Testimony of

Gabrielle Stebbins

Energy Futures Group

On Behalf of Conservation Law Foundation

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I. EXECUTIVE SUMMARY

Gabrielle A. Stebbins is a Senior Consultant with Energy Futures Group, Inc. and testifies on behalf of Conservation Law Foundation regarding a Petition for a Declaratory Order filed by Sea 3 Providence, LLC. She testifies to provide information to the Rhode Island Energy Facility Siting Board regarding the potential environmental impact of expanding Sea 3's current propane operations. Her testimony presents the findings of her high level analysis in which she compares the greenhouse gas emissions resulting from two different residential heating scenarios. One analysis identifies the emissions that result if homes currently using fuel oil for heating switch to propane. The other analysis identifies the emissions that result if homes currently using fuel oil for heating install heat pumps while keeping the existing heating system. Her analysis finds that the proposed propane expansion could result in more than doubling emissions as compared to other alternatives. Her testimony presents these findings and, based on her expertise and experience, she opines that this expansion will make achieving Rhode Island's emission reduction requirements meaningfully more challenging.

II. INTRODUCTION AND QUALIFICATIONS.

Q. Please state your name, title and employer.

A. My name is Gabrielle Stebbins. I am a Senior Consultant at Energy Futures Group, located at 10298 Route 116, Hinesburg, Vermont, 05461.

Q. Please describe Energy Futures Group.

A. Energy Futures Group (EFG) is a clean energy consulting firm established in 2010. EFG specializes in the design, implementation, and evaluation of energy efficiency and renewable energy programs and policies. EFG has worked on behalf of utilities and other program administrators, government and regulatory agencies, and environmental, low income, and affordable housing advocacy organizations in 40 states and Canadian provinces, as well as several countries in Europe. EFG's recent work includes analysis of Rhode Island's investments in gas infrastructure, expert testimony on a proposed gas supply contract before the New Hampshire Public Utilities Commission, expert testimony on three proposed gas company pilots in Illinois, modeling and development of pathways for Vermont to achieve its emission reduction requirements, technical support in the Massachusetts' Future of Gas Stakeholder proceedings, analysis and strategic planning support for the Connecticut Energy Efficiency Board, the Rhode Island Energy Efficiency and Resource Management Council and the Massachusetts Energy Efficiency Advisory Council and Department of Energy Resources. Additional work includes assessing the potential for geotargeted use of distributed energy resources – "non-wires alternatives" – to cost-effectively defer capital investment in Transmission and Distribution infrastructure; assessing the potential for and impacts of electrification of space heating, water heating and transportation; assessing the role of financing products in advancing investment in clean energy; and designing and implementing residential retrofit programs in multiple states.

Q. Please summarize your professional and educational experience.

A. As a Senior Consultant at EFG, I have specialized in the development of policy and programs for promotion of renewable energy, strategic electrification and energy efficiency, with a special focus on efforts to integrate all three. I have extensive expertise in policy and planning from work as a consultant, as director of Vermont's statewide renewable energy industry trade association (Renewable Energy Vermont, or REV), a member of the Vermont System Planning Committee (addressing transmission grid reliability planning), as a Policy Committee member of the American Public Power Association and as Chair of the Board of the Burlington Electric Department (BED), Vermont's largest municipal electric utility. In this latter role I have provided strategic direction on BED's Integrated Resource Planning process, on maintaining BED's 100% renewably-sourced portfolio and on Burlington's goal to be a net zero city across all energy use by 2030. I have designed and implemented multiple residential retrofit programs, renewable energy incentive programs and pilot programs that simultaneously promote efficiency, electrification of space heating and customer-sited renewables. I am currently providing technical support to Vermont's Climate Action Plan modeling and pathways process to achieve Vermont's greenhouse gas (GHG) emission reduction requirements. I have worked on several projects in Vermont, New York and Massachusetts incorporating heat pumps in existing residential properties to decarbonize the residential heating sector and have also written policy papers identifying policy approaches to support this decarbonization. Additional work includes updating Vermont's building energy code and authoring clean energy finance reports. Finally, I serve in the Vermont General Assembly as a State Representative on the House Transportation Committee where I have been focusing on decarbonizing the

transportation sector by increasing public transit and multi-modal transit opportunities as well as vehicle electrification.

I received an M.A. in Development Studies from the Nelson Mandela Metropolitan University, Republic of South Africa, and both a B.A. in Anthropology and a B.M. in Violin Performance from Rice University in Houston, Texas.

My resume, attached as Attachment GS-1, presents a summary of my professional and educational experience.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Conservation Law Foundation (CLF).

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide information to the Rhode Island Energy Facility Siting Board (EFSB) as it considers a Petition for a Declaratory Order filed by Sea 3 Providence, LLC (Sea 3, or the Company). Sea 3 owns and operates a liquid propane gas (LPG) terminal and storage facility located at 25 Fields Point Drive in Providence, Rhode Island (the Facility). In 2020 it imported 23,000,000 gallons of LPG via marine vessels and distributed the LPG using trucks. Sea 3 intends to alter its facility to enable it to expand its operations to import and distribute 100,000,000 gallons of LPG per year. This increase is over four times the current supply. Sea 3 intends to install piping and equipment to connect its facility to the rail network, allowing it receive shipments by rail as well as by sea. Sea 3 refers to this as the rail incorporation project (the “Project”). Sea 3 is asking the EFSB to declare that the Project is not an “alteration” of the existing major energy facility as that term is defined by the controlling statute, and

therefore does not require EFSB approval. In support of its petition, Sea 3 asserts that the Project will not result in a significant impact on the environment, or the public health, safety, and welfare. Specifically, my testimony addresses the potential environmental impact of the increase in propane consumption that the Project is entended to enable and incentivize and how this will make complying with Rhode Island's GHG emissions reduction requirements meaningfully more difficult.

