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February 15, 2019

Judith F. Judson, Commissioner  
Massachusetts Department of Energy Resources  
100 Cambridge Street, Suite 1020  
Boston, MA 02114

Re: NSTAR Electric Company d/b/a Eversource Energy  
2019 Energy Storage Target Annual Report

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Dear Commissioner Judson:

On behalf of NSTAR Electric Company d/b/a Eversource Energy (“Eversource” or the “Company”), I am enclosing Eversource’s Energy Storage Target Annual Report (“Report”) to the Department of Energy Resources (“DOER”) for the year ended December 31, 2018. This Report is submitted in accordance with Section 20 of Chapter 227 of the Acts of 2018, An Act to Advance Clean Energy (the “Act”).

The Act establishes an energy storage target of 1000 megawatt hours to be achieved by December 31, 2025 and requires each electric distribution company (“EDC”) to submit an annual report to the DOER by February 15 of each year documenting the energy storage installations in their service territory. As discussed further in the Report, as of December 31, 2018 Eversource has approximately 93 MWh (AC) and 43 MW (AC) of energy storage systems (“ESS”) either installed or in the pipeline to be installed in its service territory, representing 9.3% of the new statewide target.

The enclosed Report closely follows the form of Eversource’s 2018 Energy Storage Target Annual Report, as requested by DOER. Eversource, in collaboration with the other EDCs, has made minor adjustments to the presentation of the Report to address changes in the energy storage target pursuant to the Act. Specifically, the Report identifies ESS projects as either “installed”<sup>1</sup> or “pipeline,”<sup>2</sup> which is a change from the terminology used in the EDC’s energy storage reports to DOER for the year ended December 31, 2017, which identified ESS projects as either “procured” or “pipeline.” The EDCs have made this change to align with the Commonwealth’s energy storage target and the EDCs’ related reporting requirements established by the Act. This change in terminology is also reflected in Attachment A to Eversource’s Report.

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<sup>1</sup> For purposes of the Report, “installed” ESS means an ESS project that has been interconnected to the Company’s electric distribution system.

<sup>2</sup> ESS in the Company’s “pipeline” refers to ESS projects that are in process but not yet interconnected.

Similarly, the EDCs have deleted the description of “Project Eligibility Criteria,” which was Section II.C of their respective reports last year, because “procurement” is no longer a relevant criterion under the Act and accordingly, defining events that will count as progress towards procurement is no longer relevant. “Eligible Sources of Procurement,” which was Section II.B of the Reports last year, has been renamed “Policy Sources of ESS” and is Section II.C of this Report. Several other conforming terminology changes to reflect the change from a “procured” to an “installed” ESS target have made in this Report.

Thank you for your attention to this matter. Please contact me if you have any questions regarding this Report.

Sincerely,

A handwritten signature in blue ink, appearing to read "Matthew S. Stern".

Matthew S. Stern, Esq.

Enclosures

cc: Will Lauwers, DOER

## MA DOER Energy Storage Target Annual Report - 2019

### I. Introduction

Massachusetts law sets a target for 1,000 MWh of energy storage systems (“ESS”) to be installed by December 31, 2025.

Eversource is strongly committed to serving as a clean energy catalyst for the region and views energy storage as a core component of the clean energy transformation required to achieve the Commonwealth’s goal of a 90% greenhouse gas emission reduction by 2050.

Eversource has approximately 93 MWh<sub>ac</sub> and 43 MW<sub>ac</sub> of ESS either installed or in the pipeline in its service territory, representing 9.3% of the new statewide ESS target.

This includes development of two Eversource-led projects (to be built by third party vendors via competitive solicitation) representing a combined 30 MW and 58 MWH. These projects will defer construction of 13 miles of distribution line through the Cape Cod National Seashore, enable significantly reduced reliance on diesel-fired peakers, help shave regional (ISO-NE capacity), statewide (regional network service), and local (distribution) peaks, improve power quality, and enable integration of additional distributed energy resources (“DERs”), among other benefits.

Additionally, and with the leadership of the Department of Energy Resources (“DOER”), Eversource’s new three-year efficiency plan contemplates Eversource’s incenting the use of customer-owned DERs to reduce regional, statewide, and local peaks. We expect that storage will be a key part of this important target.

