



August 18, 2017

The Honorable June E. Tierney
Department of Public Service
112 State Street
Montpelier, VT 05620

Dear Commissioner Tierney,

Renewable Energy Vermont appreciates the opportunity to share recommendations from our members offering energy storage solutions, including Vermont manufactured products installed throughout the world. REV encourages the State's support and efforts to progress deployment of a wide variety of life-cycle cost effective energy storage solutions including batteries, pumped hydro, electric vehicles, and thermal, etc. at utility, commercial/institutional, and residential scales.

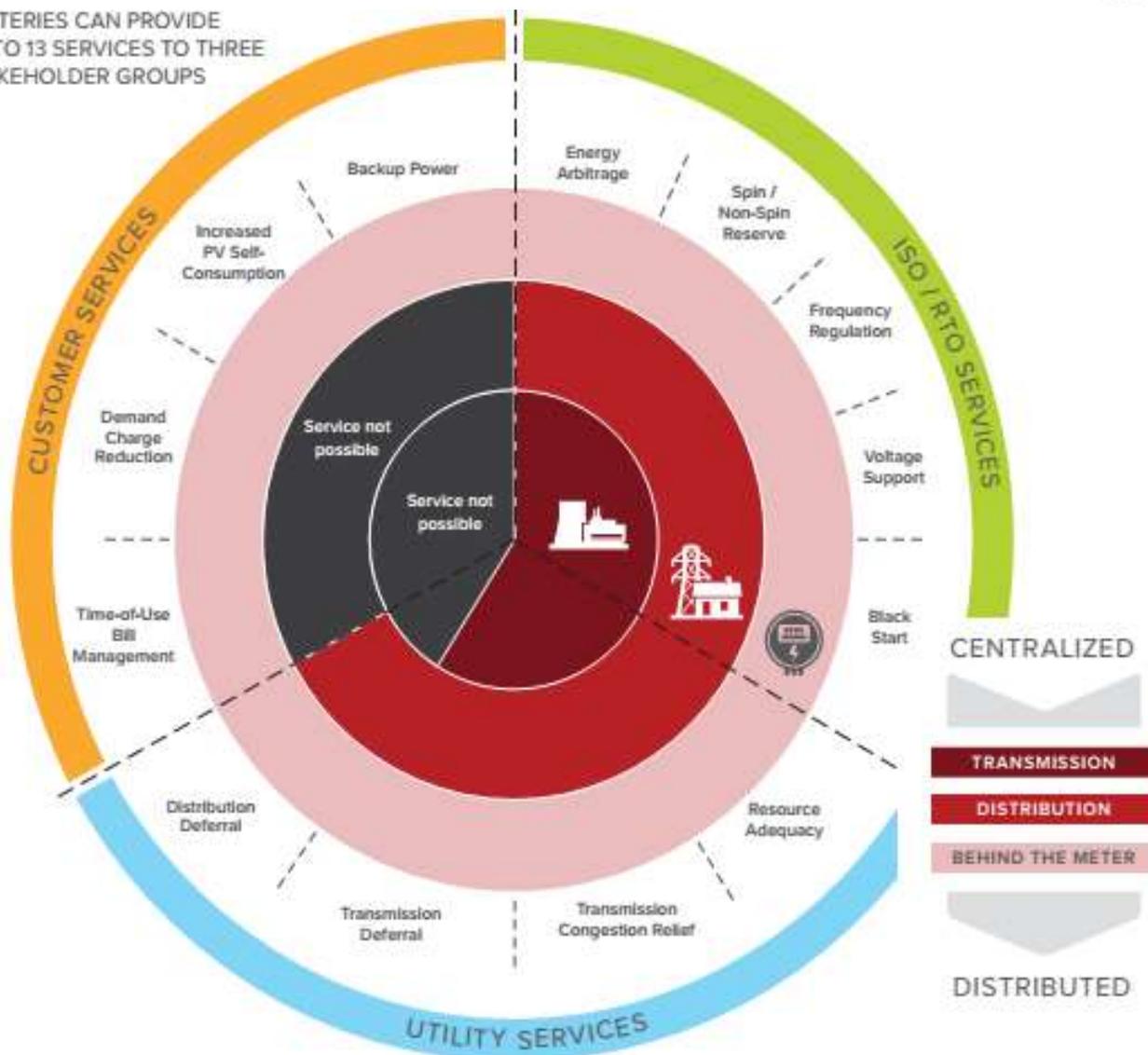
Benefits:

