

MA DOER Energy Storage Target Annual Report - 2020

I. Introduction

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

Unitil 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 net zero greenhouse gas emissions by 2050.

As of December 31, 2020, Unitil had approximately 34.04 MWh_{ac} and 12.15 MW_{ac} of ESS either installed or in the pipeline in its service territory, representing 3.4 % of the new statewide ESS target.

Unitil continues to investigate ways in which ESS can contribute to optimizing the operation of the electric system and enhance the integration of renewable distributed generation onto the system. In August 2019, Unitil received a grant to install a 2 MW/4 MWh ESS at a distribution substation. This system has been installed with real-time monitoring systems to enable precise control of the system, and Unitil anticipates that it will be operational and in service by the end of the first quarter of 2021.

What follows is Unitil’s detailed Energy Storage Target Annual Report (“Report”) to the DOER for the year ended December 31, 2020.

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 Section 15 containing a new statewide energy storage target of 1,000 MWh, to be achieved by December 31, 2025, and a new requirement for the electric distribution companies (EDCs) to report annually to the DOER on the new target 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 value energy storage systems properly, 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 Unitil’s fourth annual Report to the DOER and covers the period January 1, 2020 through December 31, 2020.

A. Data Collection

Unitil 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 distribution systems, and are requesting such data and information from customers and developers of new projects that have applied to interconnect to their respective distribution systems. As of December 3, 2019, the Department of Public Utilities (“DPU”) issued an Interim Guidance regarding ESS requiring all interconnection applications that include ESS to submit a completed ESS Questionnaire to provide technical and operational data about the proposed ESS.¹ Proposed revisions to the EDCs’ distributed generation interconnection tariffs would incorporate these ESS data requests into the interconnection application process.

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_{ac} and MW_{ac});
- ESS in the Pipeline to be installed (MWh_{ac} and MW_{ac});
- 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).²

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. Beginning in 2020, the consistency of data collection and reporting has improved with the requirement for applicants to provide a completed ESS Questionnaire. .

B. Attachment A

Attachment A to this Report includes installed ESS projects, and ESS projects in the pipeline as of December 31, 2020. 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

¹ See DG Interconnection, D.P.U. 19-55, Interim Guidance – Energy Storage Systems (December 3, 2019).

² *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>.

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”);³ and
- Customer-owned ESS enrolled in the Clean Peak Energy Portfolio Standard (“Clean Peak Standard”) program under section 225 CMR 21.00 promulgated pursuant to M.G.L. c. 25A, § 17(c).

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.
 - 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).

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

- 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 Alternative: 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, 2020, Unitil has 5 residential ESS, totaling 0.075 MWh_{ac} and 0.03 MW_{ac} interconnected in its Massachusetts service territory.

ii. Pipeline Projects

As of December 31, 2020, Unitil had approximately 34.0 MWh_{ac} and 12.1 MW_{ac} of ESS in the project pipeline.⁴

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 initiative or program. For the purposes of determining the cost-effectiveness of storage included as part of energy efficiency and demand response portfolio, 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 designed for customer-owned and sited behind-the-meter storage assets, typically referred to as daily dispatch, which means a resource type that can participate daily during the summer peak hours without adverse impacts to personal comfort or facility productivity. 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.

In the 2019-2021 Three Year Plan order (DPU 18-117), the DPU did not initially approve the full scale statewide deployment of a daily dispatch offering because it was determined to be an untested form of dispatch but did support learning more through demonstration. The PAs, Unitil, Eversource and National Grid, ran daily dispatch

⁴ The exact amounts of energy and power of the proposed projects in AC 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.

demonstrations in summer 2019 and presented the evaluation findings^{5,6} to the Massachusetts Energy Efficiency Advisory Council (“EEAC”), secured an EEAC resolution in support of daily dispatch becoming a full program offering, and submitted a Compliance Filing, DPU 20-33 through DPU 20-36, to the DPU in Q1 2020. The DPU approved daily dispatch becoming a full program offering on July 28, 2020.

