May 31, 2019

By Electronic Delivery

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Amendment to New York Independent System Operator, Inc. Order No. 841 Compliance Filing; Docket No. ER19-467-00_

Dear Secretary Bose:

The New York Independent System Operator, Inc. ("NYISO") respectfully submits limited amendments to the tariff revisions that were included in its Order No. 841[1] compliance filing submitted in the above-captioned docket on December 3, 2018 ("Compliance Filing"). As the NYISO described in its May 1, 2019 filing in this docket,[2] since the submission of the Compliance Filing, the NYISO has identified two implementation issues with respect to the ability of electric storage facilities to participate in the NYISO-administered markets as Generators that are Energy Limited Resources ("ELRs"). Accordingly, the NYISO respectfully submits three limited corrective amendments to the revisions to the NYISO's Market Administration and Control Area Services Tariff ("Services Tariff") that were initially proposed in the Compliance Filing. The purpose of the Tariff corrections is to reflect the NYISO's inability to permit electric storage facilities other than the Blenheim-Gilboa Pumped Storage Power Project ("Gilboa") to participate in its markets as ELRs that can Bid to withdraw Energy at their electrical locations. Instead, electric storage facilities will be able to participate in the NYISO's markets as Energy Storage Resources ("ESRs") when the Commission permits the Tariff revisions proposed in the Compliance Filing to become effective.

As discussed below, the tariff revisions first proposed in the Compliance Filing, as amended here, continue to be just, reasonable, and compliant with Order No. 841. The

[1] *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 162 FERC ¶ 61,127 (February 15, 2018), 83 Fed. Reg. 9580 (Mar. 6, 2018), Errata Notice (Feb 28, 2018) ("Order No. 841"), *Order on Reh'g. and Clarification*, Order No. 841-A, 167 FERC ¶ 61,154 (May 16, 2019).

[2] *See Response to April 1, 2019 Letter and Notification of Implementation Issues that Necessitate Additional Limited Compliance Tariff Revisions in Docket No. ER19-467-000*, filed May 1, 2019.

Commission should accept the NYISO's compliance tariff revisions as amended, and make them effective on the dates originally proposed in the Compliance Filing.[3]

I. Background

A. Identification of Errors in NYISO's Filing Letter

At the time that the NYISO submitted the Compliance Filing, it believed that it would be able to accommodate participation by electric storage facilities as ELRs that are able to Bid and receive a schedule to withdraw Energy as negative generation at their electrical location. However, in the course of developing specifications to implement the rules and market design proposed in the Compliance Filing, the NYISO has determined that making the ability to withdraw Energy available to a broad range of Generators that are ELRs will not be possible by the NYISO's proposed effective date, and would only be possible if NYISO undertakes a highly resource-intensive set of software and supporting tariff revisions to accommodate the operation of ELRs that are able to withdraw Energy as negative generation at their electrical location. Accordingly, the Compliance Filing's statements on this point[4] have proved to be inaccurate.

The Compliance Filing also stated that, after its proposed ESR-related tariff revisions become effective, electric storage facilities that need to withdraw Energy to recharge would be able to choose between operating as an ESR or operating as an ELR that can withdraw Energy.[5] The NYISO has similarly concluded that it will not be able to expand the ability for ELRs to withdraw Energy by the effective date requested in the Compliance Filing. Implementing ELRs as Generators that are able to withdraw Energy as negative generation at their electrical location will only be possible if and when the NYISO undertakes the resource-intensive software and supporting tariff revisions referenced above.

As explained below, developing the functionality required to permit ELRs to withdraw Energy as negative generation at their electrical location is not necessary to allow the vast majority or all of the electric storage facilities in the NYISO's interconnection queue to participate in the ISO-administered markets. The NYISO expects the ESR participation model to be a superior choice for these resources. It is not possible for the NYISO to complete and implement both its ESR participation model and withdrawal-eligible ELRs by the effective date requested in the Compliance Filing. To avoid delaying entry of electric storage facilities into the NYISO markets, the NYISO respectfully submits that it should be allowed to (a) proceed with the implementation of the ESR tariff revisions proposed in the Compliance Filing, as amended by this submission, and (b) to give its stakeholders the opportunity to weigh-in on the value of developing ELRs that can withdraw Energy as negative generation in the project prioritization process.[6]

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[3] *See* Compliance Filing at Section X.

