ACT 31 STORAGE REGULATION - DRAFT RECOMMENDATION OPTIONS

For public comment – November 1, 2019

Please submit comments on these draft recommendation options by:
November 29, 2019 to PSD.EnergyStorage@vermont.gov

VERMONT
DEPARTMENT OF PUBLIC SERVICE

Introduction

With the passage of Act 31 of 2019, Vermont took its first steps in clarifying regulatory treatment of energy storage by (1) defining an energy storage facility as, "a system that uses mechanical, chemical, or thermal processes to store energy for export to the grid"; and (2) requiring energy storage facilities 500 kW and larger to obtain a Certificate of Public Good under 30 V.S.A. § 248.

Act 31 also asked the Department of Public Service ("Department") to "make recommendations for the regulatory treatment of energy storage facilities with a capacity of less than 500 kW and energy storage facilities of any size with grid-exporting capabilities not subject to direct or indirect control by a Vermont distribution utility."

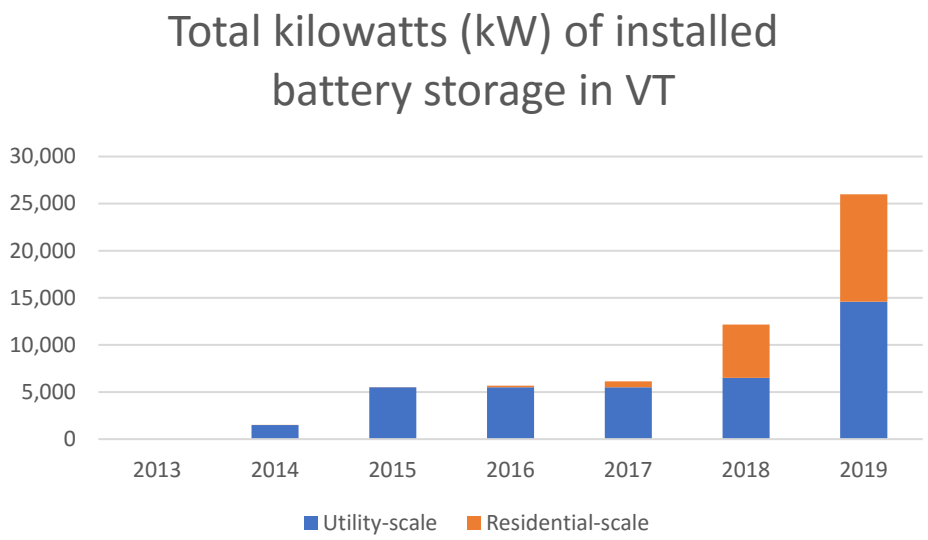
The Department offers the following *draft recommendation options* for review and consideration by energy storage stakeholders. In these draft recommendation options, the Department generally seeks to:

- Provide a clear path to permitting storage projects
- Ensure storage projects and their operations do not adversely impact the grid or ratepayers; and
- Provide public and environmental safety

The Department seeks input from stakeholders including utility customers, storage developers, utilities, first responders, various state agencies, and others on the options presented in this draft, as well as other issues and ways to address them not included in this draft.

The case for regulatory reform

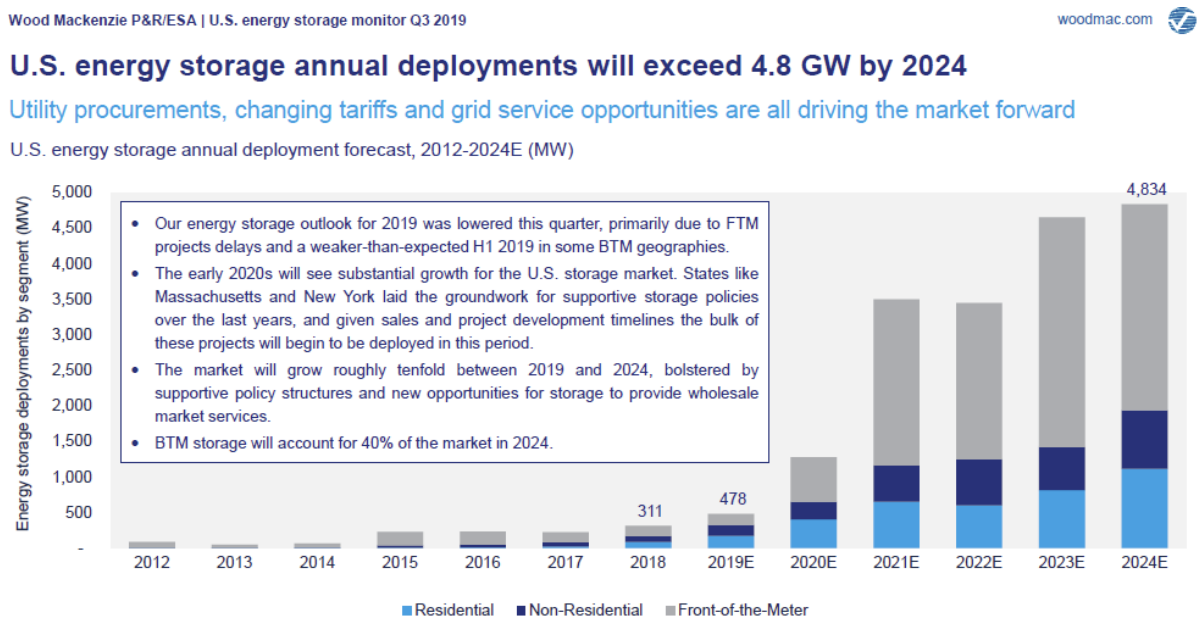
With the deployment of any technology, including storage, comes questions of whether and how to enact regulations that protect the public and the environment without imposing unnecessary hurdles on deployment. Jurisdictions around the country, including Vermont, are seeing rapid growth in energy storage deployment. In 2014, Vermont had 1.5 megawatts (MW) of interconnected battery storage. As of the publication of this draft, that number has grown to over 26 MW, with at least another 5 MW permitted and in development.



