



FILED VIA ePUC

April 16, 2025

Holly R. Anderson
Clerk of the Commission
112 State Street
Montpelier, VT 05620-2701

Re: Windy Ridge Geothermal Project

Dear Ms. Anderson:

By this filing, Vermont Gas Systems, Inc. (“VGS”) provides notice that we intend to use a portion of our innovation budget to support a geothermal installation to heat and cool the Windy Ridge housing project in Hinesburg, Vermont (the “Project”). The Project is part of a new permanently affordable housing development that is being developed by Champlain Housing Trust (“CHT”).

Our Alternative Regulation Plan provides that “VGS shall pursue and consider projects, programs, and services that support Vermont’s statewide energy goals by advancing promising technologies to facilitate efficient, lower carbon energy choices for Vermont customers.”¹ Section 9(e) requires VGS to provide 30 days’ advance notice to the Commission and the Department of Public Service “before commencing any spending on a project, program, or service under the Climate Action and Innovation Budget that exceeds \$25,000.” As detailed below, spending on this Project is expected to exceed that threshold. Accordingly, VGS is providing the following notice, addressing all criteria required by Section 9(f).

Background

Geothermal systems can significantly reduce greenhouse gas emissions and provide customers with affordable, efficient, and low maintenance heating and cooling. They are considered the most efficient heating and cooling systems available, and developing a community approach could enable decarbonized thermal services for many sectors.

Unfortunately, aside from a few college campuses, geothermal utilization on a community-scale does not exist in Vermont to date. There are three significant barriers preventing developers from adopting community geothermal systems. First, geothermal systems have high upfront costs due primarily to constructing the underground infrastructure; an investor in a community-scale system would need to accept a longer horizon for their return or utilize federal and state incentives to reduce the upfront costs. Second, developers are not familiar with the ground loop infrastructure and are therefore reluctant to take an ownership role or sell property in cases where they would be responsible for performance, operation, and maintenance. Third, as with any project providing community infrastructure, coordinating multiple property owners introduces

¹ See Alternative Regulation Plan filed on October 26, 2023 in Case No. 22-5085-PET at 13.

significant complexity; challenges aligning diverse interests, managing capital contributions, structuring billing systems, and ensuring ongoing maintenance can quickly prevent otherwise promising projects from moving forward. The regulated utility model offers a proven solution to all three barriers.

VGS is well positioned to support geothermal expansion in Vermont by developing pilot projects and facilitating workforce development in an area that closely resembles our existing utility business. Moreover, while unlocking barriers for developers and customers, offering a range of geothermal services could provide an alternative revenue source for VGS to help all ratepayers transition to a lower-carbon energy future.

In July 2022, VGS provided notice to the Commission that we were conducting exploratory work for various geothermal projects.² In that filing, we discussed many geothermal system benefits and how utilities could play an important role in improving accessibility in Vermont. For VGS especially, community geothermal closely resembles our existing construction and gas distribution business. It involves installing underground piping, designed to last up to 50 years, and serving multiple customers or entire neighborhoods. It involves recovering cost over time through periodic charges like those found on customer bills today. And importantly, it involves servicing energy infrastructure and maintaining integrity and reliability over its useful life.

In our 2022 filing, we discussed how the multi-customer community loop approach aligns well with VGS's role as a thermal utility; in that model, a single wellfield can serve several customers. We also discussed enabling utility scale partnerships with affordable housing organizations, wherein VGS could help develop permanently affordable, all-electric homes.

In our time pursuing geothermal service, we have assessed several potential projects. Working with a diverse stakeholder group including town planners, developers, and geothermal system designers and installers, we have conducted feasibility studies for several multi-customer projects within our service area. The feasibility studies considered site geology, capital costs for constructing the borefield, installation costs for the ground source heat pumps, and ensuing energy and maintenance costs for the end customer. The projects we explored ranged from large multi-family market rate apartment buildings to mixed residential development with permanently affordable apartments and townhomes.

We are now pleased to provide notice of our participation in the Windy Ridge Project. This Project—led by our strong local partners at CHT and Evernorth and supported by an innovation grant from the U.S. Department of Energy (“DOE”)—will provide permanently affordable housing to low-income Vermonters and demonstrate the benefits of geothermal technology in supporting sustainable housing for Vermont's future. Though upfront costs, familiarity, liability, and property ownership complexity are gating obstacles for developers in Vermont, the Windy Ridge Project offers a unique low-cost and low-risk opportunity for hands-on experience and real-world modeling to help address such barriers.

