

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

ISO New England Inc.) **Docket Nos. ER19-470-___**

REQUEST FOR REHEARING OF ISO NEW ENGLAND INC.

Pursuant to Section 313(a) of the Federal Power Act (the “FPA”)¹ and Rules 212 and 713 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (the “Commission”),² ISO New England Inc. (“ISO-NE”) submits this request for rehearing of the Commission’s Order on Compliance issued November 22, 2019 in the referenced proceeding.³

The Order on Compliance is for the most part a reasoned decision. But the Commission’s finding that ISO-NE fails to comply with Order No. 841’s requirement to allow electric storage resources to account for their state of charge and duration in the day-ahead market ignores substantial record evidence and would require ISO-NE to implement a needlessly problematic solution. As ISO-NE explained over the course of several filings and as will be summarized below, its participation model fully complies with Order No. 841’s requirement to allow electric storage resources to account for their state of charge characteristics (Maximum State of Charge, Minimum State of Charge, and State of Charge), and their duration characteristics (Maximum Run Time and Maximum Charge Time) in the day-ahead market. In its Order on Compliance, however, the Commission requires ISO-NE to go beyond the dictates of Order No. 841. Indeed, the particular manner in which the Commission directs ISO-NE to capture state of charge in the

¹ 16 U.S.C. 8251(a) (2019).

² 18 C.F.R. §§ 385.212, 385.713 (2019).

³ *ISO New England Inc.*, 169 FERC ¶ 61,140 (2019) (“Order on Compliance”).

day-ahead market is not only not required by Order No. 841, but is inferior to the approach filed by ISO-NE. Furthermore, implementing the Commission's approach could jeopardize critical ISO-NE projects.

I. INTRODUCTION AND BACKGROUND

In its Order on Compliance, the Commission accepted the vast majority of ISO-NE's electric storage participation rules, but required further compliance on four issues. The Commission required that ISO-NE: (1) add metering and accounting rules to the Tariff;⁴ (2) explain how the Tariff allows electric storage resources to participate simultaneously in retail and wholesale markets;⁵ (3) apply transmission charges to electric storage resources when they are charging and not providing a service;⁶ and (4) account for state of charge and duration characteristics in the day-ahead energy market.⁷ ISO-NE is filing this request for rehearing on the fourth issue only, and will be making the required compliance filing early next year.

ISO-NE has a strong commitment to enhancing the ability of storage resources to participate in the New England markets, as it has demonstrated for many years. For example:

- Since the inception of Standard Market Design in 2003, ISO-NE has offered a Maximum Daily Energy Limit parameter in the day-ahead market. This parameter is used by Limited Energy Resources, and in particular by pumped-storage hydroelectric units, to allow ISO-NE's day-ahead optimization software to determine the best hours to generate.
- In 2006, ISO-NE added a new asset type to its systems –Dispatchable Asset Related Demand (“DARDs”). This allowed the consumption side of pumped-storage hydroelectric units to offer into and be economically dispatched in the day-ahead market.
- In March of 2017, as part of a market enhancements project for pumped-storage hydroelectric units, ISO-NE added a Maximum Daily Consumption Limit parameter for

⁴ See Order on Compliance at P 220, 221 (requiring revisions to the ISO-NE Transmission, Markets, and Services Tariff (“Tariff”).

⁵ See Order on Compliance at P 224.

⁶ See Order on Compliance at P 197.

⁷ See Order on Compliance at P 151.

DARDs.⁸ Similar in concept to the Maximum Daily Energy Limit parameter, this parameter allows the day-ahead optimization software to determine the best hours to pump. (To the best of ISO-NE's knowledge, no other RTO has such a parameter.)

- On April 1, 2019, ISO-NE put into effect the rules implementing its enhanced storage participation project.⁹ This project was defined prior to the issuance of Order No. 841 and implemented prior to its effective date. The project built on many of the same features that were previously developed for pumped-storage hydroelectric units. This included the use of the Maximum Daily Energy Limit and Maximum Daily Consumption Limit parameters to manage state of charge in the day-ahead market in an optimal manner.
- In the summer of 2019, as promised,¹⁰ ISO-NE and its stakeholders developed a solution to the most protested issue in ISO-NE's Order No. 841 compliance efforts – the issue of how to treat storage resources with less than one hour of energy remaining.¹¹ On December 3, 2019, ISO-NE implemented the first stage of this solution; on March 1, 2020, it will complete the implementation.
- In Order No. 841, the Commission required that electric storage resources as small as 0.1 MW be allowed to participate in RTO markets. Prior to this, generator and DARD assets had to be at least 1 MW in order to participate in the New England markets. Since the inception of the markets, ISO-NE has modeled each market asset in both ISO-NE's market system and in ISO-NE's network reliability software. With the issuance of the minimum size requirement in Order No. 841, ISO-NE staff was concerned that a proliferation of small assets could cause issues for the network reliability software, partly because these small assets are frequently located deep in the distribution system, which is itself not modeled in the network reliability software. Therefore, ISO-NE developed a solution that allows ISO-NE to model smaller assets (e.g., 0.1 MW batteries) in the market software, and participate in the markets, *without* being modeled in the network reliability software. This ability to dissociate market modeling from reliability modeling will eliminate the risk that a proliferation of these assets will result in network reliability software issues. This functionality will be implemented on March 1, 2020.
- The New England States have strong renewable energy, carbon reduction, and storage participation goals. Driven in part by state policies, the majority of batteries currently coming forward to participate in the New England markets are to be co-located with other intermittent resources, as are the battery resources seeking to enter the markets in early

