595 Market Street
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August 18, 2017

Public Service Department
112 State Street
Montpelier, VT 05620-2701

Sent electronically

RE: Comments from Sunrun Inc. in Response to the Department of Public Service's Request for Comment on the Energy Storage Report Proposed Outline

Sunrun, Inc. ("Sunrun") respectfully submits the following comments in response to the Department of Public Service ("Department") requesting comments on its Energy Storage Report proposed outline. Sunrun is a leader in residential solar, storage, and energy management. We pioneered the "solar-as-a-service" model 10 years ago and today are the largest dedicated residential solar company in the United States. Sunrun commends the Department for developing a comprehensive outline and for taking the leadership to evaluate a broad range of programs and policies that together will encourage energy storage development in Vermont.

The Department posed the following questions for parties to provide responses to:

1. What is missing or should otherwise be modified in the proposed report outline?
2. What are the most compelling reasons for deploying energy storage in Vermont?
3. What are the biggest barriers to deploying energy storage in Vermont?
4. How should the costs and benefits of storage be evaluated?
5. How can Vermont policies, programs, and regulations best be used or modified to better accommodate or encourage storage?

Sunrun offers the following comments for consideration.

(1) What is missing or should otherwise be modified in the proposed report outline?

Sunrun recommends that the following be added to Section 6, "Potential Programs and Policies to Encourage Sound Storage Capabilities in Vermont," to expand the programs and policies that contribute to sound storage capabilities in the state.

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Transparent and easily accessible customer and third-party access to data

Customer access to near or real-time data about their electricity use is essential to enabling customers to make informed energy choices. A key aspect of the proposed outline should be to determine how the utility should perform the essential function of providing customers with data access portals and tools to monitor and assess their energy use, protect the privacy of that information, and provide appropriate avenues for the release of customer data to competitive market participants, such as Distributed Energy Resources (DER) providers. The utility's function would be that of a facilitator of customer data access and sharing.

Furthermore, it is critical that third party providers have easy access to customer data. Third party access to customer data enables innovation in customer home energy management programs. Current processes for third party providers to access this information are clumsy, time-consuming, and can lead to customer confusion. The Green Button Connect standard, when coupled with a streamlined customer experience, would help consumers access services provided by third party providers, which will cost-effectively save them money on utility bills.

Permitting Standards

Establishing statewide permitting standards for storage systems will maximize time efficiencies in the storage deployment process and aid in reducing soft costs. Modernizing the permitting process will allow for innovation and a greater customer experience. Sunrun recommends that streamlined permitting standards be developed through a multi-stakeholder transparent and non-discriminatory process that draws upon experiences in other states such as New York[1] and California.[2] Vermont currently has a favorable streamlined permitting policy in place for solar and hydroelectric systems, which provides that applications for certificates of public good are automatically deemed approved after a certain number of days (depending on system size) unless the interconnecting utility raises concerns.[3] The legislature can remove significant barriers to storage growth by extending this successful policy to include storage systems.

[1] Sustainable CUNY. NY Solar Map. Solar + Storage. https://www.nysolarmap.com/solarplusstorage/

[2] Legislation (A.B. 546) is expected to be enacted this session to provide guidance to municipalities to standardize and streamline permitting for energy storage. See American Public Power Association. "Calif. bill requires making storage permitting materials available online." August 14, 2017. http://www.publicpower.org/media/daily/ArticleDetail.cfm?ItemNumber=48674 and California A.B. 546 http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB546.

[3] Vermont Public Utilities Commission. Rule 5.105. http://puc.vermont.gov/sites/psbnew/files/doc_library/5100-PUC-nm-effective-07-01-2017_0.pdf

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Interconnection Standards

Similar to permitting, interconnection standards must be updated to reflect the dynamic nature of energy storage systems. Issues such as system capacity and grid charging and discharging should be reviewed recognizing the unique aspects of energy storage. California has been a leader in addressing storage interconnection issues, comprehensively revising its standards to incorporate storage technologies, with new standards and procedures for non-export systems, special standards for exporting systems, determination of system capacity, and inverter and communication control standards. Sunrun recommends interconnection standards be revised through a transparent stakeholder process, looking to standards established in California as guidance, as well as to other states currently revising their standards to incorporate storage, including New York and Minnesota. As an initial step, however, current interconnection regimes should not be used as an excuse to prevent the deployment of energy storage.