What follows is Eversource’s detailed Energy Storage Target Annual Report (“Report”) to the DOER for the year ended December 31, 2018.

### II. Reporting Requirements

An Act to Advance Clean Energy, Section 20 of Chapter 227 of the Acts of 2018, amended An Act Relative to Energy Diversity, Section 15 of Chapter 188 of the Acts of 2016, by striking out Section 15 in its entirety and replacing it with a new statewide energy storage target of 1,000 MWh, to be achieved by December 31, 2025, and a new requirement for the EDCs to report annually to the DOER by February 15, beginning in 2019, documenting the energy storage installations in their respective service territories.

As set forth in An Act to Advance Clean Energy, to achieve this new statewide energy storage target of 1,000 megawatt hours, DOER “may consider a variety of policies to encourage the cost-effective deployment of energy storage systems, including the refinement of existing procurement methods to properly value energy storage systems, inclusion in energy portfolio standards, the use of alternative compliance payments to develop pilot programs and the use of energy efficiency funds under section 19 of chapter 25 of the General Laws if the department determines that the energy storage system

installed at a customer's premises provides sustainable peak load reductions on either the electric or gas distribution systems and is otherwise consistent with section 11G of chapter 25A of the General Laws."

This is Eversource's first annual Report pursuant to An Act to Advance Clean Energy and covers the period January 1, 2018 through December 31, 2018.<sup>1</sup>

#### **A. Data Collection**

Eversource obtains uniform data and information for EDC-owned and non-EDC-owned ESS projects through the distributed generation ("DG") interconnection process. For purposes of annual Reports to the DOER, the EDCs have been requesting data and information for ESS projects they do not own from customers and developers of existing ESS projects already connected to their electric distribution systems and are requesting such data and information from customers and developers of new projects that have applied to interconnect to their respective electric distribution systems. The collected data and information will be used to demonstrate measurable progress towards the achievement of the ESS 1,000 MWh target of installed ESS. These data and information include:

- ESS Installed, that is, Interconnected (MWh<sub>ac</sub> and MW<sub>ac</sub>);
- ESS in the Pipeline to be installed (MWh<sub>ac</sub> and MW<sub>ac</sub>);
- Policy Sources of ESS (e.g., SMART program);
- ESS Specifications (e.g., technology type, manufacturer);
- Operational Information (e.g., installation type, system configuration); and
- Applications/ Intended Use Cases (e.g., Peak Shaving/ Load Leveling).<sup>2</sup>

The EDCs are including the above-mentioned data and information on the ESS installed and pipeline projects in their annual reports to the DOER, to the extent such data and information has been provided to them. However, for non-EDC-owned projects, such data and information must be obtained from customers and developers, who currently are not required to provide such data and information under the current DG interconnection tariff. The EDCs may be unable to obtain some or all of this customer data and information and the level and type of data and information included for each such project may vary in the Reports.

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<sup>1</sup> Although more customer-owned ESS projects will be included in this report than in the EDCs' first ESS report to DOER, submitted on February 15, 2018, pursuant to An Act Relative to Energy Diversity, the data and information on each ESS projects in Massachusetts is still limited at this early stage of ESS installation in the Commonwealth as customers are not required to provide detailed ESS project data.

<sup>2</sup> *State of Charge* report, issued on September 16, 2017. According to the report, a use case is defined as an integrated set of grid services performed by a technology at a distinct site or location on the grid. <http://www.mass.gov/eea/docs/doer/state-of-charge-report.pdf>.

## **B. Attachment A**

Attachment A to this Report includes installed ESS projects, and ESS projects in the pipeline as of December 31, 2018. For purposes of this Report, an “installed” ESS project means an ESS project that has been interconnected to an EDC’s electric distribution system.