Q: Have you previously testified in a regulatory proceeding before the EFSB?

A: No.

Q. Have you previously filed testimony in a regulatory proceeding in other states?

A. Yes. I have filed and defended testimony before the Vermont Public Service Board (now the Public Utility Commission) on behalf of REV in a case that assessed the price to be paid by all utilities into Vermont's feed-in-tariff program, the "Standard Offer." I also filed and defended testimony before the Public Utilities Commission of Ohio on behalf of the Natural Resource Defense Council pertaining to the Ohio Power Company's proposal to build 900 megawatts of renewable energy.

III. SUMMARY OF CONCLUSIONS

Q. Please summarize your primary conclusions.

A. My primary conclusions regarding Sea 3's Petition are summarized as follows:

1. Sea 3's expansion of its propane operations from 23,000,000 gallons of propane per year to 100,000,000 gallons of propane may result, based on a high-level analysis, in increasing Rhode Island's GHG emissions by 4.1 million metric metric tons over a fifteen

year period, in comparison to shifting Rhode Islanders to heating with decarbonized alternatives like heat pumps.

2. If Rhode Island homeowners shift from oil to propane rather than from oil to a decarbonized heating option such as heat pumps, this effectively "locks in" the homeowner's choice of heating equipment and fuels for upwards of two decades, as the lifetime of residential heating systems ranges from fifteen to twenty-five years.

3. This outcome is counter directional to Rhode Island's climate policy goals.

4. Decarbonizing Rhode Island's heating sector in less than three decades is currently a considerable challenge. Increasing propane consumption is a step backwards that will make reducing GHG emissions from the heating sector in this time frame even more challenging, making it even more difficult for Rhode Island to meet its overarching GHG emission requirements and energy policy mandates.

5. This increase in GHG emissions does have a significant environmental impact.

6. The EFSB should deny the Company's Petition for a Declaratory Order.

7. The EFSB should require the Company to complete a full permit application process before the EFSB.

IV. THE COMPANY'S PROPOSALS

Q. What does the Company propose in its filings?

A. In Sea 3's Petition for a Declaratory Order, the Company asserts that the Project will not result in a significant impact on the environment, or the public health, safety, and welfare, and requests that the EFSB declare that the Company's proposed expansion of its Facility

is not an alteration of an existing major energy facility under the Energy Facility Siting Act. If Sea 3's petition is granted, the Company will be allowed to move forward with the Project without review by the Board.

V. ENVIRONMENTAL IMPACT

Q. Please summarize your understanding of the environmental impact of the Company's proposal to expand its propane operations.

A. The Company proposes to expand its Terminal, located in Rhode Island's marine industrial port complex commonly known as ProvPort, to enable it to grow its operations from 23,000,000 gallons of LPG imported and distributed per year to 100,000,000 gallons. To assess the potential increase in GHG emissions resulting from the burning of an additional 77,000,000 gallons of propane per year, I analyzed the change in emissions resulting from homeowners shifting from oil heat to propane heat and compared that to the change in emissions resulting from homeowners shifting from oil heat to heat pumps powered by electricity. The high-level analysis makes a number of reasonable and conservative assumptions, resulting in a finding that if the 77,000,000 gallons of propane displace oil in Rhode Island homes rather than shifting residential space heat to heat pumps with oil as a backup, the result would be an increase of 4,135,706 metric tons of GHG emissions over a span of fifteen years. I selected a fifteen year time frame for the analysis because it is a conservative estimate of the useful life of a heating system utilizing propane.

Specifically, if Rhode Islanders shift from oil to propane, burning the amount of additional propane that Sea 3 intends to sell to consumers per year, that will result in

6,686,915 metric tons of emissions over a fifteen year period. If these Rhode Islanders instead shift to heat pumps, with oil remaining as a backup fuel option, that will result in 2,551,208 metric tons of emissions. The lower emissions achieved via heat pumps are a result of heat pumps' greater efficiency and cleaner fuel source. Overall, shifting these homes from oil to propane would result in more than doubling, and nearly tripling, the emissions produced if, instead, the homes shifted to heat pump heat while retaining the oil system as a backup fuel source. Further, because the analysis I conducted (described below) averages the emissions over the fifteen year period from 2022-2037 such that a flat 129 lbs of CO2/MMBTU is applied each year, if the propane heat is used beyond the fifteen year period, the difference in emissions between heating homes with propane and electric heatpumps will be even greater. This is due to the analysis ending at year fifteen, at which point the emissions from Rhode Island's electricity consumption is assumed to be zero, not 129 lbs of CO2/MMBTU.

Q. **Please describe the analysis that you performed to reach this conclusion.**

A. While propane can be used for a variety of purposes including space and water heating, cooking, as a fuel in cars and in industrial, agricultural and manufacturing settings, to simplify the analysis, I assumed that all 77,000,000 gallons of additional propane would be used for space heating. I further assumed that all of the additional propane would be consumed in Rhode Island residences. I converted the gallons of propane into British Thermal Units, and, using a residential annual heating load of 89/MMBTU from the Brattle Group's "Heating Sector Transformation in Rhode Island: Technical Support

Document" report, completed two analyses.[1] My analysis, attached as Attachment GS-2, presents the workbook detailing my analysis, assumptions and citations.