For a sense of scale, Green Mountain Power's ("GMP's") 2018 Integrated Resource Plan, approved by the Public Utility Commission ("PUC") in September 2019, includes an illustrative future portfolio (a conceptual future portfolio based on what we know today about costs, values, and use cases) that discusses the potential for up to 100 MW of storage and other flexible loads ramping up over a 10-year period starting in 2022.[1]

Storage growth regionally and nationally is similarly expected to rapidly accelerate in the next decade. The regional transmission organization for New England ("ISO-NE") reported in early 2019 that 20 MW of grid-scale battery projects had come online since 2015, and there were proposals to interconnect more than 1,300 MW of energy storage projects by 2022 (these are *only* projects connected to the transmission system or actively participating in wholesale markets).[2] Meanwhile, Wood Mackenzie Power & Renewables anticipates tenfold growth in the storage market between 2019 and 2024:

[1] https://greenmountainpower.com/wp-content/uploads/2019/03/IRP-Portfolio-Evaluation.pdf at 8-37
[2] https://www.iso-ne.com/static-assets/documents/2019/02/20190220_pr_state-of-the-grid_presentation_final.pdf at 19



Source: Wood Mackenzie Power & Renewables/ESA U.S. energy storage monitor

As discussed in the Department's 2017 Report to the Vermont General Assembly on the Issue of Deploying Storage on the Vermont Electric Transmission and Distribution System, storage can provide the *functionality* of load as well as generation.[3] The Department's report recognized the rapidly expanding deployment of storage and the need to reform existing – or create new – regulatory mechanisms to ensure deployment is safe, beneficial, and accountable. The options discussed for regulatory reform in this draft include regulating both grid-exporting and, potentially, some *non*-grid-exporting storage, as both pose potential impacts to the grid (e.g., fault current and inadvertent export).[4] Some of the options for regulation discussed below make use of existing regulatory processes, with proposed updates that recognize the unique characteristics of storage. There are also options that would create new processes, in recognition of both the unique characteristics of storage as well as the potential for growth of other distributed energy resources with similar characteristics and the need to modernize – rather than piecemeal modify existing – regulatory mechanisms.

The Department's 2017 report touched briefly on needed reforms to regulatory review and interconnection processes to accommodate storage. It recommended:

- 30 V.S.A. § 248 be used as the vehicle for review of larger projects, with appropriate modifications;
- Revisions to 30 V.S.A. § 8010 (or design of a like process) as a vehicle for the review of smaller storage projects;
- Commission rules, such as Rule 5.900 (which addresses decommissioning) be modified to incorporate storage; and

[3] Storage does not, however, *create* generation and is in fact a net load, given round-trip losses.

[4] Non-exporting storage is likely to pose lesser impacts than exporting storage and should be treated commensurately. Several states, e.g. California and Colorado, have adopted specific, expedited procedures for non-exporting storage or even waived it from interconnection rules if certain requirements are met. See https://www.nrel.gov/docs/fy18osti/71232.pdf.

- Interconnection of storage continue to be governed by Rule 5.500 and pending revisions thereof.

This paper reinforces and expands upon those recommendations based on technology developments, lessons learned, and best practices that have emerged since 2017. In developing these draft regulatory options, the Department seeks to address several areas of concern, while simultaneously instituting a clear path to permitting for storage implementers.

Impacts to the electric grid

As the storage industry grows, national standards, codes, and guidelines as well as industry best practices are emerging to address the technology and its applications while providing a level playing field for industry growth.[5]

Potential impacts to the grid from other inverter-based resources, such as solar photovoltaics, are generally reviewed by Vermont utilities in accordance with statewide interconnection procedures promulgated by the PUC.[6] According to the National Renewable Energy Laboratory ("NREL"), the factors a utility must assess to evaluate potential impacts on their system from energy storage facilities include:

- Planned operational capacity and behavior (i.e., dispatch strategy);
- Exporting versus non-exporting systems and associated control systems testing;
- Engineering reviews and technical screening procedures;
- Impact on load; and
- Co-location with on-site generation (e.g., solar plus storage).[7]

In many cases, a storage facility can be reviewed for system impacts in a similar fashion to a comparably sized inverter-based generation resource, such as solar. There are, however, significant differences between a solar photovoltaic facility and a storage facility in terms of the storage facility's individual behavior and also its range of possible behaviors when physically or virtually aggregated with other resources. An individual storage facility can import and store energy from a source, such as a solar facility or the grid, on a schedule or in response to a signal. It can export that stored energy to the grid, again in a controlled manner. It can perform both functions in rapid succession and change intended operations at any time.

