DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

18 CFR Part 35

[Docket Nos. RM16–23–000; AD16–20–000]

Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators

AGENCY: Federal Energy Regulatory Commission, Department of Energy.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Federal Energy Regulatory Commission (Commission) is proposing to amend its regulations under the Federal Power Act (FPA) to remove barriers to the participation of electric storage resources and distributed energy resource aggregations in the capacity, energy, and ancillary service markets operated by regional transmission organizations (RTO) and independent system operators (ISO) (organized wholesale electric markets).

DATES: Comments are due January 30, 2017.

ADDRESSES: Comments, identified by docket number, may be filed in the following ways:

- Electronic Filing through *http://www.ferc.gov*. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format.
- *Mail/Hand Delivery:* Those unable to file electronically may mail or hand-deliver comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street NE., Washington, DC 20426.

Instructions: For detailed instructions on submitting comments and additional information on this process, see the Comment Procedures Section of this document.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

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I. Introduction

1. In this Notice of Proposed Rulemaking (NOPR), the Federal Energy Regulatory Commission (Commission) is proposing reforms to remove barriers to the participation of electric storage resources [1] and distributed energy resource [2] aggregations in the organized wholesale electric markets.[3] Specifically, we propose to require each RTO and ISO to revise its tariff to (1) establish a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in the organized wholesale electric markets and (2) define distributed energy resource aggregators as a type of market participant that can participate in the organized wholesale electric markets under the participation model that best accommodates the physical and operational characteristics of its distributed energy resource aggregation. We are taking this action pursuant to our legal authority under section 206 of the FPA to ensure that the RTO/ISO tariffs are just and reasonable and not unduly discriminatory or preferential.[4]

2. Resource participation in the organized wholesale electric markets is currently governed by (1) participation models [5] consisting of market rules designed for different types of resources and (2) the technical requirements for

[1] We define an electric storage resource as a resource capable of receiving electric energy from the grid and storing it for later injection of electricity back to the grid regardless of where the resource is located on the electrical system. These resources include all types of electric storage technologies, regardless of their size, storage medium (*e.g.,* batteries, flywheels, compressed air, pumped-hydro, etc.), or whether located on the interstate grid or on a distribution system.

[2] We define distributed energy resources as a source or sink of power that is located on the distribution system, any subsystem thereof, or behind a customer meter. These resources may include, but are not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment.

[3] We define, for present purposes, organized wholesale electric markets as the capacity, energy, and ancillary service markets operated by regional transmission organizations (RTO) and independent system operators (ISO).

[4] 16 U.S.C. 824e (2012).

[5] We define a participation model as a set of tariff provisions that accommodate the participation of resources with particular physical and operational characteristics in the organized wholesale electric markets of the RTOs and ISOs.

market services that those resources are eligible to provide. Each RTO/ISO establishes the participation models for different types of resources and the technical requirements for providing services in a slightly different way. Sometimes RTO/ISO participation models place limitations on the services that certain types of resources are eligible to provide. For example, Stored Energy Resources are only allowed to provide regulation service in the Midcontinent Independent System Operator, Inc. (MISO). In addition, sometimes the technical requirements for providing a service may limit the types of resources that are able to provide it, such as the requirement for a resource to be running and synchronized to the grid to provide spinning reserves. Many tariffs were originally developed in an era when traditional generation resources were the only resources participating in the organized wholesale electric markets. As new and innovative resources have reached commercial maturity, RTOs/ISOs have updated their tariffs to establish participation models for these resources and, to some degree, reviewed the technical requirements for each service or determined which service the new resource could provide. If an RTO/ISO is not able to update its market rules before a new resource becomes commercially able to sell into the organized wholesale electric markets, the new resource may need to participate under one of the existing participation models developed for some other type of resource. Doing so may limit the market opportunities for new resources and correspondingly limit the potential supply of some services. For instance, some electric storage resources have chosen to participate as demand response resources simply because, absent other participation models, that is the participation model that more closely resembles the manner in which electric storage resources might participate in the organized wholesale electric markets. Further, new resources may have difficulty creating momentum for the market rule changes necessary to facilitate their participation and may thus need to spend considerable time and effort to gain entry to the organized wholesale electric markets. Where rules designed for traditional generation resources are applied to new technologies, where new technologies are required to fit into existing participation models, and where participation models focus on the eligibility of resources to provide services more so than the technical ability of resources to provide services, barriers can emerge to the participation of new technologies in the organized wholesale electric markets. We are therefore issuing this NOPR to address these barriers to the participation of electric storage resources and distributed energy resource aggregations in the organized wholesale electric markets.

3. First, we propose to require each RTO/ISO to revise its tariff to establish a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in the organized wholesale electric markets. As noted above, in this NOPR, we define a participation model as a set of tariff provisions that accommodate the participation of resources with particular physical and operational characteristics in the organized wholesale electric markets of the RTOs and ISOs.[6] For example, the California Independent System Operator Corporation's (CAISO) tariff defines several participation models, including those for Participating Generators, Proxy Demand Resources, Reliability Demand Response Resources, and Non-Generator Resources. These participation models create unique rules for these different types of resources where they need to be distinguished from other types of market participants. For example, the CAISO Tariff defines Non-Generator Resources as ''[r]esources that operate as either Generation or Load and that can be dispatched to any operating level within their entire capacity range but are also constrained by a MWh limit to (1) generate Energy, (2) curtail the consumption of Energy in the case of demand response, or (3) consume Energy.'' [7] Since Non-Generator Resources are operationally unique, CAISO has created rules for them that include, but are not limited to, the requirement to enter into participating generator and participating load agreements to participate in the CAISO markets,[8] the ability to participate in the Regulation Energy Management program,[9] the conditions under which payments are rescinded due to MWh constraints,[10] and the relevant bidding parameters.[11] Given the unique attributes of electric storage resources, establishing a participation model consisting of market rules that acknowledge their unique attributes will enable them to effectively participate in the organized wholesale electric markets. This participation model could adapt existing market rules to incorporate the reforms proposed below and/or create a new set of rules to accommodate the participation of electric storage resources, depending on the existing market construct in each RTO/ISO.