The PAs made multiple presentations to the EEAC during 2019 and early 2020 to describe and support the inclusion of daily dispatch as a full program offering.⁷ The PAs made an additional presentation to the EEAC in November 2020 to update the EEAC on 2020 summer active demand reduction activities.⁸

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

FERC Order 2222

On September 17, 2020 the Federal Energy Regulatory Commission (“FERC”) issued Order 2222 requiring that all Regional Transmission Organizations or Independent System Operators establish participation models for distributed energy resource aggregations in wholesale markets so those resources are allowed to provide and receive compensation for all market services for which they are technically capable.⁹ The Order includes a diverse list of distribution system-sited technologies that fall under the distributed energy resources umbrella, including both behind-the-meter and front of the meter ESS.¹⁰ ISO-NE is leading a stakeholder engagement process through the NEPOOL Markets Committee and other channels to develop a compliance proposal for submission to FERC in July 2021. The effectiveness of any forthcoming market rule changes aimed at creating new, practical and economically viable market participation opportunities for ESS will depend on a variety of factors that are yet to be determined.

Offer Review Trigger Pricing for Forward Capacity Auctions

The methodology by which ISO-NE establishes the threshold for price reviews prior to participation in each Forward Capacity Auction (“FCA”) for the ISO-NE Forward Capacity Market (“FCM”), known as offer review trigger prices (“ORTP”), has been a barrier to ESS participating in prior FCAs. ISO-NE has indicated it will expand its methodology to

⁵ Residential Energy Storage Demand Response Demonstration Evaluation: https://ma-eeac.org/wp-content/uploads/MA19DR02-E-Storage_Res-Storage-Summer-Eval_wlInfographic_2020-02-10-final.pdf

⁶ C&I Daily Dispatch Battery – Post-Summer 2019 Report

⁷ The PAs presented to the EEAC in March and November of 2019 and January 2020 on Active Demand Reduction and specifically the daily dispatch approach; <http://ma-eeac.org/march-20-eeac-meeting/>, <http://ma-eeac.org/november-20-eeac-meeting/>, <http://ma-eeac.org/january-22-eeac-meeting/>

⁸ <https://ma-eeac.org/wp-content/uploads/ADR-update-EEAC-11-17-20.pdf>

⁹ FERC Order No. 2222 at 130. https://www.ferc.gov/sites/default/files/2020-09/E-1_0.pdf

¹⁰ Id., 114.

include ESS for FCA #16, which will take place in February 2022 and will determine capacity commitments for the commitment period beginning in June 2025 and ending in May 2026. This change in methodology, to include ESS in the calculation of ORTP values, could enable ESS to offer more competitive bids into FCA #16 or future FCAs.

While access to the FCM provides a possible new value stream for ESS owners and operators, resources that clear capacity supply obligations in the FCM are subject to pay-for-performance risk and can be monetarily penalized if they fail to deliver on their cleared commitment. ESS owners and operators enrolling ESS assets into the FCM will need to carefully consider and manage the associated market risks.

Inability to Propose an ESS as a Transmission Solution to a Stated Transmission Need

Since 2019, discussions have been on-going between ISO-NE and the region's stakeholders about the ability to consider ESS as a solution to an ISO-NE-identified transmission need. In 2019, ISO-NE stated its position¹¹ that the current ISO-NE tariff and agreements did not provide for ESS to be treated as transmission and that ESS should be considered similar to a generation facility under the tariff. Under this treatment, an ESS would be included in ISO-NE transmission planning studies after obtaining a Capacity Supply Obligation in a Forward Capacity Auction. The EDCs understand that modifying the ISO-NE tariff, transmission planning procedures, and cost allocation rules to allow for the treatment of ESS as a transmission facility would be significant undertaking. Any proposal would also need to comply with the FERC's guidelines, commonly known as the "seven factor test," for the identification of transmission and distribution facilities. This topic is anticipated to be discussed further by ISO-NE and stakeholders in 2021.

Dual Participation

In 2020, FERC conditionally approved several ISO-NE market rule changes filed in compliance with FERC Order 841, which required each RTOs/ISOs to establish market participation models for ESS. Specifically, FERC required RTOs/ISOs to "account for the physical and operational characteristics of electric storage resources through bidding parameters or other means" and to ensure that ESS resources are "eligible to provide all capacity, energy, and ancillary services that [they are] technically capable of providing."¹²

ISO-NE addressed Order 841 requirements primarily through the creation of the Continuous Storage Facility ("CSF"), a participation model that allows ESS resources to participate simultaneously as Generating Assets, Dispatchable Asset-Related Demand ("DARD"), and Alternative Technology Regulation Resources ("ATRRs"). For resources

¹¹ See https://www.iso-ne.com/static-assets/documents/2019/08/a00_rc_tc_2019_07_16_17_minutes.doc, page 15

¹² Federal Energy Regulatory Commission Order 841, ¶320
<https://www.ferc.gov/whats-new/comm-meet/2018/021518/E-1.pdf>

that do not wish to participate as CSFs, ISO-NE market rules also accommodate several other participation models, including combined models such as Settlement-Only Generator (“SOG”) and ATRR. Models other than the CSF model may limit an ESS’s ability to provide certain products (e.g., Reserves), but they may also afford ESS resources additional operational flexibility relative to the CSF model.