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

Behind-the-meter (BTM) is the fastest deploying and most flexible segment of the storage industry. Residential BTM storage, especially when paired with solar, is a key component of a diversified storage fleet. The customer facing value proposition of residential BTM storage consists of bill management, increased PV self-consumption, and backup power, among other things. Residential BTM storage also empowers customer choice and creates new economic opportunities, such as employment, by attracting new businesses to the state.

Residential BTM storage also provides grid-facing benefits like distribution and transmission deferral, distribution and transmission cost reductions, energy and wholesale market cost reductions, increased renewable integration, resource adequacy, peak reduction, and ancillary services.

Diversity of energy storage is important in achieving the greatest ratepayer benefit. Storage connected at the transmission and distribution (T&D) level serves different functions to the grid than storage connected behind the meter. Additionally, the size of T&D storage is commonly over 1 MW. In contrast, residential BTM systems are usually 5-15 kW. This makes residential BTM storage very fast to deploy – many systems can be installed in a single day.

Studies[4] show that customer-sited, BTM energy storage can technically provide the largest number of services to the electricity grid. BTM storage can provide customer services

[4] Fitzgerald, Garrett, James Mandel, Jesse Morris, and Hervé Touati. The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid.

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(backup power, increased PV self-consumption, time-of-use bill management, etc.), utility services (distribution deferral, transmission deferral, transmission congestion relief, resource adequacy) and even ISO services (energy arbitrage, spin and non-spin reserves, frequency regulation, voltage support, and black start).[5]

While storage has grown in the US market, residential developments have lagged behind - because there is "just not an economic case for residential energy storage yet" – due to lack of market structures.[6] Customers (and DER aggregators) respond to rate structures and incentive support, and will act to optimize the system only when properly compensated. Recognizing that the attributes of customer-connected storage are untapped and that the market is in development and suitable compensatory mechanisms are being established for grid and utility services, it is imperative that policymakers incent a mass deployment of residential storage units with the future capabilities to provide these services when the markets are ready.

For a state like Vermont, which experiences powerful storms such as hurricanes and Nor'easters, backup power is an extremely important feature of energy storage. As our customers have experienced in other states, our BrightBox PV + storage product offering can provide backup power indefinitely, should the grid fail. This neighborhood level resiliency is difficult to value, but a very important feature of residential storage.

(3) What are the biggest barriers to deploying energy storage in Vermont?

One of the biggest barriers to deploying residential BTM storage in Vermont is ensuring that clear and strong price signals are sent to customers to encourage adoption. There are two opportunities for Vermont to overcome this barrier: establishing a sound rate structure that promotes solar and storage paired systems and providing financial support to spur sustained adoption.

A well-designed rate structure is the foundation for building out the deployment of solar and storage paired systems. Sunrun recommends that Vermont implement modern, optional time-varying rates that reflect drivers of system cost and allows for reasonable opportunity for behavior modification and valuation. These rate structures have proven successful in helping to deploy residential storage in other states. However, under these optional rate structures it is critical to avoid the creation of a separate rate class for these residential solar and storage customers and the implementation of standby charges without a data-driven tie to system costs or benefits.

Rocky Mountain Institute, September 2015. <<http://www.rmi.org/electricity_battery_value>>

[5] Page 6, Ibid

[6] https://www.greentechmedia.com/articles/read/The-State-of-US-Energy-Storage-in-7-Slides

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As the history of solar proves, incentives jump-start a market, allowing the industry to scale and reduce costs, eventually making the incentives unnecessary. California jumpstarted its storage industry through the Self Generation Incentive Program (SGIP).[7] Massachusetts has added a storage adder to its new solar incentive program. Maryland now has the first state level tax credit for storage. These states, and more, are on their way to robust storage markets.

In defining an incentive mechanism for residential storage, Vermont can look to California's SGIP rather than creating a mechanism from whole cloth. Through SGIP, the California Public Utilities Commission offers rebates to utility customers who install clean and energy-efficient distributed generation and storage technologies that reduce on-site electrical demand and greenhouse gas emissions. In order to evaluate the merits of SGIP, the CPUC engaged Itron to study the impacts of SGIP for calendar years 2014-2015. The Itron 2014-2015 impact evaluation report ("Itron report")[8] concludes that SGIP continues to: 1) reduce GHG emissions; 2) provide peak demand and energy reduction; 3) provide reductions in aggregated non-coincident customer peak demand; 4) reduce emissions of criteria air pollutants; and 5) leverage rate payer funds.

