



December 16, 2021

Holly R. Anderson, Clerk
Vermont Public Utility Commission
112 State Street Montpelier, VT 05620

Re: 21-3883-RULE Proposed Creation of PUC Rule Concerning Energy Storage

Dear Ms. Anderson:

Vermont Public Power Supply Authority (VPPSA) and Washington Electric Cooperative (WEC) submit the following comments in response to the Commission's Order dated September 17, 2021 seeking input on the proposed creation of a Commission Rule concerning energy storage.

As an overarching comment, VPPSA and WEC offer that compatibility between Rules 5.500, 5.100, and the new Public Utility Commission Rule Concerning Energy Storage should be a priority. The current discrepancies between Rules 5.100 and 5.500 introduce confusion into the interconnection of net metering systems. The timelines should be harmonized across all these related Rules to create a coordinated and consolidated set of requirements that can be understood by interested parties. Interconnection of all resources, including energy storage facilities, should be addressed through one comprehensive Interconnection Rule.

Storage holds promise to address grid challenges such as better aligning generation and load. It also introduces a great deal of complexity from a grid operation perspective. These are largely uncharted waters, and the primary objective of the Storage Rule should be to protect safety of customers. It is not possible to anticipate all the impacts that storage will have on grid operations at this time. As such, the Storage Rule should provide flexibility to distribution utilities in order for them to carry out their obligation to safely and reliably manage the distribution grid.

In many ways, storage installations are analogous to net metering generators. In its earliest iterations, net metering generators appeared, from the utility end, as reductions in load. There were not significant grid-related impacts to the utility until net metered generators began to push significant amounts of power on to the distribution grid. Similarly, storage can be sited onsite at customers' homes or businesses to reduce loads during certain time periods and increase loads at other times. If rather than offsetting on-site load, storage is used to export significant amounts of power to the grid, the impacts to the utility - and thus other customers - will increase. A streamlined regulatory process is only appropriate for systems that don't have significant grid impacts. The regulatory process should become less streamlined as impact grows and the effect on other customers increases. Once the completed interconnection agreement is obtained, it may be appropriate to offer a simplified siting process for storage facilities under a certain size threshold.



Storage technology and operations are evolving rapidly. The degree to which small-scale storage facilities are permitted to participate directly in the wholesale markets will influence the regulatory regime that Vermont puts in place to govern storage deployment. For example, the extent to which Vermont allows storage, particularly storage behind a retail customer meter, to participate in the ISO-NE markets, may affect its treatment. The implementation of FERC Order 2222 has the potential to impact the way storage is deployed. If Vermont utilities ultimately allow participation in the ISO-NE markets and are required to comply with ISO-NE operational protocols for such resources, it will likely impact the interconnection studies and restrictions, and thereby the level of streamlining that is practical for any particular installation.

Topic 1. Simplified siting

- a. **Threshold.** The amended provision of § 248(u) states that “the Commission shall establish a simplified application process for energy storage facilities subject to this section with a capacity of up to 1 MW, unless it establishes a larger threshold by rule.” Should the Commission establish a threshold larger than 1 MW for projects to be eligible for simplified siting? If not, why not? If so, what should that threshold be and why?

Response: The initial Rule should not establish a threshold larger than 1 MW for projects to be eligible for simplified siting. While the aesthetic and land use impacts of energy storage may be less significant than those of solar generators, the grid impacts are significantly more complex. A 1 MW storage installation has the potential to create substantial localized grid impacts.

The vast majority of the VPPSA members customers have loads that do not exceed 1 MW; WEC’s largest customer is 300 kW. In many cases a 1MW storage device would be the largest single generator or load on a municipal utility’s distribution circuit. Adding a resource that could be both a 1 MW load and 1 MW generator introduces a great deal of complexity from a distribution system standpoint.

These complexities could be addressed through the Interconnection Rule which currently does not include provisions for storage. A higher threshold than 1 MW for facilities to be eligible for a streamlined siting process should only be considered if a completed interconnection agreement is required at the time of the § 248 application.

