UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Electric Storage Participation in Regions	)	
With Organized Wholesale Electric	)	Docket No. AD16-20-000
Markets	)	

RESPONSE OF ISO NEW ENGLAND INC.

As requested by the Federal Energy Regulatory Commission (the "Commission") in its April 11, 2016 letter, ISO New England Inc. ("ISO-NE" or the "ISO") responds herein to the Commission's request for data regarding participation by storage resources in ISO-NE's markets.

As noted below, ISO-NE does not create market rules for specific resource types. Rather, the rules are resource neutral to the maximum extent possible. As a result, responding to this data request in the time permitted was challenging, particularly with respect to the broader questions, some of which required descriptions of large sections of ISO-NE's Tariff.[1] In sum, ISO-NE has produced the most thorough and accurate response it could in the time allotted, and welcomes follow-up from the Commission to the extent needed.

I. INTRODUCTION

ISO-NE administers its wholesale markets to be resource neutral, accommodating participation by all technology types that can meet the specific requirements for each market. Accordingly, ISO-NE's Tariff does not explicitly identify storage or other specific technologies; instead, the Tariff organizes the rules by the relevant market or service.[2]

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[1] E.g., "What are the technical performance requirements for providing capacity, energy, and ancillary services in ISO-NE's markets, as applicable" and "What are the technical qualification criteria for each type of resource eligible to participate in the capacity, energy, and ancillary service markets, as applicable?"

[2] ISO New England Transmission, Markets and Services Tariff (the "Tariff"). Capitalized terms not otherwise defined herein shall have the meanings given them in the Tariff.

In the case of energy storage resources, New England has a long history due to its large pumped-storage hydropower resources. These resources were built in the 1970s and can supply almost 2,000 MW of capacity within ten minutes. ISO-NE's market rules allow them to shift from energy consumption to energy production and participate across all markets and services.

The market rules have evolved over time to better enable storage resources to participate in the ISO markets. For example, in 2008, the ISO developed the Alternative Technology Regulation Resource ("ATRR") construct to enable energy storage devices to participate in the Regulation Market in a manner that acknowledges the physical capabilities of these limited-energy devices.[3] The ISO has also recently changed its market rules to better enable pumped-storage hydropower units to reflect the physical capabilities of the pumps associated with these facilities.[4]

Going forward, ISO-NE and its stakeholders will consider changes to software and the Tariff to allow energy storage devices that participate in the Regulation Market as ATRRs to provide Operating Reserves and fully participate in the Real-Time Energy Market. These changes will be discussed with stakeholders in the context of ISO-NE's larger project to improve price formation by transitioning away from non-dispatchable resources, where feasible. For more information, *see* ISO-NE's response to Question II.A.1 below.

In conclusion, ISO-NE currently has a platform for the participation of storage resources. This platform, extensively used by pumped storage resources, allows them to transition between demand and supply and enables participation in each of ISO-NE's markets.

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[3] *ISO New England Inc., Market Rule 1 Revisions Regarding the Provision of Regulation by Non-Generating Resources*; Docket No. ER08-54-006 (August 5, 2008).

[4] *ISO New England Inc. and New England Power Pool, DARD Pump Parameter Changes*; Docket No. ER16-954-000 (February 17, 2016).

II. RESPONSES TO DATA REQUESTS

Below, ISO-NE responds to the Commission's questions in each of the categories specified. For context, the Commission's questions are included (in italics).

A. The Eligibility of Electric Storage Resources to be Market Participants

1. *If electric storage resources are eligible to qualify as sellers in the capacity, energy, and/or ancillary service markets, please indicate the resource types (e.g. limited energy resource, generator, demand response, etc.) for which they may qualify in each market. In addition, please list where each applicable resource type is defined in the tariff, as well as the criteria for qualifying as each resource type.*

As shown in the following table and discussed in more detail below, storage resources may qualify as sellers in the capacity, energy and ancillary service markets in several ways.

Electric Storage as Sellers

Market /Grid Service (Tariff reference) → **Resource Type ↓**	**RT Energy Market (§§ III.1-6)**	**DA Energy Market (§§ III.1-6)**	**Forward Capacity (§ III.13)**	**Reserves (§III.10)/ Forward Reserves (§ III.9)**	**Regulation (§ III.14)**	**Reactive Power (VAR) (§ II, Sched 2)**	**Black-start Service (§ II, Sched 16)**
Generator Asset (dispatchable)	Yes	Yes	Yes	Yes	Min cap ≥ 5 MW and 2x AGC SetPoint Deadband plus one	Yes	Yes
Dispatchable Asset Related Demand[5]	No (but can buy)	No (but can buy)	No	Yes	Yes	No	No
Generator Asset (non-dispatchable)	Yes	Yes	Yes	No	No (but can register as ATRR)	Yes	Yes
Settlement Only Resource (<5 MW)	Yes	No	Yes	No	No (but can register as ATRR)	No	No
Real Time Demand Response	Yes	Yes	Yes	No	No (but can register as ATRR)	No	No
Alternative Technology Regulation Resource	No	No	No	No	Yes	No	No

[5] Storage resources that are dispatchable Generator Assets can also register as Dispatchable Asset Related Demands to participate as buyers in the Day-Ahead and Real-Time energy market. In doing so, the storage resources would also be eligible to provide real time reserves and sell regulation service when they are consuming electricity if they meet the technical requirements to do so. *See* Tariff Section III.1.10.6 and the definition of Dispatchable Asset Related Demand in Tariff Section I.2.2.

Registration as a Generator Asset enables full participation. Generator Assets (including storage resources) are registered via ISO-NE's Asset Registration Process and must have an interconnection of 115 kV or above and/or a maximum net output of at least 1 MW.[6] Depending on additional characteristics and capabilities, Generator Assets may provide any or all wholesale grid services (Real-Time Energy Market, Day-Ahead Energy Market, Forward Capacity Market, Forward Reserve Market, Operating Reserves, Regulation Market, VAR Service and Blackstart Service). Specifically, a Generator Asset must:

- be a Qualified Reactive Resource to provide VAR Service (*see* Schedule 2 of Section II of the Tariff)
- be offered by the owner, selected by ISO, and meet the Blackstart Service Minimum Criteria as set out in Schedule 16 to Section II of the Tariff in order to provide Blackstart Service[7]
- be dispatchable[8] and have a minimum Regulation Capacity based on unit size (but greater than or equal to 5 MW and two times the generating unit's AGC SetPoint Deadband plus one) to participate in the Regulation Market (*see* Section III.14 and Schedule 3 to Section II of the Tariff)
- be dispatchable, able to supply within ten or thirty minutes, and sustain reserve capability for one hour, among other requirements, to provide Operating Reserves and fulfill Forward Reserve Obligations (*see* Sections III.9.5.2 and III.10 of the Tariff)

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[6] For definitions of Generator Asset and Asset Registration Process (and all other defined terms), *see* Section I.2.2 of the Tariff. The Asset Registration Process can be found at http://www.iso-ne.com/participate/applications-status-changes/asset-registration#to-register-a-generator-asset. Technical requirements to qualify as a Generator Asset are specified in ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Resources, Asset Related Demands and Alternative Technology Regulation Resources, which is located at http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op14/op14_rto_final.pdf ("OP 14").

