

August 17, 2017

State of Vermont Public Service Department
112 State Street
Montpelier, VT 05620-2601

Comments of Sunverge Energy, Inc. on Vermont Energy Storage Study Outline, Pursuant to Act 53

Dear State of Vermont Public Service Department,

Sunverge is pleased to offer the below comments on the preliminary proposed outline (“outline”) for the energy storage potential study (“study”), pursuant to Act 53. Sunverge makes the following key points in its comments below regarding the study:

- The study should examine potential in discrete sectors, including residential, commercial, and industrial
- The study should examine potential for systems located both behind-the-meter (“BTM”) and in-front-of-the-meter (“IFOM”)
- Vermont should develop a framework to capture the multiple, stackable value streams of energy storage to fully realize its cost-effectiveness
- Vermont should implement time-of-use rates for net metered customers

I. Introduction

Sunverge is a California-based manufacturer of distributed energy storage solutions and energy management software. Sunverge’s solutions optimize the value of solar power by leveraging the practical advantages of distributed generation and storage. Sunverge’s energy management platform captures solar energy and stores it for use when it is needed most, thereby shifting electrical loads, flattening peak electricity demand, providing backup power, and maximizing return on renewable energy. As a manufacturer of energy storage systems and software, Sunverge supports policies that spur energy storage and the management of distributed energy resources. Sunverge currently manages one thousand behind-the-meter storage systems totaling nine megawatts of capacity in fifteen states, Australia, New Zealand, Japan, and Canada.

II. What is missing or should otherwise be modified in the proposed report outline?

Sunverge appreciates the wide-ranging scope of the report as evidenced in the outline. One key element that should be added to the outline is estimation of energy storage potential in discrete market

sectors, including residential, commercial, and industrial. Delineating potential by sector prevents one customer class from reaping the lion's share of storage investment in the state, ensuring that all classes of ratepayers reap the full benefits energy storage offers. Sector-specific potential estimates are particularly important given the benefits of energy storage can vary; for example, the impact of BTM storage on bill management for residential customers will be different to that of demand charge impact mitigation for commercial and industrial ("C&I") customers. Given that ratepayer dollars are invested in both the study itself and, at least in part, the ensuing investment in deploying energy technologies as a result of the study, it is critical that the study estimates energy storage potential by sector.

A second key element that should be included in the outline is delineation of potential for both BTM and IFOM systems. It is crucial that the report appraises each of these deployments of storage separately to fully capture the benefits that these two types of storage deliver. BTM storage in particular is uniquely-positioned to deliver benefits to customers, utilities, and the grid alike. In addition to customer benefits (described in greater detail below), managing BTM energy storage systems as a fleet allows utilities and third-party energy providers to create a virtual power plant ("VPP") which can displace investment in traditional generation assets. BTM storage can be located in areas of the grid where renewables integration, for instance, is causing the largest depreciation issues. Using the VPP to shape the load near vulnerable feeders and substations can provide valuable infrastructure relief. Further, The VPP platform can reduce demand by providing power locally BTM and thus reducing load required by homes within the VPP fleet, or the fleet can be utilized to provide power directly to the grid in areas of congestion. The outline, and consequently the study, should examine BTM storage separately from IFOM to maximize the benefits of energy storage to provide multi-faceted value for both customers and the grid.

III. What are the most compelling reasons for deploying energy storage in Vermont?

Energy storage provides a number of key benefits to Vermont ratepayers, utilities, and the grid by reducing outages and increasing reliability, optimizing demand to reduce peaks, and facilitating renewable integration. By charging from a solar photovoltaic ("PV") system during the day or from the grid during non-peak times and consuming that energy during evening peaks, energy storage optimizes time-of-use ("TOU") rate structures and reduces the bill impact of TOU rates on consumers. Increasing customer acceptance of TOU rates reduces utility costs by decreasing calls to utility call centers. This is particularly important given the highly variable levels of acceptance of TOU across different customer groups. For example, according to a recent survey conducted by Deloitte of 1,500 US energy customers, 47 percent of millennials are interested in using a time-of-use rate compared with only 28 percent of baby boomers.¹

¹ Deloitte, "Deloitte Resources 2017 Study Energy management: Sustainability and progress", p. 16. 2017. Available at:

Further, BTM energy storage facilitates the rollout of TOU rates and can help make the most of Vermont’s \$130m investment in smart meters.² Energy storage also defers the need for transmission and distribution investment and reduces load on the grid by providing ancillary services. BTM storage’s benefits in the customer and grid domain is outlined below:

Table 1: BTM Energy Storage Delivers Benefits at the Customer and Grid Level

Goals for Energy Storage	Customer domain	Grid domain
Reducing outages	Back-up power	Voltage support, frequency regulation, spin/non-spin reserve
Optimizing demand	Time varying rate bill management, demand charge reduction	T&D deferral, resource adequacy
Integrating DERs	Increased PV self-consumption	Energy arbitrage

Sunverge is pleased to see the study will examine both utility and third-party ownership models, as shown in the outline. Utilities and third-party energy service providers are central grid actors, and are well-positioned to ensure ratepayers, utilities, and the grid alike take full advantage of energy storage to reap the benefits of energy cost reduction, reduced peak capacity, ancillary services cost reduction, wholesale market cost reduction, T&D cost reduction, and integration of distributed renewable generation cost reduction.

Energy storage has already demonstrated its ability to provide these benefits for customers and utilities alike in numerous field deployments. For example, Figure 1 below shows the modeled and actual dispatch profile of a set of Sunverge energy storage systems undertaking the following services during a twenty-four hour period in a deployment by Ontario, Canada-based utility Alectra: charging from the grid, spin/non-spin operating reserves, demand response, and frequency regulation.³

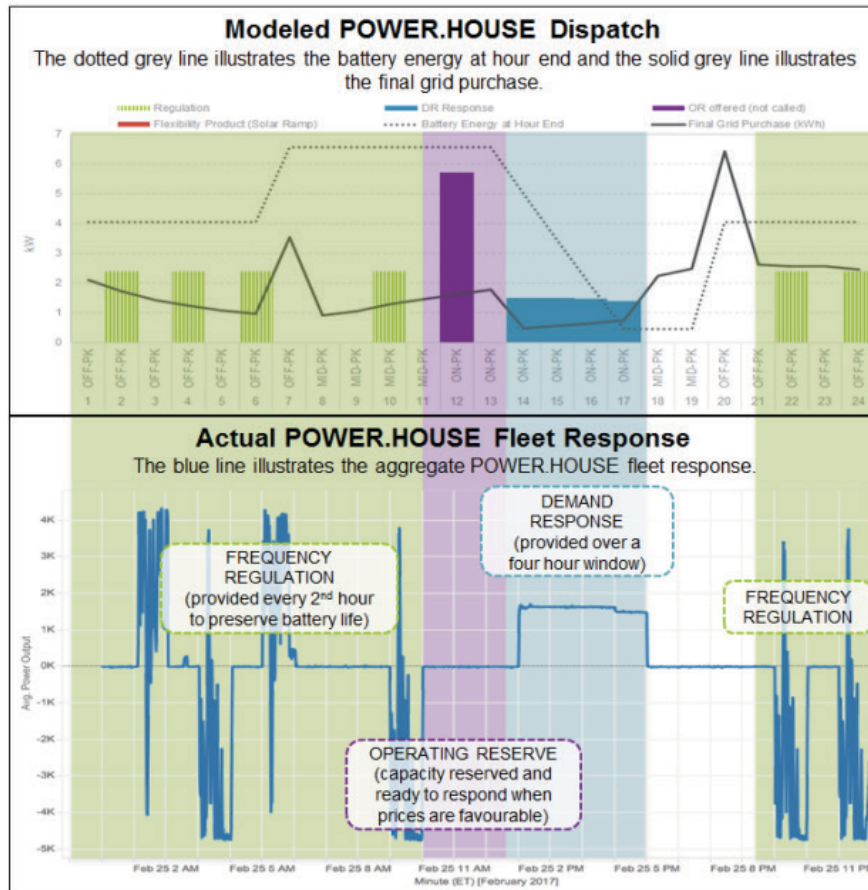
<https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-deloitte-resources-2017-study-energy-management.pdf>

² The Department of Public Service of Vermont, “Report on Savings Realized Through the Use of Smart Meters”, p. 2. March 8, 2018. Available at:

http://publicservice.vermont.gov/sites/dps/files/documents/Electric/Smart_Grid/2016_Report_on_Savings_Realized_Through_the_Use_of_Smart_Meters.pdf