- b. **Conditional waivers.** Which, if any, Section 248 criteria and requirements for a CPG should be conditionally waived?

Response: VPPSA and WEC do not have a position regarding which § 248 criteria should be conditionally waived. As the Commission notes in its Order opening this Storage Rulemaking, criteria around interconnection, public safety, and decommissioning should be applicable to storage facilities.

- c. **Codes and standards.** Are there any codes and standards relevant to energy storage that the Commission should incorporate by reference into the rule? If so, which ones and why?

Response: Sandia National Lab sponsors an Energy Storage Safety Collaborative (the “Collaborative”), whose spring/summer 2021 update¹ provides a good overview of the state of codes and standards that are relevant to energy storage. Because codes and standards are constantly being updated, especially for an emerging technology like storage, we recommend making reference to the Collaborative in the Rule and requiring §248 applications to disclose and discuss codes and standards best practices and specify which codes and standards its project will meet. Then the topic could be considered as part of the §248 process without having to amend the Rule as codes and standards change.

- d. **Application materials.** What application materials should stand-alone storage facilities be required to file to be considered administratively complete?

Response: At a minimum, the following three documents should be required:

1. A completed interconnection agreement between the storage owner and the host utility should be among the materials required for a completed § 248 application
 2. Proposed operating protocols
 3. Energy Storage Service Agreement (ESSA) or its equivalent (if applicable)
 4. Decommissioning plan
- e. **Retrofitting.** Would the list of applicable § 248 criteria or the list of materials to be filed be different for storage facilities that are being added to existing facilities (e.g., an existing solar facility with a CPG adding storage)? How should the Commission consider cumulative impacts of adding storage to existing facilities?

Response: If the addition of a storage facility will not impact the amount of power exported to the grid then the generation impacts will be minimal. Storage facilities that can operate utilizing the facilities’ existing inverter can be reviewed much more quickly for their grid impacts. An expedited process for co-located systems that sit under the existing inverter capacity is thus appropriate.

- f. **Comment deadline.** Noting that Act 54 requires the Commission to issue a CPG within 46 days if no major issues are raised, what is an appropriate deadline for stakeholder comments on CPG applications for energy storage facilities (e.g., 15 or 30 days after the application is filed)?

Response: Assuming that an interconnection agreement is obtained prior to filing for a CPG, 30 days is an appropriate deadline for stakeholder comments. If interconnection issues are not addressed prior to the CPG application being filed, a shorter timeframe for stakeholders to raise issues will encourage utilities to raise objections in order to ensure there is adequate time to review and study grid impacts.

¹ https://www.sandia.gov/energystoragesafety-ssl/wp-content/uploads/2021/06/SC-Report-by-SDO-SPRING-2021_Final.pdf



- g. **Notice.** Should the Commission modify the notice requirements of Title 30 for energy storage projects in the simplified process?

Response: The same notice requirements should apply under the simplified process as under the full § 248 process.

- h. **Interconnection.** What is the optimal process to manage interconnection for facilities in the simplified siting review? Should the Commission require that applicants file a copy of an executed interconnection agreement with the application? Are there size thresholds that should trigger a requirement for an interconnection agreement? If so, what are the appropriate size thresholds?

Response: To avoid delays in the § 248 permitting process, an executed interconnection agreement should be required at the time of application. Vermont should strive to establish one broad interconnection process that applies to all resources seeking to connect to a host utility's distribution grid and articulate that process through Rule 5.500. It is important to harmonize Rule 5.100, Rule 5.500, and the Storage Rule. As is done under the current Rule 5.500, there should be an opportunity to undergo "Fast Track" review for projects that will not have significant grid impacts. The distribution utility would need to set size and/or location thresholds for determining which projects pass Fast Track screening.