[4] *See* Compliance Filing at 15.

[5] *See* Compliance Filing at 14-15.

[6] The NYISO is presenting the development of ELRs that are able to withdraw Energy as negative generation at their electrical location to its stakeholders as a project that can be prioritized for development commencing in 2020.

B. The ESR Participation Model Will Provide Enhanced Revenues and Produce a Superior Market Solution for Energy Storage Resources with Flexible Operating Characteristics

The NYISO's proposed Tariff rules will permit ESRs to participate in its markets on a just and reasonable basis that is consistent with Order No. 841. The ESR model is designed to accommodate the operation of advanced energy storage facilities and provides greater opportunities for these resources to earn revenues in the NYISO's Energy and Ancillary Services markets than participating as an ELR that could Bid to withdraw Energy at its electrical location would. For the vast majority of electric storage facilities, including all of the storage resources that are presently in the NYISO's interconnection queue (which are all batteries), the NYISO's ESR participation model will provide superior opportunities to earn market revenues.

The ESR participation model is the superior option for flexible advanced energy storage resources because it allows a resource to offer to be dispatched from its maximum withdraw level (its Lower Operating Limit or "LOL") to its maximum injection level (its Upper Operating Limit or "UOL"). A 10 MW storage resource using the ESR model can submit a single offer to be available from -10 MW to 10 MW. The resource can be scheduled to inject Energy in one interval, and to withdraw Energy in the next interval if the LBMP at its location changes. When offering this way, the storage resource can set price if it is scheduled for Energy, Operating Reserves and/or Regulation Service.

In contrast, the ELR participation model that permits Energy withdrawals requires a storage resource to choose on an hour-by-hour basis (at least 75 minutes before the start of each market hour in real-time) whether it wishes to participate solely as an injection resource or solely as a withdrawing resource. When real-time prices change dramatically intra-hour, the operation of an ELR that can either Bid to inject Energy, or to withdraw Energy (but not both) cannot fully respond to the change. The ESR participation model enables the NYISO to maximize the use of, and the net revenues paid to, ESRs by flexibly modifying these resources' schedules in response to intra-hour positive and negative price changes (spikes).

The ESR participation model also is superior to participating in the NYISO's markets as an ELR that can Bid to withdraw Energy at its electrical location because the ESR participation model enhances the ability of ESRs to sell reserves, especially when the electric storage resource is scheduled to withdraw Energy. A 10 MW ESR's ability to offer a continuous operating range that extends from its LOL of -10 MW to its UOL of 10 MW allows the storage resource to be scheduled to provide up to 20 MW of Operating Reserves when it is scheduled to withdraw 10 MW of Energy.

The participation model used for ELRs that can Bid to withdraw Energy at their electrical location would only allow an energy storage resource to be awarded up to 10 MW of Operating

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If stakeholders indicate sufficient support for these changes, then the NYISO will move forward with developing this additional functionality. *See* Section II.B.1, below.

Reserves, as its Bid is bounded from zero to the UOL, or from zero to the LOL, depending on whether the ELR is injecting or withdrawing in that hour. While both ESRs and withdrawaleligible ELRs can accrue Operating Reserve revenues while they are scheduled to withdraw Energy, an ESR's opportunity to earn Operating Reserve revenues when it is scheduled to withdraw Energy is significantly greater.