The first analysis assumes that the properties that would end up using the newly obtained 77,000,000 million gallons of propane would be homes that currently heat by distillate fuel oil. Further, I assume that these homes would shift entirely to propane. I assumed that the oil heating systems had an annualized fuel utilization efficiency (AFUE) of 84% and I assigned the propane heating systems an AFUE of 92%. These assumptions favor propane. The 84% AFUE for oil systems is towards the lower end of the range, with mid-efficiency oil furnaces and boilers ranging from 80–85% and higher efficiency models ranging from 90–98.5%. Propane furnaces range similarly, from 80–98.5% AFUE. I selected these AFUE's because I assumed that if a homeowner were to shift from oil to propane it would most likely occur near the end of the life of their existing system, and therefore the selected replacement system would be more efficient than the previous system. I utilized the United States Energy Information Administration's (EIA) emission values, with propane emitting 139 pounds of carbon dioxide per million BTU (lbs of CO2/MMBTU) and fuel oil emitting 163 lbs of CO2/MMBTU. [2] If the 77 million gallons of additional propane were all used to shift fuel oil customers to propane space heating, GHG emissions would be reduced by a total of 1.15 million tons over 15 years, compared to continued use of fuel oil. This would initially result in a near-term reduction in GHG emissions.

[1] Brattle Group, *Heating Sector Transformation in Rhode Island: Technical Support Document* (2020), *available at* http://www.energy.ri.gov/documents/HST/RI%20HST%20Technical%20Support%20Document%204-22-20.pdf
[2] *Carbon Dioxide Emissions Coefficients*, U.S. Energy Info. Admin., https://www.eia.gov/environment/emissions/co2_vol_mass.php (last visited Nov. 11, 2021).

However, there are other alternatives to converting customers from oil to propane that have lower environmental impacts that should be used for comparison, and to test the Company's position that the proposal does not have a material environmental impact.

Therefore, I have also investigated the comparative environmental impact of converting these homes to heat pumps with oil as a backup fuel instead of converting them to propane. There are a variety of cold climate heat pumps, including ductless (single-head and multi-head) and ducted air source heat pumps, air-to-water heat pumps, and ground source heat pumps. The degree to which heat pumps offset other heating fuels currently varies due to the type, size and application of heat pumps. For example, centrally ducted heat pumps completely replace the pre-existing furnace, resulting in a 100% reduction of fossil fuel consumption used for space heating. Meanwhile, single-head, ductless systems are currently more often used for addressing room-specific heating and cooling constraints within a home, resulting in less fossil fuel consumption but not necessarily resulting in eradicating all fossil fuel used for space heating the home. While single-head ductless units can and have resulted in a homeowner no longer using any fossil fuels for space heating purposes, because there is a potential for ongoing fossil fuel use for space heating, I used a weighted average to determine the percentage of fossil fuel use.

Specifically, I made the following assumptions: that if all homeowners who could be served by the heat load from 77,000,000 gallons of propane instead purchased heat pumps, that 40% would select centrally ducted heat pumps offsetting 100% of the heat load, 30% would select multi-head ductless systems offsetting 80% of the heat load and 30% would select single-head ductless systems offsetting 40% of the heat load. This resulted in an overall shift whereby 76% of heating load that could be served by

77,000,000 gallons of propane would instead be served by electricity, and the remaing 24% would be served by backup oil systems.

I utilized the EIA data point reference mentioned earlier, where 163 pounds of carbon dioxide are emitted per MMBTU produced by burning fuel oil. I selected a coefficiency of performance for the heat pumps of 2.6. This coefficiency of performance, along with the equipment selection of 40% centrally ducted, 30% single-head and 30% multi-head ductless systems, are additional examples of selecting a conservative approach to the modeling assumptions, as technology trends are pointing to increases in heat pump efficiencies and increased sales of centrally ducted systems. Both of these trends would result in greater reductions of fossil fuel consumption. Finally, for electricity emissions, I utilized the 2019 emission rate from the Independent System Operator of New England (ISO-NE), which is a value of 633 pounds of carbon dioxide per megawatt hour (lbs of CO2/MWh) and applied a linear reduction through 2030, at which point I set the emissions from electricity consumption to zero. The likelihood that the ISO-NE grid will emit less GHG in future years as compared to 2019 emissions is strong, as evidenced by multiple states within ISO-NE adopting renewable energy mandates and the ongoing building of renewable power plants. I set the emission rate to zero for the year 2030 as a result of Executive Order 20-01, which requires that 100% of Rhode Island's electricity demand be met with renewable energy by 2030, as well as Governor McKee's stated objective to codify and implement a 100% Renewable Energy Standard by 2030.[3]

[3] Office of Governor Daniel J. McKee and Office of Lt. Governor Sabina Matos, *Rhode Island 2030: Charting a Course for the Future of the Ocean State* 45 (2021) (working draft), *available at* https://www.ri2030.com/_files/public/RI%202030_final.pdf.

The report containing this objective, titled "Rhode Island 2030," is submitted as Exhibit CLF-1.

