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Via ePUC

Holly Anderson, Clerk
Vermont Public Utility Commission
112 State Street
Montpelier, VT 05620-2701

Re: Case No. 24-3351-INV – Investigation into the potential need for transmission system improvements identified in the 2024 Vermont Long-Range Transmission Plan – GMP Response to Request for Additional Information

Dear Ms. Anderson,

Green Mountain Power (GMP) appreciates the opportunity to provide answers to the Hearing Officer's information requests of May 27, 2025, in the above-referenced proceeding regarding VELCO's 2024 Vermont Long-Range Transmission Plan (Plan).

Below, we set forth each Information Request and GMP's response.

In its comments, the Department notes that Commission Rule 5.136 includes a provision allowing distribution utilities to propose tariffs that would implement locational adjustor fees for new net-metering systems, or other new electric generation facilities, that connect within a constrained or limited headroom area of the grid. To date, no such tariff has been filed by utilities. Distribution utilities are requested to address whether they have any plans to propose tariffs. Responses should address what systems or facilities will be covered by the tariff and how the locational adjustor fees would be implemented.

GMP Response

At this time, GMP does not plan to implement locational adjustor fees for new net metering systems or other new electrical systems that connect to a constrained area of the grid. Instead, we have pursued other solutions such as a Request for Proposals for local solar generation with guidance and selection criteria designed to prefer areas of the grid that have sufficient capacity to host such sites. We also continue to evaluate other possible solutions, such as targeted storage pairing as described in discovery related to our 2024 Integrated Resource Plan, to increase

hosting capacity in constrained areas of the system. We discuss these and others below in more detail.

To understand the barriers to implementing locational adjustor fees, distribution utilities and VELCO are requested to provide an assessment of the drawbacks, barriers, opportunities, and usefulness of locational adjustor fee tariffs. Distribution utilities should address whether the barriers are administrative or technical, or if a determination has been made that such a fee would not help optimize the location of distributed generation. For example, the GMP Solar Map shows significant portions of the distribution system that are served by a substation transformer with less than 10% capacity remaining; GMP should address whether these parts of the grid are candidates for adoption of a locational adjustor fee tariff.

GMP Response

Through the implementation of our SCADA and AMI systems, GMP has gathered significant data on the operation of existing solar generation and the interaction of load across our system. This data highlights that there may be more electrical hosting capacity on constrained circuits than is currently reflected. Our current planning process compares the sum of minimum peak load and aggregate DG capacity with the top nameplate capacity of the transformer to ensure that reverse flow through the substation transformer does not exceed its capacity. A review of the current and historical data shows that peak solar production hours and minimum loading rarely line up, so the transformer sees only a fraction of the reverse flow that is assumed in studies. We will use this type of analysis to increase hosting capacity on constrained circuits without the need for unnecessary fees or large capital projects through increased transformer limits, limited curtailment, etc. This analysis necessarily requires project by project review; therefore, it is likely that we will continue to reflect potential constraints using the conservative current planning methodology as shown in our Solar Map, and update that site to inform users about our evaluation approach. At this time, this more granular, individualized analysis appears more efficient and effective than a tariffed locational adjustor fee which presents both administrative and technical challenges.

Participants, including distribution utilities and VELCO, are requested to address whether there are other mechanisms to facilitate and enable a rational distribution of generation resources across the state with respect to distribution and transmission capacity.

GMP Response

As mentioned in our responses above, GMP is considering the following tools to increase hosting capacity in constrained areas and guide developers towards unconstrained areas:

- **Limited Curtailment –** We are considering both a real-time limited curtailment option, based on a closed loop controls scheme between the GMP system and generators, as well as a generation schedule where generators back themselves down based on a

predetermined set of guidelines such as seasonal or time of day restrictions. In many cases, curtailment may be cost-effective, quick to implement, relatively simple to study, and reliable and safe without the need for large capital upgrades.

- **Planning process/criteria revisions –** As described in answer to the prior information request, we are also considering revising our distribution planning and DG interconnection standards based on years of data from operating substations that are highly penetrated with DG. Through an ongoing review of substation data, we have found that there is some inherent headroom that is untapped within our constrained circuits on the solar map. This is because peak solar generation and minimum load rarely line up to create the reverse flow on the transformer that is expected when studying new solar projects.
- **Solar soaking energy storage –** In areas where new solar would have to be curtailed to interconnect to the system, storage is a tool that could either limit or eliminate the lost energy to curtailment. We are evaluating the potential of solar soaking batteries across multiple substations.