² See correspondence of Jill Pfenning, dated July 29, 2022 in Case No. 22A-3045.

The Windy Ridge Project

Windy Ridge is a new residential development planned in Hinesburg, along Route 116, that is being developed by Champlain Housing Trust and Evernorth. The 46-acre parcel, located between the downtown area and Champlain Valley Union High School, was gifted to CHT in 2022.

This filing concerns the first portion of Windy Ridge development, known as the South Meadow Neighborhood. As shown to the right, South Meadow will have five apartment and townhouse buildings totaling 44 permanently affordable units. CHT and Evernorth are the developers for South Meadow and construction is slated to begin in early 2026 and last for approximately twelve months.



The geothermal project entails vertically drilling approximately fifteen boreholes. High density polyethylene piping loops will be placed in each borehole. Each piping loop will be serially connected through horizontal sections well below the frostline. This creates a ground heat exchanger (the geothermal borefield) that will connect and serve the buildings and their internal ground source heat pumps, located in the individual units. The geothermal borefield will be engineered to meet 100% of the South Meadow buildings' heating and cooling loads. As outlined below, when the DOE grant period ends, VGS will fully own the ground loops and be responsible for their operation, maintenance, and performance. In effect, VGS will become the thermal utility for the various property owners in South Meadow.

As a networked geothermal system that connects multiple buildings and multiple property owners, this will be the first of its kind in Vermont. While geothermal technical efficacy is well-established, third-party infrastructure ownership allowing multiple property owners to use the renewable energy underground is an innovative approach to scaling this all-electric renewable solution.

i. U.S. Department of Energy Grant

VGS, together with Champlain Housing Trust and Gas Technology Institute ("GTI"), applied for a DOE grant focused on stimulating community-scale geothermal projects. GTI is an Illinois-based technology development organization, focused on developing, scaling, and deploying energy transition solutions that improve lives, economies, and the environment.³ GTI acted as the grant lead with VGS and CHT as the community partners. In 2023, the Project was awarded a grant covering 100% of a project feasibility study at Windy Ridge ("Phase 1") and in 2024, the Project was selected for the development phase ("Phase 2") award,⁴ which will cover 90% of the

³ See GTI Energy website at <https://www.gti.energy/about/>.

⁴ The Project was selected with four other recipients, in Michigan, Illinois, Massachusetts, and Oklahoma. See Community Geothermal Heating and Cooling Initiative at https://www.energy.gov/eere/geothermal/community-geothermal-heating-and-cooling-initiative?utm_medium=email&utm_source=govdelivery.

total Project costs but requires a 10% local partner funding match, which is the subject of this innovation filing.⁵

The Phase 1 feasibility study included a comparison between the design and costs (both capital and operational) of a community-scale geothermal system as compared to an air source heat pump system for 100% of the buildings' heating and cooling loads. The Phase 2 award will cover the complete geothermal system construction and several additional components, including measurement and verification, workforce development, and community engagement. The Phase 2 match can be sourced from multiple contributors, so VGS intends to contribute in collaboration with Champlain Housing Trust and Green Mountain Power Tier 3 incentives to provide local sponsorship, as detailed below.

ii. Community Outreach

Phase 1 of the Windy Ridge Project (fully funded by the DOE) provided an opportunity for extensive community outreach. Beginning in December 2023, VGS convened several conversations soliciting community member feedback. Some key findings from these meetings included the following:

- Educational opportunities and information sharing is needed about community geothermal projects, including benefits, challenges, costs, and successful examples, and a local community geothermal project would provide this opportunity for education.
- There is clear interest in utility-led community geothermal projects, as utilities can provide installation and system maintenance, workforce training, and job stability needed by contractors and educational/training institutions.
- The lack of available, qualified technicians was a key concern, as it can impact user convenience; there is trust that utilities will develop the workforce needed to maintain and service geothermal systems.
- Developers are enthusiastic about community geothermal systems but are either not receptive to owning and operating a community geothermal system, or not sufficiently comfortable with the ownership and operational obligations themselves.
- Noted barriers included start-up costs, such as acquiring drilling equipment, which could be addressed by utility-led deployment.
- Affordable housing has different needs for initial investment costs, maintenance costs, repair, and equipment decommissioning.