4. The proposed participation model must (1) ensure that electric storage resources are eligible to provide all capacity, energy and ancillary services that they are technically capable of providing in the organized wholesale electric markets; (2) incorporate bidding parameters [12] that reflect and account for the physical and operational characteristics of electric storage resources; (3) ensure that electric storage resources can be dispatched and can set the wholesale market clearing price as both a wholesale seller and wholesale buyer consistent with existing market rules that govern when a resource can set the wholesale price; (4) establish a minimum size requirement for participation in the organized wholesale electric markets that does not exceed 100 kW; and (5) specify that the sale of energy from the organized wholesale electric markets to an electric storage resource that the resource then resells back to those markets must be at the wholesale locational marginal price (LMP).

5. Second, we propose to require each RTO/ISO to revise its tariff to allow distributed energy resource aggregators,[13] including electric storage resources, to participate directly in the organized wholesale electric markets. Specifically, we propose to require each RTO/ISO to establish distributed energy resource aggregators as a type of market participant and allow the distributed energy resource aggregators to register distributed energy resource aggregations under the participation model in the

[6] *See supra* note 5.

[7] CAISO Response at 3 (citing CAISO Tariff, App. A).

[8] *See* CAISO Tariff, sections 4.6 and 4.7.

[9] *See* CAISO Tariff, section 8.4.1.2. Regulation Energy Management is a market feature for resources located within the CAISO Balancing Authority Area that require Energy from the Real-Time Market to offer their full capacity as Regulation. CAISO Tariff, App. A (Definitions).

[10] *See* CAISO Tariff, sections 8.10.8.4 and 8.10.8.6.

[11] *See* CAISO Tariff, section 30.5.6.

[12] We refer to bidding parameters as the physical and operational constraints that a resource would identify per RTO/ISO requirements when submitting offers to sell capacity, energy, or ancillary services or bids to buy energy in the organized wholesale electric markets. Commission Staff referred to these as ''bid parameters'' in the Data Requests and Request for Comments issued on April 11, 2016 in Docket No. AD16–20–000.

[13] We define distributed energy resource aggregator as an entity that aggregates one or more distributed energy resources for purposes of participation in the organized wholesale capacity, energy, and ancillary service markets of the RTOs and ISOs.

RTO/ISO tariff that best accommodates the physical and operational characteristics of the distributed energy resource aggregation. We also propose to require that each RTO/ISO, to accommodate the participation of distributed energy resource aggregations in the organized wholesale electric markets, establish market rules on: (1) Eligibility to participate in the organized wholesale electric markets through a distributed energy resource aggregator; (2) locational requirements for distributed energy resource aggregations; (3) distribution factors and bidding parameters for distributed energy resource aggregations; (4) information and data requirements for distributed energy resource aggregations; (5) modifications to the list of resources in a distributed energy resource aggregation; (6) metering and telemetry system requirements for distributed energy resource aggregations; (7) coordination between the RTO/ISO, distributed energy resource aggregator, and the distribution utility; and (8) market participation agreements for distributed energy resource aggregators.

II. Background

A. Electric Storage Resource and Distributed Energy Resource Aggregation Participation in Organized Wholesale Electric Markets

6. The Commission has an ongoing interest in removing barriers to resources that are technically capable of participating in the organized wholesale electric markets and has been monitoring electric storage resource participation in these markets for some time. In 2010, Commission Staff issued a Request for Comments Regarding Rates, Accounting and Financial Reporting for New Electric Storage Technologies related to alternatives for categorizing and compensating storage services and, in particular, ideas on how best to develop rate policies that accommodate the flexibility of storage, consistent with the FPA.[14] Following that request, the Commission issued several rulemakings that have helped alleviate some of the barriers to electric storage resource participation in organized wholesale electric markets.[15] In addition, the Commission has addressed electric storage-related issues on a case-by-case basis.[16]

7. As the capabilities of electric storage resources and distributed energy resources continue to improve and their costs continue to decline, the Commission has become concerned that these resources may face barriers that limit them from participating in organized wholesale electric markets. To further examine this issue, the Commission hosted a panel to discuss electric storage resources at the November 19, 2015 Commission meeting. Subsequently, on April 11, 2016, Commission Staff issued data requests to each of the six RTOs/ISOs, seeking information about the rules in the organized wholesale electric markets that affect the participation of electric storage resources (Data Requests).[17] Concurrently, Commission Staff issued a Request for Comments, seeking comments on whether barriers exist to the participation of electric storage resources in the organized wholesale electric markets that may potentially lead to unjust and unreasonable wholesale rates (Request for Comments). In addition to the responses from the RTOs/ISOs, Commission Staff received 44 sets of comments from the entities identified in Appendix A.

8. A number of RTOs/ISOs allow participation of distributed energy resources, including electric storage resources, in the organized wholesale electric markets through distributed energy resource aggregations. For example, CAISO's Distributed Energy Resource Provider model allows for the participation of aggregated distributed energy resources in the energy and ancillary service markets.[18] Other RTOs/ISOs, including PJM Interconnection, L.L.C. (PJM), MISO, New York Independent System Operator, Inc.'s (NYISO), and SPP, allow aggregation in limited circumstances, typically linked to the requirement that the demand-side, generation, and electric storage resources are located behind the same point of interconnection or pricing node.[19] ISO New England Inc. (ISO–NE) also allows limited aggregations of generators, Alternative Technology Regulation Resources, Asset Related Demands, and demand resources subject to certain parameters.[20]

B. The Need for Reform

9. The Commission must ensure that the rates, terms and conditions of jurisdictional services under the FPA are just and reasonable and not unduly discriminatory or preferential. Our proposal in this proceeding is a continuation of efforts pursuant to our authority under the FPA to ensure that the RTO/ISO tariffs and market rules produce just and reasonable rates, terms and conditions of service.[21] The Commission has observed that market rules designed for traditional generation resources can create barriers to entry for emerging technologies. The Commission has responded by promulgating rules that recognize the operational characteristics of non-traditional resources such as variable energy

[14] Request for Comments Regarding Rates, Accounting and Financial Reporting for New Electric Storage Technologies, Docket No. AD10–13–000 (June 11, 2010).