⁸ See *ISO New England Inc. and New England Power Pool, DARD Pump Parameter Changes*, Docket No. ER16-954-000 (filed February 17, 2016).

⁹ See *ISO New England Inc.*, 166 FERC ¶ 61,146 (2019) (accepting Enhanced Storage Participation Revisions effective April 1, 2019).

¹⁰ See Order on Compliance at P 169 (noting that “ISO-NE has committed to work with stakeholders to develop a modified automatic redeclaration mechanism that addresses concerns raised by protestors in this proceeding”).

¹¹ The NEPOOL Markets Committee voted on the manual changes at its September 19, 2019 meeting and the NEPOOL Participants Committee voted on the manual changes at its October 4, 2019 meeting; at the latter, the changes received unanimous support with two parties abstaining.

2020. Such facilities have unique characteristics (for example, a facility constraint, such as an inverter limit, can constrain the combined operation of the intermittent resource and battery). ISO-NE is aggressively working through implementation details to ensure that the batteries entering the wholesale markets in 2020 are properly modeled.

ISO-NE agrees with the Commission that it is important to account for the state of charge and duration of electric storage resources in the day-ahead market, and believes that the solution filed by ISO-NE in its December 3, 2018 compliance filing meets or exceeds the requirements of Order No. 841.¹² Importantly, in Order No. 841, the Commission explained that it had been persuaded that “greater regional flexibility” was appropriate in determining how to account for the physical and operational characteristics of electric storage resources.¹³ In particular, the Commission found that “different RTOs/ISOs may be able to more effectively account for the physical and operational characteristics of electric storage resources through different mechanisms given their unique market designs.”¹⁴ The Commission’s Order on Compliance fails to extend this flexibility to ISO-NE. While ISO-NE’s solution to accounting for state of charge and duration in the day-ahead market differs from that ordered by the Commission in the Order on Compliance, ISO-NE’s solution satisfies or exceeds the requirements of Order No. 841 and works in harmony with New England’s market design.

The primary basis for the Commission’s rejection of ISO-NE’s approach seems to be the Commission’s assumption that ISO-NE’s approach can result in “infeasible” day-ahead schedules; yet, as will be discussed below, ISO-NE’s approach has no greater potential to result in infeasible day-ahead schedules than the Commission-directed approach. Moreover, ISO-NE’s

¹² See *ISO New England Inc. and New England Power Pool*, Revisions to ISO New England Inc. Transmission Markets and Services Tariff in Compliance with FERC Order 841, Docket No. ER19-470 (filed December 3, 2018).

¹³ See *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 162 FERC ¶ 61,127 (2018) (“Order No. 841”) at P 190, *order on reh’g*, Order No. 841-A, 167 FERC ¶ 61,154 (2019).

¹⁴ Order No. 841 at P 190.

solution – unlike the solution the Commission would impose on ISO-NE – considers optimization (that is, ISO-NE’s approach uses electric storage resource supply offers and demand bids in determining the most economically efficient day-ahead clearing for the region, which tends to result in a day-ahead schedule for the resource that discharges in the highest-priced hours of day-ahead and charges in the lowest-priced hours). In considering optimization, ISO-NE’s solution is superior to the Commission’s. Furthermore, because ISO-NE does not believe the Commission-directed solution to be compatible with ISO-NE’s optimization feature, the Commission-directed solution could not be offered to resources using that feature. Requiring ISO-NE to move from an approach that considers optimization to one that does not could result in a less economically efficient solution for New England and less-profitable day-ahead awards for ISO-NE’s electric storage resources; it would therefore not constitute well-reasoned decision-making.

Finally, requiring ISO-NE to adopt the Commission’s solution could jeopardize the timing of other critical efforts that directly impact the day-ahead market, including:

- Addressing issues with electric storage resources that are co-located with intermittent resources.
- Moving ISO-NE’s day-ahead clearing engines to a new technology, which will provide faster performance and greater optimization possibilities. ISO-NE has been working with its vendor on research and development for new clearing-engine technologies for two years. ISO-NE expects to initiate the planning and estimation of the implementation effort in early 2020. Based on previous efforts for similarly-sized projects, this is expected to be at least a two-year effort.
- Addressing New England energy security issues. It is contemplated that ISO-NE may make significant changes to the day-ahead market in order to address energy security issues, and that those solutions would be built on the new day-ahead optimization technologies in order to take advantage of the improved optimization performance. The effort to implement the energy security issues would require careful, coordinated development in concert with the new day-ahead clearing engine technology.