³ Alectra Utilities, *Power.House Feasibility Study*, p. 11. (April 18, 2017). Available at: https://www.powerstream.ca/attachments/POWER_HOUSE_Feasibility_Study.pdf

Figure 1: Alectra/Sunverge Energy Storage System Measuring Incremental Services



By directly managing the storage assets, the utility was able to deliver a diverse set of services that maximized customer, utility, and grid benefits. This has been confirmed in the Massachusetts State of Charge report, which found that utility management of BTM storage can provide a cost/benefit ratio of 2.43.⁴ Third-party energy services providers can also leverage storage to provide these benefits, in addition to utilities, providing a compelling case to benefit Vermont ratepayers, utilities, and the grid.

IV. What are the biggest barriers to deploying energy storage in Vermont?

Vermont is rightfully commended for generating a significant portion of its energy from renewable sources; however, the relatively low penetration of PV in the state represents a key barrier to deployment of energy storage at scale.⁵ According to Solar Energy Industries Association data, Vermont ranks 23rd

⁴ Massachusetts Department of Energy Resources & Massachusetts Clean Energy Center, “State of Charge”, p. 110. 2016. Available at:

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

⁵ Energy Information Administration, *Vermont State Profile and Energy Estimates*. June 15, 2017. Available at: <https://www.eia.gov/state/analysis.php?sid=VT>

nationally in installed PV capacity with 7% of the state’s electricity generated from solar.⁶ Further, estimated deployment of PV across all sector estimated to drop for the first time in 2017.⁷ Simultaneously, the Department of Energy’s National Renewable Energy Laboratory found that Vermont ranks second in the U.S. for annual PV generation potential as a percentage of electricity sales for small buildings, and third for all buildings.⁸ This demonstrates that a large number of Vermont roofs are well-suited to PV, presenting a significant opportunity to deepen Vermont’s commitment to renewables. While BTM storage is capable of charging from the grid without a connected PV system, the addition of a connected PV system improves the economics for customers and utilities alike. Vermont should build on its status as a leader in providing renewable-generated energy to ratepayers by implementing policies that encourage utility- and customer-owned PV.

Another key barrier is ensuring NEM customers have sufficient price signals to modify consumption at different times of day. It is particularly important for NEM customers to be placed on TOU rates in order to ensure storage –particularly BTM storage– can deliver value to customers. The National Renewable Energy Laboratory found that, “...flat electricity rates reduce the potential value from load shifting provided by residential PV-plus-storage systems, notably when NEM is available, because there is no incentive to shift excess PV generation from one time of day to another.”⁹ This crucial barrier can be addressed with changes to the existing NEM tariff; Sunverge’s recommendations for policy changes to NEM are discussed in Section VI below.

V. How should the costs and benefits of storage be evaluated?

The costs and benefits of energy storage should be evaluated on the basis of the multiple services provided, which is key to appraising the full value of storage. While energy storage is able to provide services in Vermont currently, the cost-effectiveness of storage increases significantly when services rendered in multiple domains can be stacked to maximize value (as described in Section III). In order to fully capture the benefits energy storage drives, Vermont must create a regulatory framework that facilitates valuation of these stacked services.

⁶ Solar Energy Industries Association, *Solar Spotlight Vermont*. June 9, 2017. Available at: http://www.seia.org/sites/default/files/2017_Q1_VT.pdf

⁷ *Ibid.*

⁸ U.S. Department of Energy National Renewable Energy Laboratory, *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment*, p. 26-27. January, 2016. Available at: <https://www.nrel.gov/docs/fy17osti/67474.pdf>

⁹ U.S. Department of Energy National Renewable Energy Laboratory, *Installed Cost Benchmarks and Deployment Barriers for Residential Solar Photovoltaics with Energy Storage: Q1 2016*, p. 22. February, 2017. Available at: <https://www.nrel.gov/docs/fy17osti/67474.pdf>

Several states are in the process of examining stacking services that can provide instructive examples. The California Public Utilities Commission is developing a “multiple-use application framework for energy storage” to stack the values energy storage delivers. The vision of that effort is, “To enable energy storage systems to stack incremental value and revenue streams by delivering multiple services to the wholesale market, distribution grid, transmission system and end users. Achieving this vision increases the value of storage, and potentially other forms of energy resources, and enhances its economic viability and cost-effectiveness.”¹⁰ New York is also evaluating ways of stacking the multiple services of energy storage via a recent NYSERDA solicitation, which states, “Leveraging the flexibility of energy storage to provide different services and ‘stack’ multiple values will be key to the adoption of distributed energy storage.”¹¹ Both of these initiatives provide useful examples of approaches to effectively value energy storage that can help inform Vermont’s own framework.