[15] *See, e.g., Frequency Regulation Compensation in the Organized Wholesale Power Markets,* Order No. 755, FERC Stats. & Regs. ¶ 31,324 (2011), *reh'g denied,* Order No. 755–A, 138 FERC ¶ 61,123 (2012) (addressing the provision of frequency regulation in organized wholesale electric markets); *Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies,* Order No. 784, FERC Stats. & Regs. ¶ 31,349 (2013), *order on clarification,* Order No. 784–A, 146 FERC ¶ 61,114 (2014) (addressing third-party sales of ancillary services in bilateral markets); *Small Generator Interconnection Agreements and Procedures,* Order No. 792, 145 FERC ¶ 61,159 (2013), *clarifying,* Order No. 792–A, 146 FERC ¶ 61,214 (2014) (addressing interconnection for small generators, including electric storage resources).

[16] *See, e.g., California Indep. Sys. Operator Corp.,* 156 FERC ¶ 61,110 (2016); *Nev. Hydro Co., Inc.,* 122 FERC ¶ 61,272 (2008), *reh'g denied,* 133 FERC ¶ 61,155 (2010); *Western Grid Development, LLC,* 130 FERC ¶ 61,056, *reh'g denied,* 133 FERC ¶ 61,029 (2010); *Midwest Indep. Trans. Sys. Operator, Inc.,* 129 FERC ¶ 61,303 (2009); *New York Indep. Sys. Operator, Inc.,* 127 FERC ¶ 61,135 (2009); *California Indep. Sys. Operator Corp.,* 132 FERC ¶ 61,211 (2010); *PJM Interconnection L.L.C.,* 151 FERC ¶ 61,208, *order on reh'g,* 152 FERC ¶ 61,064 (2015), *order on reh'g and compliance,* 155 FERC ¶ 61,157, *order on reh'g and compliance,* 155 FERC ¶ 61,260 (2016); *PJM Interconnection, L.L.C.,* 132 FERC ¶ 61,203 (2010); *Commonwealth Edison Co.,* 129 FERC ¶ 61,185, at P 8 (2009).

[17] Specifically, Commission Staff requested information related to (1) the eligibility of electric storage resources to participate in the capacity, energy, and ancillary service markets in the RTOs/ISOs; (2) the technical qualification and performance requirements for market participants; (3) the bidding parameters for different types of resources; (4) opportunities for distribution-level and aggregated electric storage resources to participate in the organized wholesale electric markets; (5) the treatment of electric storage resources when they are receiving electricity for later injection to the grid; and (6) any forthcoming rule changes or other stakeholder initiatives that may affect the participation of electric storage resources in the organized wholesale electric markets.

[18] *See California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229 (2016) (conditionally accepting tariff provisions to facilitate participation of aggregations of distribution-connected or distributed energy resources in CAISO's energy and ancillary service markets).

[19] *See* PJM Response at 20; MISO Response at 16; SPP Response at 7.

[20] ISO–NE Response at 26.

[21] *See, e.g., Integration of Variable Energy Resources,* Order No. 764, FERC Stats. & Regs. ¶ 31,331, *order on reh'g,* Order No. 764–A, 141 FERC ¶ 61,232 (2012), *order on reh'g,* Order No. 764–B, 144 FERC ¶ 61,222 (2013); *Wholesale Competition in Regions with Organized Electric Markets,* Order No. 719, FERC Stats. & Regs. ¶ 31,281 (2008), *order on reh'g,* Order No. 719–A, FERC Stats. & Regs. ¶ 31,292 (2009), *order on reh'g,* Order No. 719–B, 129 FERC ¶ 61,252 (2009).

resources and demand response.[22] For example, in Order No. 719, the Commission required each RTO/ISO to accept bids from demand response resources, on a basis comparable to any other resources, for ancillary services that are acquired in a competitive bidding process, if the demand response resources met certain criteria.[23] In Order No. 764, the Commission took action to remedy operational and other challenges associated with the integration of variable energy resources caused by existing practices as well as the ancillary services used to manage system variability that were developed at a time when virtually all generation on the system could be scheduled with relative precision and when only load exhibited significant degrees of intra-hour variation.[24]

10. In this proceeding, we propose to require RTOs/ISOs to address barriers to participation of electric storage resources in the organized wholesale electric markets. As noted above, in this NOPR, we define an electric storage resource as a resource capable of receiving electric energy from the grid and storing it for later injection of electricity back to the grid regardless of where the resource is located on the electrical system.[25] These resources include all types of electric storage technologies, regardless of their size, storage medium (*e.g.,* batteries, flywheels, compressed air, pumped-hydro, etc.), or whether located on the interstate grid or on a distribution system.[26] Electric storage resources include a number of different technologies that can serve as a sink for, or source of, electricity. Electric storage resources' ability to charge and discharge electricity provides these resources with significant operational flexibility, and they can be designed to provide a variety of grid services, including bulk energy services (*e.g.,* capacity and energy) and ancillary services (*e.g.,* regulation and reserves).[27]

11. The RTOs/ISOs have taken different approaches to integrating electric storage resources into their organized wholesale electric markets. While electric storage resources (including batteries, flywheels, and pumped-hydro facilities) are already providing energy and ancillary services in some organized wholesale electric markets, these resources often must use existing participation models designed for traditional generation or load resources that do not recognize electric storage resources' unique physical and operational characteristics. Some organized wholesale electric markets have defined participation models in their tariffs for electric storage resources, but those models limit the services that electric storage resources may provide.[28] For example, these models often allow eligible electric storage resources to participate only in the regulation market. Other organized wholesale electric market rules are designed for electric storage resources with very specific characteristics, such as pumped-hydro facilities or resources with less than a one-hour maximum run time. Smaller electric storage resources are also generally restricted to participating in the organized wholesale electric markets as demand response, which can limit their ability to employ their full operational range, prohibit them from injecting power onto the grid, and preclude them from providing certain services that they are capable of providing such as operating reserves.