[7] As "alternative energy resources," energy storage resources are required to have only two hours of fuel (at full capacity) versus the twelve hours of fuel required for generators that are not considered alternative energy resources. *See* Section II.1 of ISO New England Operating Procedure No. 11- Black Start Resource Administration, which is located at http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op11/op11_rto_final.pdf.

[8] Dispatchability refers to the installation and use of Electronic Dispatch Capability ("EDC"). EDC is the ability, through the installation and maintenance of adequate hardware and software and communications infrastructure, to provide for the electronic transmission, receipt, and acknowledgment of data relative to the dispatch of Generator Assets. EDC enables a Generator Asset to carry out the real-time dispatch processes from the ISO's issuance of Dispatch Instructions to the actual increase or decrease in output of Generator Assets. *See* Section II.A.7.c of OP 14.

As indicated above, dispatchability will determine a Generator Asset's ability to participate in the Regulation Market and provide Operating Reserves. Dispatchable generators are electronically dispatched based on their offer price in the Real-Time Energy Market and have the ability to set the market clearing price. Non-dispatchable generators are not electronically dispatched based on price. They are price-takers that must self-schedule their energy supply into the Real-Time Energy Market daily.

Currently, generators may choose whether to register as dispatchable or non-dispatchable. However, as increasing numbers of non-dispatchable resources have interconnected (*e.g.*, photovoltaic and wind), it has become clear that they can affect price formation and create reliability challenges. As a result, beginning in late 2018 or 2019, the ISO will eliminate the option for generators to register as a non-dispatchable generators, except for Settlement Only Resources and photovoltaic generators.

The pumped storage resources that currently participate in ISO-NE's markets register as dispatchable generators. That designation enables them to sell energy and provide Operating Reserves and regulation, among other services. They also register as a Dispatchable Asset Related Demand in order to purchase energy for pumping and to modify those purchases in Real-Time in response to dispatch instructions. By registering as a Dispatchable Asset Related Demand, the pumped storage resources can also supply Operating Reserves while they are in pump mode.[9]

Registration as a Settlement Only Resource enables participation in the Real-Time Energy Market and the Forward Capacity Market. If generators are

[9] *See* the definition of Dispatchable Asset Related Demand in Section I.2.2 of the Tariff. *See also* Tariff Section III.1.10.6, which specifies that these resources must self-schedule or submit a demand bid in the Energy Market.

interconnected at less than 115 kV with a maximum output of less than 5 MW, they may register as a Settlement Only Resource.[10] (That status is the only registration option if their maximum output is less than 1 MW and optional if maximum output is between 1 and 5 MW.) As the name implies, these resources are not explicitly included in the power system model and cannot bid into the Real-Time Energy Market or Day-Ahead Energy Market, but rather settle based on whatever output is provided in real-time and the Locational Marginal Price. They do not need the telemetering equipment required of a Generator Asset, but are required to have revenue metering.[11] Settlement Only Resources may participate in the Regulation Market by additionally registering as an ATRR, as discussed in more detail below.

Registration as a Real-Time Demand Response Asset enables participation in the Forward Capacity Market and in the transitional price-responsive demand program (described in Section III.E1) (for energy payments).[12] A storage resource must meet the definition of Distributed Generation (i.e., be "behind the meter") to qualify as a Real-Time Demand Response Asset. As set out in the definition of Distributed Generation, the aggregate nameplate capacity of the generation resource may not exceed 5 MW or the demand of the end-use customer where the generator is connected, whichever is greater. Further details are provided in Section III.E1 of the Tariff, including requirements

[10] *See* the definition of "Settlement Only Resource" in Section I.2.2 of the Tariff. *See also* Sections II.A.2 and II.B.3.b of OP 14 and Section 1.5 of the ISO New England Manual for Registration and Performance Auditing, which can be found at http://www.iso-ne.com/participate/rules-procedures/manuals.

[11] Both telemetering and revenue metering are described in ISO New England Operating Procedure No. 18 – Metering and Telemetering Criteria, which is located at http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op18/op18_rto_final.pdf ("OP 18").

[12] Storage resources, like Distributed Generation, with metered output during Demand Resource On-Peak or Seasonal Peak Hours can participate as a passive On-Peak or Seasonal Peak Demand Resource.

that Assets have retail delivery point metering and be able to provide at least 100 kW of demand reduction.

Although a Real-Time Demand Response Asset cannot directly provide regulation service, an energy storage device can be located behind the same retail delivery point of a Real-Time Demand Response Asset, provided that the energy storage device (like any controllable generation) is metered and reported separately to the ISO.[13] A Real-Time Demand Response Asset may participate in the Regulation Market by additionally registering as an ATRR, as discussed in more detail below.[14]

After June 1, 2018, when full integration of Demand Response Resources is achieved, Demand Response Resources will be required to bid into the Energy Markets if their associated Demand Response Capacity Resource has a Capacity Supply Obligation in the Forward Capacity Market. They will also be eligible at that time to meet Forward Reserve Obligations and provide Operating Reserves.[15]

Registration as an ATRR enables participation in the Regulation Market. A storage resource may participate in the Regulation Market as part of an ATRR. ATRRs were introduced in 2008, when ISO-NE piloted a program for non-generators to provide regulation service.[16] These rule changes reflected the expectation at the time that these emergent

[13] Metering allows the ISO to assess whether the consumption or output of the storage device was inappropriately manipulated to elevate the Demand Response Baseline of the Real-Time Demand Response Asset. For example, the storage device could be set to consume energy from the grid above normal levels during the baseline adjustment period, which would elevate the Demand Response Baseline of the Real Time Demand Response Asset above normal levels. Such an action is similar to a baseload, Distributed Generation unit reducing production below normal levels during the baseline adjustment period, which would similarly elevate the Demand Response Baseline. An elevated baseline could result in inappropriate energy and capacity payments. Interval meter data from the storage device or Distributed Generation unit is used to assess whether such activity has occurred.

[14] *See* Section V of OP-18.

[15] *ISO New England Inc.*, 150 FERC ¶ 61,007 (2015).

[16] *See* footnote 3.

resources would be small and would aggregate to provide regulation through a single regulation (AGC) SetPoint.