Given the critical nature of the day-ahead energy market optimization engine improvements and energy security issues, requiring that other aspects of the day-ahead market be changed in concert with these efforts would be imprudent.

II. STATEMENT OF ISSUES AND SPECIFICATION OF ERRORS

Pursuant to Rule 713(c) of the Commission's Rules of Practice and Procedure, ISO-NE provides the following statement of the issues and specifies the following errors:

1. In requiring that ISO-NE account for state of charge and duration characteristics in the particular manner specified in the Order on Compliance, the Commission erred by imposing on ISO-NE an obligation in excess of the requirements of Order No. 841. The Commission also failed to rationalize its decision regarding ISO-NE with its commitment in Order No. 841 to providing "regional flexibility" to allow RTOs to "more effectively account for the physical and operational characteristics of electric storage resources through different mechanisms given their unique market designs." The Commission's decision, therefore, is arbitrary and capricious and not the product of reasoned decision-making. *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *New England Power Generators Ass'n. v. FERC*, 881 F.3d 202, 210 (D.C. Cir. 2018); *Ky. Pub. Serv. Comm'n v. FERC*, 397 F.3d 1004 (D.C. Cir. 2005).

2. The Commission erred in finding that ISO-NE fails to meet Order No. 841's requirement to allow electric storage resources to account for their state of charge in the day-ahead market. In rejecting ISO-NE's approach on the grounds that it cannot ensure a feasible day-ahead schedule while imposing on ISO-NE an approach with the same attribute, the Commission's decision is arbitrary, capricious, and not the product of reasoned decision-making. The Commission also misstated material aspects of ISO-NE's approach to accounting for state of charge, causing the Commission to reach erroneous conclusions that do not withstand scrutiny. The Commission's order, therefore, is arbitrary and capricious and not the product of reasoned decision-making. 5 U.S.C. § 706(2)(A); *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *New England Power Generators Ass'n. v. FERC*, 881 F.3d 202 (D.C. Cir. 2018); *Ky. Pub. Serv. Comm'n v. FERC*, 397 F.3d 1004 (D.C. Cir. 2005).

3. The Commission erred in ignoring substantial record evidence that ISO-NE's approach to day-ahead state of charge accounting is superior to the Commission's because it considers optimality – as required by the ISO-NE Tariff – whereas the Commission's approach does not. The Commission's decision, therefore, is arbitrary and capricious and not the product of reasoned decision-making. 5 U.S.C. § 706(2)(E); *TransCanada Power Mktg. Ltd. v. FERC*, 811 F.3d 1 (D.C. Cir. 2015); *KN Energy, Inc. v. FERC*, 968 F.2d 1295 (D.C. Cir. 1992).

4. In directing ISO-NE to institute a Maximum Run and Charge Time parameter in the day-ahead market, the Commission failed entirely to consider ISO-NE's arguments that ISO-NE's day-ahead solution is superior given New England's market design. The Commission's Order is also internally inconsistent in its failure to reconcile its seemingly contrary finding that the lack of a Maximum Run Time parameter in the real-time market is consistent with Order No. 841. The Commission's order, therefore, is arbitrary and capricious and not the product of reasoned decision-making. *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *New England Power Generators Ass'n. v. FERC*, 881 F.3d 202, 210 (D.C. Cir. 2018); *Ky. Pub. Serv. Comm'n v. FERC*, 397 F.3d 1004 (D.C. Cir. 2005).

5. The Commission erred in ignoring ISO-NE's arguments that in New England, state of charge accounting should consider the majority of electric storage resources currently coming forward to participate in the New England markets, which are co-located with intermittent resources. The Commission also failed to meaningfully consider ISO-NE's arguments that adopting an alternative approach to state of charge accounting risks delay and wasted effort, could preclude the development of a better approach, and could jeopardize higher-priority ISO-NE projects. The Commission's order, therefore, is arbitrary and capricious and not the product of reasoned decision-making. *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *New England Power Generators Ass'n. v. FERC*, 881 F.3d 202, 210 (D.C. Cir. 2018); *Ky. Pub. Serv. Comm'n v. FERC*, 397 F.3d 1004 (D.C. Cir. 2005).

III. REQUEST FOR REHEARING

A. In requiring that ISO-NE account for state of charge and duration characteristics in the particular manner specified in the Order on Compliance, the Commission erred by imposing on ISO-NE an obligation in excess of the requirements of Order No. 841. The Commission also failed to rationalize its decision regarding ISO-NE with its commitment in Order No. 841 to providing "regional flexibility" to allow RTOs to "more effectively account for the physical and operational characteristics of electric storage resources through different mechanisms given their unique market designs." The Commission's decision, therefore, is arbitrary and capricious and not the product of reasoned decision-making.