12. We take action in this NOPR so that electric storage resources will be able to participate in the organized wholesale electric markets to the extent they are technically capable of doing so based on rules that take into account their unique characteristics and not based on market rules designed for the unique characteristics of other types of resources. Requiring electric storage resources to use participation models designed for a different type of resource may fail to recognize electric storage resources' physical and operational characteristics and their capability to provide energy, capacity and ancillary services in the organized wholesale electric markets. Current tariffs that do not recognize the operational characteristics of electric storage resources serve to limit the participation of electric storage resources in the organized wholesale electric markets and result in inefficient use of these resources (*i.e.,* electric storage resources may be dispatched to provide one service when they could, absent market rule limitations, provide another service more economically). As a result, resources, including electric storage resources, do not get dispatched efficiently, thereby impacting the competitiveness of the market outcomes. Limiting the services an electric storage resource is eligible to provide and limiting the efficiency in which it is dispatched to provide services may also inhibit developers' incentives to design their electric storage resources to provide all capacity, energy and ancillary services these resources could otherwise provide. This further reduces competition for providing those services in the organized wholesale electric markets. Effective integration of electric storage resources into the organized wholesale electric markets would enhance competition and, in turn, help to ensure that these markets produce just and reasonable rates.

13. We are also concerned that existing RTO/ISO tariffs impede the participation of distributed energy resources in the organized wholesale electric markets by providing limited opportunities for distributed energy resource aggregations. Distributed energy resources include a variety of constantly evolving technologies (including, but not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment) that are connected to the power grid at distribution-level voltages. While these distributed energy resources can at times effectively supply the capacity, energy, and ancillary services that are exchanged in the organized wholesale electric markets, they can at times be too small to participate in these markets individually. In addition, responses to the Data Requests and Request for Comments demonstrate that current organized wholesale electric market rules often limit the services distributed energy resources are eligible to provide, in many cases only allowing these resources to be used as demand response or load-side resources when they are located behind a customer

[22] *See, e.g.,* Order No. 764, FERC Stats. & Regs. ¶ 31,331; Order No. 719, FERC Stats. & Regs. ¶ 31,281.

[23] Order No. 719, FERC Stats. & Regs. ¶ 31,281 at PP 19, 47–48.

[24] Order No. 764, FERC Stats. & Regs. ¶ 31,331.

[25] *See supra* note 1.

[26] *Id.*

[27] Sandia National Laboratories, *DOE/EPRI Electricity Storage Handbook in Collaboration with NRECA,* Report No. SAND2015–1002, Chapter 1 (Feb. 2015) (Sandia Report).

[28] *See, e.g., Midwest Indep. Trans. Sys. Operator, Inc.,* 129 FERC ¶ 61,303 at PP 40, 64 (Commission ''note[d] that the Midwest ISO [SER] proposal is intended to implement a specific technology, the fly-wheel technology developed by Beacon Power''; and SER category was ''specifically designed for a specific technology that provides short-term Stored Resources only in the regulating reserve market''); MISO FERC Electric Tariff, section 1.S (Stored Energy Resources); NYISO Services Tariff, section 2.12 (defining Limited Energy Storage Resource as a ''Generator authorized to offer Regulation Service only and characterized by limited Energy storage, that is, the inability to sustain continuous operation at maximum Energy withdrawal or maximum Energy injection for a minimum period of one hour.''). NYISO limits Limited Energy Storage Resources to providing regulation service only and Demand Side Resources and Generators that can sustain operation for longer than one hour are not eligible to be Limited Energy Storage Resources. NYISO Response at 3–4.

meter [29] or by imposing prohibitively expensive or otherwise burdensome requirements.[30]

14. As with electric storage resources, we preliminarily find that the barriers to the participation of distributed energy resources through distributed energy resource aggregations in the organized wholesale electric markets may, in some cases, unnecessarily restrict competition, which could lead to unjust and unreasonable rates. Effective wholesale competition encourages entry and exit and promotes innovation, incentivizes the efficient operation of resources, and allocates risk appropriately between consumers and producers. Removing these barriers will enhance the competitiveness, and in turn the efficiency, of organized wholesale electric markets and thereby help to ensure just and reasonable and not unduly discriminatory or preferential rates for wholesale electric services. We also note that participation of electric storage resources in the organized wholesale electric markets allows for more efficient operation of large thermal generators, enhances reliability, provides congestion relief, improves integration of variable energy resources, and reduces the burden on the transmission system.[31]

15. Distributed energy resource aggregations are often limited to participating in organized wholesale electric markets as demand response, which can limit the aggregations' design and operations, as well as the services they may provide. However, advancements in metering, telemetry, and communication technologies support the aggregation of distributed energy resources, allowing these resources to meet the minimum size requirements to participate in the organized wholesale electric markets under participation models other than demand response. Additionally, demand response models often prohibit distributed energy resources from injecting power back onto the grid or increasing consumption if there is an operational requirement for such performance.[32] By requiring RTOs/ISOs to allow the participation of distributed energy resource aggregations, aggregators will be able to bundle distributed energy resources to meet RTO/ISO qualification and performance requirements, and the RTOs/ISOs will be able to capitalize on the aggregation's full operational range. The recent proliferation of, and technological advancements in, distributed energy technologies, as well as their decreasing costs, create opportunities for distributed energy resource aggregations to be eligible to provide a variety of services to the organized wholesale electric markets.[33]

16. Accordingly, we propose to require the RTOs/ISOs to revise their tariffs to: (1) Establish a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in the organized wholesale electric markets and (2) define distributed energy resource aggregators as a type of market participant that can participate in the organized wholesale electric markets under the participation model that best accommodates the physical and operational characteristics of its distributed energy resource aggregation. These proposed requirements will clarify how electric storage resources and distributed energy resources of all types and sizes may provide services in the organized wholesale electric markets that they are technically capable of providing.

III. Discussion

A. Elimination of Barriers to Electric Storage Resource Participation in Organized Wholesale Electric Markets

1. Creation of a Participation Model for Electric Storage Resources

i. Introduction

17. Resource participation in organized wholesale electric markets is currently governed by (1) participation models consisting of market rules designed for different types of resources and (2) the technical requirements for market services that those resources are eligible to provide. As noted above, in this NOPR, we define a participation model as a set of tariff provisions that accommodate the participation of resources with particular physical and operational characteristics in the organized wholesale electric markets of the RTOs and ISOs.[34] While these participation models are designed to

[29] *See, e.g.,* MISO Response at 15 (noting that electric storage resources connected to the distribution system can participate in its markets as Load Modifying Resources and Demand Response Resources—Types I or II); PJM Response at 3–6 (stating that, if an electric storage resource is located behind a customer meter, then PJM considers it demand response, which is not studied for deliverability and is not eligible to inject energy into the distribution or PJM transmission system and noting that any injection would subject it to generator interconnection obligations).