Currently, any resource that can inject and withdraw at least 1 MW of energy, meet the metering and telemetry requirements and follow an AGC signal can register as an ATRR.[17] ATRRs can reflect many technologies, including storage, demand response and hybrids. Also, an ATRR may be an aggregation of sub-resources in multiple locations.[18]

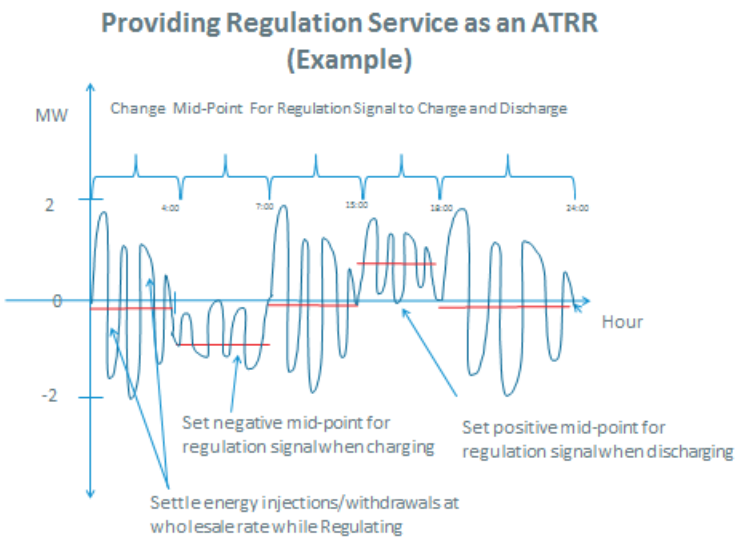
Like dispatchable generators or Dispatchable Asset Related Demands that provide regulation service, an ATRR sets a regulation high and low limit; however, ATRRs can set regulation limits at both positive and negative values, allowing for energy neutral dispatch over a fifteen to twenty minute interval. The ATRR can also set a range that establishes a non-zero mid-point (e.g., 2 MW and -1 MW). This feature enables a storage resource to discharge and charge while it provides the regulation service.[19] A storage resource can also modify the high/low regulation limits within the operating day to charge during anticipated low energy-price periods and to discharge during anticipated high energy-price periods while it follows the AGC signal.[20] The following graph illustrates an ATRR's participation in the Regulation Market.

[17] Tariff Sections III.14.2(a)(ii)(2) and III.14.2(b).

[18] Tariff Section III.14.2(c).

[19] Tariff Section III.14.6.

[20] Tariff Sections III.14.4 and III.14.5. The modified regulation bid will be evaluated as part of the next regulation resource selection, which occurs hourly.



Given their diversity, ATRRs use a variety of registration and settlement rules. ATRRs that are connected behind the retail delivery point will generally take electric service from an energy supplier at a retail price for energy consumed. This type of resource would not settle its energy consumption in the wholesale energy market.

In contrast, a storage-based ATRR connected at a single location might instead prefer to settle energy consumption and injections in the wholesale energy market at a location-specific real-time price. Accordingly, the ISO developed rules that allow such resources to register in a variety of ways for the purpose of settling energy injections and consumption while following the regulation signal.[21] Specifically, as noted above, a storage resource that is less than 5 MW maximum output per a valid interconnection agreement can also register as a Settlement Only Resource if it wants to be directly compensated for its output in the wholesale market, and as a discretely modeled Load Asset or Asset Related Demand if it wants to be directly charged for its consumption.[22] This ATRR could also elect to participate

[21] Tariff Section III.14.8(d).

[22] *Id.*

as part of a Load Asset and receive payments/charges based upon contracted terms. When a storage resource operates in this manner, and is not selected for regulation, it can elect to charge or discharge at its own discretion.

Larger storage resources, greater than or equal to 5 MW or directly connected to the transmission system at 115 kV or greater, must register as a modeled generator because these resources must be reflected in the power system model to give the Control Room visibility of their plans to inject and withdraw energy.[23] However, given rules put in place as part of the ATRR changes and the related software design, this registration must specify that the generator is non-dispatchable. Therefore, as indicated above, the non-dispatchability designation limits participation to the Day-Ahead Energy Market, Real-Time Energy Market and Forward Capacity Market, and prohibits the ATRR from providing Operating Reserves.[24]

The ISO plans to discuss with its stakeholders the development of rules and software to enable storage resources to more fully participate in the Real-Time Energy Market as dispatchable resources while continuing to participate in the regulation market as ATRRs. This will enable energy storage resources to continue to provide energy neutral regulation service while adding the capability to provide real-time reserves.[25]

[23] OP 14, Section III.B.1(a).

[24] Tariff Section III.14.8(d) ("may register the resource as … a Settlement-Only Generator, if not greater than or equal to 5 MW, or otherwise a non-dispatchable, non-regulation capable Generator Asset for settlement of net energy injections that result from following AGC dispatch instructions").

[25] As noted above, these storage resources will also likely register as Dispatchable Asset Related Demand for purposes of buying energy.

2. *Are certain types of resources ineligible to participate as sellers in the capacity, energy, or ancillary service markets by definition? If so, please explain which types of resources are ineligible to participate in which markets and why, including citations to any authority for such ineligibility (e.g., NERC standards, etc.)*

There are no resource types that are *per se* ineligible to participate in a particular market.[26] While resources are not excluded by category, they may be ineligible because they are unable to meet a market's requirements. For example, the non-dispatchability of Settlement Only Resources and non-dispatchable generators prohibits them from providing Operating Reserves, and Resources that cannot provide Energy within ten minutes cannot provide Ten-Minute Spinning or Ten-Minute Non-Spinning Reserves. Similarly, Demand Response Resources with one or more controllable generators, including storage resources, are not eligible to provide Ten Minute Spinning Reserve (TMSR) per its definition in Section I.2.2 of the Tariff. This is based on the Northeast Power Coordinating Council ("NPCC") Directory 5 (5.14) requirement that loads cannot provide synchronized reserve if the reduction in load is dependent on starting a generator to replace energy that is supplied from the grid and the measurement of Demand Response Resource performance at the retail delivery point for the associated resources.

3. *To the extent that electric storage resources are ineligible to qualify as sellers in the capacity, energy and ancillary service markets for a resource type, please explain why.*

Electric storage resources are eligible to qualify as sellers in all ISO-NE markets provided that they meet the requirements associated with that market. *See* the response to Question II.A.1 above, which outlines their potential participation and the various

[26] That said, per Tariff Section III.13.7.3.1.3, Dispatchable Asset Related Demand resources will not receive Forward Capacity Market payments, but instead each Dispatchable Asset Related Demand resource will receive an adjustment to its share of the associated Coincident Peak Contribution based on the ability of the Dispatchable Asset Related Demand resource to reduce consumption.

configurations they can use to maximize that participation across markets, and to Question II.A.2.