It is important to recognize that grid impacts will vary by the specific conditions on individual circuits. A small project in a certain location might have disproportionately large impacts, so it is unlikely that one appropriate size threshold could be established. Projects of the same size can have very different impacts depending on the circuit on which they are sited.

As noted previously, the level of streamlining should be linked with the potential grid impacts of the storage device. In that regard, residential or small commercial scale devices that are designed to provide localized support to a single customer for loads already existing may be appropriate candidates for a simplified approach. To the extent the storage device has potential to produce increased load or generation characteristics on the distribution system, a more in-depth process should be required.

- i. **Other issues.** What other issues should the Commission consider in establishing a simplified siting process for storage systems?

Response: All large storage systems (>1MW) should be required to have plans for addressing siting, safety, cyber and physical security, and extreme weather and environmental concerns.

Topic 2. Aggregations and interplay between owners, operators, and utilities

General comments:



The implications of widespread deployment of small-scale storage installations are not well understood. There will need to be coordination among participants, aggregators, and utilities as well as an appropriate degree of regulatory oversight to ensure that storage is seamlessly integrated into the grid for the benefit of all electric consumers. Some level of dispatchability will be required to avoid system disruptions and cost implications for all customers.

There is a spectrum of requirements that could be imposed on storage installations ranging from utility control of operations, to cooperation and collaboration between the utility and the aggregator, to communication between the two sets of entities. The degree of regulatory oversight imposed on storage installations and aggregators should be tied to the potential level of system impact resulting from the storage installation(s). For example, if a storage installation is used only for load reduction at a customer's premise, the utility will be largely agnostic to that installation. For storage installations that intend to export power onto the distribution grid, there is a greater need to coordinate with host utility.

There are two separate, distinct, categories of impacts that storage will have on the host utility and its customers: 1) safety and reliability and 2) financial impacts. As a general principle, storage installations should not be permitted to cause adverse impacts on the distribution system or cause economic harm to other customers. The interconnection process may involve both sets of impacts.

One regulatory framework could address only the physical impacts of storage installations on the distribution system and leave market participation and financial aspects of business operations to contracts. Tariffs could be developed for storage aggregators to address their unique operating characteristics. There would be separate agreements between customers and aggregators detailing their operational and financial arrangements.

Another option would be to include consideration of service arrangements and operation protocols within the context of Rule 5.500. This would require expanding the interconnection process to include both the engineering study and the financial negotiation regarding how the storage installation will be operated.

Finally, VPPSA presumes storage installations will be retail customers served by the host utility. If the Commission has a different intent, more discussion among parties will be needed. For example, if storage installations were to be permitted to purchase electricity at wholesale there may need to be distribution and transmission charges assessed by the host utility, VELCO and ISO-NE.

- a. **Visibility to utilities.** Are there specific requirements related to two-way communications with distribution utilities that the Commission should impose on aggregators as a condition of receiving a § 231 CPG?

Response: Some level of interoperability between storage aggregators and distribution utility communication systems should be required. Host utilities need access to data regarding storage operations so that they can understand the distribution system impacts. Data will need to be communicated seamlessly from the end point (storage installation) to the host utility and potentially up to VELCO (the transmission grid operator). This communication likely won't be



efficiently achieved if storage operators are working with proprietary Application Programming Interfaces (API). It is appropriate for the Commission to establish and require an open source or interoperability standard early on to facilitate communication. This will help ensure reliable grid operations and avoid costs of accessing data being borne by ratepayers. Communication standards and protocols should apply to all storage installations as well as aggregators.

- b. **Override.** Are there circumstances under which local distribution utilities may need to override operator control to charge or discharge aggregated systems to maintain system stability and reliability? If so, is that currently technically feasible?

Response: Yes, some level of dispatchability will be necessary in order for DUs to maintain safe and reliable grid operations. The general operating parameters of aggregated storage facilities should be considered and evaluated in the interconnection process. Nonetheless, there may be situations in which it is necessary for a DU to override operator control to preserve grid stability and/or protect ratepayers. The Storage Rule being developed by the PUC should explicitly allow DUs to curtail storage output and disconnect these systems from the grid as necessary without penalty to the DU. Utility tariff language should also include these provisions.