A grid operator or intermediary can also orchestrate the activities of many individual units to act in the aggregate, which, in essence, creates a much larger, virtual resource that combines many small, distributed resources to either add to or (as is the case today) reduce bulk system load. As NREL writes:

> Further complicating the issue, these dispatch strategies may not be fixed over time as market conditions and incentives shift and optimal dispatch strategies change. In the case of non-exporting or limited-export storage systems, the nameplate capacity may be a poor indicator of the system's potential impact on

[5] These include UL 9540, UL 9540A, NFPA 855, IEC 62933, and UL 1741

[6] Not all energy storage is inverter-based, but most of the installed and planned storage in Vermont is inverter-based.

[7] Peterson, Zachary. Emerging Practices for Energy Storage Interconnection: NREL, 2018. https://www.nrel.gov/dgic/interconnection-insights-2018-11.html

> the grid and lead to an unnecessarily time-consuming and costly review. The industry is in the early stages of defining how storage projects should be evaluated throughout the interconnection process.[8]

The Department recommends that, in the context of the currently open interconnection rulemaking proceeding (19-0856-RULE), one or more workshops should be held to specifically address storage interconnection, making use of existing best practices available through the NREL briefing paper cited herein as well as the newly released Interstate Renewable Energy Council's ("IREC's") 2019 Model Interconnection Procedures.[9]

Impacts to ratepayers and consumers

The Department's 2017 energy storage report to the legislature covered potential issues related to costs and benefits of energy storage projects in depth. These issues (including consideration of who should bear costs and receive benefits) have been part of the investigation of several storage projects since that report's publication.[10] Energy storage "values" depend on use cases and must generally be stacked in order to exceed installation and operation costs. Potential values to ratepayers and individual consumers include avoided power supply costs (primarily capacity, or peak, related costs), integration of renewable energy, and resilience.

Aggregations of resources offer the opportunity create "virtual power plants" that can potentially benefit individual customers and ratepayers in general. In GMP's Tesla Powerwall and Bring Your Own Device pilots, for example, customers and the utility share the cost of a storage installation in the customer's home. The battery is available to the customer in the event of a power outage and to the utility and its ratepayers to reduce system demand during monthly and annual peaks. GMP's Aggregation pilot presents the opportunity for third parties to work directly with customers to aggregate fleets of batteries (and other devices) in response to GMP dispatch signals.

Through these programs, GMP has created value streams for customers and third parties that have attracted participation. Outside of GMP territory, such programs are being explored by other utilities, but have not yet been implemented. However, there are other, non-utility value streams (i.e. New England wholesale electricity markets) that could create value streams for third parties to develop similar shared-cost, shared-value programs with utility customers without the participation or even awareness of the utilities whose systems are being used by these batteries as they charge and discharge. Aggregations of such batteries being deployed to benefit individual customers (for resilience), and the region as a whole (reducing regional peaks, regulation, etc.), could nevertheless introduce costs for Vermont utilities and their ratepayers. This could happen if, for example, an aggregation is signaled to discharge to reduce the regional peak (in the late afternoon) and then immediately recharges just in time to add to the later Vermont peak. It could also happen if discharging occurs simultaneously with solar output in a generation-constrained area.

---

[8] Ibid

[9] Ibid, https://irecusa.org/publications/irec-model-interconnection-procedures-2019/

[10] Report to the Vermont General Assembly on the Issue of Deploying Storage on the Vermont Electric Transmission and Distribution System; see PUC Dockets 17-5003-PET, 17-5236-PET, 18-1658-PET 18-2902-PET, 18-3088-PET, 19-3167-TF, 19A-3193, 19A-1020, etc.

The Department is working on a separate but related initiative to explore rate design pathways – for loads in general, specific end uses, and generation – to better align system costs with system benefits. There are potential implications for storage, such as price signals that place greater value on renewable generation during evening peaks, and therefore incent pairing solar with storage to shift its production from daylight to evening hours – but those are outside the scope of this particular report. There are also Federal Energy Regulatory Commission ("FERC") proceedings looking into operational implications of aggregations of distributed energy resources such as storage that may have outcomes bearing on the concerns outlined above.[11]

In the meantime, many of these issues can likely be addressed in the context of the state's interconnection rule (Rule 5.500), especially if *all* storage systems deployed in the state are addressed by that rule, as proposed here.