4. *When electric storage resources are eligible to participate in the capacity, energy, and ancillary services markets, are there different rules for different types of electric storage resources? For example, are there different qualification or performance requirements for batteries versus pumped storage resources? If so, please state these rules and explain the distinctions they draw for the participation of different types of electric storage resources.*

All storage-based Generator Assets are generally subject to the same market rules, with a few exceptions. In recognition of the varying operating characteristics of resources, the ISO's Operating Procedure No. 23 ("Generator Resource Auditing") has specific auditing requirements for pumped storage resources. However, these requirements fit within the more general requirement that applies to all generators, which is that multiple resources within a single station, whose capability is limited by common elements and/or commonly assigned staffing, should establish capability based on simultaneous audits.[27] Additionally, the bidding parameters in the Energy Market are different for different resource types. *See* the response to question II.C.1.

5. *Can electric storage resources set the price in the capacity, energy, and ancillary service markets? If not, please explain all circumstances under which electric storage resources are not eligible to set the market-clearing price.*

In each of ISO-NE's markets,[28] energy storage resources may be able to set the clearing price. This ability is dependent on their Resource type. Specifically:

- In the **Real-Time Energy Market**, the ability to set the price relates to dispatchability. Consequently, storage resources that are registered as dispatchable Generator Assets may set the clearing price, as can Dispatchable

[27] Section III.B of Operating Procedure No. 23, which is located at http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op23/op23_rto_final.pdf.

[28] More details and citations are included in the response to the first question in this section. ISO-NE's Blackstart and VAR Services are not discussed in this response, as they are not markets. Qualifying Blackstart Resources are paid a proxy price. Qualified Reactive Resources receive a Capacity Cost payment.

Asset Related Demands. Settlement Only Resources, non-dispatchable Generator Assets and non-dispatchable Demand Resources cannot set the clearing price.[29]

- In the **Day-Ahead Energy Market**, a storage resource of 1 MW and above can set price by offering into the market as a Generator Resource, Asset Related Demand or Dispatchable Asset Related Demand. Participants can also submit a demand bid in the zone where their storage resource consumes energy or a virtual transaction to buy and/or sell.

- By qualifying as a new Generator Resource or as a Demand Resource, an electric storage resource can bid its qualified MWs into the Forward Capacity Auction or reconfiguration auction and potentially set the **Forward Capacity Market** clearing price.

- The **Forward Reserve Market** is a portfolio market that allows participants to assign multiple resources (including storage resources) that can meet the performance requirements. Any Market Participant can potentially set the market clearing price.

- An electric storage resource or aggregation of storage resources (1 MW+) can potentially set the **Regulation Market** clearing prices (capacity and mileage) by offering as an ATRR. An electric storage resource can also potentially set the market-clearing regulation price by offering into the Regulation Market as a Generator Resource or Dispatchable Asset Related Demand, if it meets the MW minimum requirement.

B. Qualification Criteria and Performance Requirements

1. *What are the minimum capacity requirements and minimum offer sizes to sell capacity, energy, and ancillary services?*

A generating facility (including storage) less than 1 MW is not allowed to register as a defined Generator Asset but may register as a Settlement Only Resource, in which case it may not bid into the Energy Markets (it is a price-taker).[30] To participate as a Demand Response Resource, it must be capable of a minimum of 100 kW of demand reduction, but

[29] Today, Real-Time Demand Response Assets are price-takers in the Real-Time Energy Market, but with the full integration of demand response into the Energy Market scheduled for June 1, 2018, Demand Response Resources will have the potential to set market clearing prices.

[30] Real-time Operating Reserves are co-optimized with energy provision in the Real-Time Energy Market.

may be made up of an aggregation of Demand Response Assets.[31] To participate as a Real-Time Demand Response Asset in the transitional price-responsive demand program, it must be capable of a minimum of 100 kW of demand reduction. The minimum offer in the Energy Market for defined Generator Assets, Real-Time Demand Response Assets, and Demand Response Resources is 100 kW.

To be eligible to participate in the Forward Capacity Market, each resource must be at least 100 kW in size per Tariff Section III.13.1. Pursuant to Tariff Section III.13.1.4.1, the amount of capacity offered by a Demand Resource shall be a minimum of 100 kW aggregated in the relevant zone.

Regarding ancillary services, there are no minimum capacity requirements to participate in the Forward Reserve Market or to provide VAR or Black Start Service. To participate in the Regulation Market as a Generator Asset, the unit must capable of supplying a minimum Regulation Capacity of 5 MW per Tariff Section III.14.2. To participate as an ATRR, the unit must be capable of supplying a minimum Regulation Capacity of 1 MW, also per Section III.14.2. The ATRR may be an aggregation of multiple facilities to meet the 1 MW minimum capacity.

2. *What are the technical qualification criteria for each type of resource eligible to participate in the capacity, energy, and ancillary service markets, as applicable?*

General Requirements. The ISO has a list of specific items that need to be completed by new facilities that generate electricity (including energy storage resources).[32] These requirements include interconnection to the grid, either to the transmission facilities

[31] Section 1 of Appendix E2 to Section III of the Tariff.

[32] http://www.iso-ne.com/static-assets/documents/2014/10/Coordinate_New_Generation_Project_Summary_and_Checklist.xlsx.

operated by the ISO, or the local transmission or distribution system.[33] Additionally, Settlement Only Resources, Generator Assets, Real-Time Demand Response Assets, Demand Response Resources, Dispatchable Asset Related Demands and ATRRs must meet OP 14 and OP 18's requirements for metering, telemetering and specifying a Designated Entity for receipt of dispatch instructions and communication with the ISO control room.

Operating Reserve Requirements. There are no technical requirements for participation in the Forward Reserve Market, which procures forward obligations for physical delivery. Participants that accept a Forward Reserve Obligation must ultimately assign the performance obligation to Forward Reserve Resources. Tariff Section III.9.5.2 outlines the requirements for Forward Reserve Resources, which include dispatchability and establishment of an audit value. Fundamentally, these Resources must be able to perform as TMOR (Thirty-Minute Operating Reserves), TMSR (Ten-Minute Spinning Reserves), or TMNSR (Ten-Minute Non-Spinning Reserves), as defined in Tariff Section I.2.2. The requirements for performance as Operating Reserves include the ability to sustain reserve capability for one hour.

Regulation Service Requirements. To provide frequency regulation, a Generator Asset must have a minimum Regulation Capacity based on unit size (but greater than or equal to 5 MW and two times the generator's AGC SetPoint Deadband plus one). Alternatively, a Resource that can inject and withdraw at least 1 MW of energy can register as an ATRR.[34] In either case, the minimum Automatic Response Rate is 1 MW/minute and

[33] *See* Schedule 22 to Section II of the Tariff for Large Generator Interconnection Procedures, which are applicable to Generator Assets of more than 20 MW. Schedule 23 to Section II of the Tariff is applicable to Generator Assets of 20 MW or less. In this context, a generator is any device for the production of electricity identified in the Interconnection Request.