The Commission initially proposed, in its Notice of Proposed Rulemaking, that RTOs should account for the physical and operational characteristics of electric storage resources by means of bidding parameters. In the Order No. 841 final rulemaking, however, the Commission wrote that it had been persuaded by commenters' arguments "that there may be other means of accounting for the physical and operational characteristics of electric storage resources than

bidding parameters.”¹⁵ The Commission therefore found that “greater regional flexibility than the Commission proposed in the NOPR is appropriate” and that “different RTOs/ISOs may be able to more effectively account for the physical and operational characteristics of electric storage resources through different mechanisms given their unique market designs.”¹⁶

In its Order on Compliance, the Commission finds that ISO-NE has not accounted in the day-ahead market for the physical and operational characteristics state of charge (State of Charge, Maximum State of Charge, and Minimum State of Charge) and duration (Maximum Charge Time and Maximum Run Time). ISO-NE, due to its unique limited-energy resource model, has proposed an electric storage participation model in which state of charge and duration are represented in the day-ahead market, not through five individual bidding parameters, but instead by means of ISO-NE’s optimization of the day-ahead clearing of the supply offers and demand bids submitted by electric storage resources as constrained by their “Maximum Daily Energy Limit” and “Maximum Daily Storage Limit” parameters. This solution is entirely in keeping with the letter and spirit of order No. 841’s requirement to “account for the physical and operational characteristics of electric storage resources through bidding parameters *or other means.*”¹⁷

As demonstrated below, ISO-NE’s approach satisfies the rationales the Commission provides for its requirement to account for the state of charge and duration characteristics of electric storage resources in the day-ahead market at least as effectively as would adopting the Commission’s State of Charge, Maximum State of Charge, Minimum State of Charge, Maximum Run Time, and Maximum Charge Time bidding parameters.

¹⁵ Order No. 841 at P 190.

¹⁶ Order No. 841 at P 190.

¹⁷ Order No. 841 at P 4 (emphasis added).

- B. The Commission erred in finding that ISO-NE fails to meet Order No. 841’s requirement to allow electric storage resources to account for their state of charge in the day-ahead market. In rejecting ISO-NE’s approach on the grounds that it cannot ensure a feasible day-ahead schedule while imposing on ISO-NE an approach with the same attribute, the Commission’s decision is arbitrary, capricious, and not the product of reasoned decision-making. The Commission also misstated material aspects of ISO-NE’s approach to accounting for state of charge, causing the Commission to reach erroneous conclusions that do not withstand scrutiny. The Commission’s order, therefore, is arbitrary and capricious and not the product of reasoned decision-making.**

In the Order on Compliance, the Commission wrote that “neither the Maximum Daily Energy Limit nor the Maximum Daily Consumption Limit parameters adequately provide electric storage resources with a mechanism to account for their State of Charge in the day-ahead market.”¹⁸ This is not correct. Electric storage resources can account for their day-ahead state of charge by incorporating that state of charge into their Maximum Daily Energy Limit and Maximum Daily Consumption Limit parameters. For example, a resource can account for an expected state of charge of half-charged by submitting a Maximum Daily Energy Limit and Maximum Daily Charge Limit that each equal one-half of its total MWh capability; or a resource can account for an expected state of charge of fully charged by submitting a Maximum Daily Energy Limit equal to its full MWh capability and a Maximum Daily Consumption Limit equal to zero.¹⁹

The Commission’s chief concern regarding Maximum Daily Energy Limit and Maximum Daily Consumption Limit is that their use “could result in infeasible schedules, i.e., the

¹⁸ Order on Compliance at P 149.

¹⁹ Because of this, the Commission’s finding in the Order on Compliance that ISO-NE’s “limited bidding parameters” mean that ISO-NE must “make assumptions about the state of charge of an electric storage resource” is false. *See* Order on Compliance at P 149. ISO-NE makes no assumptions about the state of charge of electric storage resources. Under ISO-NE’s approach, there is no need for a dedicated state of charge bidding parameter because the participant accounts for state of charge in the day-ahead market by means of Maximum Daily Energy Limit and Maximum Daily Consumption Limit.

scheduling of [] charging or discharging MWhs at times when the electric storage resource cannot physically withdraw or inject based on its State of Charge.”²⁰ This too is untrue.

Maximum Daily Energy Limit and Maximum Daily Consumption Limit will ensure a feasible day-ahead schedule if the participant accurately takes into account the storage resource’s expected state of charge at the start of the Operating Day.²¹ In this respect, as explained below, ISO-NE’s solution either meets or exceeds the solution directed by the Order on Compliance.

Whether or not a day-ahead schedule is feasible can be assessed in three ways: 1) a day-ahead schedule can be judged infeasible looking at the day-ahead schedule in isolation; 2) a day-ahead schedule can be judged infeasible using the actual state of charge at the start of the Operating Day; or 3) a day-ahead schedule can be judged infeasible considering real-time conditions. Under any definition of feasibility, ISO-NE’s solution meets Order No. 841’s day-ahead state of charge accounting requirements and meets or exceeds the solution required by the Order on Compliance.