In addition to the benefits participating energy storage resources receive, the ESR model is also expected to produce more efficient solutions and to enhance the efficiency of the NYISO's markets as a whole. The NYISO designed the ESR participation model to include state of charge management, which can improve the scheduling of energy storage resources in the Day-Ahead Market and increase the revenue potential of storage resources by allowing the NYISO's market optimization to (i) account for charge/discharge losses with its roundtrip efficiency parameter, and (ii) determine the optimal hours to charge and discharge a storage resource based on the resource's submitted hourly production cost and energy level. This improved scheduling capability will benefit New York consumers by ensuring that charging and discharging of the participating ESR is performed while minimizing the overall production cost for all resources and customers participating in the NYISO's Day-Ahead Market.

II. Tariff Amendments

A. Revisions to Services Tariff

The NYISO has identified three provisions in the proposed amendments contained in the Compliance Filing that erroneously state or suggest that the NYISO is able to accommodate participation in its markets by all electric storage facilities that are capable of withdrawing Energy to recharge or refill as ELRs that are eligible to withdraw Energy as negative generation at their electrical location. The NYISO proposes here to delete such language to clarify that the NYISO lacks the ability to offer ELR as a participation model for electric storage facilities that must withdraw Energy from the grid to recharge or refill. The three sections of the Services Tariff that require amendment ("Amended Tariff Provisions"), and the necessary changes, are as follows.

The first change is to the definition of Energy Limited Resource in Section 2.5 of the Services Tariff. Specifically, the NYISO seeks to amend the definition of Energy Limited Resource proposed in the Compliance Filing, as follows (the proposed deletion is highlighted):

> **Energy Limited Resource:** Capacity resources, not including BTM:NG Resources, that, due to environmental restrictions on operations, cyclical requirements, such as the need to recharge or refill, or other non-economic reasons, are unable to operate continuously on a daily basis, but are able to operate for at least four consecutive hours each day. If an Energy Limited Resource requires Energy to recharge or refill, it is also a Withdrawal-Eligible Generator. Energy Limited Resources must register their Energy limiting characteristics with, and justify them to, the ISO consistent with ISO Procedures. Resources that meet the qualifications to be an Energy Limited Resource, and choose to participate in the wholesale market as an Energy Limited Resource, are not subject to the rules applicable to Energy Storage Resources.

The NYISO also seeks to amend the versions of Services Tariff Sections 15.4.2.1 and 15.4.3.1 that were proposed in the Compliance Filing as follows (the proposed deletions are highlighted):

15.4.2.1 Bidding and Bid Selection

Resources capable of providing Spinning Reserve, 10-Minute Non-Synchronized Reserve and/or 30-Minute Reserve in the Day-Ahead commitment may submit Availability Bids for each hour of the upcoming day. If a Supplier offers Resources that are capable, based on their indicated commitment status, of providing Operating Reserves but does not submit an Availability Bid, its Day-Ahead Bid will be rejected in its entirety. A Supplier may resubmit a complete Day-Ahead Bid, provided that the new bid is timely.

* * *

For an Energy Limited Resource that is withdrawing Energy, the sum of the Resource's Energy Schedule, the amount of Regulation Capacity it is scheduled to provide, and the amount of each Operating Reserves product it is scheduled to provide ~~shall not exceed the lesser of zero or its Upper Operating Limit. F~~or an Energy Storage Resource that is withdrawing Energy, the sum of the Resource's Energy Schedule, the amount of Regulation Capacity it is scheduled to provide, and the amount of Operating Reserves product it is scheduled to provide shall not exceed its Upper Operating Limit.

15.4.3.1 Bid Selection

The ISO will automatically select Operating Reserves Suppliers in real-time from eligible Resources, that submit Real-Time Bids pursuant to Section 4.4 of, and Attachment D to, this ISO Services Tariff. Each Supplier will automatically be assigned a real-time Operating Reserves Availability bid of $0/MW for the quantity of Capacity that it makes available to the ISO in its Real-Time Bid.