All of these tools would be useful for the GMP system since we have visibility into the operation of our distribution and subtransmission systems, and we have years of historical data from which to make informed engineering planning decisions.

In their comments, BED and VPPSA state that any mechanism relying on active control of distributed energy resource assets needs to occur at the distribution utility level to ensure that actions taken for statewide benefit do not lead to offsetting localized system or reliability problems or cause cost shifting among stakeholders. Participants are requested to address whether active control of distributed energy resource assets needs to occur at the distribution utility level and address the potential benefits, disadvantages, and costs of active control of these assets.

GMP Response

We agree with BED and VPPSA. Active control of DERs is needed at the distribution level to ensure that actions taken for reliability reasons on regional or statewide levels do not negatively impact local constraints the transmission operators do not have visibility into. GMP operators, for example, are able to see the real-time switching configuration of the distribution system and any potential contingencies that may limit the ability to dispatch DERs for statewide issues.

Coordination will continue to be important between the DUs and VELCO to predict, plan for, and respond to regional and statewide reliability events that are on the bulk electric system or fall across multiple DUs. If VELCO and the DUs rely on the dispatch of DERs to defer upgrades, these DERs must be available for dispatch when they are needed. Actual dispatch of these resources must come from the DUs that have the visibility and understanding of the distribution systems they operate.

In its comments, VPPSA notes that the Plan discusses the desire to make use of nontransmission alternatives ("NTAs") and coordinate them with distributed generation siting and raises concerns about the reliance on active control or management of NTAs, including whether the active management of NTAs have the potential to negatively affect distribution level reliability, as loads are shifted locally or in time, and may result in significant cost shifting across stakeholders. Participants are requested to address the potential benefits, disadvantages, and costs that accompany active management of distributed energy resources and NTAs, including whether and how the shifting of costs or reliability problems across stakeholders can be avoided.

GMP Response

See above discussion regarding how this potential scenario can be addressed by the DUs that have direct visibility into their own systems and maintain active control of these devices. When a DER applies for installation, the interconnecting DU should study the potential impact of that DER to ensure distribution system reliability. Once interconnected, the interconnected DU has the visibility into its system operations to ensure that dispatching DERs is not negatively affecting reliability. An analysis of peak dispatches over the past few years found that our actions focused on peak shaving have saved all Vermont customers money by reducing the system-wide peak in Vermont. We would be happy to work with the other DUs to review this data and follow up on any further analysis as needed.

In its comments, GMP states that its 2024 Integrated Resources Plan ("IRP") identifies that GMP has identified what an optimized deployment of solar and flexible resources would look like and how much generation capacity headroom exists across GMP's system. GMP is requested to file that information on optimized deployment and capacity headroom into this proceeding and address its efforts to date and plans for future work with stakeholders to ensure optimal deployment.

GMP Response:

See attached excerpts from GMP's 2024 IRP and the associated engineering study. The following pages are especially relevant to the discussion of optimal DER distribution:

- Pages 3-30–3-36: GMP's discussion of optimal DG deployment
- Appendix E, pages 9–14 – Optimal DG deployment study overview

In its comments, GMP states that it will use additional tools to limit the scope of grid upgrades needed to integrate new distributed renewables, including limited curtailment of distributed renewable generation, use of distributed storage and flexible load resources, and solar plant design choices that can enhance plant capacity factors. GMP is requested to provide additional information on how it implements these tools, including how GMP determines the most cost-effective way to integrate additional distributed generation. Responses should address how GMP determines what grid upgrades are the most cost-effective option.

GMP Response:

See responses above regarding various solutions GMP is reviewing for implementation. Having multiple options available helps ensure that the most cost-effective option can be deployed in any given situation.

In its comments, BED states that the Plan could benefit from additional analyses and discussion on the following issues: (1) duration, frequency, and load profile of transformer overloads under N-1-1 conditions; (2) rate of increase in the deployment of distributed generation and other distributed energy resources; (3) rate of increase in the deployment of electric vehicles and advanced heat pumps; (4) rate of increase in the deployment of energy storage in key areas of the state; (5) whether existing rate structures, such as electric vehicle rates, could alleviate forecasted overload conditions; and (6) whether future dynamic rate structures could alleviate forecasted overload conditions. Participants are requested to address how the Plan and state distribution and transmission planning can benefit from analysis of these issues and file any supplemental information, data, or analyses that would aid in the discussion of these issues.