## **C. Policy Sources of ESS**

The EDCs have jointly identified several state policies, programs, and funding sources intended to drive the installation of ESS in the Commonwealth. Where the EDCs are aware of the state policy, program or funding source associated with an ESS project, the EDCs have identified that policy source in Attachment A. Policy sources of ESS projects include, but are not limited to:

- Utility-owned ESS for transmission and distribution operation and management for the benefit of customers (“Utility-Owned T&D”);
- Utility-owned ESS for research and development purposes, such as those projects supported by U.S. Department of Energy grants, or utility-scale solar plus storage projects developed to support research programs (“Utility-Owned R&D”);
- ESS to be paired with newly authorized large-scale energy procurements featuring 9,450,000 MWh of clean energy and 1,600 MW of offshore wind generation under Sections 83C and 83D of the Green Communities Act (“Section 83C or 83D”);
- Customer-owned ESS enrolled in an EDC’s energy efficiency/ demand response demonstration project or program (“Energy Efficiency/DR program”);
- Customer-owned ESS enrolled in the EDC’s Solar Massachusetts Renewable Target (“SMART”) program that qualify for the SMART storage adder (“SMART program”); and
- Customer-owned ESS funded by the DOER’s or Massachusetts Clean Energy Center’s (“MassCEC”) Advancing Commonwealth Energy Storage (“ACES”) and Peak Demand Reduction Grant programs, which include projects to which the EDC has provided in-kind and/or financial support (“DOER/ MassCEC Funded Projects”).<sup>3</sup>

## **D. Applications and Intended Use Cases**

Based on the *State of Charge* report and the EDCs’ own expertise, the EDCs have identified the following primary applications and use cases for ESS. This list may be modified as the EDCs monitor relevant industry trends and gain further hands-on experience with energy storage.

- i. Wholesale Market (i.e., Energy, Capacity, Ancillary Services): ESS have the potential to participate in all major categories of the wholesale market.
  - a. In the wholesale energy market, ESS may be able to produce revenue by arbitraging hourly electricity prices, charging when the wholesale price is low and discharging when the wholesale price is high.

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<sup>3</sup> Any ACES or Peak Demand Reduction Grant project where the EDC is the award recipient or the EDC partner on the project.

- b. ESS may participate in the ISO-NE Forward Capacity Auction and earn revenue by contributing to ISO New England's installed capacity.
- c. ESS may also be able to generate revenue by participating in the ancillary services market (e.g., black start and frequency regulation).

While energy arbitrage, capacity, and ancillary service revenues have the potential to be monetized for the benefit of the ESS owner, individual customers may potentially benefit from reduced system costs.

- ii. Peak Shaving / Load Leveling: ESS can store energy during hours of low demand and discharge energy when the system is peaking. This may reduce the entire system peak and result in lower utilization of inefficient and expensive gas and oil units. It may also reduce ISO-NE capacity and regional network service costs.
- iii. Generation Support (e.g., Peaker Replacement): ESS can discharge when the system is peaking, thus acting in place of peaking capacity. ESS have the potential to be cleaner and more reliable than a traditional combustion turbine unit.
- iv. T&D Asset Deferral: Strategic deployment of ESS has the potential to defer or eliminate transmission and distribution upgrades in specific locations. The potential for transmission and distribution deferrals need to be studied on an individual basis in consideration of local circumstances and system characteristics.
- v. Power Quality (e.g., Voltage/VAR Support): ESS can provide voltage/VAR support. Reactive power cannot be efficiently transmitted over long distances, which makes distributed ESS an attractive alternative to traditional voltage/VAR support supplied by generating units in some locations.
- vi. Customer Bill Savings (e.g., Demand Charge Management): Individual customers can utilize ESS to shave the peaks and fill the troughs of their load. By reducing peak load, customers may be able to mitigate their installed capacity tag. Commercial and industrial customers may also have the potential to realize bill savings by lowering their peak demand and avoiding a demand charge. Customers with time varying rates can also use ESS to perform arbitrage by charging the ESS during less expensive off-peak times and discharging for their own use during more expensive peak periods.
- vii. Renewable Energy Integration (e.g., Ramping, Smoothing): ESS can quickly follow the variable and unpredictable generation of an intermittent renewable resource making it smooth and dispatchable. ESS can thus support the further integration of renewable resources.
- viii. Renewable Energy Shifting: ESS have the potential to store energy generated by renewable resources when system demand is low and discharge when system demand is high.

- ix. Reliability and Resiliency: ESS can support reliability and resiliency by locally providing energy during an outage event.
- x. Microgrid: ESS can help promote a cost-effective and reliable microgrid. By storing energy produced by renewable resources or by combined heat and power (CHP) for use when those assets are not generating, ESS can support microgrid “islanding” and going off the main grid at times when there is an electric distribution system outage or when it would be otherwise advantageous to the microgrid operator.