The Department's draft report should recognize the extensive benefits that all scales of energy storage solutions offer to individual residences, businesses, institutions, utilities, ratepayers, and environmental health including:

- ✓ grid resiliency, integrity, stability, and reliability;
- ✓ emergency preparedness and community resilience to weather related or other disruptions to electricity;
- ✓ managed timing of electricity use, lowering electric costs;
- ✓ lower costs to all ratepayers by reducing electricity demand during peak periods when additional supply is needed;
- ✓ avoiding costly distribution and transmission infrastructure upgrades, reducing costs to ratepayers;
- ✓ providing backup power when the grid is offline;
- ✓ replacing fossil fuel backup generators, resulting in lower air and climate pollution and reduced financial wealth exports;
- ✓ reduced greenhouse gas pollution;
- ✓ maximizing use of existing and new renewable energy production;
- ✓ fast ramping electricity reserve capacity;
- ✓ transmission congestion relief;
- ✓ increased grid efficiency;
- ✓ eliminating minimum load violations;
- ✓ voltage support; and
- ✓ local economic growth.

The Rocky Mountain Institute graphic below identifies the benefits of battery energy storage.

BATTERIES CAN PROVIDE UP TO 13 SERVICES TO THREE STAKEHOLDER GROUPS



It is important that all stakeholders – 1) electricity end users; 2) storage project owners; 3) ratepayers; and 4) the utilities (on a transparent and competitive procurement basis) have access to realizing the benefits of energy storage. Similarly, a variety of types of energy storage should have access to provide services and realize compensation for those services.

Barriers:

- ✘ Compensation for services and values provided for non-utility owned energy storage projects is only available in the wholesale market and for large, utility scale projects.
- ✘ Certainty of value and length of compensation for the services provided.



- ✘ Limited regulatory authorization and/or utility 'permission' to use behind the meter, grid-connected energy storage, particularly for commercial and institutional customers.
- ✘ Authorization for mechanisms to share benefits and compensation among stakeholders – especially the benefits from distributed/modular storage.
- ✘ No authorization for customers or project owners to aggregate multiple customers' access to a single grid-connected energy storage project.
- ✘ No market access to either customer owned or 3rd party owned energy storage projects to provide aggregated benefits to utilities or commercial/institutional customers.
- ✘ Limited or no familiarity, knowledge, or experience with storage technology and/or benefits among utilities.
- ✘ Extremely limited risk ability for utility capital investments in new energy storage technologies.
- ✘ No access to financial or other compensation to customer and 3rd party owned energy storage project owners or financiers for the ancillary and grid services provided by the project.
- ✘ Vermont's current utility regulation structure directly encourages traditional infrastructure investments rather than non-wires and performance/service based alternatives such as energy storage.

Recommendations:

The recommendations offered by REV below are market based; oriented to enable fair compensation to all Vermonters for value that energy storage provides and an equitable competitive market enabling cost effective customer choices. Recommendations included within the Department's report should:

- Enable capture of the full value of energy storage;
- Require energy storage competition in all grid and resource planning efforts and procurements by utilities and the State;
- Ensure fair and equal access for energy storage to the grid and markets;
- Support customer, 3rd party, and utility ownership models.

Dynamic Electricity Price Signals

The State should encourage dynamic market signals and rate design for all utilities. Dynamic market signals include time of use (TOU) rates, renewables plus storage tariffs, critical peak pricing, real time rates, etc. The Public Utilities Commission should require utilities to establish tariffs for non-utility owned energy storage projects so that all customers have the access to compensation for the services that their grid-connected storage projects provide. High volume electricity users should be the focus of TOU rates. Given the currently available technology, a time of use (TOU) rate should initially be elective for residential customers to shield vulnerable low and fixed income individuals from unintended cost impacts. Such rates must be properly designed and set a levels that would actually encourage energy storage deployment.



Price signals or risk and reward sharing mechanisms must exist in order for a customer and project owner to realize the benefits associated with and be appropriately compensated for the value provided by their energy storage project. If an electricity customer purchases and installs an energy storage device, they should be eligible to receive a lower cost of power from the utility if that device is dispatchable by the utility for demand reduction up to 50 times per year.