[34] Tariff Sections III.14.2(a)(ii)(2) and III.14.2(b).

the unit must be capable of receiving and following automatic generation control (AGC) SetPoints sent electronically at four-second intervals.[35]

To provide Regulation Service, a Resource must have a demonstrated capability to reliably follow Dispatch Instructions, consistent with normal operating characteristics and physical offer parameters, including Regulation Capacity and Automatic Response Rate. Resources without an operational history of providing Regulation must establish and demonstrate this capability as set forth in Tariff Section III.14.2(b)(iv).

Forward Capacity Market Requirements. To be eligible to assume a Capacity Supply Obligation for a Capacity Commitment Period through the Forward Capacity Auction, a resource must be accepted in the Forward Capacity Auction qualification process. Specifically, each resource, or portion thereof, must qualify as a New Generating Capacity Resource (Section III.13.1.1), an Existing Generating Capacity Resource (Section III.13.1.2), a New Import Capacity Resource or Existing Import Capacity Resource (Section III.13.1.3), or a New Demand Resource or Existing Demand Resource (Section III.13.1.4). Each resource must be at least 100 kW in size to participate in the Forward Capacity Auction, except for certain grandfathered resources. An offer may be composed of separate resources, pursuant to the provisions of Section III.13.1.5. Should an electrical storage resource seek to qualify as a Demand Resource, the load it is seeking to curtail must be represented as well.[36]

VAR Requirements. To be eligible to receive VAR payments, a source of dynamic reactive power (generator or non-generator) must have its real power, reactive power, and

[35] Section III.14.2 of the Tariff.

[36] Tariff Sections III.13 and III.13.1. *See also* the training courses outlining the qualification procedures for new and existing Resources at http://www.iso-ne.com/participate/training/materials/?key-topic=FCM Capacity Commitment Period 2020-2021.

automatic voltage regulator status telemetered to the ISO and the applicable Local Control Center, demonstrate its capability, and otherwise meet all the requirements for participation found in Schedule 2.II of Section II of the Tariff and the Schedule 2 Business Procedure.[37]

Blackstart Requirements. To provide Blackstart Service, a generator (including an electricity storage device) must submit an application through Operating Procedure No. 11 ("OP 11") Appendix D. The ISO, in consultation with the System Restoration Working Group consisting of Transmission Operators in New England, will evaluate the generator based upon size, location, and interconnection voltage level. In the event that the generator meets all of the requirements of Schedule 16 and OP 11 and the ISO determines that the generator is beneficial to the System Restoration Plan, then the participant and ISO will enter into a Blackstart Commitment for a specified period of time. During the duration of this commitment, the generator is required to have a certain amount of fuel available at all times. Resources running on alternative energy fuels (including energy storage devices) must always be able to run for 2 hours at full load.[38]

3. *What are the technical performance requirements for providing capacity, energy, and ancillary services in ISO-NE's markets, as applicable*

Many of the performance requirements are outlined above. In general, performance is tied to compensation and is evident through metering and settlement. Other general requirements include submitting to audits (Tariff Section III.1.5 and, for Demand Resources, Section III.E1.2.3), providing accurate information, resource maintenance, informing the ISO

[37] The business procedure is located at http://www.iso-ne.com/static-assets/documents/rules_proceds/operating/gen_var_cap/schedule_2_var_business_procedure.pdf.

[38] Section 1.4 of Schedule 16 to Section II of the Tariff.

of significant changes, and submitting to central dispatch (Tariff Section I.1.3). To the extent specific performance requirements are specified for each market, they are detailed below.

Energy Market. Following offers into the Day-Ahead Energy Market, participants must either produce the energy they bid, or be settled against the Real-Time price in lieu of the energy (Tariff Section III.1.10.1(c)). Section III.1.10 includes details about scheduling and submission of bids and offers in the Energy Market.[39] Section III.1.10.2(b)-(c) requires limited energy and hydropower resources to keep the ISO informed of their fuel availability and ability to operate.

Reserves. In order for resources to be eligible to provide Operating Reserves, they must be capable of providing energy (or reduction) within 10 or 30 minutes and sustaining the output (or reduction) for at least one hour. Fast Start Resources are able to provide Operating Reserves from an offline state based upon their audited capability as defined in Tariff Section IIII.9.5.3.

There are no specific technical performance requirements for the Forward Reserve Market; however, participants accepting a Forward Reserve Obligation must assign Resources to provide reserves pursuant to Tariff Section III.9.5.1. These Forward Reserve Resources must be capable of providing Operating Reserves in order to be counted upon to meet the Forward Reserve Obligation. Participants who are unable to meet their Forward Reserve Obligations are subject to penalties for failure to reserve and failure to activate as defined in Section III.9.7.

[39] Tariff Section III.1.10.6 contains specific requirements for Dispatchable Asset Related Demands. Changes to offers and other parameters are covered in Tariff Section III.1.10.9.

Regulation. Requirements for offers are outlined in Tariff Section III.14.3(a), and constraints on offers related to historical performance are described in Section III.14.3(b). As set forth in Section III.14.7, a Resource is considered to be non-performing if, after a grace period, the Resource is not responding to AGC SetPoints at a rate at least equal to a percentage of its Automatic Response Rate or outside a tolerance band around the AGC SetPoint that is equal to a percentage of the Regulation Capacity of the Resource. The grace period will be between two and four minutes. Penalties are outlined in Section III.14.8(b)(iv), which states that regulation capacity and service payments will be reduced to reflect the proportion of time the Resource was determined to be non-performing.

Forward Capacity Market. Each Generating Capacity Resource that receives a Capacity Supply Obligation must offer into the Energy Market and meet other obligations regarding its offers, outages, and data provision.[40] Intermittent Power Resources must submit Real-Time Energy Market offers in accordance with their Resources' characteristics, unless they are Settlement-Only, and are subject to data, outage and other requirements similar to those of Generating Capacity Resources.[41] Seasonal Peak Demand Resources, On-Peak Demand Resources and Real-Time Emergency Generation Resources may not submit Supply Offers into the Day-Ahead Energy Market or Real-Time Energy Markets, while a Real-Time Demand Response Asset associated with a Real-Time Demand Response Resource may submit Demand Reduction Offers on a Day-Ahead and Real-Time basis pursuant to Appendix E.[42] Demand Response Resources associated with Demand Response Capacity Resources that receives a Capacity Supply Obligation must offer into the Energy

[40] Tariff Section III.13.6.1.1.

[41] Tariff Section III.13.6.1.3.

[42] Tariff Section III.13.6.1.5.1.