[30] *See* Energy Storage Association Comments at 29 (stating that metering and telemetry requirements and interconnection processes can pose prohibitively high transaction costs for the small project sizes that characterize behind-the-meter storage, which creates undue burdens on behind-the-meter storage participation in most RTOs/ISOs and noting that the ability to bid aggregated distributed resources into wholesale markets is not possible in some RTOs/ISOs and is unclear in others (such as NYISO, which does not allow aggregations to meet the 1 MW size for a Limited Energy Storage Resource)). Energy Storage Association also asserts that at present most RTOs/ISOs do not allow behind-the-meter storage to net inject power to provide wholesale generator services. *Id. See also* NextEra Comments at 11 (stating that every RTO/ISO prohibits behind-the-meter resources from having net injections to the grid).

[31] Among the benefits cited by a recent report by the Lawrence Berkeley National Laboratory are (1) a less costly, cleaner, and more competitive bulk power system and (2) greater reliability through consumer reliance upon distributed energy resources to provide resilience from bulk power and system and distribution service interruptions. Lawrence Berkeley National Laboratory, *Electric Industry Structure and Regulatory Responses in a High Distributed Energy Resources Future,* at 26–28 (Report 1, Nov. 2015), *https://emp.lbl.gov/sites/all/files/lbnl-1003823_0.pdf* (Berkeley Lab Report). *See also* DNV–GL, *A Review of Distributed Energy Resources: New York Independent System Operator,* at 18 (Sept. 2014) (DNV–GL Report), *http://www.nyiso.com/public/webdocs/media_room/publications_presentations/Other_Reports/Other_Reports/A_Review_of_Distributed_Energy_Resources_September_2014* (''Benefit streams commonly attributed to distributed energy resources include, among others: Avoided expansion of generation, transmission, or distribution facilities, power outage mitigation or critical power support during power outages (resiliency) and power quality improvement (enhanced reliability); U.S. Department of Energy, *The Potential Benefits of Distributed Generation and Rate-related Issues that May Impede Their Expansion: A Study Pursuant to Section1817 of the Energy Policy Act of 2005* (Feb. 2007), *https://www.ferc.gov/legal/fed-sta/exp-study.pdf*.; IEA, *Re-powering Markets: Market design and regulation during the transition to low-carbon power systems,* at 33 (2016) (''active management of renewable resources connected to distribution networks can help reduce or delay distribution network investments'').

[32] *See* PJM Response at 5 (stating that, like other types of resources that participate in PJM's markets only by providing load reductions, demand-side electric storage resources are not studied by PJM through the generation interconnection process and are not allowed to inject energy beyond the customer's meter and onto the distribution or transmission system, as applicable).

[33] The Berkeley Lab Report notes that technological and procedural innovation and advancements are leading to substantial reduction in the cost of some of these resources, such as through a continued long-term downward trend in the installed cost of solar PV. Berkeley Lab Report at 50, App. A. It adds that there is a wide range of forecasts of the potential for distributed energy resources over the coming decades, some of which suggest that penetrations could be significant. Estimated increases range from a current 11 percent distributed energy resource penetration rate to 19 percent of required capacity (MW) in the Eastern Interconnection under a base case analysis by 2030; and a projection of a 37.5 percent penetration in the Western Interconnection by 2032. *Id.* at 51 (citing Western Electricity Coordinating Council, *SPSC Study High EE/DR/DG* (Sept. 19, 2013), *https://www.wecc.biz/_layouts/15/WopiFrame.aspx?sourcedoc=/Reliability/2032_HighEEDSMDG_StudyReport.docx&action=default&DefaultItemOpen=1*; Navigant Consulting, Inc., *Assessment of Demand-Side Resources Within the Eastern Interconnection,* March 2013, *http://bit.ly/EISPCdsr*).

[34] *See supra* note 5.

accommodate the unique characteristics of different resources, new technologies may be required to fit into existing participation models when market rules for their unique characteristics have not been developed. Moreover, even where participation models for new technologies, such as electric storage resources, do exist, they may unnecessarily limit a resource's ability to qualify for the participation model or to provide certain services using it, despite the technical capabilities of the resource.

18. The Commission previously has allowed flexibility for each RTO/ISO to approach the integration of electric storage resources in its organized wholesale electric markets differently. RTOs/ISOs developed most of their participation models before electric storage resources achieved their current technical capability and commercial viability, so some markets rely on these existing models for the participation of electric storage resources. For example, ISO–NE indicates that, for an electric storage resource to be eligible to provide all wholesale services, it must register as a Generator Asset,[35] which is a participation model designed for traditional generation and which may not reflect the distinct operational characteristics or capabilities of electric storage resources. Alternatively, some RTOs/ISOs have created participation models for electric storage resources that limit the participation of those resources to the regulation market or are designed for electric storage resources with very specific characteristics, such as pumped-hydro facilities or resources with less than a one-hour maximum run time.[36] However, other RTOs/ISOs have created participation models for electric storage resources to provide a wider variety of services in the organized wholesale electric markets (such as PJM's Energy Storage Resource model [37] and CAISO's Non-Generator Resource model [38]). Establishing a robust participation model for electric storage resources will help remove barriers to the participation of electric storage resources in the organized wholesale electric markets and ensure that electric storage resources can provide the services that they are technically capable of providing.

ii. Current Rules

19. In their responses to the Data Requests, the RTOs/ISOs describe opportunities for electric storage resources to provide various energy and ancillary service market services. For example, in CAISO, electric storage resources are eligible to participate in the energy and ancillary service markets as Participating Generators, Non-Generator Resources, Pumped Storage Hydro Units, or Demand Response Resources, even as part of distributed energy resource aggregations.[39] Under ISO–NE's market rules, electric storage resources can provide all services when they qualify as a generator, provide all services except 10-minute spinning and 10-minute non-spinning reserves when they qualify as demand response, and provide regulation as an Alternative Technology Regulation Resource.[40]