VI. How can Vermont policies, programs, and regulations best be used or modified to better accommodate or encourage storage?

Vermont should implement policies that facilitate both proper valuation and efficient deployment of energy storage. Developing and implementing a regulatory accounting framework for the valuation of the multiple benefits energy storage delivers, as described in Sunverge’s response to the previous question, provides a strong impetus to deploy storage. Creating a clear framework for utilities to capture the full benefits of deploying energy storage maximizes the value of deploying storage for ratepayers, utilities, and the grid.

Incorporating energy storage into integrated resource planning leverages existing policy mechanisms to facilitate greater certainty in the deployment of energy storage. The New Mexico Public Regulation Commission recently voted unanimously, with the support of all regulated utilities, to amend its integrated resource planning rules to include energy storage, stating that “...energy storage has become a commercially viable technology shown to improve the overall use and economics of the electric grid.”¹² Similarly, allowing utilities to ratebase energy storage deployments utilizes existing Vermont regulation to facilitate increased deployment of energy storage. For example, Xcel Energy of Colorado received deferred

¹⁰ R.15-03-011, *Joint Workshop Report and Framework: Multiple-Use Applications for Energy Storage*, p. 3. May 15, 2017. Available at:

<http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M187/K237/187237488.PDF>

¹¹ NYSERDA, *Demonstrating Distributed Energy Storage for ‘Stacking’ Customer and Grid Values Program Opportunity Notice (PON) 3541*. May 31, 2017. Available at:

<https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00Pt0000002xEM8EAM>

¹² New Mexico Public Regulation Commission, *Commission Unanimously Approves Amending Rule to Include Energy Storage*. August 9, 2017. Available at:

<http://www.nmprc.state.nm.us/rssfeedfiles/pressreleases/2017-8-8CommissionUnanimouslyApprovesAmendingRuleToIncludeEnergyStorage.pdf>

ratebase approval from the Public Utilities Commission of Colorado for two customer-sited solar-storage projects.¹³ Encouraging deployment of storage as part of utility planning processes and general rate cases ensures that utilities have greater certainty of cost recovery for deploying a technology that provides significant benefit to Vermont ratepayers.

Vermont should also utilize rate structures to encourage deployment of storage. Energy storage by its design helps change the shape of electricity demand by storing energy when demand is low and discharging energy when demand is high. Therefore, energy storage is particularly valuable in the deployment of TOU rates as storage can mitigate bill impacts, increasing customer acceptance of TOU rates while benefitting utilities through appropriate price signals to customers. California recently modified its Net Energy Metering (“NEM”) tariff to realize these benefits as part of the rollout of the state’s “NEM 2.0” tariff, defaulting all customers who interconnect PV and/or storage systems to a TOU rate.¹⁴ Ensuring net metered systems are on TOU rates maximizes the value of storage to utilities and customers alike, mitigating peak demand and reducing outages.

VII. Conclusion

Sunverge appreciates the opportunity to provide comments on the outline, and commends the Vermont Department of Public Service and the Vermont General Assembly for its efforts to continue its track record of implementing innovative programs that benefit Vermont ratepayers and maximize renewable energy resources. As a leading residential BTM energy storage solution provider, Sunverge looks forward to continued participation in the study.

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¹³ Public Utilities Commission of Colorado, *Decision C16-0196 Granting Motion and Approving Settlement Agreement*, p. 8. March 2, 2016. Available at:

https://www.dora.state.co.us/pls/efi/efi_p2_v2_demo.show_document?p_dms_document_id=687423

¹⁴ California Public Utilities Commission, *D. 16-01-044 Decision Adopting Successor to Net Energy Metering Tariff*. September 15, 2016. Available at:

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M162/K043/162043082.PDF>