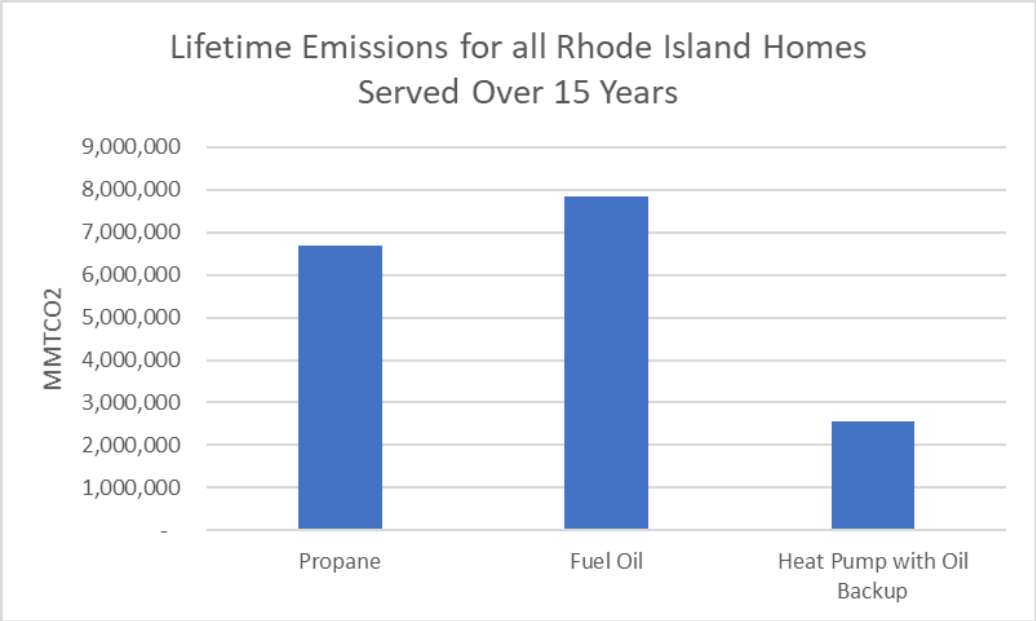
Q. **Does it make sense to set the GHG emissions for Rhode Island's electricity consumption to zero beginning in 2030, if it is part of the ISO-NE regional grid, and there may still be emissions resulting from the overall grid?**

A. Rhode Island will presumably remain interconnected and dependent on the ISO-NE system, and yes, therefore, decarbonization of Rhode Island's electricity consumption will depend in part on the decarbonization of the grid writ large. However, the previous and current Rhode Island Governors have and continue to set policy stances requiring the achievement of 100% renewable electricity by 2030. Further, multiple states in the ISO-NE region have mandates for increased renewables procurements and five of the six states in the ISO-NE region have mandatory GHG emission reduction requirements. Finally, if the assumption in the analysis, that Rhode Island's electric supply is emission free by 2030, does not materialize, there are other conservative assumptions in the analysis that provide a counter balance to this particular assumption. Ultimately, the point of the high level analysis is to show the significant potential environmental impact that Sea 3's proposal may have.

Q. What are your findings?

A. Figure 1 presents the findings of my analysis. If 77,000,000 gallons of propane were to be utilized to shift homes currently heating with fuel oil to heating with propane over a period of fifteen years, with the efficiencies I mentioned previously, this would result in 6.6 million metric tons of GHG emissions over a fifteen year period. If these homes

instead continued to heat with oil, the GHG emissions would result in 7.8 million metric tons. Finally, if instead of shifting from oil to propane, the homes were retrofitted with heat pumps, this would result in 2.5 million metric tons of GHG emissions over a fifteen year period. In this analysis, I assume that all homeowners who install heat pumps, keep their existing oil system in place as a back up – and that they use that back up on the colder days and nights of the winter. This is, again, a conservative assumption, as I am seeing homes remove the existing system entirely, as well as retain the existing system but not use it at all.



Q. You have stated that you consider the results of the analysis to be conservative. Why is that?

A. I consider the results of the analysis to be conservative for the following four reasons:

- The AFUEs selected for the oil heating system tend towards the lower end of efficiency ratings while the AFUEs selected for the propane heating systems tend towards the higher end of efficiency ratings;

- I assumed a flat adoption rate of 40% for centrally ducted systems, 30% single-head ducted systems and 30% multi-head ducted systems all at the same starting year of 2022. It is highly likely that during the 2022-2037 time period, heat pump technology will continue to evolve and improve, with central systems overtaking a larger share of the market as compared to ductless systems;

- I assumed a flat rate of 2.6 for the heat pump coefficiency of performance. Technology trends point towards heat pumps improving in efficiency and being able to heat in colder outdoor temperatures through improvements in compressor design and control strategies such as variable speed drives. The flat rate of 2.6 coefficiency of performance does not capture these expected improvements in performance;

- Furnaces and boilers are typically estimated to last fifteen years. However, many last upwards of 25 years.[4] The selection of fifteen years, rather than a weighted average, does not capture the additional years that a homeowner would continue to use propane, rather than potentially shift to an alternative heating system such as a heat pump.

[4] Brattle Group, *Heating Sector Transformation in Rhode Island* (2020), (at 59) *available at* http://www.energy.ri.gov/documents/HST/RI%20HST%20Technical%20Support%20Document%204-22-20.pdf.

Q: Why does your analysis only look at shifting from oil heat to propane or oil heat to heat pumps?

A: Certainly there are other fuel sources available to heat buildings and homes. These include, of course, natural gas, kerosene and wood heat. There are also opportunities with ground source heat pumps and district heating. I chose to focus on shifting from oil to propane for a number of reasons. First, in Rhode Island, the predominant heating fuel is gas (serving 52.1% of heating fuel needs) followed by fuel oil (32.4%) followed by electricity (8.7%) with propane next at 2.0%.[5] These data points are obtained from the Brattle Group's "Heating Sector Transformation in Rhode Island" report, submitted as Exhibit CLF-2. Second,with current fuel prices, with gas having the lowest price, followed by propane and then oil, the customer most likely to shift to propane is currently a homeowner heating with oil. I chose to compare this oil-to-propane shift with the oil-to-heat pump shift because heat pumps are one of the primary technologies currently available for decarbonizing how buildings are heated, and Rhode Island is legally obligated to decarbonize its heating sector.

Q. Earlier, you mentioned trends in heat pump performance and costs. Are you witnessing other trends?

[5] Brattle Group, *Heating Sector Transformation in Rhode Island* at 6.