Market. Tariff Section III.13.6.1.5 contains additional requirements for Demand Resources, including auditing and data provision requirements.

Each Generating Capacity Resource, Non-Intermittent Settlement Only Resource and Import Capacity Resource with a Capacity Supply Obligation has its performance measured during Shortage Events, which are defined in Tariff Section III.13.7.1.1.1 and include any period of thirty or more contiguous minutes of Reserve Constraint Penalty Factor activation for Ten-Minute Non-Spinning Reserves.

Each Generating Capacity Resource, Non-Intermittent Settlement Only Resource and Import Capacity Resource will be compensated according to its availability score.[43] In addition, Poorly Performing Resources, which within four years receive three scores of less than or equal to 40% and fail to be available in ten or more Shortage Events, will be precluded from participating in any subsequent Forward Capacity Auctions, reconfiguration auctions or Capacity Supply Obligation Bilaterals.[44] Resource performance may also affect the assessment of available capacity, as set forth in Section III.13.7.1.

Intermittent Power Resources and Intermittent Settlement Only Resources have their qualification adjusted for future periods based upon their performance during Shortage Events as described in Section III.13.1.1.2.2.6 and Section III.13.1.2.2.2. Each Demand Resource with a Capacity Supply Obligation has its performance measured based upon its Demand Reduction Value, as calculated in Tariff Section 13.7.1.5.3. Each Demand Resource will be compensated according to its Capacity Value as defined in Tariff Section III.13.7.1.5.1 and the settlement calculations in Tariff Section III.13.7.2.7.5.

[43] Tariff Section III.13.7.1.1.1A *et seq.*

[44] Tariff Section III.13.7.1.1.5.

Beginning in 2018, the measurement criteria will change when the region transitions to the "Pay For Performance" rules approved by the Commission in Dockets No. ER14-1050 and EL14-52.[45]

VAR. A resource is eligible to receive VAR payments as a Qualified Reactive Resource under Schedule 2 of Section II of the Tariff as long as it provides measurable reactive power voltage support to the New England Transmission System, as determined from time-to-time by the ISO, and performs a valid reactive capability test at least once every five years or as otherwise required by the ISO or a Local Control Center. Payment eligibility will be modified based on performance and audits.

Schedule 16 Blackstart Service. Designated Blackstart Resources are required to perform a blackstart capability test at least once every twelve months. Additionally, there are provisions in the Tariff for suspension of some or all of the blackstart compensation for failure to maintain blackstart capability or perform during an actual blackstart event. See Tariff Section II, Schedule 16, Section 4.4 (Suspension of Payments as a Result of a Failure to Maintain Blackstart Capability), which grants a Resource thirty days to rectify a failure to provide Blackstart service before payments are suspended, and Section 4.5 (Suspension of Payments as a Result of a Failure to Perform During a System Restoration), which provides for immediate payment suspension.

[45] *ISO New England Inc.*, 147 FERC 61,172 (2014).

4. *What are the bases for these qualification and performance standards (e.g., North American Electric Reliability Corporation (NERC) reliability standards)? Please provide the technical and operational justifications for these qualification and performance standards, with citations if possible.*

Many of the provisions in ISO-NE's Tariff originated with a Commission initiative (*e.g.,* the pro forma OATT, Order No. 755). Certainly, all have been approved by the Commission. Where there are other clear sources for qualification and performance standards, like the North American Electric Reliability Corporation ("NERC") or NPCC, they are cited below.

General. The following lists the applicable criteria for interconnection and participation in the New England markets: NERC TPL-001-4 Transmission Planning Standard; NPCC Regional Reliability Reference Directory #1, "Design and Operation of the Bulk Power System"; ISO New England Planning Procedure 3, "Reliability Standards for the New England Area Bulk Power Supply System"; ISO New England Planning Procedure 10 (PP-10), "Planning Procedure to Support the Forward Capacity Market"; ISO New England Planning Procedure 5-1 (PP5-1), "Guidelines For Conducting And Evaluating Proposed Plan Application Analyses"; and ISO New England Planning Procedure 5-6 (PP5-6), "Scope of Interconnection Studies for Generation and Elective Transmission Upgrades."

Reserves. NPCC Regional Reliability Reference Directory #5 Reserves Section 5.13 requires output sustainability for one hour for Operating Reserves. This requirement reflects the need to stabilize the system and be ready for the next potentially large contingency. Section 5.14 lists several requirements that must be met in order for Resources to provide Reserves. Some of these requirements (a, f, and g) are focused on double-counting issues. The others (b, c, d, e , and f) are focused on ensuring that the Resource should provide Reserves in a manner that is at least minimally compliant with the intent of Reserves—*e.g.,*

(e) the Resource ramp rate must meet the minimum requirements for each Balancing Authority; and (b) a Resource must not be designed such that it has a high probability of failing to deliver when called upon.

VAR. Generators that receive compensation for VAR Service are required to have an Automatic Voltage Regulator in Automatic and controlling a voltage setpoint, and are required to follow real time reactive dispatch.[46] These performance requirements help ISO to meet NERC VAR standard 001, which requires that each Transmission Operator shall schedule sufficient reactive resources to regulate voltage levels under normal and contingency conditions. NERC VAR-002 requires that each Generator Operator shall maintain the generator voltage or Reactive Power schedule (within each generating facility's capabilities) provided by the Transmission Operator.

Blackstart Service. NERC EOP-5 requires that each Transmission Operator have a plan to restore the transmission system following a disturbance, and the use of blackstart resources is required to restore the shut-down area to service.

Resource and Demand Balancing. The NERC Resource and Demand Balancing standards BAL-001-1, BAL-002-1, BAL-003-1.1 and BAL-005-0.2b establish requirements for Balancing Authorities for frequency control, frequency response, reserve establishment and automatic generation control. These requirements are key inputs to the design of the associated markets and the resulting requirements for resource participation.

[46] Section IIA of Schedule 2 to Section II of the Tariff.

C. Bid Parameters for Electric Storage Resources

1. *What are the required bid parameters for each defined resource type to sell in the capacity, energy and ancillary service markets? Are there additional bid parameters that each defined resource type may submit? Are there any bid parameters unique to electric storage resources in each market?*

Bidding parameters are the same for all resources that bid into the Forward Capacity, Forward Reserve and Regulation Markets, including electric storage resources. In the Energy Market, however, the bidding parameters reflect the physical characteristics of each resource type, including electric storage resources. For example, pumped storage resources that participate as Dispatchable Asset Related Demands will soon have four additional bidding parameters to better reflect their physical characteristics.[47] Likewise, demand response resources have additional bidding parameters to better align with the physical needs of Load Participants that offer demand reductions into the energy market. *See* the chart on the next page.