GMP Response:

We agree that having an understanding of the issues raised by BED is appropriate. VELCO has now performed a time series analysis of the study areas to determine critical loading levels and how regional loads compare to those critical levels. This has been tremendously helpful to better understand the nature of the potential violations and how underlying load shapes contribute to them.

The Plan as filed identifies steady state worst case scenarios and poses traditional transmission solutions to resolve these issues, assuming that once a violation occurs it remains in place until resolved. As such, within this conservative framework, it is not surprising that transmission facility upgrades appear to be the right solutions; in essence, if the system is just upsized enough to account for the worst-case scenario, then any potential violation is solved. The intention of Docket 7081 was to enhance transparency and support potentially appropriate, cost-effective alternatives to the transmission solutions that would be shown necessary in this traditional planning framework, including NTAs. While initially, efficiency measures were thought to be the only viable NTAs because they (like transmission upgrades) reduce load indefinitely, we now

have a much wider breadth of potential NTAs to consider, including energy storage and load management. These are potentially more flexible solutions that are not easily compared to traditional efficiency measures and transmission upgrades without detailed analysis of the use cases, potential violations, and potential solutions to resolve those violations that these resources offer.

As noted, much of this work has occurred in the course of this proceeding regarding the Plan. For example, the Plan originally stated that "75 MW of load reduction [is needed in the] northern area by 2033." See 2024 Vermont Long-Range Transmission Plan, VSPC Draft (April 17, 2024) at Table 2, page 41. Since all potential modern NTAs are finite energy solutions, the DUs needed to understand whether that is 75 MW for a whole season, one day, or one load cycle. The only acceptable way to reduce the peak load by 75 MW indefinitely (other than load shedding, which would not be a desired solution) is a transmission upgrade. Without a time series analysis which refines and further defines the problem, it would be unknown if there were another viable NTA for the problems discussed in the 2024 LRP. In the months following the publication of the Plan, VELCO provided further analysis showing that a peak load reduction is only required for five hours, meaning that a solution is needed that is 375 MWh (5 hours x 75 MW).

The MOU and proceeding governing the LRTP process do not account for the change in forecast that may occur during the subsequent plan cycle (i.e., the change in EV forecast from 2022 to 2025, shows a 33% reduction in EV adoption rates by 2030). If the Plan proposes an upgrade based on an increase in load, the process should allow for a NTA analysis that also incorporates any change in forecast. This would help ensure that any required 248 petition is supported by the most up to date analysis.

The next plan should also account for the proposed changes in the ISO PP7, which aims to align the planning process more closely with the mandates of FERC Order 881. Specifically, ISO PP7 will lower the facility rating temperature of the winter case from 50 degrees Fahrenheit (50 F) to 20 F. The 90/10 winter peak load case is based on extreme cold temperatures. It is not prudent to study winter peak load with 50 F facility ratings given that we know that the winter loading increases as temperature decreases, and much of the forecasted increase of load is due to the anticipated increase of electrified heating.

In its comments, Efficiency Vermont identifies some additional analysis and considerations: (1) What are the parameters and sensitivities to electrification and load growth in the state? What assumptions about growth and load profiles are being utilized in the Plan's forecast that might be instructive to a potential solution? What metrics should be tracked to determine if this forecast is likely to materialize? (2) What attributes of the growth of distributed generation and time of generation throughout the state should be understood? (3) How can the use of flexible load resources serve as a potential mitigating solution to overload conditions and/or absorption of excess renewables? (4) What are the avoided costs that should be used as a basis for deciding whether NTA investments are cost-effective? (5) How should stakeholders identify the time for planning, implementation, and measuring results? Participants are requested to address these issues along with the issues identified by BED.