20. In MISO, electric storage resources are eligible to participate as a Stored Energy Resource (which is only eligible to provide regulation), a Generation Resource, a Use-Limited Resource that is unable to operate continuously on a daily basis, and several types of demand response resources (some of which are limited in the products that they are eligible to provide).[41] NYISO allows electric storage resources to qualify as Energy Limited Resources, Limited Energy Storage Resources (which are eligible to provide regulation service only), or demand response resources.[42] PJM allows electric storage resources to participate as generation resources or demand-side resources (which are not eligible to provide non-synchronized reserves).[43] Finally, SPP allows electric storage resources to qualify as Demand Response Resources, Dispatchable Resources, External Resources, External Dynamic Resources, and Quick-Start Resources, if they can sustain output for 60 minutes.[44]

21. Some RTOs/ISOs concede that their existing participation models may fail to address the characteristics of certain electric storage resources.[45] CAISO urges the Commission to preserve some flexibility for the RTOs/ISOs to develop market rules and participation models that respond to electric storage developments.[46]

iii. Comments

22. Numerous commenters argue that the lack of a participation model that accommodates the participation of electric storage resources creates barriers to their participation in organized wholesale electric markets. For example, Alevo asserts that the lack of a defined asset class for electric storage resources poses a barrier to their participation, limiting market efficiency and competition and increasing costs.[47] Advanced Energy Economy claims that the failure to account for the unique attributes, characteristics, and benefits of advanced energy technologies prevents projects from obtaining financing.[48] More specifically, Energy Storage Association asserts that NYISO's Behind-the-Meter Net Generator design still effectively excludes participation of electric storage resources because it does not account for electric storage functionality.[49]

23. Many commenters request that the Commission require the RTOs/ISOs to establish a participation model for electric storage resources that allows them to provide all services.[50] Alevo argues that such a participation model should not limit duration of discharge or services provided,[51] while NY Battery and Energy Storage Consortium states that it should utilize appropriate bidding parameters and resource modeling for electric storage resources.[52] California Energy Storage Alliance asks the Commission to direct the RTOs/ISOs to develop a market model specific to behind-the-meter electric storage resources, which would allow them to respond to market signals to provide any wholesale market service (*e.g.,* frequency regulation, demand response, spinning reserve) without restrictions, with its market participation governed by minimum performance requirements.[53] Electric Vehicle R&D Group supports the creation of a separate participation model for electric storage resources that

[35] ISO–NE Response at 3–5.

[36] MISO Response at 2 (stating that MISO's Stored Energy Resource model is limited to regulation service); and NYISO Response at 3–4 (stating that NYISO limits Limited Energy Storage Resources to providing regulation service only).

[37] An Energy Storage Resource is defined as a ''flywheel or battery storage facility solely used for short term storage and injection of energy at a later time to participate in the PJM energy and/or Ancillary Services markets as a Market Seller.'' PJM Response at 6 (citing PJM Tariff, Att. K, section 1.3.).

[38] *See supra* note 7.

[39] CAISO Response at 2–8. *See California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229.

[40] ISO–NE Response at 3–5.

[41] MISO Response at 7–8.

[42] NYISO Response at 1–6.

[43] PJM Response at 4.

[44] SPP Response at 3–4.

[45] MISO Response at 3; NYISO Response at 17.

[46] CAISO Response at 1–2.

[47] Alevo Comments at 4, 7–17 (pointing to its analyses of the benefits that electric storage resource participation could provide to energy, capacity, and ancillary service markets).

[48] Advanced Energy Economy Comments at 7.

[49] Energy Storage Association Comments at 29–30.

[50] *Id.* at 8–9, 24; NY Battery and Energy Storage Consortium Comments at 5; Ormat Comments at 2–3; Electric Vehicle R&D Group Comments at 3.

[51] Alevo Comments at 8.

[52] NY Battery and Energy Storage Consortium Comments at 5.

[53] California Energy Storage Alliance Comments at 4–5.

allows for bidirectional power flow.[54] Duke Energy also encourages modifications to market rules to facilitate electric storage resource deployment, subject to reliability requirements and non-preferential treatment.[55]

Other commenters explain how the existing participation models for demand response resources, under which electric storage resources sometimes participate in the organized wholesale electric markets, do not adequately accommodate electric storage resource participation. Advanced Microgrid Solutions asserts that the compensation methods under demand response resource participation models should not be applied to electric storage resources because, unlike the demand reductions that demand response resources provide, the energy that electric storage resources deliver is purchased in the form of energy consumed during another time such that any net-benefit test is unnecessary.[56] Energy Storage Association, SolarCity, and California Energy Storage Alliance contend that the baselines used to measure demand response resource deliveries present a barrier to electric storage resource participation under demand response participation models and can limit the ability of behind-the-meter electric storage resources to provide their full capability into wholesale markets.[57] SolarCity further argues that requiring behind-the-meter electric storage resources to participate as demand response creates a barrier for these resources, as they are physically and economically capable of providing electricity beyond the customer's load.[58] Tesla contends that customer-sited resources (such as electric storage resources) are interactive grid resources that are often relegated to act as less flexible demand response resources when participating in organized wholesale electric markets.[59] Energy Storage Association argues that wholesale demand response constructs can prohibit behind-the-meter electric storage resources from offering other services.[60]

24. Many commenters also state that behind-the-meter electric storage resources should be permitted to inject power beyond the retail meter. Energy Storage Association and NextEra argue that no RTO/ISO allows behind-the-meter storage to net inject power to provide wholesale generator services.[61] Similarly, Advanced Energy Economy and Solar Grid Storage argue that PJM's restriction on the injection of energy past a customer's retail meter during operations for providing ancillary services in their markets is a barrier to storage.[62] Solar Grid Storage argues that PJM's ''no injection'' barrier effectively excludes all residential customers with storage from participation in the PJM ancillary service markets, despite the growing potential of this customer segment to provide meaningful resources to that organized market.[63]

25. Some commenters call for the creation of a ''load increase'' participation model for electric storage resources that allows electric storage resources to be dispatched to receive electricity from the grid. For example, National Hydropower Association states that pumped-storage projects are not adequately valued because they are regarded as either a generator or a load, which results in the undervaluation of these projects and no new major plants being built in the last 30 years.[64] National Hydropower Association asks the Commission to consider adding pumped-storage as a dispatchable ''load increase'' demand response resource.[65]

iv. Proposed Reforms

26. As numerous commenters state, existing RTO/ISO rules that govern participation of electric storage resources in some organized wholesale electric markets fail to ensure that electric storage resources that are technically capable of providing specific services are permitted to do so. Providing a participation model that recognizes the unique characteristics of electric storage resources will help eliminate barriers to their participation in the organized wholesale electric markets and promote competition and economic efficiency. We therefore propose to require each RTO/ISO to revise its tariff to include a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in organized wholesale electric markets.