## **E. Target Results**

See Attachment A for data and information regarding installed (e.g., interconnected) ESS projects and ESS projects in the pipeline to be installed.

- i. Installed Projects

As of December 31, 2018, Eversource had approximately 2.5 MWh and 1 MW of ESS installed, that is, interconnected, in its Massachusetts service territory.

- ii. Pipeline Projects

As of December 31, 2018, Eversource had approximately 90 MWh and 42 MW of ESS in the project pipeline.<sup>4</sup>

## **F. Cost-Effectiveness and Viability**

### Energy Efficiency/ Demand Response

In Massachusetts, the energy efficiency program administrators (“PAs”) use a Total Resource Cost (“TRC”) test to determine the cost-effectiveness of an offering. For the purposes of determining the cost-effectiveness of storage included as part of energy efficiency and demand response, the PAs would apply the TRC standard. The PAs look at the total cost of the project, regardless of funding source, and compare that against the total benefits of the project and determine if the benefits exceed the costs. In the 2019-2021 Three Year Energy Efficiency Plan, the PAs proposed a pay for performance program design for storage assets. For pay for performance specifically, the PAs are not incenting the equipment itself, only the performance of the equipment assuming it is already in a customer’s home or facility. Therefore, when assessing the cost effectiveness of the pay for performance storage offerings, the PAs will look only at the amount of the incentive they are proposing to offer and compare that against the level of benefits the kW reduction is expected to produce.

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<sup>4</sup> The exact amounts of energy and power of the proposed projects in AC and DC ratings could not be confirmed at the time of Report submittal, but will be known as the projects move from the pipeline to the installed list.

## **G. Market Barriers and Solutions to the Adoption of Energy Storage**

### Market Barriers: Dual Participation

The Federal Energy Regulatory Commission (“FERC”) recently issued Order 841, which is designed to remove barriers to the participation of electric energy storage resources in the capacity, energy, and ancillary service markets. The order requires each Regional Transmission Organization (“RTO”) or Independent System Operator (“ISO”) to establish a market participation model for electric energy storage resources that ensure that energy storage resources are “eligible to provide all capacity, energy, and ancillary services that the resource is technically capable of providing in the RTO/ISO markets” and that the markets “account for the physical and operational characteristics of electric storage resources through bidding parameters or other means.”<sup>5</sup> FERC Order 841 addresses market barriers to electric energy storage resources participating in the various wholesale markets under the energy storage participation models; however, the Order has not addressed barriers to electric storage resources that seek to dually participate in the wholesale electricity markets and serve some alternative use case, such as a transmission or distribution deferral.

Within the context of Eversource’s company-owned or operated energy storage programs, one of the primary use cases for energy storage is in the deferral of a transmission or distribution investment through Non-Wires Alternative (“NWA”) projects. In some instances, the NWA projects may only be required for the primary T&D deferral use case in certain seasonal peak hours and could feasibly participate in the ISO-NE wholesale electricity markets during the remainder of the year. In other cases, an NWA project may be capable of achieving the T&D deferral goal and maintaining system reliability while simultaneously participating in the ISO-NE wholesale electricity markets. In these instances, the revenue earned through participation in the ISO-NE wholesale electricity markets could reduce the cost to customers of implementing energy storage resources in NWA applications. ISO-NE’s market rules require that if a resource participates in the wholesale markets as a modelled generator at any point throughout the year, the operation of that facility falls under the jurisdiction of ISO-NE and must meet the requirements for dispatch and scheduling in the Day-Ahead and Real-Time energy markets specific to that resource size and class. Participating as a modelled generator is also required for the ESS to provide wholesale ancillary products, such as frequency regulation. This can be an impediment to NWA projects participating in the ISO-NE markets, as the EDC must maintain the ability to dispatch the underlying energy storage resource at times when it is required to maintain reliability, and the timing of these dispatches may not align with the timing required to ensure that ISO-NE schedules the resource for dispatch.

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<sup>5</sup> Federal Energy Regulatory Commission Docket Nos. RM16-23-000; AD16-20-000; Order No. 841 at i.