The State should encourage end user rates for electric vehicles as a way to deploy mobile energy storage solutions as well as meet several other State statutory and legal commitments and address alleged rate pressures from overall decreased demand.

Aggregation

The State should explicitly authorize and encourage mechanisms that aggregate load as a way to enable energy storage market access. This recommendation could be implemented through explicit statutory authority, regulatory changes, and/or required rate design, such as a group curtailable load rider. Curtailable load arrangements should not be limited to a single electricity customer. Many potential Vermont storage projects and electricity customers are inhibited from participating in the regional market for ancillary services (frequency market, etc.) without some type of load aggregation because the minimum capacity required is 1 MW.

Multiple accounts should be able to participate in owning all or a portion of an energy storage project's capacity and the host utility can benefit should any portion of the project's capacity not be allocated or exceed customer owners needs. Utilities will also receive a multitude of benefits listed above. This aggregation concept mirrors the successful virtual net metering and community solar model that Vermont pioneered, which has been replicated by states all across the country.

Given the very limited number of individual electricity accounts or similarly owned and commonly sited customers with the need or capacity for a 1MW energy storage project in Vermont (which is unlike other New England states such as Massachusetts), REV suggests this recommendation as a way to create a Vermont specific solution and opportunity for energy storage deployment.

For some applications, and for electricity end users that do not use a lot of energy, the hassle, learning curve, and transaction costs may make using energy storage infeasible, despite attractive benefits. There should be opportunities for non-utility service providers to operate as load and distributed resources aggregators that combine several or many smaller end users in a given area. Rules and tariffs must specifically authorize and include mechanisms for aggregation by customers, 3rd parties, and utilities.

Energy Efficiency

The State should statutorily authorize energy efficiency utilities to utilize energy storage as tool to achieve their performance based deliverables for ratepayers and reduce electricity costs for all Vermonters. Energy storage can enable demand response resources, lower



peak demand, and improve energy efficiency for customers and the electricity grid. Vermont's energy efficiency utilities have enabled customers to access many new beneficial low to no carbon technologies (ex: cold climate heat pumps; advanced wood heating; variable drives, smart thermostats, etc.). Many Vermonters would not have been able to utilize these solutions without incentives, education, or objective technical advice from our efficiency utilities. All Vermonters should have access and when needed assistance to utilize all tools to reduce their electricity costs and Vermont's energy efficiency utilities are well poised to contribute to that value to our citizens in a cost effective way while also driving local economic opportunities.

REV recommends legislation to authorize energy efficiency utilities to include renewable energy storage in their efficiency plans, programs, and incentives, and report back to the legislature annually for three years by December 31 regarding their efforts to encourage renewable energy storage.

Risk & Reward Sharing Mechanisms and Competitive and Transparent Procurement

REV recommends legislation to authorize renewable energy plus storage projects as a pilot initiative for the 2019 and 2020 Standard Offer Program. The legislation should direct that the energy storage projects be selected from a competitive bidding process and direct that the Public Utility Commission report back to the legislature after the first and second year of implementation.

The numerous municipal and cooperative electric utilities in Vermont are unlikely to have any ability to assume risk or the necessary capacity to expend to deploy and manage utility or commercial/institutional energy storage projects. Vermont's Standard Offer Program has a tremendous record of success in achieving new renewable energy technology deployment, driving down prices, and creating economic development. Authorizing a limited renewable energy plus storage procurement through the Standard Offer Program would enable Vermont's small utilities to reduce risk, lower their direct costs, gain familiarity with energy storage solutions, and receive numerous benefits from the project. The authorization should not be deducted from the renewable energy deployment total, but additional or complementary.

Utilities (and thereby ratepayers) without storage on their networks end up paying more for the cost of power because they technically have a higher percentage of the ISO power pool at the peak. Utilizing the Standard Offer Program can assist smaller utilities with this issue while reducing their risk.

Workforce Development

Vermont businesses in the energy storage manufacturing and project development sector could create more jobs with State support to train workers.

Utility Regulation

The recently initiated utility regulation Public Utilities Commission docket offers an opportunity to encourage energy storage deployment by utilities. Utility regulation should



provide incentives for public and private utilities to integrate energy storage into their networks equal in capacity (MWh) up to 20% their annual peak power (MW).