* * *

For an Energy Limited Resource that is withdrawing Energy, the sum of the Resource's Energy schedule, the amount of Regulation Capacity it is scheduled to provide, and the amount of each Operating Reserves product it is scheduled to provide ~~shall not exceed the lesser of zero or its UOL. F~~or an Energy Storage Resource that is withdrawing Energy, the sum of the Resource's Energy Schedule, the amount of Regulation Capacity it is scheduled to provide and the amount of Operating Reserves product it is scheduled to provide shall not exceed its UOL. The ISO may limit the availability of a Withdrawal-Eligible Generator to provide Operating Reserves based on its Energy Level constraints.

The proposed amendments are very limited in scope, and are intended only to reflect the practical implementation limitations that the NYISO has identified. None of the proposed changes affect Services Tariff provisions that have been accepted for filing by the Commission.

B. Justification

1. Implementation of Withdrawal-Eligible ELRs in NYISO's Energy and Ancillary Services Markets Will Require a Prolonged Effort that Will Delay the Participation of ESRs in the NYISO Markets and Will Provide Limited or No Benefits

The NYISO's market and settlement systems are not presently designed to economically evaluate Bids to withdraw Energy, or to settle Energy withdrawals as negative generation at the generator bus, for any resource other than Gilboa. Gilboa commenced operation before the NYISO-administered markets were first implemented in 1999, and is presently the only pumped storage resource in the New York Control Area ("NYCA") that is able to withdraw Energy as negative generation to fill its reservoirs.

At the time that the NYISO submitted the Compliance Filing, it believed that the software that accommodates Gilboa's participation in the markets could be quickly adapted to permit other electric storage facilities to participate as ELRs that are able to withdraw Energy as negative generation at their electrical location. The market and settlement software that NYISO employs to accommodate pumped storage as an ELR that can withdraw Energy is specifically tied to the Gilboa unit's operation and to its associated generator buses. In the process of developing software specifications to implement its Order No. 841 compliance proposal, the NYISO determined that the existing software could not be enhanced or expanded to accommodate a broader range of resources, and instead would need to be almost entirely reconstructed. The existing software does not include the functionality to add new resources; not even resources that have operating characteristics similar to Gilboa's. Furthermore, the current software design provides limited bidding flexibility that is adequate to accommodate large pumped storage facilities, but that the NYISO does not expect to be sufficient for new battery technologies.[7] Because of the described limitations of the existing software, the NYISO will not be able to permit new resources to withdraw Energy as negative generation until the ESR participation model is completed and deployed.

The NYISO cannot readily enhance and expand its existing software to permit new resources that need to withdraw Energy in order to recharge to participate as Generators that are ELRs. Substantial additional effort (effectively, a major new software redesign, using many of the same resources that the NYISO is relying on to implement the other Order No. 841 compliance tasks) would be required to reconstruct and enhance the existing software to permit

[7] For example, Gilboa's Bids to withdraw Energy contain a single price (that Gilboa is willing to pay to withdraw Energy) and a specific MW value, indicating the quantity of Energy that Gilboa will be scheduled to withdraw when its Bid is accepted. The software is not designed to accept Bids to withdraw differing quantities of Energy at different prices.

the scheduling and settlement of new ELRs that withdraw Energy as negative generation at their electrical location. The NYISO anticipates implementing the ESR-related tariff revisions proposed in its Compliance Filing, as amended by this filing, no earlier than May 1, 2020.[8] The NYISO would not be able to undertake the additional work to enable ELRs to withdraw Energy as negative generation before the ESR effort is completed without significantly impacting the delivery schedule for the ESR functionality.

Redeveloping the necessary software capabilities and implementing ELRs that can withdraw Energy as negative generation at their location in the NYISO's markets would require modifications to many of the same systems (*e.g.*, the Market Information System, Security-Constrained Unit Commitment, Real-Time Commitment, Real-Time Dispatch and Billing and Settlement System) that the NYISO must modify to implement ESR. The NYISO employees and external contractors who possess the necessary expertise are currently fully engaged in developing the functionality needed to implement ESR and in supporting the NYISO's ongoing efforts to replace its Energy Management and Business Management Systems. If the Commission were to instruct the NYISO to develop and implement ELRs that can withdraw energy as negative generation before the ESR project is complete, then the NYISO's employees and contractors would be required to divide their time between the ELR and ESR projects, which would significantly delay NYISO's efforts to complete and deploy its proposed ESR participation model for energy storage facilities.