When judging feasibility looking at the day-ahead schedule in isolation, any schedule that does not violate the physical limits of the electric storage resource is feasible. For example, a day-ahead schedule for a 1MW/2MWh battery in which the battery charges for two hours at 1 MW beginning at 12 a.m. would be feasible. A schedule in which the battery was scheduled to charge or discharge at 1 MW for three or more consecutive hours would be infeasible. Maximum Daily Energy Limit and Maximum Daily Consumption Limit can ensure this type of feasibility. In contrast, the alternative presented in the Order on Compliance, which would have ISO-NE “account for the resource’s State of Charge at the start of each day-ahead market interval”

²⁰ Order on Compliance at P 150.

²¹ See, e.g., ISO-NE Answer at 11-12; ISO-NE Data Request Response at 12.

cannot.²² If, following the Commission’s direction, ISO-NE were to adopt an approach in which electric storage resources submit their state of charge in the day-ahead market at the start of each-day ahead market interval (in New England, at the start of each hour), an electric storage resource could receive an entirely *infeasible* day-schedule – for example, a schedule in which it only charges (or only discharges) for the entire day. To illustrate, under the Commission-directed solution, a battery that anticipates that it will alternate between fully discharged and fully charged would submit state of charge parameters for the start of each day-ahead hour that alternate between fully discharged and fully charged. If day-ahead prices turn out to be lower than expected and never rise to the resource’s supply offer price, the resource will never be scheduled to discharge, it will simply be scheduled to charge in every-other hour. The result is that, after the first hour of the day-ahead market, the schedule is infeasible. In contrast, the Maximum Daily Energy Limit and Maximum Daily Storage Limit parameters prevent this, because the resource can set a cap on the total MWhs it charges and discharges.

When judging feasibility using the actual state of charge at the start of the Operating Day, a day-ahead schedule that is feasible in isolation can become infeasible. For example, the feasible day-ahead schedule above, in which a 1MW/2MWh battery charges for two hours at 1 MW beginning at 12 a.m. becomes infeasible if the actual state of charge at the beginning of the operating day is anything other than empty. As ISO-NE explained in its Data Request Response:

[a] day-ahead schedule that is entirely feasible when determined for a storage resource that is (for example) half full at the start of hour one of the Operating Day may prove entirely *infeasible* if it turns out that the resource’s state of charge going

²² See Order on Compliance at P 150 (stating that “Maximum Daily Energy Limit and Maximum Daily Consumption Limit . . . cannot ensure that [] charging or discharging MWhs will be scheduled at times when the electric storage resource can withdraw or inject *because ISO-NE’s day-ahead market software does not account for the resource’s State of Charge at the start of each day-ahead market interval.*”) (emphasis added).

into the Operating Day is different than the initial assumption (for example, three-quarters full).²³

Put another way, to ensure that a day-ahead schedule proves feasible, the resource must accurately predict, at the time the resource finalizes its day-ahead offer, what its state of charge will be at the start of the Operating Day. Accurately predicting state of charge at the start of the Operating Day requires either that the resource accurately predict its state of charge 14 hours in advance²⁴ or that the resource take uneconomic action in real-time leading up to the start of the Operating Day. If one assumes that the language in the Order on Compliance rejecting ISO-NE's approach for not "account[ing] for the resource's State of Charge at the start of each day-ahead market interval" permits a solution in which a resource's state of charge is submitted once at the start of the day-ahead market (rather than the start of each hour of day-ahead), the Commission's approach and ISO-NE's approach are equally likely to achieve feasibility.²⁵ In either case, a feasible day-ahead schedule will result only if the resource correctly predicts what its initial state of charge will be at the start of the Operating Day.

Once the Operating Day has begun, there is no way to ensure a day-ahead schedule will be achievable, because in New England, the day-ahead MW schedules of resources are not carried over into real-time.²⁶ Instead, resources are dispatched in real-time based on real-time system conditions and their real-time offer data, with no regard given to their day-ahead

²³ ISO-NE Answers to Questions Posed in the Commission's April 1, 2019 Letter, Docket No. ER19-470-000, (filed May 1, 2019) ("ISO-NE Data Request Response") at 13 (emphasis added).

²⁴ See ISO-NE Data Request Response at 13 n. 14 (noting that "to ensure a feasible schedule, the Market Participant must accurately predict the state of charge 14 hours prior to start of the Operating Day, because the day-ahead bidding window closes at 10 am for the Operating Day beginning that night at 12 am").

²⁵ If one assumes that the Order on Compliance requires an approach in which participants submit a separate state of charge for the start of each hour of the day-ahead, then, as discussed above, ISO-NE's approach is superior to the Commission's approach.

