June Tierney, esq.
Commissioner, Public Service Department
112 State St
Montpelier, VT 05620-2601

Re: VPIRG comments regarding Public Service Department Energy Storage Study

Dear Commissioner Tierney,

Thank you for the opportunity to offer comments on the Energy Storage Study that the Department is preparing, pursuant to Act 53 (2017). As an organization that was actively engaged in the process and passage of Act 53, VPIRG appreciates that the Department is seeking stakeholder input into this report.

Energy storage is one of the most consequential issues in the energy landscape today. The potential upside of integrating energy storage correctly is significant from an economic and environmental standpoint, and the downside of falling behind in adopting energy storage, or failing to strategically integrate and value storage carries significant consequences, particularly economic.

Below is our response to the draft report outline and the questions that were posed:

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

Given the importance of energy storage in the global energy conversation, organizations around the country and world have spent significant resources on determining the best way to value, incentivize and integrate storage. We recommend that wherever possible, this report rely on and reference those existing resources rather than re-creating them here. For instance, specifically Sections 2 & 3 can largely be comprised of references to existing resources rather than a new analysis. That way, the bulk of the report and the Department's resources can be spent on the sections that discuss how to move forward on storage integration in Vermont (in particular, Sections 5, 6, and 7).

In particular, the work done in the Massachusetts State of Charge report should be utilized, given the similarities between our two states (part of ISO-NE, similar penetrations of distributed generation and renewable energy, similar risk of long term outages due to severe weather events). We also recommend utilizing the work from the Interstate Renewable Energy Council (IREC) and the Energy Storage Association (ESA) on integrating storage and policies to support that integration.

We commend the Department for including Section 5, and would underscore its importance to the report. While utilities will be key storage developers, ensuring multiple players can participate competitively in the storage market will encourage innovation, help bring costs down for all consumers, and build a long term stable market that is not overly reliant on one player. We recommend that the discussion of the possible policy avenues in Section 6 continuously reference the discussion in Section 5 to determine which policies encourage market participation and which support utility ownership. We recommend Section 5 additionally consider the end user/beneficiary of the storage system, to consider how storage policies impact not just different size users (utilities, businesses & residential users) but also users of different income levels and types (low- and middle- income single family households, commercial affordable housing entities, public entities and schools, etc.).

In regards to Section 6, we recommend organizing this section with an eye towards the goal of the policy. There are several different category clusters that have been used when talking about storage policy in the past. For instance, ESA discusses Value, Competition, and Access.[1] IREC groups policies into Classification & Ownership, Planning, Grid Access, and Value Stream.[2] Grouping policies in this manner will help prioritize policy action based on near and long term goals. For instance, if barriers to access exist (interconnection standards, siting criteria/threshold for 248 review), then policies designed to incentivize storage development (procurement target, RPS multipliers, rate design) will be less effective.

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

Energy storage has diverse benefits depending on where and how it is integrated into the grid. Smart integration and valuation of storage can maximize these diverse benefits. On the other hand, if the multiple value streams are not appropriately accounted for, the financial incentive might be reduced and the state will lag behind in taking advantage of this critical resource. In any long term energy and grid planning, it is critical to determine which of the many benefits of storage are most valuable to Vermont, and design programs that incentivize those projects that are the most valuable to the entire grid and the state priorities.

The following are only a subset of the total benefits of energy storage to the grid and ratepayers. However, these are likely the opportunities for the most significant benefit specifically for Vermont, and should be prioritized and valued appropriately.

a. Climate resiliency, increasing reliability, and reducing system disruptions.

Vermont is no stranger to extreme weather events, but the severity, duration, and thereby potential devastation from those events is only increasing each year. Energy storage can help assuage a significant impact from these events: the loss of power and the cost to re-power the state after one of these events.

The 2016 Comprehensive Energy Plan (CEP) notes that storm costs were $22 million just for Vermont Electric Cooperative and Green Mountain Power in 2013. That does not include the additional cost and stress to residents and businesses of being without power for multiple days, let alone the public health and safety risk of decreased access to food, clean water, and medical facilities. Distributed storage supports a more resilient grid overall, creating a lower risk of widespread outages. When distributed storage is implemented as part of a microgrid, it supports vital public health and safety functions for high-risk communities and can provide significant cost savings for those communities and ratepayers statewide.

