



FILED VIA ePUC

June 3, 2022

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

Re: Large-Scale Electric Boiler Optimization Project

Dear Ms. Anderson:

By this filing, Vermont Gas Systems, Inc. (“VGS” or the “Company”) provides notice that it intends to contribute to an electric boiler optimization project at Jay Peak Resort in Jay, Vermont (“Jay Peak”) for the opportunity to observe promising new technology capable of facilitating cost-effective, large-scale hybrid fuel systems that use both electric and fossil fuel thermal sources.

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.”¹ Section 5(d) requires VGS to provide 30 days’ advance notice to the Commission and the Department of Public Service (“Department”) 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.

Introduction

Exploration of hybrid thermal systems that employ electrification is critical to VGS’s Climate Action Plan and Vermont’s implementation of the Global Warming Solutions Act. Our industrial- and commercial-scale customers stand to benefit significantly from emerging technologies that offer cost-effective, real-time electrification in conjunction with existing fuel sources. Hybrid systems such as the project discussed herein represent opportunities to collaborate between gas and electric distribution utilities to the mutual benefit of both. Thus, we aim to support emerging solutions in electrification capable of interacting with existing thermal heating technologies in ways that maximize the benefits of both systems. Contributing to the Pump House Project described below will allow VGS to participate in the research and development necessary to promptly deploy this emerging technology to our large-scale natural gas customers, which could lead to considerable greenhouse gas reduction for our customers and the State.

¹ See Exhibit VGS-JMP-5 filed May 21, 2021 in Case No. 19-3529-PET.

The Pump House Project

Approximately 600,000 gallons of propane are used each year as the primary heat source for the Pump House indoor waterpark at Jay Peak, releasing approximately 3,500 tons of CO₂ annually. The Pump House is a significant draw for tourism, both locally and regionally, but is a challenging subject for decarbonization due to the thermal energy required and Jay Peak's location in a remote area of Vermont. By deploying an electric boiler to be used in conjunction with existing fossil-fueled equipment, this project will demonstrate an emerging technology that uses dispatch sequencing algorithms to support hybrid heating at scale.

Medley Thermal ("Medley") is a member of the 2020 DeltaClimaVT incubator program. It has developed software designed to optimize electric boiler use in conjunction with existing fuel sources by inputting price signals from the wholesale electric power marketplace. For Jay Peak, Medley's software will be programmed to use price information under Vermont Electric Cooperative's ("VEC") service classification #5.² This is a dynamic rate that passes through most wholesale electric market price signals, including real-time power supply costs, and capacity charges based on the project's contribution to VEC and ISO-NE coincident peaks. Importantly, VEC will provide 100% renewable energy to the electric boiler. Medley's software will initially be programmed to dispatch the electric boiler on a purely economic basis, using electricity when the cost to do so drops below the delivered propane cost, but avoiding monthly and annual peak periods. In the future, the software may be further refined to reflect inputs not currently available, such as variable renewable energy credit pricing or carbon costs.

Economic and Environmental Benefits

Historically, the primary concern over electric boiler use in Vermont has been related to high costs to operate based on the cost of electricity, which can exceed the cost to operate a fossil fuel boiler by 2-5 times or more, depending on fuel type.³ Full electrification is often cost prohibitive at industrial scale due to charges for Capacity and Regional Network Service (RNS), which are allocated based on an asset's consumption during hours that coincide with local or regional consumption peaks. However, Medley's software has the potential to reduce the operational cost of an electric boiler not only by avoiding operation during such peak hours, but also by selectively avoiding periods when wholesale power supply costs are elevated. Continuity of thermal service is accomplished by operating the boiler on an alternative fuel when the electric boiler is off; this creates a hybrid system that can respond to market signals in real-time. The dynamic nature of Medley's dispatch software achieves reduction in both carbon emissions and

² See Sheets 75-76M (pdf pages 106-120) at https://vermontelectric.coop/client_media/files/VEC_tariff_effective_01_01_2022_6.pdf.

³ As of March 2022, the Energy Information Administration reported average industrial electric rates in Vermont at 11.83 cents per kWh. Natural gas prices have risen substantially in recent weeks reducing, but not eliminating, the cost delta between natural gas and electricity. For example, at a delivered natural gas price of \$9.50/MMBtu, and assuming an efficiency penalty of 10% for the fossil fuel boiler, the electric boiler's fuel cost is more than three times higher. Propane- and oil-fired boilers will generally exhibit smaller multiples due to higher fuel cost.

operational cost that would be unachievable for a boiler that relies exclusively on a single fuel source. Given the high temperature requirements of the Pump House, as with many industrial heating processes, electrification via air-sourced heat pumps is not technologically viable, so this project represents a considerable step toward identifying solutions that can help meet Vermont's Global Warming Solutions Act requirements for industrial processes.

According to Medley's retrospective cost simulations for the Pump House over a five-year period (2017-2021), developed with shadow billing provided by VEC, dynamic dispatch of an electric boiler would have achieved electrification for 76% of the Pump House's heating load, equivalent to approximately 456,000 gallons of propane annually. Accounting for electrical costs under VEC's service classification #5, the simulation resulted in cost savings ranging from 9% to 33% per year.

Offsetting 456,000 gallons of propane annually would result in an emissions reduction of 2,635 tons of CO₂e per year. Assuming a total project cost of \$1,000,000 and a service lifetime of 20 years, the cost of CO₂e emissions avoided is approximately \$19 per ton, which compares favorably to generally accepted ranges for societal carbon costs of \$100 to \$150 per ton. If successful, Medley's software will allow the project to increase average load on the VEC system without increasing peak load or contributing to coincident peaks on which VELCO and ISO-NE charges are calculated. By increasing VEC revenue without increasing the need for significant transmission or generation assets, this project will create the opportunity to increase electric load without the need for significant transmission or generation buildout, which has a positive impact for the utility.