²⁶ For slow-start resources only, such as nuclear units, the day-ahead on/off commitment schedules are carried over into real-time.

schedules. And resources are required to follow their real-time dispatch; they do not have the option of instead following their day-ahead schedule.²⁷ This means that, in New England, it is not possible to schedule real-time dispatch in the day-ahead market. Because of this, the Commission's rejection of ISO-NE's approach to day-ahead state of charge accounting on the grounds that it might result in "dispatch points that violate [] physical and operational limits"²⁸ is nonsensical.

To take an example, assume the 1MW/2MWh battery with a day-ahead schedule that charges at 1MW for two hours beginning at 12 a.m. is also scheduled to discharge at 6 a.m., when day-ahead prices begin to climb. Assume also that the battery begins the Operating Day empty, as it predicted it would, so that the day-ahead schedule continues to be feasible considering the resource's initial state of charge at the start of the Operating Day. In real-time, assume that the battery is charged to full by 2 a.m. But then, at 4 a.m., a price spike occurs, and real-time prices jump from \$25/MW to \$125/MW, well above the battery's offer price. If the price spike lasts for two hours, the real-time dispatch software will fully discharge the battery. At 6 a.m., the day-ahead schedule would prove infeasible, because the battery is already empty (and so cannot discharge).

In addition to its material misstatements regarding state of charge accounting and day-ahead schedule feasibility, the Commission makes another material misstatement concerning ISO-NE's approach: the Commission incorrectly asserts that ISO-NE believes that storage

²⁷ As noted above, while resources can request uneconomic actions in real-time (via self-commitment or self-dispatch) they cannot simply choose not to follow their real-time dispatch.

²⁸ Order on Compliance at P 151 (finding that, "Order No. 841 does require RTOs/ISOs to *account* for State of Charge so that electric storage resources can participate in the energy market without receiving dispatch points that violate their physical and operational limits, which in turn will enable these resources to provide all of the services that they are technically capable of providing and allow the RTOs/ISOs to procure these services more efficiently.").

resources should limit themselves to one full charge and discharge cycle in the day-ahead market.²⁹

In fact, as ISO-NE explained in its Data Request Response, storage resources are *not* limited to a single charge-discharge cycle in the day-ahead market. Instead, storage resources can shape their day-ahead offers for as many charge-discharge cycles as they wish: “If a storage operator wishes to be scheduled for multiple charge-discharge cycles in a day, it can set its Maximum Daily Energy and Storage Limits to the MWh quantity it would like to discharge and charge, and use its offer and bid prices to shape whether and when its resource clears in the day-ahead market.”³⁰ The Commission does not mention this in the Order on Compliance. The Commission’s mistake led the Commission to erroneously conclude that ISO-NE’s day-ahead proposal is “at odds with the requirement in Order No. 841 that each RTO/ISO must account for the physical and operational characteristics of electric storage resources, through bidding parameters or other means.”³¹ The result is an unreasoned decision.

C. The Commission erred in ignoring substantial record evidence that ISO-NE’s approach to day-ahead state of charge accounting is superior to the Commission’s because it considers optimality – as required by the ISO-NE Tariff – whereas the Commission’s approach does not. The Commission’s decision, therefore, is arbitrary and capricious and not the product of reasoned decision-making.

As ISO-NE explained in its Data Request Response, ISO-NE is required by its Tariff to consider optimality: “While the Commission’s question focuses on the *feasibility* of day-ahead

²⁹ See Order on Compliance at P 151 (referring to “ISO-NE’s suggestion that electric storage resources should limit themselves to one full charge and discharge cycle in the day-ahead market”).

³⁰ Data Request Response at 12 n. 44.

³¹ Order on Compliance at P 150 (finding that, “ISO-NE’s suggestion that electric storage resources should limit themselves to one full charge and discharge cycle in the day-ahead market is at odds with the requirement in Order No. 841 that each RTO/ISO must account for the physical and operational characteristics of electric storage resources, through bidding parameters or other means, in order to improve the ability of electric storage resources to provide all of the services that they are technically capable of providing and allow RTOs/ISOs to procure these services more efficiently.”).

schedules, ISO-NE is required by its Tariff to consider *optimality*.”³² Under the Commission’s approach, an electric storage resource will be scheduled day-ahead in the first hour(s) of the day in which it is able to economically produce or consume energy. For example, under the Commission’s approach, if a 1MW/2 MWh battery offers to supply 1 MW at a price of \$40 in every hour of day-ahead and consume 1 MW at a price of \$20 in every hour, and the day-ahead price at 12:00 am and 1:00 am is \$41/MW, the battery will be scheduled to fully discharge by 2:00 am. If the day-ahead price never drops to \$20, the battery will not be scheduled to charge, and so cannot be scheduled to discharge at the peak hour of the day, even if the peak is \$500/MW. That solution would not satisfy the ISO-NE Tariff. Instead, the Tariff requires ISO-NE to schedule resources day-ahead when they are able to produce and consume energy in the “least cost” fashion,³³ with the result that the same battery would be scheduled to discharge at the \$500/MW peak hour, rather than in the \$41/MW first two hours of the day. As ISO-NE explained, because its day-ahead approach optimizes the charging and the discharging of storage resources, the result is a day-ahead schedule that maximizes social welfare, which tends also “to result in the resource’s Generator Asset clearing in the highest-priced hours of the day-ahead market and its DARD clearing in the lowest-priced hours.”³⁴

In contrast, the Commission-directed approach does not consider optimality. In its Order on Compliance, the Commission entirely disregards both that ISO-NE’s Tariff requires it to optimize day-ahead market clearing and the benefits that doing so brings to the system and

³² ISO-NE Data Request Response at 14 (emphasis in original).