A. Yes. I am currently managing three projects focused on decarbonizing how homes are heated, and have witnessed such trends in the context of these programs:

- In Massachusetts, for the Massachusetts Clean Energy Center and Department of Energy Resources, I am managing the Solar Access Program, which focuses on delivering a residential clean energy loan deploying solar and cold climate air source heat pumps with no cash flow impact to customers. The design of the program involved bundling rebates, incentives, and tax credits and applying them to the loan to reduce the monthly payment to result in a guaranteed neutral or better cash flow. The sizing of the solar and heat pumps was determined by an internally developed Financial Tool incorporating current heat-related costs and energy usage, and balancing these with expected savings over the ten-year loan term, at which point the homeowner owns the system outright. Modeled results show lifetime savings of 11.9 million pounds of GHG emissions and $2.9 million in homeowner net energy savings in 49 homes.

- In New York, on behalf of New York State Energy and Research Development Authority, I managed the Hudson Valley Heat Pump Program, in which the focus was not on identifying the optimized financial package, but rather on the design, application, contractor installation, and customer use of the heat pumps to optimize performance, customer use and coefficiency of performance. This project has now advanced to be selected by the Department of Energy to compare heat pump performance in laboratory settings to those in actual homes.

- Finally, in Vermont, I have managed the Zero Energy Now program since 2016, in which a combination of efficiency, renewables and strategic electrification has resulted in an average savings of 64% of grid electricity and fossil fuel consumption.[6]

These projects, and others similar to them, show that many states are focusing on program design and policy trends to decarbonize our building energy consumption through a three-pronged approach. This approach involves (a) reducing how much energy we need via efficiency measures such as air sealing and insulation, (b) strategically electrifying our heating sector through technologies such as heat pumps, and (c) increasing renewables, storage, and flexible load management to meet our electricity demand.

For Rhode Island to meet its various energy mandates, reducing emissions from the building sector will be critical. Even more critical will be focusing specifically on the residential sector, since, as of 2017, the residential sector consumed 51% of the total energy consumed in the residential, commercial and industrial sectors, as compared to commercial (33%) and industrial (16%).[7] However, Sea 3's proposal, assuming that a significant portion of the newly available propane would go to heating buildings and homes, would not only run counter to efforts to decarbonize residential energy use by increasing emissions in the short term as compared to electric heat pumps, it would also delay potential emissions reductions by years or decades by "locking in" customers to propane equipment.

[6] *See* Zero Energy Now, http://zeroenergynowvt.com/ (last visited Nov. 11, 2021).
[7] Brattle Group, *Heating Sector Transformation in Rhode Island* at 5.

Q. Sea 3 briefly discusses the potential future use of "renewable propane" in its response memorandum. What can you tell us about "renewable propane"?

A. Within the energy industry, there are discussions and analyses underway to assess the potential role for fuels such as renewable gas, biofuels and renewable propane. However, much of this discussion is exploratory at this time, with many uncertainties and unknowns. For example, a study conducted by a gas industry trade group found that there may be limited supply of renewable gas.[8] Additionally there are warranty and technological concerns with these fuels that have been raised and would need to be addressed,[9] the cost associated with them is uncertain and is likely to be substantial, and these fuels are not necessarily carbon-neutral, as there may be emissions associated with producing these fuels and bringing them to consumers, depending on the production and delivery approach. Further, if the Company anticipates that renewable propane will have any effect on the environmental impact of the Project, then it is incumbent on the Company to explain any such effects in significantly further detail than what is currently on record. This would include discussion of the potential, cost, availability and emissions associated with renewable propane. However, the Company fails to provide analysis on any of these topics.

[8] Am. Gas Found., *Renewable Sources of Natural Gas: Supply and Emissions Reductions Assessment* (Dec. 2019), *available at* https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf.

[9] This is particularly true when blended mixes of biofuels are used within heating systems originally designed to use fuel oil or propane.

VI. RHODE ISLAND'S BROADER EMISSIONS REDUCTION REQUIREMENTS AND HOW THIS PROPOSAL IMPACTS THEM

Q. You state that, if the Company is successful in increasing sales from 23,000,000 to 100,000,000 gallons of propane per year this could result in an additional 3,369,735 metric tons of GHG emissions as compared to having Rhode Islanders instead shift to using cold climate heat pumps to meet more of their heating needs. How does this interplay with Rhode Island's GHG emission reduction mandates?

A. If Rhode Islanders were to shift to heating more with propane, rather than heat pumps powered by electricity, it would make achieving Rhode Island's GHG emission reduction targets meaningfully more difficult. Rhode Island's 2021 Act on Climate mandates a 45% GHG emissions reduction from 1990 levels by 2030, an 80% reduction by 2040 and net zero emissions by 2050. Under these mandates, total state emissions must be reduced to 6.86 million metric tons of CO2e/year by 2035, 2.5 million metric tons of CO2e/year by 2040 and zero tons/year by 2050. In 2017, Rhode Island's total GHG emissions were 11.74 million metric tons of CO2e. 15.9%, or 1.87 million metric tons, resulted from residential heating. [10] Rhode Island's most recent full emissions intentory[11] is submitted as Exhibit CLF-3. Proposing to increase emissions from increased propane consumption by 4.1 million metric tons over a fifteen year time period is counter directional to Rhode Island's mandated climate requirements and will make meeting the targets harder. On an annual basis, this results in 275,714 metric tons, or about 2.3% of Rhode Island's 2019

[10] R.I. Dep't of Envtl. Mgmt., *Greenhouse Gas Emissions Inventory*, http://www.dem.ri.gov/programs/air/ghg-emissions-inventory.php (last visited Nov. 11, 2021).
[11] *See* R.I. Dep't of Envtl. Mgmt., *2016 Rhode Island Greenhouse Gas Emissions Inventory* (2019), *available at* http://www.dem.ri.gov/programs/air/documents/ghg-emissions-inventory-16.pdf.

total emissions. Clearly, this percentage is even higher when considering emissions resulting only from the residential sector.