VGS also interviewed geothermal well-drillers working in Vermont to discuss both the demand for geothermal drilling and how they attract, train, and maintain employees. Interviews were also conducted with Vermont Works for Women, Vermont State University, and Vermont Adult Learning to discuss current gaps in the geothermal workforce, the training needed to bring more

⁵ Though we remain optimistic about the treatment of geothermal initiatives by the Trump administration, we are aware that U.S. Department of Energy grant funding may be at risk. Nevertheless, we consider it prudent to initiate this notice such that both funding sources may be established concurrently, and we can be ready to proceed upon confirmation from both the DOE and Public Utility Commission. If innovation funds are allowed but the DOE grant is interrupted, VGS will reassess plans for the Project and update the Commission accordingly.

Vermonters into the geothermal workforce, and how VGS might support this training. In our Phase 2 proposal, VGS committed to providing on-site educational opportunities to participants in these training programs through site tours during construction and upon Project completion.

VGS also evaluated the current VGS Field Service Technician and System Operator job descriptions against job descriptions provided by the International Ground Source Heat Pump Association (“IGSHPA”). We identified commonalities and areas where additional licensure may be required. In 2023, VGS hosted IGSHPA for a two-day geothermal installation training for twelve operations staff members and offered a 10-week IGSHPA online Geo Exchange Designer course, which three VGS engineers attended. In 2024, six heat pump technicians trained with the geothermal heat pump equipment manufacturer, Water Furnace, and learned geothermal system components. VGS will continue to grow our employee training program through the Windy Ridge Project, during which employees will shadow contractors installing both geothermal loops and heat pump equipment.

iii. Project Benefits

VGS’s participation in the Windy Ridge Project will advance geothermal as a low carbon energy choice for Vermont customers in several ways. It offers a unique opportunity for VGS, housing developers, customers, electric utilities, policymakers, and communities to understand and measure the benefits of geothermal systems. Specifically, the Project will provide the following diverse benefits:

- a. **For Our Natural Gas Customers and Employees:** For VGS ratepayers, the Windy Ridge Project will kickstart VGS’s geothermal service offering, which will test an alternative utility thermal model for customers across the economic spectrum. We anticipate that geothermal projects will help diversify VGS revenue sources and support a cost-effective transition to a lower-carbon energy future. Further, the Project will provide VGS with valuable experience operating an alternative thermal pipeline infrastructure that mirrors our existing natural gas infrastructure. VGS employees will gain hands-on training in geothermal system design, construction, and maintenance, building upon our employees’ existing skill sets. This presents a potential growth path for VGS that is aligned with Vermont’s climate goals.
- b. **For Market Participants:** The Project will demonstrate to customers and developers an all-electric solution with superior life-cycle costs and grid benefits. By demonstrating community geothermal feasibility and benefits, the Windy Ridge Project will encourage adoption in other communities across Vermont. We know that developers are receptive to community geothermal systems in theory, but we have learned that where a community-scale development will ultimately involve multiple property owners, developers need a competent and responsive third-party operator. A utility entity serves this purpose well, just as it does for natural gas and electricity customers for whom regulation ensures safe, reliable and affordable operations and costs over the long term. Currently, VGS is the only entity in Vermont offering to perform this third-party role for community scale geothermal and the Windy Ridge Project is our first opportunity to demonstrate success. Moreover, the Project site will be an educational tool, such that

community members and interested parties can access tours and presentations on community geothermal system design, development, and operation.

- c. **For Geothermal Customers:** The Windy Ridge Project will provide residents with a dependable, cost-effective way to heat and cool their homes. The system is designed to cover 100% of the development's heating, cooling, and hot water needs, offering a hassle-free experience with reliable service, predictable costs, and year-round comfort. Windy Ridge will provide environmentally sustainable and permanently affordable housing to many renters and homebuyers in Chittenden County, an opportunity VGS and Champlain Housing Trust hope to replicate for more low- and moderate-income Vermonters.
- d. **For the Environment and Electric Grid:** The baseline thermal energy solution proposed for Windy Ridge met residents' heating and cooling needs with air source heat pumps and provided hot water through natural gas. The geothermal system at Windy Ridge is expected to reduce carbon emissions by approximately 70% compared to that baseline. Additionally, geothermal systems provide a continuous, non-peaking electric load, requiring less electricity to heat and cool buildings, immune from weather-induced commodity price volatility. As compared to air-source heat pumps, geothermal systems will place a lower demand on the electric grid, reducing the need for future electric generation, storage, and infrastructure.
- e. **Measurement and Verification:** Once operational, the system performance will be monitored, measured, and analyzed at a customer, building, and grid level. Through energy modeling, the grid impact will then be compared against other, all-electric, heating and cooling alternatives. Grant partner, Frontier Energy, is responsible for Windy Ridge measurement and verification. The measurement and verification plan includes monitoring: the ground loop heat extraction/rejection; the inlet/outlet temperature; the electric consumption of all pumps, water source heat pumps, and controls; and advanced metering infrastructure power data. Key outcomes will include the total system coefficient of performance based on delivered energy and power consumption, and the aggregated demand impacts that the geothermal system and water source heat pumps have on peak grid demand. Ultimately, this data will inform future community geothermal system sizing and provide valuable modeling analysis.