A similar project adjacent to VGS infrastructure would have the same benefits to the local electric distribution company, but also provide benefits to VGS's system and ratepayers. By offering fuel switching capability to customers who otherwise might not have the option, a VGS customer with an electric boiler would minimize or eliminate contributions to peak gas demand, helping VGS delay or eliminate infrastructure investments. Benefits from reduced capital and operating costs would accrue to all ratepayers.

VGS Participation

Participating in the Pump House Project will allow VGS to evaluate a large-scale hybrid heating project firsthand, from equipment order through installation and operation. The project will offer valuable insight into the real-time operational interaction that occurs when deploying traditional fossil fuel boilers and electric boilers with smart technology, and demonstrate how Medley's software performs under real-world conditions. With the potential for increasing volatility in global energy markets due to unpredictable geopolitical influences, performance of the system during periods of market stress will be an important area of study. Our goal is to validate the viability of the dispatch optimization software and gain valuable operational insight that our engineering and service teams can build into working models for hybrid systems deployable to large-scale VGS customers.

Currently, VGS is in discussion with three large-scale industrial customers who are considering employing an electric boiler to displace some portion of their natural gas load. For each of our customers, carbon savings are important, and for at least one, the primary motivation for pursuing an electric boiler is focused on climate benefits that would otherwise be unachievable. For others, resilience and fuel diversity, combined with the potential to use pricing volatility to their advantage, provide strong motivation. Because VGS has not assisted in deploying this kind of equipment in the past, there are many unknowns in terms of costs and operations. Participating in the Pump House Project will give VGS firsthand knowledge and experience with electric boiler/hybrid systems that can be directly applied to VGS's own customers who have interest in installing such systems. Likewise observing firsthand the operation of Medley's software will equip VGS with the tools to be able to use technology to make these hybrid systems function in a cost-effective manner.

Though geographically apart from our pipeline infrastructure and traditional footprint, this is an appropriate project for VGS engagement because it is an optimal and timely opportunity for research and development in an area that current VGS customers are exploring. VGS is an eager contributor to Vermont's decarbonization efforts and is actively gathering intelligence to help move its customers and the State forward without delay. Further, VGS's contribution will fill a critical gap in funding that may otherwise stall the Pump House Project indefinitely. VGS sees itself as a leader in the State's efforts to identify and deploy viable decarbonization solutions for thermal systems and is willing to put its resources to work to ensure viable solutions are tested and studied in real-time.

Inter-Utility Collaboration

Collaboration among the gas and electric distribution utilities is critical to maximizing value from both systems. Electric rate paradigms such as VEC's service classification #5 offer both utilities access to the variable market pricing that allows optimization between them. By accurately reflecting the variable cost of service, VEC opens the door to new decarbonization methods that would otherwise go unrealized.

VGS has undertaken preliminary discussions with other electric distribution utilities in Vermont regarding variable rate structures. The Pump House Project is expected to show how such structures benefit the electric grid by increasing load (and electric revenue) during periods when excess capacity is available but not during periods of peak stress that would cause incremental fixed costs, such as capacity charges. Electric rate designs could be approved for other utilities that mirror the VEC tariff, with all incremental charges passed through. This method avoids conflicts of interest between utilities by clearly communicating the range of economic outcomes across the universe of operational behavior. In conjunction with accurate gas utility tariffs, an operator—through software like Medley's—can make informed decisions about fuel choice based on cost, carbon, and operational requirements. Utilities, meanwhile, can expect full compensation for the service provided.

As the use of hybrid electric thermal systems grows in Vermont, coordination of the hybrid fleet will be critical to the success of economic optimization. Complexity will grow, but conflict can

be minimized with software like Medley's and appropriately designed tariffs on both the electric and gas systems.

Cost and Timeline

VGS plans to contribute \$150,000 from our FY22 Climate Action and Innovation Budget to help fund the Pump House Project, which represents 15% of the total cost of installing and integrating the electric boiler. The expense will be integrated in base rates through our innovation expense budget, impacting all customers equally. Our role will be limited to the initial contribution and operational observation of the system and software.

The project is moving on an accelerated schedule to be in-service for the winter 2022-2023 season. Installation is planned during summer 2022, with a targeted start-up in November 2022. Accordingly, it will be critical for initial deposits to be made on selected equipment as soon as possible to secure production slots for long-lead items.

Conclusion

Electrifying commercial- and industrial-scale thermal load can be challenging—demonstration projects are needed to confirm anticipated results that will help potential users see the operational feasibility and to learn about the costs and operations of such systems. Hybrid thermal systems that deploy both electric and traditional boilers through smart technology to optimize cost-effectiveness are a possible solution to decarbonization of such loads. Medley's dispatch optimization software promises significant environmental benefits and Jay Peak's Pump House Project provides a timely and realizable opportunity to evaluate its capability. VGS's contribution will move the project forward, and the knowledge VGS gains will inform how to deploy similar projects for our customers, including those who are currently exploring this possible decarbonization solution. Clearly, this is a project that "support[s] 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.

We are available to the Commission and the Department to answer any questions about this filing.

Respectfully submitted,

/s/ Jill Pfenning

Jill Pfenning
VP, Financial & Regulatory and General Counsel
Vermont Gas Systems, Inc.
jpfenning@vermontgas.com