Impacts to public health

Energy storage systems comprise several elements, which act in concert to provide the system with its functionality.[12] These include the individual cells that make up the battery modules, the strings of modules, the storage control unit, and the inverter unit (which connects the DC battery to the AC home and grid). Public safety impacts from battery storage technologies (the type of storage currently being deployed in Vermont) relate primarily to fire hazards posed by particular battery chemistries, as well as balance of system and installation issues. While some lead-acid batteries are being deployed in Vermont, most installations use lithium-ion chemistries (particularly lithium nickel-manganese-cobalt). Lithium-ion batteries are prevalent in modern consumer electronics, but generally not at the energy densities and magnitude of residential- and grid-scale batteries.[13]

Concerns about fire safety risks are not merely speculative in nature. Recent utility-scale battery storage installation fires – for example, the 2012 Arizona Public Service Elden Substation battery fire, the 2019 McMicken Energy Storage Facility fire, and nearly two dozen storage facility fires in South Korea since 2017 – have highlighted potential risks that deserve attention.[14]

The storage industry is actively working to develop and deploy safer battery chemistries, such as lithium-ferro-phosphate. But in the meantime, prudent fire-prevention measures that consider the entire energy storage system should be enacted, and first responders should be provided with the knowledge necessary to address battery storage fires should they occur.

---

[11] See https://www.ferc.gov/eventcalendar/EventDetails.aspx?ID=10920&CalType=%20&CalendarID=116&Date=04/10/2018&View=Listview

[12] For the purposes of this report, "energy storage" means "batteries" unless otherwise noted, as batteries are the only advanced storage technology currently being deployed. As new technologies are deployed in Vermont, regulatory frameworks put in place now may need to evolve.

[13] The primary hazard risks posed by large-format lithium ion-based energy storage systems include thermal runaway and resulting heat and gas emissions. See https://readytalk.webcasts.com/viewer/event.jsp?ei=1263100&tp_key=06672291bf.

[14] https://pv-magazine-usa.com/2019/08/08/lithium-ion-not-prudent-and-create-unacceptable-risks/

Installations in buildings under the fire safety code jurisdiction of the Department of Public Safety ("DPS") – generally all buildings *except* detached, single-family, owner-occupied dwellings – must adhere to DPS's fire safety codes. Those codes incorporate updates to national fire safety codes, including from the National Fire Protection Association ("NFPA"). NFPA 855 is the most recently codified update and includes specific measures to address battery storage installations, including a requirement to install a sticker on the main electrical meter pack indicating the presence of an energy storage system in the building.[15] One potential recommendation is to extend this requirement to detached, single-family, owner-occupied dwellings. As these are not under DPS's jurisdiction, the requirement would need to be included in other applicable codes and standards, perhaps PUC Rule 5.500 (interconnection) or a new PUC rule specific to storage.

The Department understands that the Vermont Fire Safety Training Academy is taking steps to incorporate battery storage into its training manuals. The Department seeks input from the Academy and from other fire safety professionals on any additional recommendations that should be included in this report, such as a notification to municipalities or local fire departments when a battery storage system is installed, or access to a database of such installations.

Impacts to environmental health[16]

The Agency of Natural Resources ("ANR") has recommended that all batteries be banned from disposal (including landfill disposal and incineration) due to concerns about potential corrosivity, reactivity, fire hazard, and the safety of waste management personnel.[17] Batteries from sources other than households may also be subject to regulation under the Vermont Hazardous Waste Management Regulations as either hazardous waste or universal waste.[18]

ANR suggests it is appropriate to prohibit the disposal of batteries and require their recycling for recovery of constituent materials. This could require updating the Vermont solid waste landfill ban statutes and possibly adding these batteries to an extended producer responsibility program where product manufacturers take responsibility for end-of-life management.[19] Also, amendments to PUC Rule 4.900 (decommissioning) to address energy storage facilities and/or address storage decommissioning as part of a new, comprehensive storage rule may be needed.

Regulation recommendations

The Department's draft proposed recommendation options seek to expand upon the recommendations in its 2017 report in the following ways:

- Clarify the PUC's general jurisdiction over storage absent specific modifications to Title 30 requirements;

[15] NFPA 855 will be incorporated into the next update of the Department of Public Safety's Fire and Building Safety Code, slated for 2021.

[16] While environmental health is outside the Public Service Department's jurisdiction, it is within the Public Utility Commission's jurisdiction under 30 V.S.A. § 248(b)(5), which assesses project impacts on aesthetics, historic sites, air and water purity, the natural environment, and public health and safety.

[17] https://dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/Universal-Recycling/2019-Report-on-Battery-Stewardship.pdf

[18] Vermont Hazardous Waste Management Regulations

[19] See https://legislature.vermont.gov/statutes/section/10/159/06621a

- Offer specific modifications to Title 30 requirements for storage facilities including a presumption of waivers of 30 V.S.A. § § 107-109 and – except for aggregators - § 231;
- Require all storage be subject to 30 V.S.A. § 248 review, with appropriate process modifications for smaller and aggregated storage facilities and storage facilities paired with renewables;
- Explore appropriate pathways for siting and interconnection review of storage facilities (e.g. utilize existing pathways for renewables or create new pathways for storage and other emerging distributed energy resources);
- Offer potential revisions to various PUC rules to include storage.