In addition, please see supportive letters from the Town of Hinesburg, Champlain Housing Trust, and Evernorth, included with this filing as **Attachments A, B, and C**, respectively.⁶

Cost

The Project is estimated to cost approximately \$3.5 million, of which 90% will be covered by the Department of Energy, and 10% will be shared by local partners. Installing the exterior ground loops and interior ground source heat pump equipment accounts for two thirds of the cost; the remainder will support administration and management, measurement and verification, and ongoing market uplift. Estimated Project costs and funding sources are detailed below.

⁶ Evernorth's project description referring to 36 units in four buildings excludes the fifth, eight-unit building being developed by CHT only.

Project Funding Uses	
Administration & Project Management	\$111,866
Exterior Ground Loop Installation	\$528,265
Ground Source Heat Pump Installation	\$1,695,261
Measurement and Verification	\$537,232
Community Engagement	\$294,795
Workforce Development	\$48,492
Case Study Development	\$129,089
Total Project Funding Uses	\$3,345,000

Project Funding Sources	
DOE	\$3,010,000
VGS	\$64,313
CHT	\$192,937
GMP Estimated (Tier 3) Incentive	\$77,750
Total Project Funding Sources	\$3,345,000

The cost-share between VGS and CHT was determined by applying a percentage ratio of the overall geothermal system costs (ground loops and inside equipment) to each responsible party. In this case the estimated total system-only costs are \$2,223,526 (\$1,695,261 (CHT's inside equipment) + \$528,265 (VGS's ground loops)).⁷ The cost-share is approximately 75% to CHT and 25% to VGS. The resulting amount is further reduced by GMP's Tier 3 incentive, also split proportionally. This approach allows VGS to offer acceptable energy and maintenance costs for the development's low- to moderate-income residents.

VGS expects to spend approximately \$64,000 of innovation funds supporting this Project. Note that innovation expense up to \$500,000 annually and innovation capital up to \$1.5 million annually are already included in rates through our Alternative Regulation Plan Climate Action and Innovation Budget. Though we expect this Project to include both expense and capital investments, VGS's contribution to this Project will have no impact on customer rates beyond what is already accounted for in Base Rates through alternative regulation.

The cost to customers receiving geothermal service is discussed in the *Variance From Tariffed Services* section below.

Timeline

We anticipate the DOE's Phase 2 grant to begin between May and July 2025 and to continue for approximately 30 months. South Meadow at Windy Ridge is scheduled to break ground in January 2026 and be under construction for one year. CHT anticipates all units will be occupied in early 2027.

⁷

VGS and CHT have included 10-20% contingencies.

Variance From Tariffed Services

Regarding payment for service from eventual geothermal customers, a new service agreement will be required. Owners or residents will pay VGS a monthly fee that will cover ongoing geothermal loop service and maintenance obligations. This fee will also cover costs associated with VGS's ownership of the external loop, including electric costs to operate external system components, administrative costs, and insurance. During the 30-month grant period, VGS will provide preventative maintenance for the heat pump equipment for an additional monthly charge. Post-grant, owners or residents will also be able to opt into a VGS service plan, covering maintenance and service for heat pump equipment.

Vermont Energy Goals and Greenhouse Gas Emissions

Vermont's 2022 Comprehensive Energy Plan directs the reduction of greenhouse gas emissions by 90% and fossil fuel consumption by 80% below 1990 levels, by 2050. Fossil fuel use in Vermont's existing building sector represents approximately 36% of our greenhouse gas inventory.⁸ A primary strategy articulated in the Comprehensive Energy Plan for the thermal sector is reducing thermal energy demand.⁹

The Environmental Protection Agency reports that geothermal heat pumps can reduce energy use and emissions by up to 44% compared to air source heat pumps. By leveraging stable underground temperatures, geothermal systems also lower peak demand on the electric grid during extreme weather. The 2023 DOE report, *Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the U.S.*, modeled a scenario in which geothermal heat pumps were installed in 68% of existing and new U.S. buildings, alongside weatherizing single-family homes from 2022 to 2050.¹⁰ The report projects this strategy would yield over \$1 trillion in cumulative electric cost savings, reduce consumer heating fuel bills by \$19 billion annually, and cut grid expansion needs by 38%, avoiding 43,500 transmission line miles. Additionally, electricity demand would decrease by 13%, and wholesale electricity prices would drop by 12%.