³³ See Tariff Section III.1.7.6. (“The ISO shall schedule Day-Ahead and schedule and dispatch in Real-Time Resources economically on the basis of least-cost, security-constrained dispatch and the prices and operating characteristics offered by Market Participants.”).

³⁴ ISO-NE Data Request Response at 13.

individual storage resources.³⁵ Consideration of optimization in day-ahead state of charge accounting makes ISO-NE’s approach more effective than the Commission-directed approach in “improving the ability of electric storage resources to provide all of the services that they are technically capable of providing”³⁶ and in “allowing ISO-NE to procure such services more efficiently”³⁷ – and yet, in the Order on Compliance, the Commission cited these Order No. 841 requirements as rationales for *rejecting* ISO-NE’s approach.

Moreover, ISO-NE does not believe that the Commission-directed solution would be compatible with ISO-NE’s optimization feature. Therefore, the Commission-directed solution could not be offered to resources using the Maximum Daily Energy Limit and Maximum Daily Consumption Limit parameters. Requiring ISO-NE to move from a daily-cycle optimization to an approach that includes no optimization would produce an inferior day-ahead solution, could financially harm ISO-NE’s electric storage resources, and hence would not constitute well-reasoned decision-making.

D. In directing ISO-NE to institute a Maximum Run and Charge Time parameter in the day-ahead market, the Commission failed entirely to consider ISO-NE’s arguments that ISO-NE’s day-ahead solution is superior given New England’s market design. The Commission’s Order is also internally inconsistent in its failure to reconcile its seemingly contrary finding that the lack of a Maximum Run Time parameter in the real-time market is consistent with Order No. 841. The Commission’s order, therefore, is arbitrary and capricious and not the product of reasoned decision-making.

In the Order on Compliance, the Commission directed ISO-NE to institute a Maximum Run and Charge Time parameter in the day-ahead market.³⁸ In doing so, the Commission ignores

³⁵ The Data Request Response also notes, and the Commission also ignores, that resources in New England have been successfully using Maximum Daily Energy Limit and Maximum Daily Consumption Limit to achieve feasible and optimal schedules for years. (*See* ISO-NE Data Request Response at 13.)

³⁶ *See* Order on Compliance at P 150 (citing Order No. 841 at P 191).

³⁷ *See* Order on Compliance at P 150 (citing Order No. 841 at P 191).

³⁸ *See* Order on Compliance at P 149.

ISO-NE's arguments that ISO-NE's day-ahead solution accounts for the duration characteristic of electric storage resources at least as effectively as would a Maximum Run Time parameter and, given New England's market design, is in fact more useful.³⁹ As ISO-NE explained, a Maximum Run Time parameter would provide no useful information given the structure of the New England markets: "Under the ISO-NE energy market design, a Limited Energy Resource's maximum run [or charge] time is entirely dependent on the rate at which the resource discharges or charges (respectively); in ISO-NE, then, a maximum run time parameter alone would not provide useful information."⁴⁰ ISO-NE continued:

Rather than relying on time-based limitations, ISO-NE software instead relies on energy-based limitations to determine how long a resource will be able to generate or charge. These energy-based limitations – available energy and available storage in real-time and Maximum Daily Energy Limit and Maximum Daily Storage Limit in day-ahead – are, at least with respect to ISO-NE's market design, superior to maximum run time because they more closely model the true physical constraints at the facility. For example, an empty 10 MW/10 MWh battery has a maximum charge time of one hour if it is charged at a 100% rate; but would have a 10-hour maximum charge time if charged at a 10% rate. In either case, it has 10 MWh of available storage and no available energy.⁴¹

The Commission does not respond to, or even mention, this argument in its day-ahead discussion. As with the state of charge characteristics, the way in which ISO-NE accounts for duration characteristics in the day-ahead market satisfies the Commission's rationales for requiring RTOs to account for duration characteristics as well as or better than adopting a Maximum Run Time. Namely, ISO-NE's approach to accounting for duration characteristics in the day-ahead market allows an electric storage resource to:

- reflect that it is physically impossible to charge or discharge for longer than its

³⁹ In ISO-NE, the term "run time" is used for both generation and consumption; the term "charge time" is not used. For example, in ISO-NE's market software, both generators and DARDs submit a "Minimum Run Time" parameter.

⁴⁰ ISO-NE Answer at 18.