Further, as mentioned in the Brattle Group's "Heating Sector Transformation" report, it is critical to "take advantage of 'natural investment opportunities': Heating infrastructure, such as building envelope components, boilers or furnaces, gas distribution pipes, powerlines, etc., is very long-lived and is replaced or updated only infrequently. It is generally much less costly (and thus more cost-effective) to change such infrastructure at a time when the existing infrastructure would otherwise be replaced (or is soon to be replaced), serviced, or even just accessed in the normal course of operations. This has two implications. First, it will often be best to time a change to the heating system to coincide with such interventions, since at that point it will involve less incremental cost and less disruption – for instance by timing the installation of a heat pump with the end of life of a furnace to save costs. Since the useful life of a typical furnace or boiler is roughly 25 years, a prompt start means that such natural investment opportunities may occur about once on average for each building by 2050."[12]

In energy program design, the term for missing this once-every-25-years moment to support consumers to select equipment that produces fewer GHG emissions is a "lost opportunity." If Rhode Islanders choose to invest in a new propane furnace or boiler, rather than in other decarbonized alternatives, this effectively locks the customer in to using that system for many years to come. Attempting to convince a homeowner to shift to an alternative, decarbonized heating system, after they have recently invested in a new

[12] Brattle Group, *Heating Sector Transformation in Rhode Island* at 59.

system utilizing propane, is far more challenging than incentivizing homeowners to shift when they are actively researching which new system to purchase. These lost opportunities are costly for the property owner as well as for the Rhode Island energy program implementers.

Q. In your experience, how are other states decarbonizing their energy use?

A. Many state energy plans separate energy consumption into the following sectors: transportation, thermal (residential, commercial, industrial buildings), industrial processes, agriculture, power, and land use/land use change/forestry (LULUCF). Rhode Island's Greenhouse Gas Emissions Inventory report also follows this pattern, as shown in Figure 2.[13]

[13] R.I. Dep't of Envtl. Mgmt., *Quick Facts: 1990-2017 Rhode Island GHG Emissions Inventory*, http://www.dem.ri.gov/programs/air/documents/ghg-quick-facts17.pdf (last visited Nov. 11, 2021).

While decarbonizing our buildings is not an easy task to accomplish, the building sector, along with our transportation sector, is frequently one of the first sectors to be prioritized. This is because there are, currently, commercially-available technologies such as heat pumps (and, for the transportation sector, electric vehicles) that are commercially available, technically feasible and more affordable than other decarbonization activities. This is not to say, however, that decarbonizing buildings is an easy task. Indeed, the Brattle Group's "Heating Sector Transformation in Rhode Island" study states "although three decades may seem a long time, the scale of the transformation needed in over 400,000 residences, corresponding numbers of small and large commercial buildings and industrial facilities, and an entire energy delivery infrastructure is a difficult challenge that will require sustained and careful attending, beginning urgently today."[14] Further, this report studied how to achieve 80% emission reductions by 2050; the mandate is now 80% by 2040. Every home and building that converts to propane in the near term makes achieving building decarbonization goals, and Rhode Island's emission reduction requirements, meaningfully more challenging for policy makers, energy program designers and homeowners.

[14] Brattle Group, *Heating Sector Transformation in Rhode Island* at 73.

Additionally, each missed opportunity whereby an oil home shifts to propane heating, places greater pressure on identifying other ways to reduce emissions. Yet decarbonizing other sectors, such as agriculture and energy-intensive industries (for example, those that produce basic materials such as steel, aluminum, cement, and fertilizers) is even more challenging than decarbonizing the building and transportation sectors.[15] The end result of increasing emissions from consuming more propane for heating buildings, is that Rhode Island policy makers will need to identify other and more ways to reduce emissions. With today's current technology options, it is likely that those "other ways" may be more costly and more difficult than decarbonizing our residential heating systems.

VII. FINDINGS AND RECOMMENDATIONS

Q. Based on the evidence you provide above, what are your findings and recommendations for the EFSB?

A. 1. Sea 3 proposes to expand its Facility, with the stated goal of importing and distributing an additional 77 million gallons of propane per year.

2. Shifting Rhode Island residences currently using oil to propane by 77 million gallons, rather than shifting these residences to heat pumps, results in an increase of 3.4 million metric tons of GHG emissions over fifteen years.

[15] https://www.wri.org/climate/expert-perspective/unlocking-hard-abate-sectors

3. This increase in propane consumption, and the emissions that it will produce as compared to the adoption of decarbonized heating technologies like electric heat pumps, constitute a significant environmental impact from a scientific and legal perspective.

4. Therefore, I recommend the EFSB deny the Company's Petition for a Declaratory Order, and instead require the Company to complete a full permit review and process before the EFSB.