[47] Letter Order, Docket Nos. ER16-954-000 and ER16-954-001 (March 16, 2016).

Generators	ARD and DARD	Real-Time Demand Response Asset[6]	Demand Response Resource[7]
Ramp Rate	√		√
Max Daily Starts	Pump Only (effective 3/2017)		
Max Daily Energy (MWh)	Pump Only (effective 3/2017)		
Min Down Time (hr.)	Pump Only (effective 3/2017)		Min Time Between Reductions (hr.)
Min Run Time (hr.)	Pump Only (effective 3/2017)	Min Interruption Duration (hr.)	Min Reduction Time (hr.)
Notification Time (hr.)[1]			√
Start-Up Time (hr.)[2]			√
Economic Min (MW)[3]	Min Consumption (MW)		Min Reduction (MW)
Economic Max (MW)[4]	Max Consumption (MW)		Max Reduction (MW)
Claim 10 Capable	√		√
Claim 30 Capable	√		√
Claim 10 (MW)	√		√
Claim 30 (MW)	√		√
Start-Up Fee ($)[5]		Curtailment Initiation Price ($)	Interruption Cost ($)
Use Offer Slope Flag	√		√
MW/Price pairs	√	√	√
Unit status (Unavailable, Economic, Must Run)	√		√ (Economic, Unavailable)
Schedule Selection	√		√
Schedule Applicability (DA, RT or both)	√		√
Schedule Availability (Yes, No)	√		√

Notes: A '√' Indicates that the offer parameter for the resource type is the same as that for generators except where noted.

[1] The Notification Times specified by generators can acknowledge the thermal state of their units.

[2] The Start-Up Time specified by generators can acknowledge the thermal state of their units.

[3] Generators can also specify a minimum output level for Emergency Situations.

[4] Generators can also specify a maximum physical output level.

[5] The Start-up Fee specified for generators also acknowledges the thermal state of their units. Generators can also specify a 'No Load Fee' parameter to account for the costs incurred when a generator is committed but not yet dispatched above its Economic Minimum.

[6] The Real-Time Demand Response Asset construct will sunset with the transitional price responsive demand program on 5/31/2018.

[7] The Demand Response Resources construct will begin on 6/1/2018 when demand response is fully integrated into the Energy Market.

D. Distribution-Connected and Aggregated Electric Storage Resources

1. *Are there opportunities for electric storage resources connected to the distribution system, or a subsystem thereof, to participate in the capacity, energy, and ancillary service markets? If so, please describe those opportunities (i.e., in which markets, as what type of resource, and subject to what tariff provisions may such electric storage resources participate?).*

The opportunities for electric storage resources to participate in ISO-NE's markets are not contingent on being directly connected to the transmission system. These opportunities are described in the response to Question II.A.1, above.

2. *Are there opportunities for aggregated electric storage resources to participate in the capacity, energy, and ancillary service markets? If so, please describe those opportunities (i.e., in which markets, as what type of resource, and subject to what tariff provisions may such electric storage resources participate?).*

In each of the categories of generators, ATRRs, Asset Related Demands and demand resources, multiple resources may be combined to form a single resource.

Generators must either be at the same physical site or be part of a project that, by its technical nature, requires coordinated control of the units being combined. Only the defined generator will be represented, acted upon or allowed to transact in the various markets.[48]

ATRRs may consist of an aggregation of multiple end-use customers throughout the New England Control Area, provided that individual sub-resources must be less than 1 MW of Regulation Capacity. If a sub-resource is greater than or equal to 1 MW of Regulation Capacity, it must register as a separate ATRR.[49]

[48] OP 14 Section II.A.

[49] Tariff Section III.14.2(c).

Asset Related Demands may consist of an aggregation of multiple end-use customers so long as they are served from the same point or points of electrical connection and the 1 MW threshold is applied to the aggregate.[50]

Finally, for purposes of the Forward Capacity Market, Demand Resources may consist of an aggregation of multiple end-use customers so long as they are located within a Dispatch Zone or Load Zone, as appropriate for the resource type, and are at least 100 kW in size as defined in Tariff Section III.13.1.4.1.

For purposes of the energy and reserve markets, Demand Response Resources may consist of an aggregation of multiple end-use customers (i.e., Demand Response Assets) so long they are located within a Dispatch Zone and Reserve Zone and these Demand Response Assets are at least 10 kW in size and have an expected Maximum Interruptible Capacity of 5 MW or less as defined in Tariff Section III.E2.1.1. If a Demand Response Asset has an expected Maximum Interruptible Capacity greater than 5 MW, it must be registered as its own Demand Response Resource as defined in Tariff Section III.E2.1.3(f).

3. *If electric storage resources are providing services to the wholesale market and to another entity (e.g., a distribution utility), and if there are tariff provisions that permit or penalize potential deviation from the RTO/ISO economic dispatch signal in that circumstance, please provide them.*

No such provision exists. In the event that a Transmission Owner requests dispatch to promote the reliability of the distribution system, ISO-NE would make that dispatch request and coordinate the resource's output.[51]

[50] *See* the definition of Asset Related Demand in Section I.2.2.

[51] Tariff Section III.6.2.1.

E. When Electric Storage Resources are Receiving Electricity

1. *Under what circumstances would an electric storage resource submit bids to buy energy in the wholesale markets (i.e., when would an electric storage resource be a wholesale buyer under ISO-NE's market rules/tariff)?*

A Market Participant with an electric storage resource wishing to receive energy from the wholesale market may do so as any other load would,[52] or by registering the electric storage resource as an Asset Related Demand[53] (or part of an Asset Related Demand) or as a Dispatchable Asset Related Demand.[54] Of these resource types, only a Dispatchable Asset Related Demand may submit bids to buy energy in both the Day-Ahead and Real-Time Energy Markets because it is dispatchable. Load Serving Entities bid into the Day-Ahead Market for their Load Assets at the location of the Load Asset, and Asset Related Demands may submit bids to buy energy in the Day-Ahead Energy Market, but, in the Real-Time Energy Market, both Load Assets and Asset Related Demand are price takers.[55] (A Market Participant that owns a large storage device that is registered as a generator may wish to

[52] *See* Section I.2.2 ("Load Asset means a physical load that has been registered in accordance with the Asset Registration Process"). The Load Asset registration process can be found at: http://www.iso-ne.com/participate/applications-status-changes/load-tie-line-asset-registration and in the ISO New England Manual for Registration and Performance Auditing (Manual M-RPA) available at http://www.iso-ne.com/participate/rules-procedures/manuals.

[53] *See* Section I.2.2 ("Asset Related Demand is a physical load that has been discretely modeled within the ISO's dispatch and settlement systems, settles at a Node, and, except for pumped storage load, is made up of one or more individual end-use metered customers receiving service from the same point or points of electrical supply, with an aggregate average hourly load of 1 MW or greater during the 12 months preceding its registration").