South Meadow at Windy Ridge will be a new construction development with 44 permanently affordable housing units that are completely fossil fuel free, with estimated greenhouse gas emissions reductions around 36 MTCO₂e annually. The Project plan includes evaluating the real-world grid impacts of South Meadow's community geothermal system against the modeled

⁸ See Energy Action Network, *Key Findings from the 2023 Annual Progress Report for Vermont*, available at: <https://eanvt.org/annual-report/2023-apr-key-findings/>.

⁹ See Vermont Department of Public Service, *2022 Vermont Comprehensive Energy Plan* at 164 ("achieving Vermont's energy and climate-related goals will also require new strategies for further reducing thermal energy consumption across all the market segments").

¹⁰ See <https://info.ornl.gov/sites/publications/Files/Pub196793.pdf>; see also *The Economic Value of Ground Source Heat Pumps for Building Sector Decarbonization* (2020) finding that "inclusion of more efficient ground-source heat pumps (GSHPs) provides an opportunity to reduce the overall costs and impacts of electrifying space heating in most parts of Canada," available at [https://www.hrai.ca/uploads/userfiles/files/Dunsky_HRAI_Benefits%20of%20GSHPs_\(2020-10-30\)_F.PDF](https://www.hrai.ca/uploads/userfiles/files/Dunsky_HRAI_Benefits%20of%20GSHPs_(2020-10-30)_F.PDF).

grid impacts of the alternative all-electric, air source heat pump and heat pump water heater system. It is an ideal first step toward a very promising geothermal future.

Energy Efficiency

The South Meadow geothermal system will not include any natural gas service on site and therefore VGS's Energy Efficiency Utility will not be directly involved in this Project. However, both Efficiency Vermont (through its high-performance building program) and Green Mountain Power (through the Tier 3 program) are important partners supporting the Project's overall efficiency and decarbonization.

Customer Outreach

In addition to the extensive community outreach described above, the Windy Ridge Project also resulted from extensive customer outreach over the past several years. As VGS explored opportunities for community-scale geothermal, we consulted and collaborated with over a dozen property developers (including several affordable housing developers), town planners, geothermal design firms, geothermal builders, utilities, efficiency programs, clean energy advocacy groups such as Energy Action Network, AIA-VT, town energy committees, national geothermal industry groups, existing geothermal customers, and many others. Everyone we met with saw geothermal as a long overdue solution that could eliminate the need for fossil fuels in their buildings, reduce energy costs and heating and cooling system maintenance, and provide electric grid benefits. Our outreach also exposed the critical need for a third party to enter the market that is willing to design, build, own, operate, and maintain the underground infrastructure, particularly when multiple buildings and property owners are involved.

Specific to this Project, community engagement was integral to the DOE feasibility grant. We are hopeful that this pilot's many benefits will help pave the way for more Vermont community-scale geothermal projects to follow.

Conclusion

The Windy Ridge Project offers an exciting, low risk opportunity for VGS to explore how utility-owned and -operated geothermal can meet customer needs and support Vermont's clean energy goals. The Project will help VGS assess the training required to prepare its employees to install and maintain community-scale geothermal systems and identify the most practical and cost-effective ways to deliver them. It also provides a chance to study how geothermal systems interact with the electric grid, offering insights for future collaboration with electric utilities. The Project will give developers and community members hands-on experience with community geothermal systems, helping them gain confidence in its ability to reliably, comfortably, and affordably heat and cool homes and other buildings. It will be a blueprint for advancing a promising thermal energy alternative for our northerly state and a new revenue source for VGS and our ratepayers.

Holly R. Anderson, Clerk
April 16, 2025
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As always, we are available to the Commission and the Department to answer any questions about this filing.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Mary G. Bouchard". The signature is fluid and cursive, with the first name "Mary" and last name "Bouchard" clearly distinguishable.

Mary G. Bouchard
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