GMP Response

GMP defers to VELCO for further explanation of the explicit parameters and sensitivities that were studied in the 2024 Long Range Plan. VELCO and the DUs may consider the following in future planning processes:

1) In the Plan, VELCO assumed that 100% of EV charging would be uncontrolled. Today, GMP has a time-of-use-based and an event-based EV charging tariff. We can see that the EV charging curves used in the Plan do not align with the load shapes that GMP is seeing today and that we plan to design in the future as more EVs come online. Knowing the underlying load shape (base load, heat pumps, etc.) is important because it gives the DUs more insight into how we should be shaping the EV charging loads, as well as how storage should be charged/discharged.
2) GMP has found that the time and availability of distributed generation is an important aspect of the picture to understand. For example, even a small amount of solar generation on a cold day in the middle of winter can create a large dip in loads in the middle of the day that can allow GMP to charge storage to more effectively manage winter evening peak loads.
3) Storage, EV chargers, and FLM are all potential tools for managing distributed generation. Storage can act both as a generator at peak hours and a load during low load/high generation times. DUs can incentivize daytime EV charging to both shift peak nighttime loads and reduce reverse flow onto the transmission. FLM programs can encompass these and other customer-based tools to shape load.
4) The Plan identifies the avoided costs that should be used as the basis for NTA assessment.
5) The Plan identifies five areas of concern, all of which may require upgrades between 2029 and 2034 due to forecasted load growth. As Docket 7081 requires, we are now in the NTA analysis process. That will give stakeholders information on the full scope of the alleged violations and potential solutions, allowing for a meaningful discussion about the alternatives, along with achievable deadlines for planning and implementation.

As identified in the Department's comments, participants are requested to address the present condition of coordination of statewide distribution and transmission planning work, including strengths and weaknesses, and what steps are needed to ensure that NTAs are given full, fair and timely consideration as envisioned by Docket 7081. Responses should include a step-by-steprecitation of how: (1) effective data and information gathering and collaboration will occur; (2) load growth, load controllability, and other key assumptions will be collectively determined; and (3) grid cost and resiliency factors can be better reflected in distributed generation siting and utility infrastructure investment decisions moving forward and incorporated in the next iteration of the Plan. Responses should also address: (1) any recommendations for changes to the Docket 7081 process to ensure NTAs are given full consideration; and (2) any recommendations for which entities are responsible for paying for transmission level upgrades that become necessary because of distributed generation growth, rather than load growth.

GMP Response

GMP coordinates the work of planning our subtransmission and distribution system first by focusing on the bulk transmission planning work, through participation in the VSPC load forecasting subcommittee; and second, by aligning the planning assumptions used within the Long-Range Transmission Plan into our own Integrated Resource Plan. We consistently engage in all VSPC subcommittees to ensure our perspective, as a customer looking at the bulk transmission system, is represented.

As exemplified through the 2024 LRTP and subsequent NTA analysis, the Docket 7081 process continues to ensure that NTAs are given thorough consideration. This cycle has differed from past analyses because the suite of NTAs currently available is significantly more plentiful, yet many of them are finite resources requiring more nuanced analysis than traditional energy efficiency measures. Because of their finite nature, modern NTAs can only be effectively compared to their wired alternatives if the duration and frequency of the potential violation is known. Please see attached GMP's July 16th presentation to the VSPC summarizing the NTA analysis to date.

VELCO announced its enhanced Point of Interconnection Heat Map – a publicly accessible, interactive tool designed to improve transparency regarding available capacity on VELCO's transmission system. This tool is intended to assist in the optimized siting of distributed generation resources across the state. Participants are requested to address how this tool can be used in coordination of statewide distribution and transmission planning work.

GMP Response:

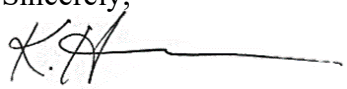
The Point of Interconnection Heat Map is useful in that it provides an upper bound on how much DG can be interconnected at each VELCO bus. GMP limits the amount of reverse flow through substation power transformers, so the constraints that reduce hosting capacity today are largely

on the distribution system; transmission hosting limits are not being reached. When evaluating solar hosting capacity, the Point of Interconnection Heat Map is helpful to make sure the reliability of the bulk transmission system is retained, while also focusing on ways that we can relieve constrained areas of the distribution system and work towards optimizing the existing distribution system to utilize the transmission system.

We have been discussing the POI Heat Map with VELCO planning engineers to potentially expand its scope to include GMP's subtransmission system, and by expanding the load flow case library to include light load spring days with all DGs outputting at full nameplate capacity.

Thank you for the opportunity to submit these comments. Please reach out with any questions.

Sincerely,



Kamran Hassan
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cc: Service List *(via ePUC)*