Clarify the PUC's general jurisdiction over storage absent specific modifications to Title 30 requirements

As a threshold matter, the Department recommends amending the definition of "energy storage facility" from Act 31 of 2019, in 30 V.S.A. § 201, as follows:

***

> *(4) As used in this chapter, "energy storage facility" means a device or system that captures energy produced at one time, stores that energy for a period of time, and delivers that energy as electricity for use at a future time~~uses mechanical, chemical, or thermal processes to store energy for export to the grid~~."*

The amended language reflects the definition of "energy storage device" contained in IREC's newly released 2019 *Model Interconnection Procedures*, which address storage for the first time and also contain provisions to address necessary interconnection review procedures for storage devices, including devices that do not export to the grid. The Act 31 definition addressed grid-exporting systems only and – as explained during IREC's October 4, 2019 webinar about the procedures – energy storage systems connected in parallel to the distribution system can still introduce potential safety impacts regardless of whether they are exporting.[20]

The Department also recommends the following changes to 30 V.S.A. § 203, to clarify the jurisdictional role of the PUC and Department over energy storage facilities:

***

> *(1) A company engaged in the manufacture, transmission, distribution, storage, or sale of gas or electricity directly to the public or to be used ultimately by the public for lighting, heating, or power and so far as relates to their use or occupancy of the public highways.*
>
> *(2) That part of the business of a company that consists of the manufacture, transmission, distribution, storage, or sale of gas or electricity directly to the public or to be used ultimately by the public for lighting, heating, or power and so far as relates to their use or occupancy of the public highways.*

***

[20] https://irecusa.org/wp-content/uploads/2019/10/IREC-model-interconnection-procedures-2019_100319.pdf. A notification – as opposed to interconnection review – process may be the most appropriate way to treat non-exporting systems that meet certain requirements. See for example https://www.pge.com/tariffs/tm2/pdf/ELEC_RULES_21.pdf, p. 255.

Offer specific modifications to Title 30 requirements for storage facilities including a presumption of waivers of 30 V.S.A. § § 107-109 and – except for aggregators - § 231

Presumption of waivers of 30 V.S.A. § § 107, 108, and 109 for standalone storage projects[21]
Certain merchant renewable generators eligible for qualifying facility status under the Public Utility Regulatory Policies Act ("PURPA"), pursuant to PUC Rule 4.108, enjoy de minimis regulation in the form of exemptions from traditional utility regulation requirements. While standalone storage is not a qualifying facility under PURPA, the PUC has granted waivers of 30 V.S.A. § § 107, 108, and 109 to the few standalone merchant storage facilities that have been permitted under 30 V.S.A. § 248 thus far.[22] Codifying these waivers could make sense for merchant storage projects, and could be written in 30 V.S.A. § 209 as:

***

> *(k) Energy storage facilities. Except when owned by a retail distribution utility, an energy efficiency utility, or Vermont Electric Power Company, Inc., competitive suppliers of energy storage services that do not serve retail customers shall be exempt from 30 V.S.A. § § 107, 108, and 109.*

Presumption of waiver of 30 V.S.A. § 231 for storage operators other than aggregators[23]
The Department recommends that aggregators of storage, utility or third-party, be subject to 30 V.S.A. § 231 regulation, based on the potential impacts to ratepayers of aggregations as discussed earlier in this report.

***

> *(c) A person, partnership, unincorporated association, or previously incorporated association that owns and/or operates an energy storage facility is subject to this section only if the person, partnership, unincorporated association, or previously incorporated association is in the business of operating an aggregation of energy storage facilities.*

Require all storage be subject to 30 V.S.A. § 248 review, with appropriate process modifications for smaller and aggregated storage facilities and storage facilities paired with renewables

The Department recommends undoing a change made in Act 31 of 2019, which had set a threshold of 500 kW for 30 V.S.A. § 248 review of storage facilities. This would entail striking 30 V.S.A. § 248(u), as follows:

***

> ~~*(u) A certificate under this section shall only be required for an energy storage facility that has a capacity of 500 kW or greater*~~.[24]

[21] § 107 (Acquisition of control of one utility company by another; supervision); § 108 (Issue of bonds or other securities); and § 109 (Sales and leases; hearings)
[22] See Case Nos. 18-1658-PET and 18-3088-PET
[23] § 231 (Certificate of Public Good; abandonment of service; hearing)
[24] If this language is not removed, it should at least be modified to read: (u) For stand-alone energy storage facilities, a~~A~~ certificate under this section shall only be required ~~for an energy storage~~ if the facility ~~that~~ has a capacity of ~~500~~ 100 kW or greater.

The Department recommends this change for several reasons. First, it is not clear that 500 kW - or any capacity threshold at all – is the appropriate trigger for siting review. FERC allows for storage resources as small as 100 kW to participate in wholesale markets, which could implicate 30 V.S.A. § 248 criteria such as (b)(2) need and (b)(4) economic development. Also, the ability of storage facilities to operate like a generator (putting out power) is far more limited than most actual generators. Conventionally "dispatchable" generators are generally rated only by their maximum output in kW or MW because their "stored" energy (in the form of fuel in tanks or water behind dams) is so large that it can generally be replenished before there is any real threat of it "running out" during a period of need. Such generators may run at maximum power for many hours or even days. Storage facilities are often much more limited in their reserve size, and therefore should be rated like conventional generators, in terms of their maximum power output (and their maximum demand when charging) in kW or MW, *but unlike conventional generators, they should also be rated in terms of their energy capacity in kWh or MWh.* This energy capacity may alternatively be expressed as *duration at maximum power output, in hours*. Regardless of which way it is quantified, it is a crucial and unique performance parameter of storage.