27. As the costs of electric storage resources continue to decline and their technical potential expands, the ability of these resources to provide operational and economic benefits to the organized wholesale electric markets will increase. We preliminarily find that it is important to remove barriers to participation now so that the competitive benefits are realized without delay.

28. We thus preliminarily find that it is necessary to take action to remove barriers to the participation of electric storage resources in organized wholesale electric markets by requiring that the RTOs/ISOs revise their tariffs to establish a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in the organized wholesale electric markets. In addition, to accommodate the physical and operational characteristics of electric storage resources, we propose to require that this participation model satisfy each of the following requirements (as discussed in detail in Section III.A.2 of this NOPR):

a. Electric storage resources must be eligible to provide all capacity, energy and ancillary services that they are technically capable of providing in the organized wholesale electric markets;

b. The bidding parameters incorporated in the participation model must reflect and account for the physical and operational characteristics of electric storage resources;

c. Electric storage resources can be dispatched and can set the wholesale market clearing price as both a wholesale seller and a wholesale buyer consistent with existing rules that govern when a resource can set the wholesale price;

d. The minimum size requirement for electric storage resources to participate in the organized wholesale electric markets must not exceed 100 kW; and

e. The sale of energy from the organized wholesale electric markets to an electric storage resource that the resource then resells back to those markets must be at the wholesale LMP.

29. To further ensure that the proposed participation model for electric storage resources will accommodate both existing and future electric storage resource technologies, we propose that each RTO/ISO define the criteria in its tariff that a resource must meet to qualify to use this participation model based on the physical and operational attributes of electric storage resources, namely their ability to both charge and discharge energy. As such, the qualification

[54] Electric Vehicle R&D Group Comments at 3.

[55] Duke Energy Comments at 4.

[56] Advanced Microgrid Solutions Comments at 5.

[57] Energy Storage Association Comments at 28; SolarCity Comments at 8; California Energy Storage Alliance Comments at 4.

[58] SolarCity Comments at 4.

[59] Tesla Comments at 4.

[60] Energy Storage Association Comments at 28.

[61] *Id.* at 29; NextEra Comments at 11. NextEra explains that a net injection is when the output of an electric storage resource exceeds the customer's load that it is sited with and the electric storage resource exports power back to the grid.

[62] Advanced Energy Economy Comments at 16–17; Solar Grid Storage Comments at 2.

[63] Solar Grid Storage Comments at 3.

[64] National Hydropower Association Comments at 5–6.

[65] *Id.* at 6.

criteria for the proposed participation model must not limit participation to any particular type of electric storage resource or other technology. In addition, those qualification criteria should ensure that the RTO/ISO is able to dispatch the resource in a way that recognizes its physical constraints and optimizes its benefits to the RTO/ISO. We do not at this time propose to define the qualification criteria that each RTO/ISO use but rather propose to provide the RTOs/ISOs with flexibility to propose qualification criteria that best suit their proposed participation models. However, we invite comment on whether the Commission should establish the qualification criteria and, if so, what specific qualification criteria the Commission should require.

30. We are not proposing to limit the use of this participation model exclusively to electric storage resources as defined herein. While the requirements for the proposed participation model set forth here are designed to accommodate the physical and operational characteristics of electric storage resources, we acknowledge that there may be other types of resources whose physical or operational characteristics could qualify under the proposed participation model. This may be particularly true for the distributed energy resource aggregations considered in Section III.B below.[66]

31. In addition to including a participation model for electric storage resources in its tariff, we propose that each RTO/ISO propose any necessary additions or modifications to its existing tariff provisions to specify: (1) Whether resources that qualify to use the participation model for electric storage resources will participate in the organized wholesale electric markets through existing or new market participation agreements; and (2) whether particular existing market rules apply to resources participating under the electric storage resource participation model. CAISO, for example, has adopted numerous tariff revisions for its Non-Generator Resource participation model.[67]

32. Finally, we recognize that there are implementation costs for creating a new participation model for electric storage resources. While we believe the participation model and its characteristics described below will benefit the participation of electric storage resources in the organized wholesale electric markets, we acknowledge that the RTOs/ISOs will need to develop rules that govern the participation model as well as make software changes to reflect how these resources will be modeled and dispatched when they participate in the markets. We therefore seek comment from the RTOs/ISOs on the changes that would be required to implement the proposed participation model for electric storage resources as well as the associated costs and how those costs could be minimized.

2. Requirements for the Participation Model for Electric Storage Resources

a. Eligibility To Participate in Organized Wholesale Electric Markets

i. Introduction

33. Electric storage resources have the potential to provide a diverse array of services to the organized wholesale electric markets and to be designed to meet various technical requirements. However, in many cases, the existing participation models that electric storage resources are eligible to use in the RTOs/ISOs preclude electric storage resources from providing all of the services that they are technically capable of providing. In other instances, barriers may emerge as a result of the existing technical requirements for providing certain services that may not be appropriate for fast and controllable technologies such as electric storage resources. Market rules that were designed for traditional generation technologies or that otherwise prevent new technologies from providing services that they are technically capable of providing can have detrimental impacts on the competitiveness of the organized wholesale electric markets.

ii. Current Rules

34. Several of the RTOs/ISOs identify limitations on the services that electric storage resources may provide, depending on the participation model an electric storage resource elects to use. ISO–NE states that the non-dispatchability of Settlement Only Resources and non-dispatchable generators prohibits such resources from providing operating reserves. In addition, resources that cannot provide energy within 10 minutes cannot provide 10-minute spinning or 10-minute non-spinning reserves.[68] ISO–NE also states that demand response resources with one or more controllable generators, including storage resources, are not eligible to provide 10-minute spinning reserve. In ISO–NE, electric storage resources can only provide regulation as an Alternative Technology Regulation Resource.[69]

35. MISO states that a Stored Energy Resource is not qualified for capacity, energy, ramp capability and contingency reserves.[70] MISO states that Demand Response Resource—Type I is not eligible for regulating reserve and ramp capability products and that Dispatchable Intermittent Resources are a subset of Generation Resources that are not eligible to provide regulating reserves and contingency reserves. MISO states that the Load Modifying Resource category is designed to provide energy in emergency conditions and is only intended for the provision of capacity. MISO also states that Emergency Demand Response can only provide emergency energy, on a voluntary basis.

