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September 27, 2022

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

Re: Notice re Climate Action and Innovation, RRMC Geothermal Project

Dear Ms. Anderson:

By this filing, Vermont Gas Systems, Inc. ("VGS" or the "Company") provides notice of a new project under our Climate Action and Innovation programming.[1] On July 29, 2022, VGS filed notice that it is exploring what role it can play in expanding geothermal heating and cooling in Vermont.[2] That letter noted that VGS is using innovation funds on exploratory *pre-development* work for various potential geothermal projects. Today's filing provides notice specific to a geothermal project at Rutland Regional Medical Center ("RRMC") that is ready to enter the implementation phase.

Introduction: VGS's Geothermal Program Pilot

A geothermal system is a time-tested, highly efficient energy technology used to heat and cool a building by transferring energy to and from the earth. In Vermont, the temperature underground is close to 50 degrees Fahrenheit year-round, presenting a renewable and consistent energy source. A geothermal system takes advantage of this constant temperature by transferring heat to and from a ground source heat pump ("GSHP") to provide space heating and cooling.[3] Geothermal systems are considered the most efficient heating and cooling systems available.[4] They present a unique proposition that lessens or potentially eliminates fossil fuel consumption, reduces total energy consumption, electrifies residual energy requirements, and provides summer cooling with zero incremental expense.

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[1] Section 5 of the Company's Alternative Regulation Plan provides that VGS shall pursue "projects, programs, and services that support Vermont's statewide energy goals by advancing promising technologies to facilitate efficient, lower carbon energy choices for its customers." *See* Exhibit VGS-JMP-5 filed May 21, 2021 in Case No. 19-3529-PET ("ARP") at 5.

[2] Please see correspondence of Jill Pfenning, Esq., dated July 29, 2022, in Case No. 22A-3045 for more information on geothermal technology and VGS's program pilot.

[3] For more information on how geothermal systems function, see NYSERDA's short video, *How it works Ground Source Heat Pumps*, available at https://www.youtube.com/watch?v=qV48cX4d-WY.

[4] According to the U.S. Environmental Protection Agency, "For every unit of electricity used in operating the system, the heat pump can deliver as much as five times the energy from the ground, resulting in a net energy benefit." https://www.epa.gov/rhc/geothermal-heating-and-cooling-technologies.

As discussed in our July 29th filing, geothermal systems have many environmental benefits, and VGS is well positioned to enable widespread adoption in Vermont. Initially, VGS is providing support to building owners and developers interested in geothermal systems as an alternative to traditional heating and cooling. This will help answer key technical, workforce, regulatory, and financial questions that will enable the Company to further develop a geothermal program. VGS has identified two geothermal project classes to pursue: (1) Single-customer, small-to-medium commercial installations, where a standalone geothermal loop serves the heating and cooling needs of a single commercial building; and (2) multi-customer loops, where a single wellfield or series of wellfields serves numerous customers. The small-to-medium commercial installation approach (like the RRMC project presented here) will benefit the pilot by providing VGS with geothermal design, financial modelling, and construction/implementation experience, at a relatively low cost because of the scale of the project. Piloting the multi-customer approach will add unique elements associated with providing geothermal systems on a utility scale, but at a higher cost. Both project types offer value to program development as the goal is to gain timely experience that illuminates paths for a utility geothermal business model.

Ultimately, we believe the multi-customer approach aligns best with our role as a thermal utility. This model closely resembles our existing business model: constructing and maintaining networked infrastructure for delivering thermal energy and recovering that cost over time. Developing this community loop approach will also enable decarbonized thermal services for many other sectors, including municipalities, schools, and affordable housing markets. Potential utility applications for geothermal systems in Vermont are widespread. Drilling and trenching technologies are fundamental to VGS, and the pipe materials used for geothermal applications are nearly identical to those for natural gas service. As a utility, VGS has distributed energy to heat homes and businesses for 60 years. Now we are actively pursuing a future in which customers continue to rely on us for home heating in a decarbonized world.

The Diabetes & Endocrinology Center Project

The Diabetes & Endocrinology Center ("DEC") in Rutland, Vermont, is a 6,000-square-foot medical office and outpatient building on the RRMC campus. The DEC currently uses propane and electricity to heat and cool its space, but a failing cooling tower has presented the opportunity to consider decarbonized heating and cooling alternatives.

As discussed above, geothermal technology can provide remarkable environmental and economic benefits. Replacing DEC's current system with a geothermal system will significantly reduce energy usage and maintenance requirements on site and eliminate fossil fuel usage for space heating. Installing geothermal is estimated to avoid approximately 6 MTCO2e[5] annually from fossil fuel reductions[6], reduce overall space heating and cooling energy consumption by

[5] Metric Tons of Carbon Dioxide Equivalent is a standard unit of measure allowing comparison between various measures and initiatives.
[6] Based on GMP's 100% carbon-free electric supply (https://greenmountainpower.com/energy-mix/).

49%, and reduce energy and maintenance expenditure by more than $200,000 over the 15-year term, as compared to an update to the existing system over the same timeframe.

Geothermal emerged as a worthy replacement strategy for the DEC for several reasons. First, the DEC building has an existing internal HVAC technology and distribution system in place that can be repurposed to support a geothermal loop. Second, recently drilled test wells nearby revealed favorable subsurface geology, and an adequate well field space exists adjacent to the structure. Finally, the DEC building sits on RRMC's main campus along with many other RRMC satellite buildings, so there is potential to connect additional square footage to create a networked geothermal system, potentially increasing the system's economic and environmental value over time as it could be expanded to cover additional buildings on the campus.