Second, no other resource is reviewed under 30 V.S.A. § 248 based on a size threshold specified in 30 V.S.A. § 248. Instead, resources and sizes that receive differential treatment in relation to the criteria or processes of 30 V.S.A. § 248 – such as net-metering and renewable resources up to 2.2 MW in size – are directed to receive such treatment elsewhere in statute or related rules. In the next section, options to modify the criteria and processes applicable to storage are explored.

However, there are several additional potential modifications to sections of 30 V.S.A. § 248 to completely integrate storage and ensure appropriate review. These could include:

- § 248(a)(4)(F)(i):
  In any proceeding regarding an electric generation <u>or energy storage</u> facility that will have a capacity greater than 500 kilowatts and will be sited on a tract containing primary agricultural soils as defined in 10 V.S.A. § 6001, the Agency shall appear as a party and provide evidence and recommendations concerning any findings to be made under subdivision (b)(5) of this section on those soils, and may provide evidence and recommendations concerning any other matters to be determined by the Commission in such a proceeding.

  ***

- § 248(a)(4)(J):

  (J) This subdivision (J) applies to an application for an electric generation facility with a capacity that is greater than 50 kilowatts <u>and to an application for an energy storage facility that is greater than 1 megawatt</u>, unless the facility is located on a new or existing structure the primary purpose of which is not the generation of electricity. In addition to any other information required by the Commission, the application for such a facility shall include information that delineates:

  ***

- § 30 V.S.A. § 248(k):

(k)(1) Notwithstanding any other provisions of this section, the Commission may waive, for a specified and limited time, the prohibitions contained in this section upon site preparation for or construction of an electric transmission facility or a generation or energy storage facility necessary to ensure the stability or reliability of the electric system or a natural gas facility, pending full review under this section.

***

- § 30 V.S.A. § 248(l):
  (l) Notwithstanding other provisions of this section, and without limiting any existing authority of the Governor, and pursuant to 20 V.S.A. § 9(10) and (11), when the Governor has proclaimed a state of emergency pursuant to 20 V.S.A. § 9, the Governor, in consultation with the Chair of the Public Utility Commission and the Commissioner of Public Service or their designees, may waive the prohibitions contained in this section upon site preparation for or construction of an electric transmission facility or a generation or energy storage facility necessary to ensure the stability or reliability of the electric system or a natural gas facility. Waivers issued under this subsection shall be subject to such conditions as are required by the Governor, and shall be valid for the duration of the declared emergency plus 180 days, or such lesser overall term as determined by the Governor. Upon the expiration of a waiver under this subsection, if a certificate of public good has not been issued under this section, the Commission shall require the removal, relocation, or alteration of the facilities, subject to the waiver, as the Commission finds will best promote the general good of the State.

Finally, amendments may be needed to municipal and regional planning and land use statutes to exempt storage projects that are subject to PUC jurisdiction under 30 V.S.A. § 248 from Act 250/local jurisdiction, in a similar manner to how electric generation facilities are treated. For example:

- Amend 10 V.S.A. § 6003(3)(D):
  The word 'development' does not include:

  ***

  (iii) The construction of improvements for an electric generation, energy storage, or transmission facility that requires a certificate of public good under 30 V.S.A. § 248, a natural gas facility as defined in 30 V.S.A. § 248(a)(3), or a telecommunications facility issued a certificate of public good under 30 V.S.A. § 248a.

- Amend 24 V.S.A. § 4413 (Limitations on municipal bylaws):
  (b) A bylaw under this chapter shall not regulate public utility power generating plants, energy storage facilities, and transmission facilities regulated under 30 V.S.A. § 248.

Explore appropriate pathways for siting and interconnection review of storage facilities (e.g. utilize existing pathways for renewables or create new pathways for storage and other emerging distributed energy resources)

The options discussed below focus on (1) either modifying those elements of statute and/or related rules that provide for differential treatment of certain types or sizes of resources to

include storage, or (2) creating parallel structures that exclusively focus on storage and potentially other forthcoming technologies that offer similar opportunities and challenges (e.g. vehicle-to-grid).

Along with striking 30 V.S.A. § 248(u), the Department recommends language directing the PUC to amend existing rules or adopt and implement new rules, as appropriate, that govern the installation and operation of energy storage facilities.

Potential pathways to pursue include, but are not limited to, the following:

Option 1: Modify existing pathway(s) for renewables to incorporate storage
Modifying existing pathways to incorporate storage could resemble "treating" storage in a similar fashion to renewable generation in statute and rules, where it functions in similar ways (or is paired with a renewable resource), but with modifications to address situations where it does not. This pathway has the advantage of familiarity for stakeholders and not having to reinvent the wheel. However, it may not be able to address all intended uses of storage and may also entail more process than necessary (for applicants as well as program administrators) for certain use cases of storage.