Regarding technical feasibility, utilities can curtail both load and generation currently; however, this is not a remote or automated process. Fuses can be physically disconnected. Control systems in each generator will disconnect from the grid through programmed protection systems if voltage or frequency go out of bounds or if there is an outage. This type of automatic disconnect is built into the protection systems.

With storage installations, DUs may need to throttle the battery output or load up or down if there are issues on the system. VPPSA and WEC do not believe utilities should be granted direct control of storage assets that they do not own. Rather DUs should be granted the authority to dispatch these resources as needed to ensure safe and stable grid operations. DUs do not necessarily need to control a storage device owned by a customer, but instead the DU should dictate how much flexibility is granted around battery facility operations. If a storage owner or operator violates the DU's operating parameters physical disconnect should be permitted.

- c. **Notice of changes to an aggregation.** Aggregations are likely to change over time. For example, small resources may leave or join aggregations rather frequently. What requirements for notice should be included in § 231 CPGs when changes occur to aggregations?

Response: Changes to an aggregation should be communicated to the utility and the utility should have the opportunity to review and provide comments regarding changes. Specifically, the DU should be provided the customer name and the address and size (kW) of the storage installation so they can effectively track and dispatch storage facilities. Utilities have a reasonable interest in knowing where on the grid storage resources are located. VPPSA and WEC anticipate that storage will often be coupled with on-site generation; however, Rule 5.100 currently has no reference to storage.



- d. **Dispute resolution.** Should the Commission create a special or unique dispute resolution process for parties involved in energy storage? If so, what is an appropriate process for dispute resolution when disputes arise between storage facility owners, operators, and the interconnecting providers? Are disputes likely on matters other than system stability and reliability? Are there limits on the Commission's jurisdiction to resolve disputes among these entities?

Response: Disputes related to siting, CPGs, interconnection, and tariffs should be addressed through existing Commission procedures under its existing jurisdiction. The boundary of the Commission's jurisdiction is a legal question that VPPSA has not explored.

Storage facilities have the potential to create physical impacts on the grid as well as potential financial impacts due to market participation. In the context of FERC Order 2222 those financial impacts could include the need to upgrade utility back-office software and billing procedures if retail customer devices were allowed to participate in the regional wholesale markets. Those investments would likely be significant. If there are disputes related to wholesale market rules or market participation by storage owners and/or aggregators FERC and ISO-NE may be involved.

VPPSA and WEC suggest that the Commission also identify a staff person to respond to specific questions on the proposed storage when there is a lack of clarity or a topic that is not explicitly addressed in the rule.

- e. **Other issues.** What issues outside system stability and reliability should the Commission consider when issuing a CPG for energy storage aggregators?

Response: One key consideration the Commission should consider when issuing a CPG for a storage installation is whether there may be financial harm to ratepayers due to the storage installation's operation. The Commission should also be cognizant of the technology and software that will be needed to achieve communication between the storage facility and the host utility.

Another issue that should be considered is decommissioning of storage facilities. This should be addressed in the CPG and/or the interconnection agreement.

Topic 3. Role of energy storage

- a. **System optimization.** How can the Commission encourage or require energy storage systems paired with existing resources to allow for system optimization, including: injecting power during times tied to regional power supply expense drivers, alleviating local grid congestion, and shifting renewable production to cover peak times? What tools, inverter settings, and control protocols are needed to ensure that storage paired with systems in State programs is benefitting the grid as much as possible?

Response: In general, generators and storage aggregators will respond to price signals. Grid congestion and power supply expenses could be minimized by setting location-specific prices for generation produced through state programs (e.g. Net Metering and Standard Offer.) Similar



mechanisms could be employed by distribution utilities through time-of-use rates that align price signals with cost drivers.