The Itron report also concludes that as of the end of 2015, SGIP had provided $656 million in incentives to projects with an estimated total project investment of $2.3 billion; representing a leverage ratio of greater than 3.5 to one. This does not even account for the full benefits that SGIP resources provide to the grid. Undoubtedly, the SGIP program has been successful in achieving its stated intent of reduction of GHG gases and provided several additional benefits to the grid. SGIP will invest more than $60 million in residential energy storage, leveraging hundreds of millions of dollars in private investment and grid.

Another barrier to the deployment of innovative energy storage systems is utility ownership. Generally, utilities should not be able to own BTM storage, which puts competitive free-market companies at a disadvantage. Furthermore, because competitive companies cannot ratebase assets, allowing utilities to own BTM storage would keep the costs of this storage artificially high and not drive the greatest ratepayer benefit, and even drive up retail electricity rates. By contrast, when private, third-party companies compete in the marketplace, the greatest efficiency is achieved for all ratepayers.

In addition, third-party or ratepayer owned BTM storage can be aggregated and receive dispatch signals or autonomously respond, making the most economic and efficient use of the asset, without utility control. Third-party providers also drive more rapid adoption and

[7] SGIP is an incentive program targeted towards customer connected storage. The SGIP program provides rebates for qualifying distributed energy systems installed on the customer's side of the utility meter. Residential energy storage receives a rebate level of $0.50/Wh, which gradually steps down.

[8] http://www.cpuc.ca.gov/WorkAra/DownloadAsset.aspx?id=6442451496

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deployment than utilities. Therefore, only ratepayers and third-party companies should be able to own BTM storage.

Utilities have direct access to customers and branding advantages over third-party installers, presenting barriers to entry and innovation for private companies. This raises the possibility of market manipulation to prevent competition. Also, in the absence of a current market for customer provided grid services, utilities may use storage as a distribution system optimization tool and reduce the customer's ability to save on energy bills and store energy for backup.

Utilities should instead focus on developing rate structures and creating incentives for grid optimization. This will in turn help create an economic case for residential storage. Any deployment of utility-owned BTM storage should be limited so as to preserve the benefits of competition in the market.

Green Mountain Power is currently permitted to own BTM storage systems under the "Innovative Pilot" program as part of the utility's Alternative Regulation Plan.[9] As Green Mountain Power moves away from the Alternative Regulation framework, any future utility ownership of BTM storage should be carefully scrutinized by the Vermont Public Utility Commission and the Department in order to ensure that the competitive market is not diminished or unfairly disadvantaged by future utility owned projects. This could be accomplished by establishing clear requirements governing regulatory approval of future utility owned projects, with an emphasis on making sure the playing field is level between competitive providers and utilities. In the context of an energy storage procurement target, the Legislature can ensure that competition is allowed to flourish by prohibiting or limiting the use of utility-owned assets for compliance.

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

Any evaluation of the costs and benefits of storage needs to be transparent and include all potential benefits and grid services, including benefits to host customers as well as the societal and ratepayer benefits, that storage projects provide. Storage can provide a number of benefits to the grid, including ancillary services, grid infrastructure congestion relief, enhanced grid reliability and resiliency, peak demand reduction, and energy use time-shifting benefits. The costs and benefits of storage must be holistically measured on a rubric that is consistent with utility methods of assessment of traditional poles and wires upgrades. Lastly, the costs and benefits of storage must be evaluated from different

[9] Green Mountain Power. GMP - Tesla Powerwall Innovative Pilot. December 2, 2015. http://www.greenmountainpower.com/wp-content/uploads/2017/01/Hudson-12.02.2015-Tesla-Pilot-Filing.pdf

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perspectives, including societal perspective, ratepayer perspective, customer perspective, and utility perspective.