FERC is currently exploring the issue of dual participation of energy storage resources from a policy and operational standpoint in Docket No. AD16-25-000. If energy storage projects in T&D deferral use cases are authorized to participate in the ISO-NE markets it will lower the cost to customers to fund these types of investments and make energy storage technologies more cost-competitive with traditional infrastructure upgrades.

#### Market Barriers: DC Coupled Solar Facilities with Storage

Eversource is aware that many solar facility developers seek to pair their solar capacity with battery storage capacity to take advantage of the Commonwealth's SMART program storage adder and enhance the operational capabilities of the solar generation asset. Many of these are designed to be co-located and AC-connected, meaning that each component, the solar PV and battery storage system, has its own dedicated inverter(s) and the battery charges from AC-power flowing into its inverter. However, an increasingly popular design is to connect the battery storage to the solar PV output behind the inverter, or multiple inverters, as a direct current (DC) connection. Such systems have combined AC output for both resources.

This type of connection is allowed by Eversource's Standards for Interconnection of Distributed Resources, and the regulations of the SMART program from DOER. ISO-NE also does not restrict DC-coupled solar and storage from connecting to and participating as an energy exporter. However, DC-coupling creates limitations for such systems to participate in ISO-NE markets. At present, ISO-NE indicates that it will allow solar-plus-storage "combined assets" to register and participate in ISO-NE's real-time energy market, but such participation may only be as a "settlement only generator," or SOG. ISO-NE will not allow such facilities to register as modelled generators, apparently due to constraints in its generation dispatch modelling software, and as such DC-coupled assets will not be able to participate in ancillary service markets, such as frequency regulation and generation reserve markets. This market constraint will limit the potential benefits from and market-based financial support to those resources until it is addressed by ISO-NE.

### **H. Recommendations for Future Energy Storage Programs and Policies**

#### Clean Peak Standard

In 2019, Eversource expects that DOER will continue with and potentially conclude the process of developing and promulgating regulations to implement the Clean Peak Standard, which was enacted on August 9, 2018, when Governor Baker signed into law An Act to Advance Clean Energy. Included in this statute was the addition of the Clean Peak Standard. This section of the law requires DOER to establish a baseline minimum percentage of kWh sales to end use customers that shall be met with Clean Peak Certificates ("CPCs"). As part of the regulations DOER can include the following: (i) establishment of seasonal peak periods; (ii) methodology by which CPC values shall be

established, which may include a process by which the EDCs competitively procure CPCs from Clean Peak Resources (“CPRs”) and enter into Long Term Contracts, subject to approval from the Department of Public Utilities (“Department”); (iii) establishment of minimum percentage of CPCs that must be derived from demand response resources; (iv) an alternative compliance mechanism for retail electricity suppliers; and (v) procedures by which each retail electricity supplier shall annual submit for DOER’s review and filing demonstrating its compliance with the requirement of this section.

Energy storage is a central element of the Clean Peak Standard, as it is defined to qualify for the CPS when it is “primarily charge by eligible renewable resources.” Eversource sees the development of the CPS as an opportunity for DOER to advance the Commonwealth’s energy storage goals while also addressing GHG and local pollutants, and the high costs associated with periods of peak demand. To this end, Eversource has commented that DOER should implement regulations that will ensure that renewable energy is being used in qualifying energy storage devices in a way that is consistent with the region-wide tracking of generation attributes provided for by the NEPOOL Generation Information System (“GIS”), and lower GHG emissions within the constraints of the Regional Greenhouse Gas Initiative (“RGGI”).

In addition to its specific comments on DOER’s 36 initial stakeholder questions, Eversource is supportive of implementing the CPS in such a way that will support four key principles, as follows:

- (1) has a net reduction or de minimis impact to customer bills over its life (by leveraging cost lowering benefits of peak reduction, including avoided regional network service and ISO-NE capacity supply obligation costs);
- (2) will actually reduce ISO-NE capacity requirements, regional network service costs, and Massachusetts greenhouse gas emissions;
- (3) does not jeopardize distribution or transmission reliability standards and, where possible, should provide benefits by helping to integrate DERs; and
- (4) avoids undue administrative complexity and leaves flexibility to adapt and integrate changes in renewable generation, demand response, and battery storage technology.