[54] *See* Tariff Section I.2.2 ("Dispatchable Asset Related Demand is any portion of an Asset Related Demand of a Market Participant that is capable of having its energy consumption modified in Real-Time in response to Dispatch Instructions[,] has Electronic Dispatch Capability, and must be able to increase or decrease energy consumption between its Minimum Consumption Limit and Maximum Consumption Limit in accordance with Dispatch Instructions and must meet the technical requirements specified in the ISO New England Manuals. Pumped storage facilities may qualify as Dispatchable Asset Related Demand resources, however, such resources shall not qualify as a capacity resource for both the generating output and dispatchable pumping demand of the facility."). *See also* Tariff Section III.1.10.6 (Dispatchable Asset Related Demand Resources).

[55] Because load assets and Asset Related Demand are not dispatchable, they cannot set price. *See* Tariff Section III.2.2 ("Real-Time Locational Marginal Prices for energy and Real-Time Reserve Clearing Prices will be calculated based on a jointly optimized economic dispatch of energy and designation of Operating Reserve utilizing the prices of energy offers and bids, and Reserve Constraint Penalty Factors when applicable").

register the load of the storage device as a kind of load asset, a discretely modeled "station service load asset.")[56]

Alternatively, a Market Participant with a storage resource may prefer not to purchase energy directly from the wholesale markets to serve the storage device. Instead, the owner of the storage facility would contract to buy energy outside of the ISO-NE markets, from a Load Serving Entity (which in turn purchases energy from the wholesale markets).

2. *If electric storage resources must bid to buy electricity from ISO-NE's market, what are the minimum load obligations, minimum bid sizes, or other minimum parameters to buy electricity in each market? For example, is there a minimum consumption limit to be eligible to pay the locational marginal price (LMP) for energy or a minimum charging duration that must be met to be a wholesale buyer?*

Strictly speaking, there are no minimum load obligations, minimum bid sizes or other minimum parameters to buy energy in the Day-Ahead Energy Market or Real-Time Energy Market. The practical limits to participation are a function of other restrictions: energy market bids (and offers) cannot be smaller than 100 kW and meter readings cannot be smaller than 1 kWh. The peak load of an Asset Related Demand or Dispatchable Asset Demand must be at least 1 MW in the prior year in order to so register,[57] but this does not constrain their minimum consumption – in any given interval, their consumption can be zero.

3. *Do electric storage resources participating in the capacity, energy, and ancillary service markets always pay LMP for the electricity they receive, and if not, under what circumstances do they not?*

Storage resources purchasing energy directly from the wholesale market always are settled based upon the LMP for the electricity they receive. If the storage resource is

[56] Tariff Section III.13.7.3.1.

[57] Tariff Section I.2.2.

registered as a Load Asset, it will settle at the zonal LMP for energy,[58] and if it is registered as an Asset Related Demand or Dispatchable Asset Related Demand, it will settle at the nodal LMP for energy.[59] An electric storage facility that is selling regulation services into the wholesale regulation market but purchasing energy from a Load Serving Entity would pay whatever price is specified under its contract with the Load Serving Entity.

4. *Are there circumstances when an electric storage resource receives energy but is not considered load and therefore does not pay for its consumption? For example, if an electric storage resource provides frequency regulation and is asked to receive energy (i.e., provide regulation down) is that considered consumption or provision of frequency regulation, and is the resource charged a wholesale rate for this action?*

All net consumption is ultimately paid for in the wholesale markets, whatever the energy is used for (including providing regulation services). Currently, the netting period is one hour.

F. Potential Changes to the Rules Affecting Electric Storage Resources

1. *Are there any forthcoming or pending proposals or on-going stakeholder processes that could change or contemplate changing the rules by which electric storage resources can sell into ISO-NE's markets? If so, please describe the proposals or stakeholder processes briefly and provide citations to any relevant websites or public documents.*

Building upon the Do Not Exceed Dispatch changes in Docket No. ER16-870-000 that were accepted by the Commission,[60] the ISO has continued working with stakeholders to modify the rules to require that most resources (with the exception, most notably, of photovoltaic) be dispatchable in real-time. These changes are specifically focused on enhancing price formation and are most relevant during times of excess generation on the system or where there are export constraints that are binding.

[58] Section 12.2.5.1 of Manual 28.

[59] Asset Related Demand and Dispatchable Asset Related Demand settle at the nodal price by definition. *See* I.2.2.

[60] *ISO New England Inc. and New England Power Pool Participants Committee*, 152 FERC ¶ 61,065 (2015).

The current Tariff requires that any ATRR greater than 5 MW at a single location have a modelled "non-dispatchable, non-regulating" generator in the power system model.[61] The ISO, as part of its move to require resources to be on economic electronic dispatch in real-time, is evaluating changes to (i) require that the generator (greater than 5 MW at a single location) associated with an ATRR also be on economic electronic dispatch in real-time and (ii) allow them to be associated with a Dispatchable Asset Related Demand. This is similar to the approach used to model other large scale storage, like pumped storage, which is modeled as both a generator and a Dispatchable Asset Related Demand, reflecting the reversible nature of the turbine/generator assemblies.

2. *Are there any forthcoming or pending proposals or on-going stakeholder processes that could change or are contemplating changing the rules by which electric storage resources buy electricity from ISO-NE's market? If so, please describe the proposals or stakeholder processes briefly, and provide citations to any relevant websites or public documents.*

The ISO has proposed changes related to the treatment of pumped-storage facilities in Docket Nos. ER16-954-000 and ER16-954-001. These changes were accepted by the Commission by letter order on March 16, 2016 and are expected to be effective in 2017.

These changes specifically enhance the Dispatchable Asset Related Demand rules that are used to model the consumption or pumping side of the storage facility in the market to better reflect the physical characteristics of this technology, thereby enhancing the ability of these resources to participate in both the Day-Ahead and Real-Time Markets. Specifically, these Resources will be able to specify a Minimum-Run Time and Minimum-Down Time for use in the Real-Time Energy Market and a Maximum Daily Consumption Limit and Maximum Number of Daily Starts for use in the Day-Ahead Energy Market. The

[61] Tariff Section III.14.8(d).

rule changes also include several changes to the Net Commitment Period Compensation rules that lower the financial risks of operating a pumped-storage resource on an economic basis.

The rule changes should result in better outcomes for these pumped-storage units (lower financial risks) and for the market as a whole (more optimal day-ahead market schedules and real-time dispatch solutions).

III. CONCLUSION

In conclusion, ISO-NE respectfully submits the foregoing responses to the Commission's data request.

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Commission Secretary in these proceedings.

Dated at Holyoke, Massachusetts this 16th day of May, 2016.

/s/ Linda M. Morrison
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