A key requirement for Order 841 compliance is the ability for ESS resources to serve both retail and wholesale markets (also called “dual participation”). In its conditional acceptance of ISO-NE’s tariff revisions issued in August 2020, FERC accepted ISO-NE’s response to FERC’s requirement to submit a further compliance filing “to explain how its Tariff allows for electric storage resources to participate in both wholesale and retail markets.”¹³ ISO-NE’s compliance filing, submitted to FERC on February 10, 2020, proposed new tariff language to state that ESS will “not be precluded from providing retail services so long as it is able to fulfill its wholesale Energy Market and Forward Capacity Market obligations including, but not limited to, satisfying meter data reporting requirements and notifying the ISO of any changes to operational capabilities.”¹⁴ ISO-NE’s tariff revisions are expected to take effect March 1, 2021.

Market Barriers: DC Coupled Solar Facilities with Storage

Solar facility developers are incentivized 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 alternating current (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, some projects connect the battery storage to the solar PV output behind the inverter as a direct current (DC) connection. Such systems have combined AC output for both resources through a single meter.

This type of connection is allowed by the EDCs’ Standards for Interconnection of Distributed Generation, and DOER’s regulations of the SMART program. DOER and industry participants have highlighted that the PV output that is used to charge the ESS directly is not fully compensated under the SMART program, due to roundtrip efficiency losses of the ESS. In addition, the industry has previously noted ISO-NE market participation barriers related to this system configuration.

¹³ FERC Order on ISO-NE Order 841 Compliance Filing, November 22, 2019 https://elibrary.ferc.gov/idmws/file_list.asp?document_id=14815902

¹⁴ Docket No. ER19-470-000, ISO-NE Revisions in Compliance with the Order No. 841 Order on Compliance, at 11 (February 10, 2020), available at https://www.iso-ne.com/static-assets/documents/2020/02/compliance_filing_order_841.pdf

In early 2020, the EDCs, DOER and industry stakeholders continued discussions about resolving SMART program compensation issues related to DC-coupled storage systems. These discussions resulted in a high-level consensus proposal for resolving this compensation issue that would ensure DC-coupled systems were not disadvantaged in the SMART program. Final agreement on the equations for calculating the true-up payment as well as other operational details remain pending. DOER is currently exploring SMART program modifications consistent with these consensus program changes.

Similarly, in August 2020, ISO-NE updated Operating Procedure 18 to better accommodate market participation by DC-coupled solar and storage systems.¹⁵ The outcome of the OP-18 modification process established metering configurations that allow apportionment between solar and storage assets for market participation purposes.

H. Recommendations for Future Energy Storage Programs and Policies

2030 Clean Energy and Climate Plan and 2050 Decarbonization Roadmap

The interim Clean Energy and Climate Plan for 2030 (“2030 CECP”) and associated Massachusetts 2050 Decarbonization Roadmap (“Roadmap”) identify ESS as an important part of the Commonwealth’s renewable energy portfolio.¹⁶ 2030 CECP anticipates that offshore wind will be the primary source of electricity for a decarbonized energy system and that new bulk storage will be needed to maintain reliability of offshore wind generation during infrequent, potentially multi-day, periods of very low offshore wind generation. 2030 CECP notes that MassCEC will continue to facilitate on pace market development for the ESS industry. The Roadmap identifies eight potential regional pathways to achieving net zero greenhouse gas emissions by 2050, including a “no thermal” option that will require increased reliance on ground mounted solar, and new, long-duration, utility-scale ESS to balance grid impacts.

¹⁵ https://www.iso-ne.com/static-assets/documents/rules_proceeds/operating/isone/op18/op18_rto_final.pdf

¹⁶ The 2030 CECP remains open to public comment through February 22, 2021.