Q. Does this conclude your testimony?

A. Yes, but I reserve the right to supplement my testimony as necessary.

Gabrielle Stebbins
Senior Consultant

ENERGY FUTURES GROUP

CLF-4
GS-1

Professional Summary

Gabrielle specializes in the development of policy and programs for promotion of renewable energy, strategic electrification and energy efficiency, with a special focus on efforts to integrate all three. She has extensive expertise in policy and planning from work as a consultant, as director of Vermont's statewide renewable energy industry trade association, as a member of Vermont System Planning Committee (addressing transmission grid reliability planning) and the American Public Power Association's Policy Committee, and as Chair of the Board of the Burlington Electric Department (BED), Vermont's largest municipal electric utility. In the latter role Gabrielle has provided strategic direction on BEDs IRP, maintaining BED's 100% renewably-sourced portfolio and on Burlington's goal to be a net zero city across all energy use by 2030. Gabrielle brings to her policy and planning work a grounded understanding of what it takes to move markets from policy incubation in the legislative arena, to program design in the regulatory arena, to the implementation arena, having managed residential efficiency programs, renewable energy incentive programs and pilot programs that simultaneously promote efficiency, electrification of space heating and customer-sited renewables. Most recently, she has been elected to the Vermont General Assembly as a State Representative where she is driving transformation in the House Transportation Committee.

Experience

2016-present: Senior Consultant: Energy Futures Group, Hinesburg, Vermont (VT)

2011-2015: Executive Director: Renewable Energy Vermont, Montpelier, VT

2008-2011: Program Manager: Vermont Energy Investment Corporation, Burlington, VT

2004-2008: Program Coordinator: Massachusetts Department of Fish and Game, Boston, MA

2002-2004: Environmental Educator: Town of Brookline, Waquoit Bay National Estuarine Reserve, MA

Education

M.A. in Development Studies: Sustainable Development, *Distinction*, Nelson Mandela Metropolitan University, Republic of South Africa, 2002

Coursework in Ethics and Public Policy, *4.0,* Harvard University, Massachusetts (MA), 1999

B.A., Anthropology; B.M Violin Performance, *Cum Laude*, Rice University, Texas, 1998

Selected Projects

- Department of Energy. Office of Science. Developed and implemented the pilot "Vermont Energy Mortgage" program, which incorporated energy upgrade costs into existing mortgage products, including a discounted interest rate, funds to address additional green appraisal and

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project inspection costs, free access to energy coaching services, pre- and post-project Home Energy Score analyses and a quality and savings guarantee. 2020 – 2021.

- Energy Action Network. Conduct the research, survey development, interviews and writing of a white paper entitled "Regulatory Options to Reduce Carbon Dioxide Emissions from Fossil Fuel Use in the Thermal Sector in Vermont". (2019 – present)
- Massachusetts Clean Energy Center and Massachusetts Department of Energy Resources. Design, develop, and manage a comprehensive retrofit program at low-income properties incorporating heat pumps, solar and weatherization audits. Program requires no money down by coordinating financing and incentives and provides an energy savings guarantee. (2017 to present)
- New York State Energy Research and Development Authority (NYSERDA). Manage the Hudson Valley Heat Pump Program – a comprehensive approach to residential energy savings incorporating heat pumps, weatherization, solar and detailed data savings monitoring (2017 to present). Research, interviews, analysis for Ductless Mini-Split Heat Pump Market Characterization Study. (2016 - 2017)
- Washington Electric Co-operative. Conduct research, analysis and author of rural co-operative utility's "2020 Integrated Resource Plan". (2019 – present)
- Lawrence Berkeley National Laboratory. Identify and implement methods to auto-populate the Multiple Listing Service with residential solar data in Vermont, New Hampshire. (2016 to 2019)
- Vermont Agency of Administration. Technical support services to inform Vermont's Climate Action Plan. Work included review of current greenhouse gas emissions inventory and analyzing, researching and recommending pathways for achieving Vermont's Global Warming Solutions Act 2025, 2030 and 2050 requirements. (subcontractor to The Cadmus Group). 2021.
- Vermont Clean Energy Development Fund.
    - Vermont Clean Energy Finance Report. Conduct the research and analysis, survey design and interview process, and author three annual reports. (2018-present)
    - Vermont Small Scale Renewable Energy Incentive Program. Managed the Vermont Small Scale Renewable Energy Incentive Program, including analysis and program modifications. (2008-2011)
- Vermont Department of Public Service.
    - Regulatory Analysis of Utility Involvement in Behind-the-Meter Services. Conduct the research and high-level analysis regarding utility behind-the-meter services and regulatory responses to such services (e.g. solar, storage, electric vehicle charging stations, water heaters). (2019)
    - 2020 Vermont Building Energy Code Update. Manage Vermont's building energy code update process. (2018 – present)
    - 2017 and 2021 Vermont Market Baseline Analysis. Designed surveys, held interviews, wrote findings assessing market transformation within residential buildings. (present)
- Natural Resources Defense Council.
    - Review, analysis and critique of Michigan's Integrated Resource Planning process and outcome, with particular emphasis on development of renewable energy scenarios and related assumptions (2017).

  - Review and analysis of utility efficiency program plan filings in Ohio and Maryland in support of expert witness testimony (2016).
- Renewable Energy Vermont. Led industry association representing solar, wind, hydro, bio, geothermal and efficiency businesses. Responsibilities included member and stakeholder coordination, policy development with the state legislature and utility regulators, oversight of public education efforts and renewable energy conferences. Doubled membership and budget during Executive Director tenureship. (2011-2015)
- Efficiency Vermont. Developed, designed and implemented multiple energy savings projects focused on targeted outreach and community facilitation to have community members identify energy savings opportunities for their neighbors through a "Home Energy Visit" incorporating air sealing, weatherization and efficiency upgrades. (2008 – 2011)
- Massachusetts Department of Fish and Game.
  - Developed, trained and coordinated citizen scientists in the "Adopt-A-Stream" and "River Inflow Stream" programs, including meeting facilitation to develop community owned river restoration goals and Action Plans. (2004 – 2008)
  - Designed, developed and led multiple community meetings, presentations and "charettes" to assist communities in progressing with large scale river restoration projects. (2004 – 2008)

Selected Presentations and Papers

"Critical Elements in Short Supply: Assessing the Shortcomings of National Grid's Long-Term Capacity Report." Prepared for 350.org and 350Brooklyn. New York. 2020.