Distribution utilities will optimize system operation to ensure reliability and serve the economic interests of customers as a whole. It is important for the Commission's regulatory regime to recognize DU primacy on reliability and safety. Distribution utilities should be provided the ability to curtail generators and storage facilities to optimize grid operation. In addition, when individual or aggregated storage facilities have the potential to provide system value, DUs will voluntarily enter contracts with owners and aggregators, or implement tariffs, to acquire that value. Affording distribution utilities the flexibility to set compensation commensurate with value provided would maximize the benefits provided to all customers by storage facilities. Because the value of both generation and storage resources are extremely dependent on location, there should not be any type of statewide "adder" to the compensation paid to facilities in state programs that add storage.

- b. **Carbon impact.** Storage systems programmed to optimize deployment for revenue only can have a significant carbon impact because they can charge on carbon-intensive, overnight energy. If storage systems are paired with resources in State renewable programs, should the Commission impose charge and discharge requirements related to carbon intensity? If so, how might this be done?

Response: VPPSA and WEC suggest that additional data would be needed to test the assumptions embedded in this question. While solar output occurs only during the day, other carbon-free resources such as wind, hydro, and nuclear produce electricity overnight.

Storage resources can be deployed to maximize a variety of value streams. As the Commission's question notes, the economic and environmental impact of storage will depend on the individual use case. Currently the renewable programs being implemented by the state are Net Metering and the Standard Offer Program. It is not clear that there is a mechanism for the PUC to impose charge and discharge requirements on storage installed at existing Standard Offer plants and Net Metering installations. VPPSA and WEC recommend against making changes to the Standard Offer Program given that roughly 10% of the program capacity remains. Doing so would add cost and administrative complexity to that program.

This question further relates to the methodology used by the state to account for carbon emissions. If Vermont is headed to a 100% carbon-free electric sector requirement then this is a moot question in relation to Vermont's contracted energy supplies. If instead the Commission is suggesting that batteries be operated to reduce ISO-wide carbon emissions that would disconnect battery operations from the economic impacts to Vermonters.

- c. **Equity and access.** Historically disadvantaged and low-income communities have comparatively little access to clean energy technologies, including storage. How can the benefits of energy storage be shared in an equitable fashion? How can the Commission improve equity and access for energy storage?



Response: VPPSA and WEC share the Commission's concern around equity. Vermont electric customers should be shielded from increased costs in order for individual customers and the private sector to earn a return on investment from storage installations. At an absolute minimum, the regulatory regime for storage facilities should be structured to avoid pushing costs on to ratepayers as a whole. Distribution utilities should be afforded the ability to curtail storage facilities to avoid financial harm to ratepayers. The Commission and stakeholders should endeavor to avoid repeating the State's collective experience under the Net Metering program, which has resulted in ongoing cost shifts among customers.

Vermont's distribution utilities are charged with providing least-cost services to all ratepayers and are currently deploying battery storage facilities for the benefit of all customers. As with generating resources, larger-scale storage installations are more cost-effective than small, individual installations. Simply put, the unregulated private sector is not designed to serve the public interest. Municipal and cooperative utilities operate on a non-profit basis and thus don't need a substantial return on investment in order to deploy storage. As such, WEC and the VPPSA member utilities view equity as most efficiently being provided through deployment of least-cost utility-wide resources that benefit all consumers.

Ensuring equity in Vermont's energy programs will necessitate an increased reliance on public and regulated entities. The unregulated market has not, and will not, ensure equitable distribution of benefits.

d. **Other issues.** What other issues should the Commission consider when determining how to integrate storage with existing resources?

Response: None at this time.

Thank you for your consideration of these comments. Please contact me (mbailey@vppsa.com or 802-882-8509) with any questions you may have.

Sincerely,

A handwritten signature in blue ink that reads "Melissa Bailey". The signature is written in a cursive, flowing style.

Melissa Bailey
Manager of Government and Member Affairs
Vermont Public Power Supply Authority