A standard methodology and guidance for evaluating the costs and benefits of storage systems should be adopted or developed so that projects and programs are evaluated fairly and consistently. This should not be interpreted to mean that all projects must meet a strict cost-effectiveness standard, but rather, that competing projects or programs, should be compared on their relative costs and benefits. A thorough understanding of the costs and benefits of storage and a standard methodology for evaluating these costs and benefits is crucial to the effective design of programs that the Commission develops to support energy storage. For example, different tariff designs will encourage different operational modes and different system types. Thus, the Commission will need a standard cost-benefit methodology to ensure that program and rate designs will have the intended effects, and to inform future modifications of such programs as the market evolves.

There are several studies and resources that have detailed the numerous benefits that storage can provide, including studies from the Interstate Renewable Energy Council,[10] Massachusetts' State of Charge study,[11] and Rocky Mountain Institute's "The Economics of Battery Storage" report.[12] These studies can inform the state's development of cost-benefit evaluation methodologies and program development.

Notably, each of the services that storage can provide is currently valued and compensated through different mechanisms and by different entities, and the benefits of storage do not necessarily accrue directly to the storage project or host customer. Customers who install energy storage devices currently do not have the ability to monetize all of the benefits their systems provide. For example, the value of storage to network or distribution services are not currently monetized, leaving customers without a value stream for the benefits they provide be deferring circuit upgrades, substation upgrades, congestion relief, etc. Therefore, additional programs and tariffs are necessary to fairly compensate storage customers. Furthermore, the aggregate benefits of multiple storage projects may be greater than the sum of the benefits of each individual project; this nuance should also be considered in the evaluation and design of energy storage programs. Moreover, because DER providers and other non-utility market participants are able to cost-effectively provide alternative grid solutions, including non-wires alternatives such as energy storage, to traditional utility infrastructure, the Commission should ensure that energy storage NWAs are evaluated in a non-discriminatory manner.

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[10] Interstate Renewable Energy Council. Charging Ahead; An Energy Storage Guide for Policymakers. April 2017. http://www.irecusa.org/wp-content/uploads/2017/04/IREC_Charging-Ahead_Energy-Storage-Guide_FINALApril2017.pdf and Valuation of Solar + Storage in Hawaii: Methodology. June 2015. http://www.irecusa.org/publications/valuation-of-solarstorage-in-hawaii-methodology/

[11] http://www.mass.gov/eea/docs/doer/state-of-charge-report.pdf

[12] http://www.rmi.org/ELECTRICITY_BATTERY_VALUE

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

Sunrun encourages Vermont to establish a comprehensive storage program, implementing a range of policies and regulations that draw upon lessons from other states, to encourage storage deployment in Vermont. One program that could significantly drive storage deployment is establishing an energy storage procurement target. A storage procurement target is a cost-effective, efficient regulatory method of jumpstarting a long-term and stable energy storage market. A procurement target reduces risk to allow innovative business models to develop, while also ensuring that competition creates the highest benefit at the least cost to ratepayers. A well-crafted target can also ensure that diverse market segments develop for storage – from standalone utility scale, to commercial and industrial, to residential applications. For example, California passed Assembly Bill 2514 which directed the California Public Utilities Commission (CPUC) to adopt an energy storage program and procurement target. As a result, the CPUC established an energy storage target of 1,325 MW by 2020 – the largest in the nation – for the state's investor owned electric utilities (Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric).[13] Similarly, Nevada passed Senate Bill 204 during this year's legislative session, which directs the Public Utilities Commission of Nevada (PUCN) to consider setting storage energy targets.[14]

In Conclusion

Sunrun recognizes the immense opportunity that Vermont is presented with to create a robust energy storage market. The Department's Energy Storage Report proposed outline is a critical step in thoroughly evaluating the benefits energy storage provides to the grid to then effectively implement policies that fully capture its value for all customers. Establishing a comprehensive set of programs and policies through a multi-stakeholder and transparent process will set the state on the path to becoming a national leader in storage. This will create an ecosystem in Vermont for innovative business models, technology offerings, and more advanced market structures to establish roots that will benefit the entire ratebase. We appreciate the Department's consideration of these comments and look forward to an ongoing discussion of energy storage in Vermont.

Sincerely,

Christopher J. Rauscher, Director of Public Policy

[13] Decision adopting energy storage procurement framework and design program http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M079/K533/79533378.PDF
[14] https://www.leg.state.nv.us/App/NELIS/REL/79th2017/Bill/5078/Overview