As explained in Section I.B of this filing letter, the NYISO expects that the ESR participation model will provide greater opportunities for electric storage facilities to earn market revenues than operating as an ELR that is able to withdraw Energy might, and that the NYISO's markets will operate more efficiently if electric storage facilities participate as ESRs. As further explained below, the NYISO is not aware of any electric storage facilities in its interconnection queue that would not be able to participate in the NYISO's markets as ESRs. In light of these facts, it is unnecessary for the Commission to instruct the NYISO to delay the implementation of the ESR participation model until the NYISO is also able to permit Generators that are Energy Limited Resources to withdraw Energy as negative generation at their electrical location. Such a delay would only impede the ability of viable energy storage resources to participate in the ISO-administered markets. The NYISO requests that the Commission accept the tariff revisions specified above so that it may concentrate its resources on implementing the ESR participation model as quickly as practicable.

In order to determine whether software enhancements needed to accommodate withdrawal-eligible ELRs are of high value to the NYISO's stakeholders and are worth pursuing, the NYISO is in the process of presenting this set of enhancements to its stakeholders as a project that can be prioritized for development commencing in 2020.[9] If stakeholders indicate

[8] *See* Compliance Filing at 2, 64.

[9] *See* proposed Project #37, entitled *WEELR Participation Model*, at the following link: https://www.nyiso.com/documents/20142/6544060/Project%20Candidate%20Descriptions%20-%20clean.pdf/48f51ad1-b2c7-e36f-5270-846eb6778c6f

sufficient support for these changes, then the NYISO will move forward with developing this additional functionality, including any necessary supporting Tariff revisions.

Facts stated in this section regarding the NYISO's ability to develop necessary market and settlement software to implement its ESR participation model, and/or to develop the ability to accommodate ELRs that can withdraw Energy as negative generation at their location, are confirmed in the Affidavit of Brandon Cheely, the NYISO's Manager of Reliability and Markets Technologies, which is included as Attachment I hereto.

2. The NYISO's Order No. 841 Compliance Proposal Remains Just and Reasonable, and Does Not Unduly Discriminate Against Any Type of Electric Storage Facility

The NYISO respectfully submits that, even without the enhanced ELR functionality referenced above, its proposal to comply with Order No. 841 is just, reasonable, and not unduly discriminatory, and should be approved. For the vast majority of electric storage facilities, including all of the electric storage facilities that are currently in the NYISO's interconnection queue, participating as an ESR will provide greater market revenues to the resource than participating as an ELR that can withdraw Energy would, and will enable the NYISO to develop a more efficient least-cost market solution.

a. Because Gilboa Is Different From the Electric Storage Facilities Entering the NYISO Markets Today Treating it Differently Is Justified

All electric storage facilities in the NYISO's current interconnection queue are based on advanced battery technology.[10] The NYISO understands based on discussions with its stakeholders and developers that the advanced storage technologies being contemplated for future deployment in New York as ESRs, including the projects in the NYISO's interconnection queue, are capable of being synchronized to the grid without injecting or withdrawing any Energy and can be dispatched to inject or withdraw Energy from an idle state (where there is no Energy injection or withdrawal occurring). No start-up decision or minimum load, or related commitment costs, should be required for these resources to accurately represent their capabilities. Rather, when available, these electric storage facilities can respond in milliseconds without advance notice to a dispatch instruction, and can idle at zero output. The ESR participation model is designed to accommodate the operation of battery-based and other advanced energy storage facilities.