To use existing pathways could look something like doing all of the following:

- Modifying 30 V.S.A. § 8007 to include energy storage. This section of statute provides for simplified application procedures for small renewable energy plants. It extends net-metering and interconnection processes and criteria waivers to non-net-metering renewable plants up to 150 kW and directs the PUC to establish appropriately scaled standards and procedures for renewable plants larger than 150 kW and up to 2.2 MW in size. In addition to modifying § 8007 to include storage, it could also be updated to acknowledge the inception of the Renewable Energy Standard. Potential revisions include:[25]

  (a) The same application form, rules, and procedures that the Commission applies to net metering systems of 150 kilowatts (kW) or less under sections 248 and 8010 of this title shall apply to the review under section 248 of this title of any renewable energy plant with a plant capacity of 150 kW or less and any energy storage facility with a capacity of less than 100 kW and to the interconnection of such a plant or facility with the system of a Vermont retail electricity provider. This requirement includes any waivers of criteria under section 248 of this title made pursuant to section 8010 of this title.

  (b) With respect to renewable energy plants that have a plant capacity that is greater than 150 kW and is ~~2.2~~ 5 MW or less, and energy storage facilities or aggregations that are 100 kW and greater, the Commission shall establish by rule or order standards and

[25] This may necessitate an update by the PUC of its *Order RE: Simplified Procedures for Renewable Energy Plants With a Capacity Between 150 kW and 2.2 MW(* https://puc.vermont.gov/sites/psbnew/files/doc_library/simplified-procedures-for-renewable-energy-plants.pdf). The criteria that are conditionally waived, the notice and hearing requirements that are modified, and the petition and review processes that are simplified may be different for energy storage facilities or for energy storage facilities of certain sizes, in specific use cases, etc.

procedures governing application for, and issuance or revocation of, a certificate of public good for such a plant or facility or aggregation under the provisions of section 248 of this title, and the interconnection of such a plant or facility or aggregation with the system of a Vermont retail electricity provider.

(1) In developing such rules or orders, the Commission:

(A) Shall waive the requirements of section 248 of this title that are not applicable to such a plant or facility or aggregation, including, for a plant or facility or aggregation that is not owned by a Vermont retail electricity provider, criteria that are generally applicable to such a provider.

(B) May modify notice and hearing requirements of this title as it deems appropriate.

(C) Shall simplify the petition and review process as appropriate.

***

- Modifying 30 V.S.A. § 8002, definitions used in Chapter 89 of Title 30 (Renewable Energy Programs), to include energy storage facilities, by inserting a stand-alone definition of "energy storage facility" that mirrors the definition in 30 V.S.A. § 201 (with the modifications suggested above), and then potentially adding it to the existing definition of "net metering system," as in:
  - Insert a definition for "Energy storage facility":
    As used in this chapter:
    ***
    (X) "Energy storage facility" means a device or system that captures energy produced at one time, stores that energy for a period of time, and delivers that energy as electricity for use at a future time.
    ***
  - Amend the definition of "net metering system" as follows:
    ***
    (16) "Net metering system" means a plant for generation of electricity that:
    (A) is of no more than 500 kW capacity;
    (B) operates in parallel with facilities of the electric distribution system;
    (C) is intended primarily to offset the customer's own electricity requirements and does not primarily supply electricity to electric vehicle supply equipment, as defined in section 201 of this title, for the resale of electricity to the public by the kWh or for other retail sales to the public, including those based in whole or in part on a flat fee per charging session or a time-based fee for occupying a parking space while using electric vehicle supply equipment; and
    (D)(i) employs a renewable energy source, including a renewable energy source paired with energy storage facility; or
    (ii) is a qualified micro-combined heat and power system of 20 kW or fewer that meets the definition of combined heat and power in subsection

8015(b) of this title and uses any fuel source that meets air quality standards.

***

- Modifying 30 V.S.A. § 8010, which governs self-generation and net metering, to include energy storage:

***

(2) The rules shall have provisions that govern:

***

(G) The treatment of energy storage facilities paired with renewable energy sources, including retrofits of existing systems

- Potentially modifying other definitions in 30 V.S.A. § 201 to ensure storage facilities can be paired with renewables in the state's renewable energy programs, particularly in order to help firm or time-shift renewable production for the benefit of the grid and ratepayers (stakeholder input would be helpful to determine what these might be).

- Revising PUC Rule 5.100 (the net metering rule) and Rule 5.500 to incorporate energy storage. Both rules are currently in active rulemakings, and one of the areas of inquiry is the process for interconnection of net-metering registration systems (anything up to 15 kW, as well as rooftop solar and hydroelectric systems up to 500 kW). At present, and as a result of a disconnect between the two rules, the registration form is the de facto interconnection application for registration-eligible systems. The PUC has asked stakeholders for comments addressing whether and how to make the form better serve that purpose. Because non-net-metering small generation sources also use the net-metering registration form for PUC – and thus utility interconnection – review (pursuant to 30 V.S.A. § 8007), it is also the logical path for review (whether PUC, utility interconnection, or both) of small storage systems not subject to full 30 V.S.A. § 248 review.