In particular, low and moderate income households and communities are often the most vulnerable to severe weather events. Well-designed microgrids utilizing storage with renewable energy systems will ensure key community functions are not lost during extended outages, which results in tangible savings for those communities in the long run. The Center for American Progress reported earlier this year that every $1 invested in community resiliency efforts saves $4 in disaster recovery costs.[3]

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[1] Energy Storage Association, "State Policies to Fully Charge Advanced Energy Storage: The Menu of Options," July 2017, p. 2.
[2] Stanfield, Sky et al., "Charging Ahead: An Energy Storage Guide for State Policymakers," Interstate Renewable Energy Council, April 2017, p. ii.
[3] Peterson, Miranda and Cathleen Kelley, "U.S. Communities Clobbered by $53 Billion in Extreme Weather and Climate Disasters in 2016," Center for American Progress, Jan 19, 2017.

b. Reducing peak demand, flattening load curves.

Energy storage can be used to shift loads and ultimately flatten load curves, which can offer significant cost savings for ratepayers across the state. The Massachusetts State of Charge report found that on average the top 1% of hours cost ratepayers 8% of their annual spend, and the top 10% cost 40% of the annual spend (averaged for years 2013-2015).[4] Flattening peaks reduces the duration and extremity of those system-wide peaks.

Other New England states are recognizing the economic benefits of investing in storage. Massachusetts is leading the way with the procurement target of 200 MW by 2020 that followed the State of Charge report. As other states within ISO-NE reduce their peak demand, Vermont risks falling behind and carrying the burden of the grid's peak demand payments, which would have significant financial implications for all ratepayers.

c. Integrating renewable energy and fully utilizing generation resources.

As Vermont moves towards our goal of 90% renewable energy by 2050, we must continue to build diverse renewable resources to maximize our in state renewable energy potential. Storage is critical for getting to that goal in an economically and environmentally efficient manner.

Storage can flatten the differences in load between solar and wind (for instance, using stored peak solar production to cover the evening peak demand period before wind energy ramps up). Currently, natural gas peaker plants are primarily used for this purpose. These plants are built to be used for a tiny percentage of the hours in a year[5] and could be completely eliminated by well-integrated, easily dispatchable storage.

In addition, integrating storage as renewables are built will ultimately result in the most efficient use of renewable energy. Rather than having times of grid congestion that force the curtailment of wind farms or the devaluing of renewable resources, that valuable energy can be stored and used during peak times. Currently, generation in the grid is built to accommodate peak demand. Storage will allow us to build less generation but use it at its full potential.

d. Reducing demand charges for certain commercial customers

By allowing certain larger users to manage their load, energy storage can reduce the cost of demand charges for commercial customers on the applicable utility rates (for ex. GMP Rate 8). One example of a customer who would most benefit is a multifamily affordable housing complex, where reducing the demand charges for the entire building would result in lower electric bills for Vermonters who need it the most. Schools, churches, and other public and community institutions that are on a demand charge rate could similarly benefit.

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

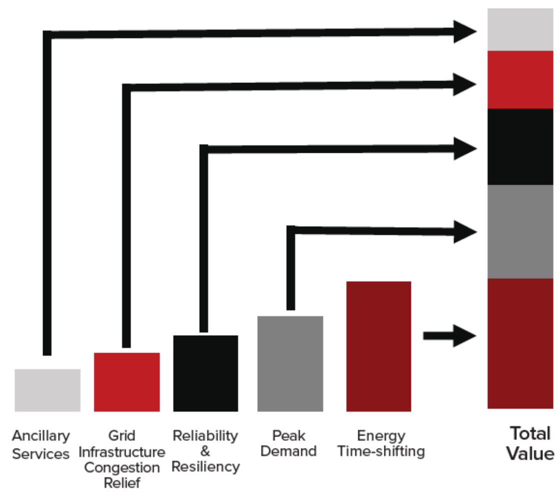
Despite significant progress in advanced energy storage technology and the upfront cost, storage is still in its infancy. Anecdotally, in California storage integration is approximately where solar integration was in 2003, and California is still well ahead of every other state in terms of storage development. Possibly

[4] "State of Charge: Massachusetts Energy Storage Initiative," Massachusetts Department of Energy Resources and Massachusetts Clean Energy Center, September 16, 2016, p. 28.
[5] Ibid p. vii-viii.

even more than solar, storage carries the tantalizing promise of significant grid-wide benefits, but similarly requires upfront investment and policy to realize those benefits and drive down the cost to widen accessibility.