"Zero Energy Now: 60%+ Total Energy Savings in Existing Buildings." American Council on Energy Efficiency Economy (ACEEE). California. 2020.

"Burlington Electric: One Approach to the Utility of the Future." ACEEE. California. 2018.

"Next Generation Residential Retrofit Programs." ACEEE. Virginia. 2017.

"The Challenges of Comparing PV's Success to Efficiency." ACEEE. California. 2016.

"Group Net-Metering: Challenges and Opportunities." Solar Canada. Toronto. 2016.

Professional Affiliations

State Representative, **Vermont General Assembly**, (VT). 2021 – present.

Member, Policy Committee, **American Public Power Association,** (DC). 2018 – 2021.

Board Director, **Burlington Electric Commission,** (VT) 2014 – present. Chair: 2016 – present.

Founder and Board Director, **Renewable Energy Vermont Education Fund**, (VT) 2013-2016.

Supply-Side Representative, **Vermont System Planning Committee**, (VT) 2011–2014.

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Increase in Propane gallons[1]	Increase in BTUs	Increase in MMBTUs	Annual Heating Load[2]	Fuel	Efficiency	Units	MMBtu Consumption	Physical Units (Gallons or kWh)	Annual Emissions Per HH (metric tons)	Emissions over 15 years Per HH (electricity decline)	Households served	Emissions for all homes served over 15 years (metric tons)
77,000,000	7.0532E+12	7,053,200	76.54	Propane	92%	AFUE	83	907	5	79	84,778	6,686,915
				Fuel Oil	84%	AFUE	91	656	7	101	77,406	7,838,670
				Electricity meets 76% of load	*2.6*	*COP*	*22*	*6,557*	*0.4*	*6*		
				Back Up Fuel Oil meets 24% of load	*84%*	*AFUE*	*22*	*157*	*1.6*	*24*		
				Heat Pump with Oil Backup						30	84,778	2,551,208

	Per year	Over 15 years	% per year
Increase in emissions from propane to HP+oil	275,714	4,135,706	2.3%

Heat Pump System Type		Share of Annual Heating Load	Share of HP Installs	Weighted average heating load displaced	
	Single Head	40%	30%	76%	Emissions come from electricity - see next tab
	Multi Head	80%	30%	24%	Emissions come from fuel oil as back up - see next tab
	Central ducted	100%	40%		

Sources/Explanations:

1 Petitioner Filing

2 89/MMBTU https://brattlefiles.blob.core.windows.net/webfiles/Brattle_Heating-Sector-Transformation_Technical%20Support%20Document.pdf

EIA is consumption not building loading

Cell D2: 0.86 average efficiency assumed for existing heating systems in RI

	lbs CO2		2019	2020	2021	2022
Propane		per MMBtu				139
Fuel Oil		per MMBtu				163
Electricity Revised		Per MWh	633	575	518	460
Average Electricity 2022- 2037	129					

https://www.iso-ne.com/static-assets/documents/2021/03/2019_air_emissions_report.pdf

Table 1-1
2018 and 2019 ISO New England System Emissions (ktons)
and Emission Rates (lbs/MWh)

	Annual System[a] Emissions					
	2018 Emissions (ktons)	2019 Emissions (ktons)	Change in Emissions (%)	2018 Emission Rate (lbs/MWh)	2019 Emission Rate (lbs/MWh)	Change in Emission Rate (%)
NO_X	15.61	12.87	-17.6	0.30	0.26	-13.3
SO_2	4.96	2.34	-52. 8	0.10	0.05	-50.0
CO_2	34,096	30,997	-9.1	658	633	-3.8

(a) The term "system" refers to native generation here and throughout the report.

[4] Net energy for load (NEL) is calculated by summing the metered output of native generation, price-responsive demand, and net interchange (imports minus exports). It excludes the electric energy required to fill/refill pumped storage plants.

[5] In this report, "generation" refers to energy production and not capacity.

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
139	139	139	139	139	139	139	139	139	139	139	139
163	163	163	163	163	163	163	163	163	163	163	163
403	345	288	230	173	115	58	0	0	0	0	0

RI RE goal - 100% renewable electricity by 2030

2035	2036	2037	2038	2039	2040	2041	2042
139	139	139	139	139	139	139	139
163	163	163	163	163	163	163	163
0	0	0	0	0	0	0	0

https://www.eia.gov/e
https://www.eia.gov/e

nvironment/emissions/co2_vol_mass.php
nvironment/emissions/co2_vol_mass.php

Year	GHG Reduction Target	GHG Emissions Target (Million Metric Tons CO2 equivalent / year)
1990	N/A	12.48 (historical)
2035	45%	6.86
2040	80%	2.5
2050	Net Zero	0

2017 Gross GHG Emissions = 11.74 million metric tons of CO2e http://www.dem.ri.gov/programs/air/ghg-emissions-inventory.php

Energy Conversions

	Units	BTUs/Unit	Units per MMBTU
Natural Gas	Therms	100,000	10.0
Propane	Gallons	91,600	10.9
Fuel Oil	Gallons	138,200	7.2
Electric	kWh	3,413	293.0

Energy Conversions

	Units	BTUs/Unit	Units per MMBTU
Natural Gas	Therms	100,000	10.0
Propane	Gallons	91,600	10.9
Fuel Oil	Gallons	138,200	7.2
Electric	kWh	3,413	293.0