  An alternative pathway – and the one favored by the Department – would be to decouple the net-metering and interconnection processes, and instead address *all* interconnection (including of net-metered facilities and energy storage facilities) entirely within the context of the interconnection rule. This would create more flexibility to address accelerating advancements in distributed energy resource technologies (DERs), such as grid-interactive microgrids and electric vehicles, particularly if the rule is flexible enough to quickly accommodate similarly accelerating advancements in codes and standards that address DER system impacts, such as ISO-NE's Source Requirements Document that address potential impacts of high penetrations of DERs on bulk transmission system reliability[26].

  Regardless of how the net-metering and interconnection rules interact, both will need updates to incorporate energy storage.[27] Standalone storage may be addressable with

[26] https://www.iso-ne.com/static-assets/documents/2018/02/a2_implementation_of_revised_ieee_standard_1547_presentation.pdf

[27] This may also necessitate update to fee structures associated with net-metering and interconnection applications.

modifications to the interconnection rule, but net-metering systems will be increasingly paired with storage, either as new applications or retrofits to existing projects, as costs come down and price signals (from distribution utilities or ISO-NE markets) materialize. As it stands, storage systems are already being paired with net-metering systems in response to the ability of system owners to obtain the federal Investment Tax Credit for the storage system if it is charged at least 75% from solar; and Green Mountain Power's Bring Your Own Device (BYOD) program offers an additional up-front incentive for batteries located in solar-saturated areas of its distribution system.[28]

Other areas for exploration in these rules include whether and how to evaluate resource impacts based on intended use (e.g., should a solar + storage resource be evaluated based on nameplate gross or planned maximum export capacity, which especially in constrained areas can impact costs that are existential for a project; also whether the resource should be evaluated based on intended timing of charging, which can introduce constraints if it coincides with peak usage times), and how to ensure that storage devices can't be charged with grid power that is later exported to the grid and compensated like net-metering generation.

Option 2: Create new pathways to address storage and future distributed energy resources ("DERs") that don't fit neatly into the traditional categories of load, generation, and/or transmission

Creating new pathways to incorporate storage would provide storage (and, in the future, similar advanced technologies) with a dedicated framework and focus in order to address all intended uses and right-size review criteria and processes by giving the PUC broad authority to adopt and amend rules to achieve certain objectives. The language could be modeled on language in 30 V.S.A. § 8010 (perhaps create a § 8011), which governs self-generation and net metering, as in:

(a) The Commission shall adopt and implement rules that govern the installation and operation of energy storage facilities.

(1) The rules shall include provisions that govern:

(A) The respective duties of retail electricity providers and net metering customers;

(B) The electrical and fire safety, power quality, interconnection, metering, and disposal of energy storage facilities;

(C) The formation of aggregations of energy storage facilities and the resolution of disputes between energy storage facility owners and the interconnecting provider

(D) Energy storage facilities paired with other resources, such as net-metering and Standard Offer plants, including retrofits of existing plants

(2) The rules shall establish standards and procedures governing application for and issuance or revocation of a certificate of public good for energy storage facilities under the provisions of section 248 of this title. In establishing these standards and procedures:

[28] https://www.nrel.gov/docs/fy18osti/70384.pdf, http://isonewswire.com/updates/2019/4/22/earth-day-2019-a-capacity-market-first.html, https://greenmountainpower.com/bring-your-own-device/battery-systems/,

(A) The rules may waive the requirements of section 248 of this title that are not applicable to energy storage facilities, including criteria that are generally applicable to public service companies as defined in this title.
(B) The rules may modify notice and hearing requirements of this title as the Commission considers appropriate.
(C) The rules shall seek to simplify the application and review process as appropriate

Potential revisions to various PUC rules to include storage

The Department offers the following potential revisions to the following PUC rules to incorporate storage, and welcomes stakeholder input on other rules that may benefit from similar revisions:

- Amendments to PUC Rule 5.200 Notification of Power Supply Transactions (unless a separate storage rule is developed that addresses contracts between distribution utilities and energy storage facility owners):
    - Amend 5.201 (Purpose) to state, "…Additionally, all Vermont electric utilities are required to notify the Commission and Department of certain contracts, as specified in section 5.202, entered into by an electric utility for the purpose of purchasing or leasing electrical generation, energy storage, or transmission facilities within Vermont."
    - Amend 5.202 (Notification to the Public Utility Commission and Department of Public Service) sections (A), (C), and (D) to include "energy storage facility" after each instance of "electrical generation facility."

- Amendments to PUC Rule 5.900 Decommissioning (unless a separate storage rule is developed that addresses decommissioning):
    - Amend the first sentence as follows: "This rule applies to all electric generation, electric transmission, energy storage, and natural gas facilities that are or become subject to the jurisdiction of the Vermont Public Utility Commission pursuant to 30 V.S.A. § 248."
    - Amend Rule 5.904 to include an equivalent section for storage facilities. At a minimum, for storage installations of all sizes, the Department recommends a provision for the proper disposal of the device(s) consistent with environmental regulatory parameters. For larger installations, the decommissioning requirements of Rule 5.904 should apply to stand-alone or integrated storage.

Conclusion

The Department welcomes comments from stakeholders on these draft recommendation options emailed by November 29, 2019 to PSD.EnergyStorage@vermont.gov. The final report, due January 15, 2020, will provide the final set of recommendations for consideration by the legislature.