The ability for a TEN to provide electric grid system benefits (relative to thermal needs being met by electric resistance and heat pumps, or by providing a controllable resource to otherwise help manage the grid) and reduce thermal load depends on system design, electrical grid constraints and the availability of thermal resources in the geographic area where a TEN is sited. The ability for regulated utilities to demonstrate the net benefits that prospective TEN projects could convey to their broader customer base depends on a robust, uniform societal and ratepayer cost-benefit framework against which projects can be evaluated on a case-by-case basis. Regulation of distribution utilities offering TENs should be considered carefully, ensuring just and reasonable rates for current and potential new customers.

Rate Structure

In any ownership structure, the Department expects that customers and owners will be charged specific rates for TEN service. A rate structure commonly applied to TENs service includes components that differ depending on system design and the needs of the community in which the network is located. For example, the rate structure of the False Creek Neighborhood Energy Utility ("NEU") located in Vancouver, BC employs two primary components that are similar to the structure of regulated electric or gas utility rates; they use a fixed monthly capacity charge and a variable monthly energy use charge.[5]

Construction of Thermal Energy Networks and Vermont examples

Neighborhood-scale integrated space and domestic hot water heating may be a foreign concept to most Vermonters. TENs development in Vermont has a greater chance of success when widely held community values are respected, and focused stakeholder engagement processes are followed. Particularly with regard to municipally owned or supported projects, feedback received during public engagement is an essential component in developing new projects. Public engagement early in a project's design process would help ensure successful development of both the proposed project in question and future TENs overall.

The creation of guidelines for best practices in the development of TENs could be a useful tool to support development. Any proposed TEN(s) development or substantial modifications to existing TENs in the state should employ a set of standardized guidelines to aid

[5] The monthly capacity charge covers the cost of maintaining an adequate heating capacity to satisfy peak heat load. The cost of the capacity charge is determined based on a customer's actual or estimated peak heat energy demand. The NEU determines the relative capacity charge for residential buildings by basing charges on a building's net floor area ($/m2). The monthly energy usage charge reflects monthly heat energy delivered to each ratepayer and is billed to the ratepayer by volume priced based on the cost of the thermal energy source. The NEU and its rate structure is just one example of many. The specific rate structure associated with a newly built TEN will be determined based on a variety of factors unique to each network including but not limited to how the system is designed, owned, and operated.

in the development process. Feedback received during public engagement helps identify key criteria that community members want included as part of a proposed TEN development. Ensuring achievement of key criteria identified during public outreach will require knowledgeable elected officials and municipal planners that are aware of the rules and regulations associated with the development of TEN(s) in their community. Guidelines would help shape the development of project proposals, provide clarification regarding applicable regulations and corresponding agencies, and set regulatory expectations for stakeholders. It is likely that an allocation of resources to the Commission or other entity would be necessary to support this work.

A recent DOE-funded study involving Vermont Gas Systems, Inc. ("VGS") was structured "to perform a feasibility analysis and develop a complete engineering plan for a community geothermal system for a new affordable housing development" in Hinesburg.[6] The study found that initial total installed costs for the geothermal system were greater than the baseline scenario.[7] However, a Life Cycle Cost Analysis ("LCCA") found the proposed geothermal systems to have lower annual operation expenditures, maintenance costs and lower equipment replacement costs than the baseline scenario. The new development project has been designed and conceived as a two-phase approach. Each phase, having a slightly different design, was analyzed as part of the LCCA. The results of the LCCA show that even with higher upfront

[6] Kaushik Biswas, Coalition for Community-Supported Affordable Geothermal Energy Systems Energy (C2SAGES) Budget Period (BP)1 (2024).
[7] The baseline HVAC system for comparison includes zone ASHPs. These are assumed to be mini split systems or packaged terminal heat pumps. Each residential unit is ventilated by zone ERV, while the building common areas are ventilated by a central ERV. None of the ERV's have heating or cooling coils, only heat recovery devices. DHW is provided by direct fired natural gas water heaters. Vestibules are heated by electric radiators."

costs the community geothermal systems will save money, and "are estimated to save 37% and 10% for the Phase 1 and Phase 2 developments respectively." In addition to completing a LCCA, the study also modeled estimates of energy usage. One key finding of these modeling estimates shows that the geothermal systems can reduce DHW and HVAC energy use by 45-48%.

Pilot projects like the one in Hinesburg have shown the potential of TENs to save money, lower emissions, and reduce thermal energy-related demand. However, they also show that these projects would not be economically viable without supplemental funding. The New York State Energy Research Development Authority ("NYSERDA") has made significant progress in expanding the deployment of TEN infrastructure in recent years through their work on Clean TENs, Program Opportunity Notice 4614. Vermont has the potential to learn from what NYSERDA and others have done. More consideration of other incentive programs could inform an assessment of Vermont efficiency or distribution utility efforts, better addressing barriers such as initial project costs. NYSERDA's approach of assisting with the initially higher project costs of TENs enables more widespread, cost-effective replication of TENs across the state of New York[8]. A similar development authority could be established in Vermont to gain TEN market insights on pricing, business models, and TENs designs that could then be shared with instate stakeholders. This sharing of information could spur innovative collaboration and help break down common barriers to TEN adoption and assist in growing the market for TENs in Vermont.

Conclusion

[8] Large Scale Thermal, NYSERDA, https://www.nyserda.ny.gov/All-Programs/Large-Scale-Thermal. The approach established funding categories for different parts of project development and implementation. "Category A" provided up to $100k for project feasibility and "scoping studies". Category B provided up to $500k in funding for detailed design studies. Category C provided up to $4M in funding for project construction.

TENs have the potential to be a key tool in Vermont's future energy landscape, if cost-effective projects can be supported with an effective and efficient blend of regulation and program support. The above comments describe varying examples of TEN regulation and program opportunities that could be explored to better determine whether and how to best support this opportunity.

DATED at Montpelier, Vermont, this 3rd day of March 2025.

Respectfully submitted,

VERMONT DEPARTMENT OF PUBLIC SERVICE

By: /s/ Michael A. Swain
Michael A. Swain, Special Counsel
112 State Street
Montpelier VT 05602
(802) 461-9755
Michael.Swain@vermont.gov

cc: Service List (via ePUC)

DATED at Montpelier, Vermont, this XXth day of February 2025.

Respectfully submitted,

VERMONT DEPARTMENT OF PUBLIC SERVICE

By: /s/ Michael A. Swain
Michael A. Swain, Special Counsel
112 State Street
Montpelier VT 05602
(802) 461-9755
Michael.Swain@vermont.gov

cc: Service List (via ePUC)

Thank you for the opportunity to comment.

Dated at Montpelier, Vermont this 3rd day of March 2025.

VERMONT DEPARTMENT OF PUBLIC SERVICE

By: /s/ *Matthew Bakerpoole*
Matthew Bakerpoole, Special Counsel
112 State Street
Montpelier, VT 05620
802-505-0538
matthew.bakerpoole@vermont.gov