If utility rules and regulations do not provide adequate incentive for a utility to defer a transmission or distribution upgrade, then the T&D deferral value of energy storage is unavailable to projects. If a renewable energy project owner cannot get a credit for reducing electric service power quality impacts, then that energy storage value is unavailable to projects.

Renewable Energy Standard Implementation

Tier III of Vermont's Renewable Energy Standard authorizes utilities to support energy storage projects. With the exception of very limited (except for Burlington Electric Department) incentives for electric vehicles, REV is unaware of any utilities progressing storage solutions to achieve Tier III compliance. The Department could explicitly encourage its utilization given the numerous benefits to both ratepayers and utilities and inquire as to why energy storage is not being utilized. For example, Vermont Electric Coop's Tier III plan includes extending distribution infrastructure – was a life-cycle cost and benefit analysis or consideration of onsite renewables combined with energy storage considered? An energy storage solution in this scenario would have greater immediate pollution reduction, fossil fuel displacement, and customer and state wealth retention benefits.

Ensuring Maximum Local Economic Benefits

Vermont could realize the maximum benefits of growing an in-state energy storage market by requiring or incenting storage products manufactured in Vermont. California recently began implementing a value added opportunity for projects manufactured within its state and in response several companies (including Vermont-based Dynapower) established manufacturing operations in the state. Vermont should consider taking a similar approach, which would encourage new manufacturing jobs and local economic development, and help maintain the existing energy storage manufacturing jobs in our state.

Vermont is already home to at least three energy storage products manufacturers – Dynapower, Northern Reliability, and Northern Power Systems. The majority of their Vermont manufactured products have no access to market deployment in Vermont currently. The lack of in-state opportunities, significant storage market growth opportunities in other states, and high cost of doing business in Vermont forces these companies to regularly weigh the cost/benefit of their manufacturing locations, frankly creating an incentive for these employers to leave the state.

Integrated Resource Planning

Energy storage should be incorporated within all IRPs. The State should evaluate IRPs to ensure that energy storage is considered using the latest cost and performance data; matching resource need with resource selection; using sub hourly modeling; ensuring net cost of capacity (stacked benefits) are considered; and incorporating load-site storage options as a potential resource.



Beyond Vermont – Regional Solutions & Transparency

The Department of Public Service should work with ISO-NE to further open wholesale markets and properly value energy storage in the capacity market.

Transparency is necessary for the ISO-NE ancillary, capacity charges and benefits that energy storage can provide to utilities.

Recommendations on Next Steps:

Avoiding Future Barriers

Permitting, siting, and unnecessary regulations should not become a barrier to realizing the benefits of energy storage deployment in Vermont. Similarly, energy storage projects under certain conditions (size, location, type) should not be subject to state agency review fees. Given the different types of energy storage technologies and uses, it is not appropriate to default to treating them as generators in statutes and regulations. Vermont's existing statutes and regulations do not adequately accommodate energy storage deployment.

REV preliminarily identified a few barriers within existing rules and others are likely to exist. Existing net metering or standard offer projects should not be penalized for connecting energy storage and should actually be encouraged to maximize the prior investment in renewable energy. Certificates of Public Good should not be required for grid connected energy storage projects that do not export electricity above a certain amount (TBD) onto the grid.

The pending interconnection rule should be reviewed for impacts on energy storage projects. The interconnection rule should exempt energy storage projects from delays by allowing projects co-located at existing points of interconnection expedited review or exemption from utility requests for supplemental review if there is no increase in electricity injection from the project. Furthermore, transmission studies should examine storage as a highly-controllable, predictable asset, not as an intermittent load or imprecise generator. Load modifying energy storage should be exempt from interconnection study. The rule could require expedited interconnection review for energy storage projects located on congested feeders or intended to discharge during peak demand hours.

Given the time constraints of the Department's first report and the legislature's directive regarding the focus of the report, REV recommends that a workgroup be formed to collaboratively identify and work on regulatory changes related to energy storage recommendations from the Department.

Deployment Goals & Requirements

The Department should identify the benefits of a specific energy storage procurement goal or requirement for Vermont within its report and consequentially begin the work to establish a storage deployment target. Setting a cost-effective procurement target for energy storage jump-starts longer term market creation, encourages private investments, and can provide immediate and long-term benefit to all ratepayers. California, Oregon,



New York, Massachusetts, Nevada, and Maryland have already completed or initiated specific targets.