⁴¹ ISO-NE Answer at 18.

state of charge would allow;⁴²

- prevent ISO-NE from dispatching the resource to charge for a duration that would exceed the resource's Maximum State of Charge;⁴³ and
- provide useful information about how long the resource can be relied upon to receive energy from the grid if ISO-NE needs to dispatch it to do so.⁴⁴

Finally, ISO-NE also explained in its Answer that not including a Maximum Run Time parameter for electric storage resources is consistent with its treatment of other resource types. As ISO-NE explained, “no ISO-NE system relies on a maximum run time parameter and no resource-type submits one.”⁴⁵ The Commission found this argument persuasive when discussing the real-time market in the Order on Compliance. It wrote, in accepting the lack of a Maximum Run Time parameter: “As ISO-NE explains, its software does not contain a Maximum Run Time parameter. Therefore ISO-NE’s treatment of electric storage resources is consistent with its treatment of other resources.”⁴⁶ One paragraph later however, in its day-ahead market analysis, the Commission required that ISO-NE adopt a Maximum Run Time parameter – with no mention that no resource submits a Maximum Run Time parameter and no discussion of why this fact would be persuasive in one instance but not in another.

For all of these reasons, the Commission’s finding that ISO-NE’s approach to accounting for the duration characteristics of electric storage resources in the day-ahead market fails to comply with Order No. 841 is not the result of reasoned decision-making.

E. The Commission erred in ignoring ISO-NE’s arguments that in New England, state of charge accounting should consider the majority of electric storage resources currently coming forward to participate in the New

⁴² Order No. 841 at 221.

⁴³ Order No. 841 at 223.

⁴⁴ Order No. 841 at 223.

⁴⁵ ISO-NE Answer at 17-18.

⁴⁶ Order on Compliance at P 148.

England markets, which are co-located with intermittent resources. The Commission also failed to meaningfully consider ISO-NE’s arguments that adopting an alternative approach to state of charge accounting risks delay and wasted effort, could preclude the development of a better approach, and could jeopardize higher-priority ISO-NE projects. The Commission’s order, therefore, is arbitrary and capricious and not the product of reasoned decision-making.

In its Data Request Response, ISO-NE noted that its “early experience is that the majority of batteries expressing interest in participating in the New England markets are to be paired with photovoltaic (“PV”) facilities.”⁴⁷ On this point, ISO-NE observed that these facilities may have constraints unrelated to the battery’s charge/discharge cycle – for example, the battery and PV may share an inverter that places a limit on the combined output of the battery and PV, or the facility may be designed such that the battery can charge only from the PV.⁴⁸ In the Data Request Response, ISO-NE observed that by allowing these resources to account for *facility* constraints (as opposed to the constraints of the electric storage resource alone), ISO-NE’s approach to day-ahead state of charge accounting might prove superior to others. In the Order on Compliance, the Commission does not address ISO-NE’s concerns about how co-located facility constraints might impact state of charge accounting and how various day-ahead approaches might impact co-located storage-PV resources – the majority of storage resources expressing interest in participating in the New England wholesale markets. Nor did the Commission consider ISO-NE’s explanation that because its day-ahead market software “has a limited lifespan due to a software re-architecting being undertaken by ISO-NE’s vendor in conjunction with ISO-NE and other RTOs,” expending significant resources on the current platform was not an optimal course of action. Neither did it heed ISO-NE’s concern that no change to the day-

⁴⁷ ISO-NE Data Request Response at 15 n.52.

⁴⁸ See ISO-NE Data Request Response at 15 n. 52.

ahead market could come before the rearchitecture of the day-ahead market software.⁴⁹ Nor did it acknowledge ISO-NE's caution that, while further improvement to ISO-NE's storage rules would continue following its Order No. 841 compliance effort (just as those efforts began prior to the issuance of Order No. 841), especially in the case of new products and services:

it is extremely difficult to anticipate what issues will arise and which will be most pressing. Hence, those further efforts should be undertaken with the benefit of some experience gained after implementation, when both ISO-NE and participants have gained more insight into the operational requirements of storage resources as well as a sense of the strengths and weaknesses of the rules as filed. To do otherwise not only risks wasted effort and resources, but could actually delay or preclude better solutions once they are identified.”⁵⁰

Finally, as suggested in the Data Request Response, requiring ISO-NE to adopt the Commission's solution to accounting for electric storage resource state of charge characteristics and duration characteristics in the day-ahead market could jeopardize the timing of other critical efforts that directly impact the day-ahead market, including addressing issues related to storage resources co-located with intermittent resources; the aforementioned rearchitecture of the day-ahead market software; and addressing New England energy security issues

IV. CONCLUSION

WHEREFORE, for the foregoing reasons, ISO-NE respectfully requests that the Commission grant its request for rehearing.

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⁴⁹ See ISO-NE Answer at 6 and 12 (explaining that ISO-NE's current day-ahead market and real-time market software has a limited lifespan due to a software re-architecting being undertaken by ISO-NE's vendor in conjunction with ISO-NE and other RTOs).

⁵⁰ ISO-NE Answer at 3.

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