Cost and Carbon Value

VGS will install the external geothermal well field and associated piping and will provide ongoing maintenance through a third-party contractor. RRMC will be responsible for internal equipment, which will be significantly repurposed from the existing heat pump system. VGS's cost to install the geothermal loop is approximately $115,000 including overhead, as shown in the table below. $15,000 will be contributed by Efficiency Vermont, and $21,500 will be contributed by VGS from innovation funding. The remaining project cost, approximately $78,500, will initially come from innovation funding, but will be recovered through fees paid by RRMC during a 15-year term. In addition, VGS's operational costs will be recovered through fees paid by RRMC. After the initial term, RRMC will have the option to own the system. If VGS develops an applicable tariff for the system, RRMC may switch to the tariff.[7] RRMC will pay its own electric costs directly, including those for power consumed by pumps associated with the geothermal loop. The following table shows the estimated cost and timeline associated with installing the geothermal loop.

Expense Description	**Amount**	**Timeline**
Drilling geothermal wells	$60,000	Fall 2022
Grouting and piping to the interior piping loop	$30,000	Fall 2022
Engineering and project management	$10,000	Fall 2022
VGS Overhead Allocation	$15,000	Fall 2022

Geothermal installations are permanent, and while some components might be removed and repurposed, in general, the system's value will be derived from the service it provides to the DEC building. The risk to non-participating ratepayers is payment default by RRMC. However, RRMC is a long-established private, non-profit organization providing medical services to the

[7] As discussed above, and further in our July 29th filing, VGS is ultimately pursuing a utility-style geothermal offering that closely resembles our existing business, including cost recovery through periodic charges on customer bills. We expect such an offering may be administered pursuant to a Commission-approved geothermal service tariff, which we will propose as appropriate following our pilot initiatives.

community. It consistently raises revenue through a variety of methods, including donations, town funding, and direct billing for service. Further, VGS expects its agreement with RRMC will include a requirement to assign the service agreement to a new owner, should the building be sold.

The value of carbon as it relates to this project can be evaluated from several angles. At a basic level, this pilot will last 15 years at a cost to ratepayers of $21,500. Simple division yields a cost of avoided carbon of approximately $238/MT of CO2e at the burner tip. However, the geothermal loop is a 30- to 50-year asset that will provide carbon reduction well beyond the pilot term, which reduces the avoided carbon cost to $75-125/MT of CO2e. Including avoided emissions associated with production, distribution, and delivering propane to the DEC would incrementally reduce the carbon values calculated here. From the customer's perspective, and from a larger societal evaluation, the total ownership and operation cost will be less expensive for the geothermal loop than the alternative propane-fired boiler serving the heat pumps. When calculating carbon values, VGS uses the incremental cost of the low-carbon solution over a traditional solution, divided by the volume of energy delivered (i.e., Incremental Cost / Lifetime Carbon Saved = Carbon Value). Since the incremental cost for the project is negative, the carbon value is similarly negative, indicating a highly effective conversion case for this facility from a carbon reduction benefit perspective.

VGS Participation

The DEC project presents an immediate and important opportunity to advance a utility geothermal service past the concept stage, to the practical learning stage. After many months spent exploring, discussing, and modelling the concept with design-engineers, architects, developers, customers, utilities, and a wide range of other stakeholders, actualizing a project will provide the education and proof-of-concept VGS needs to pursue other projects that align with VGS's broader geothermal vision. The interest for efficient and effective decarbonized thermal solutions is high across the various developer perspectives that comprise Vermont's new construction landscape, particularly so in the residential market where the demand for new housing is soaring. Currently, VGS is in discussions with several established housing developers in the affordable housing sector who plan to bring online hundreds of new units in the coming years. As VGS seeks to aggressively develop new decarbonized solutions that can scale (i.e., community or networked geothermal solutions), the DEC project immediately provides us with greater footing in those ongoing discussions and explorations.

Internally, the DEC project will help us acquire experience and knowledge in geothermal construction, equipment installation, and performance in areas such as:

- Well field site selection;
- Borehole number, size, and spacing;
- Suitability of available drilling equipment and personnel;

- Interior equipment performance and maintenance; and
- External and internal interface optimization.
- Pump selection and maintenance

It will also help us understand customer usage patterns, including:

- Identifying peak loading cycles, winter and summer, for commercial class customers;
- Identifying possibilities for successful expansion of the geothermal loops to neighboring buildings on the RRMC campus; and
- Studying the impact of service intervals on reliability and efficiency.

With each of these pilot projects we anticipate collaboration with Efficiency Vermont and the electric distribution utility to capture data that helps inform a range of valuable attributes including system performance, system capacity, and load profiles. As an electrification strategy, geothermal will eliminate fossil load while increasing demand for power. However, geothermal can help mitigate electrical peaking demand that is expected with other thermal electrification methods, such as air-source heat pumps, because it is highly efficient and carries a nearly flat load profile.

Conclusion

Vermont has set ambitious climate obligations for itself, and VGS is committed to providing critical support for decarbonization through innovative services. The DEC project will be a timely demonstration project for other potential geothermal customers and the knowledge VGS will gain will inform how to efficiently deploy similar projects. In this way, it will "support Vermont's statewide energy goals by advancing promising technologies to facilitate efficient, lower carbon energy choices for [our] customers", as contemplated by our Alternative Regulation Plan.

As always, we are available to the Commission and the Department to answer any questions about this filing.

Respectfully submitted,

/s/ Jill Pfenning

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