Allowing or directing utilities to dispatch energy storage with a customer or energy storage project owner's authorization could maximize the value of energy storage to all parties. REV recommends that the Department further explore the benefits and challenges with implementing this concept. Customers should be able to deploy the storage product of their choice, within certain guidelines.

Funding

A multifaceted funding source and plan is needed to immediately begin replenishing the Clean Energy Development Fund. In FY17, only approximately \$50,000 is tentatively available to support renewable energy storage projects and the CEDF is soon expected to run out of funds. The incoming VW settlement funds should be deposited into the CEDF.

Locational Value

Distribution system data, including the location of existing and projected network constraints should be available to energy storage project developers to enable high value siting of energy storage.

In the future, the State should consider undertaking a distributional locational marginal pricing signal for energy storage projects. This could be done initially on a pilot basis. Locational price signals offer an opportunity to encourage deployment of energy storage solutions in areas that provide greater value to alleviating local grid congestion and deferring or eliminating the need for costly traditional transmission and distribution infrastructure. Further, future prioritization via other mechanisms of renewable energy storage in grid congested areas could be developed once greater initial deployment of energy storage occurs. Energy storage is still very much in the early early adopters phase in Vermont, so locational mandates would create barriers to progressing deployment at this point.

Smart Grid Architecture

The State should initiate a conversation about the open smart grid architecture required across Vermont to enable innovative services and product deployment such as energy storage and create a lower carbon energy grid and economy. Similar proceedings are underway or already in implementation phase in other states such as New York, California, Oregon, Rhode Island, and Hawaii, and have already proven to be critical in growing economic development and deploying cost effective energy storage and demand response solutions. Vermont needs to evolve its current regulatory markets, rate design policies, and evaluate the roles of distribution, transmission, and efficiency utilities so that all stakeholders are aligned to facilitate the State's total renewable energy, economic, and climate commitments.



Conclusion:

Again, we sincerely appreciate the open and collaborative process that the Department is leading in crafting its first energy storage report. Energy storage solutions, several of which are manufactured in Vermont, are standing by, ready and available today to contribute to improving Vermont's electricity grid. We look forward to the State's efforts to eliminate barriers and encourage greater energy storage deployment immediately.

Federal tax incentives enabling Vermont to maximize private investment in energy storage projects are stepping down soon, so delays in deployment equate to significant short and long term lost opportunity for cost savings among all Vermont ratepayers and local economic growth. Other states in New England and around the country are far ahead of Vermont in realizing the extensive and numerous benefits of energy storage.

Please do not hesitate to reach out to me at 802-595-5373 or olivia@revermont.org with any questions on our comments.

Best Regards,

Olivia Campbell Andersen
Executive Director

Cc: Chairman Chris Bray
Chairwoman Ann Cummings
Chairman Stephen Carr
Delegate Laura Sibilica

Renewable Energy Vermont represents businesses, non-profits, utilities, and individuals committed to reducing our reliance on dirty fossil fuels by increasing clean renewable energy and energy efficiency in Vermont. Vermont's clean energy economy directly enables at least 19,080 jobs at 3,751 businesses, representing approximately 6% of Vermont's workforce. Together, we will achieve 90% total renewable energy (electric, thermal, transportation) before 2050.



Additional Resources:

Massachusetts: <http://www.mass.gov/eea/docs/doer/state-of-charge-report.pdf>

New York: [https://www.ny-best.org/sites/default/files/type-page/39090/attachments/NY-BEST%20Roadmap 2016 finalspreads.c.pdf](https://www.ny-best.org/sites/default/files/type-page/39090/attachments/NY-BEST%20Roadmap%202016%20finalspreads.c.pdf)

California: <http://www.energy.ca.gov/research/energystorage/tour/roadmap/>

Self Generation Incentive Program: <http://www.cpuc.ca.gov/General.aspx?id=11430>

Good overview article on NY City efforts:

<https://pv-magazine-usa.com/2017/03/03/cuny-report-looks-at-barriers-to-pv-storage-in-new-york-city/>

Rocky Mountain Institute, "The Economics of Battery Energy Storage":

<https://rmi.org/insights/reports/economics-battery-energy-storage/>