The upfront cost is still the most significant barrier to adoption. Overcoming the financial barrier requires two distinct steps: identifying the value stack and monetizing/incentivizing that value. First, in order to recognize which of the diverse benefits of storage offers the most value to the grid as a whole, a value stack should be identified to ensure the most accurate accounting of the value.[6] The value stack should align with state policy and priorities to ensure storage is being valued in a way that supports our state goals.

Second, that full value stack must be monetized. Through policy and regulation, the financial benefits of storage must be recognized through upfront incentive or other financial motivator.



IREC's illustrative model of a storage value stack.

That being said, a financial incentive or motivator such as a procurement target will not be effective without ensuring that grid planning and processes incorporate and welcome storage. In particular, interconnection and siting processes must help make storage accessible for all market players.

Finally, a key benefit as identified above involves reducing grid congestion. Without transparent locational data to encourage development in the most valuable areas of the grid, developers and interested parties will not know where to encourage and build storage projects, and projects may be built in areas where they have less overall benefit to the grid.

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

As explained above, a value stack is critical for identifying and valuing the benefits of storage. Similarly, the costs must be stacked in order to understand the net benefit to Vermont and ratepayers. In recent years several storage-specific modeling tools have been developed to create an accurate, and customizable picture of the value of storage in a particular grid of state. IREC has compiled a partial list of modeling tools.[7] A tool should be chosen based on the ability of a particular tool to successfully model the benefits the state prioritizes.

While modeling the costs of storage (upfront and ongoing) is relatively straightforward, modeling the benefits is much more difficult. However, if the benefits are undervalued, the pace of development will be slower than necessary and both short and long term benefits will go unrealized. Identifying a value stack upfront and accounting for the diverse benefits to our grid is a critical process.

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[6] Stanfield, Sky et al., "Charging Ahead: An Energy Storage Guide for State Policymakers," Interstate Renewable Energy Council, April 2017, p. 8.

[7] Ibid, p. 13.

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

As we have already mentioned, interconnection and siting processes must explicitly include processes for integrating storage. In addition, grid and utility planning processes must plan for the integration of storage in order to prioritize the most effective storage projects and avoid unnecessary grid upgrades where possible.

Net metering, the standard offer program, and utility rate design can all be modified to create financial motivation for storage systems. However, the primary risk in modifying net metering and the standard offer is the unintended reduction in those programs for non-storage systems. Any modification of those programs to include storage should increase the total size of the program to allow more systems to be built. In regards to rate design, certain mechanisms like demand charges and time varying rates can help incentivize storage. However, those same rates can be financial disincentives or burdens to customers without storage. These rates should optional as appropriate rather than being imposed on the entire rate class.

Modifying our existing renewable energy standard presents a clear opportunity to create a target, and thereby a motivator for developing storage. This could be done through a storage specific expansion to the Tier III program or a distinct Massachusetts-style procurement target. The primary risk in targeting storage through the RES is that it is in the jurisdiction of the utilities, and therefore could result in less market participation through non-utility players. As discussed previously, overreliance on a single or single type of market player, particularly at such a nascent stage in an industry's development, threatens a long term stable market. Thus, care must be taken in any policy discussion to ensure that all ownership models are considered and encouraged.

In that vein, the existing Energy Efficiency Utility (EEU) structure doesn't currently allow for EEUs to integrate storage. However, as players with expertise in demand side resources and planning and mandates to deliver many of the same benefits storage can provide (reduced peak demand, for instance), the state should consider expanding the jurisdiction of the EEUs to explicitly allow storage to be integrated into their efficiency work. In doing so, a process must be determined to allow the EEU's to realize/share the full value of the storage system (beyond just the efficiency/demand reduction value) to the grid as a whole.

Conclusion

We appreciate the Department's work on this important report. VPIRG looks forward to staying engaged through the report process and in advocating for the next steps to ensure Vermont benefits from storage integration.

Sincerely,

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