There is one electric storage facility in the NYISO's markets - Gilboa - that is eligible to submit start-up bids, to recover minimum generation costs, and to withdraw Energy as negative

[10] There are no pumped storage projects in the NYISO's interconnection queue and the NYISO is not aware of any developer that plans to interconnect a new pumped storage facility to the New York Control Area.

generation in the NYISO's markets. Gilboa entered service in 1973 and has participated in the NYISO's markets since their inception in 1999. The scheduling and operation of battery-based and other advanced energy storage facilities is very different from the manner in which pumped storage hydroelectric technologies, such as Gilboa, must operate. Unlike a battery, Gilboa relies on enormous hydroelectric turbines to produce Energy and to pump water back into its reservoirs. While a battery-based electric storage facility can inject small amounts (a MW or less) of Energy, it is not possible to operate the large hydroelectric turbines at Gilboa to produce similarly small quantities of Energy. The turbines simply will not spin, or will not spin quickly enough, to produce electricity. When the turbines are used to pump water into the reservoir at Gilboa they require a substantial amount of Energy to operate and are not capable of starting nearly-instantaneously. These differences between advanced energy storage facilities and pumped storage facilities justify treating advanced energy storage facilities differently in the NYISO's markets. There is no immediate need for the NYISO to develop additional functionality to accommodate large hydroelectric pumped storage facilities because no such facilities have been proposed for interconnection to the NYCA.

b. The ESR Participation Model Will Provide Electric Storage Facilities with Flexible Operating Characteristics the Opportunity to Participate in the NYISO's Markets on a Just and Reasonable Basis

Section I.B of this filing letter explains in detail how the NYISO's ESR participation model gives electric storage facilities with flexible operating characteristics the opportunity to earn enhanced revenues in the NYISO's markets. The proposed ESR rules will provide flexible electric storage facilities greater opportunity to earn Energy and Ancillary Services market revenues than participating as an ELR that can Bid to withdraw Energy at its electrical location might. The proposed ESR rules will permit electric storage facilities with flexible operating characteristics to participate in the NYISO's markets on a just and reasonable basis.

III. Documents Submitted

Along with this filing letter, the NYISO respectfully submits the following documents:

1. The Affidavit of Brandon Cheely ("Attachment I");

2. A clean version of the proposed revisions to the NYISO's Services Tariff ("Attachment II"); and

3. A blacklined version of the proposed revisions to the NYISO's Services Tariff ("Attachment III").

IV. Effective Date and Comment Period

The changes reflected in the Amended Tariff Provisions are very narrow in scope, and do not affect the NYISO's timeframe for developing the other changes necessary to implement its Order No. 841 compliance proposal. Accordingly, the NYISO continues to ask for the same effective dates requested in Section X of the Compliance Filing.

In addition, the NYISO respectfully requests that the Commission limit the scope of the comments that might be submitted on this filing to the specific changes reflected in the Amended Tariff Provisions. As emphasized above, the amendments proposed herein are limited to the narrow issue of the NYISO's ability to accommodate the full participation in the NYISO-administered markets of energy storage resources as ELRs that are able to withdraw Energy as negative generation at their electrical location. The comments to be submitted on this filing should be limited to this issue, and to the specific tariff amendments being proposed by the NYISO in this filing. Parties to this proceeding have had notice of, and a full opportunity to comment on, all other aspects of the Compliance Filing, and the Commission should not permit parties to comment on issues that are not implicated by the present filing.

V. Service

The NYISO will send an electronic link to this filing to the official representative of each party to this proceeding, to the official representative of each of its customers, to each participant on its stakeholder committees, and to the New York Public Service Commission. In addition, a complete copy of the documents included with this filing will be posted on the NYISO's website at www.nyiso.com.

VI. Conclusion

The NYISO respectfully submits that the amendments to the Compliance Filing, as set forth above, are just, reasonable, and fully compliant with Order No. 841. Accordingly, the NYISO asks that the Commission accept the Compliance Filing, as amended herein, without modification.

Respectfully submitted,

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