36. NYISO states that Limited Energy Storage Resources are limited to selling only regulation service in the ancillary service market.[71] NYISO further states that Emergency Demand Response Program resources are only eligible to provide energy, Special Case Resources are only eligible to provide energy and capacity, and Demand Side Ancillary Services Program Resources are only eligible to provide ancillary services. PJM states that demand response resources, including electric storage resources, are ineligible to provide non-synchronized reserves because demand response resources are already synchronized to the grid when consuming power, and so would always

[66] For example, resources such as thermal storage that can both increase and decrease their energy consumption could aggregate with other distributed energy resources with common physical or operational characteristics and qualify as a market participant using the participation model proposed here.

[67] *See, e.g.,* CAISO Tariff, sections 4.6 (Relationship Between CAISO and supply resources), 4.7 (Relationship between CAISO and participating loads), 8.4.1.2 (availability of Regulation Energy Management to Scheduling Coordinators for Non-Generator Resources), 8.10.8.4 (Rescission of Ancillary Service Capacity Payments for Non-Generator Resources), 8.10.8.6 (Rescission of Payments for Regulation Up and Regulation Down Capacity), 11.8 (Bid cost recovery for scheduling coordinators for Non-Generator Resources), 27.9 (MWh Constraints for Non-Generator Resources), 30.5.6 (bid components of Non-Generator Resource bids), 31.2 (Day-ahead market power mitigation process), 34.1.5 (Mitigating of Bids in the real time market), 40.10.3.2 Flexible Capacity Category—Base Ramping Resources (addressing inclusion of Non-Generator Resources), 40.10.3.3 Flexible Capacity Category—Peak Ramping Resources (addressing inclusion of Non-Generator Resources), 40.10.3.4 Flexible Capacity Category—Super-Peak Ramping Resources (addressing inclusion of Non-Generator Resources), 40.10.6.1 (Day-Ahead and Real-Time Availability providing for certain Non-Generator Resources bidding requirements).

[68] ISO–NE Response at 11.

[69] *Id.* at 3–5.

[70] MISO Response at 7–8.

[71] NYISO Response at 6–7.

be classified as sync reserves when curtailing.[72]

iii. Comments

37. Many commenters point to organized wholesale electric markets where electric storage resources cannot participate, or cannot participate fully, because market rules are either designed for traditional generation or they place unnecessary limitations on electric storage resources. Both Advanced Energy Economy and NextEra argue that a resource's eligibility to provide a particular service should be based on whether it has the technical attributes necessary to provide that service rather than on its participation model.[73] EEI argues that RTOs/ISOs may need to modify their tariffs to account for electric storage resources because many existing market rules went into place prior to the relatively recent advances in electric storage technology.[74] Likewise, Alevo contends that applying market rules to electric storage resources that were designed for transmission, generation, and demand assets unfairly disadvantages electric storage resources.[75] SolarCity claims that market rules that prevent the participation of electric storage resources in multiple markets, particularly for ancillary services, discriminate against behind-the-meter electric storage resources that can provide multiple services concurrently by preventing them from stacking multiple value streams.[76] SolarCity suggests that the provision of one wholesale market product should not preclude provision of other wholesale market products when resources are technically capable of providing multiple services.

38. Some commenters note concerns with the eligibility of electric storage resources to provide services in specific markets. According to AES Companies, Indianapolis Power & Light Company's Harding Street Battery Energy Storage System, a fully-developed grid-scale battery, cannot participate in MISO's markets because of the limitations placed on the services Stored Energy Resources are eligible to provide and the way they are dispatched.[77] AES Companies further note that MISO's Stored Energy Resource definition specifically disallows capacity accreditation, even though some electric storage resources have sufficient discharge duration to provide capacity and ancillary services.[78] Similarly, Minnesota Energy Storage Alliance contends that none of the participation models that allow electric storage resources to participate in MISO's capacity, energy, and ancillary service markets facilitate participation of battery storage technologies and, in some cases, they limit the products an electric storage resource can provide.[79] In contrast, Manitoba Hydro, which operates hydroelectric facilities with reservoir storage that participate in the MISO market as Use-Limited Resources, states that MISO's current market rules are not barriers to electric storage resource participation.[80]

39. NY Battery and Energy Storage Consortium asserts that NYISO's market rules prevent electric storage resources from fully participating in NYISO's markets, noting that electric storage resources with less than 60 minutes of output duration can only participate as Limited Energy Storage Resources and can only provide regulation.[81] NY Transmission Owners also argue that NYISO's rules do not reflect the ability of certain electric storage resources to provide their maximum output for regulation service over a multi-hour period and do not allow them to participate in the energy and ancillary service markets.[82]

40. According to Energy Storage Association, resources that participate under CAISO's Proxy Demand Response participation model are prohibited from providing frequency regulation, even though they may be technically capable of doing so.[83] Finally, NextEra notes that ISO–NE, NYISO, and MISO prohibit an electric storage resource offering regulation from offering any other service, even though a longer-duration electric storage resource could provide regulation from a portion of its capacity while providing other reserve services or energy from the remainder of its capacity.[84]

41. Other commenters focus on technical requirements that limit the ability of electric storage resource to provide certain services. NRECA states that minimum technical requirements should not create undue barriers to resources capable of performing a service.[85] Similarly, APPA states that RTOs/ISOs should establish reasonable qualification criteria on a resource-specific basis.[86] NY Battery and Energy Storage Consortium argues that distributed electric storage resources, both grid-connected and customer-sited, face barriers to market participation due to eligibility rules and qualification/performance requirements that should be eliminated.[87]

42. Some commenters focus on the technical requirements in the regulation markets. Viridity explains that, while the rapid ramp rates of electric storage resources allow them to provide regulation service, their discharge is of limited duration, so RTOs/ISOs should utilize these resources for short periods.[88] According to Viridity, requiring such resources to provide regulation service over longer periods is inconsistent with the nature of frequency response and is detrimental to the life span and effectiveness of these resources. NextEra contends that, despite implementation of Order No. 755 (which removed certain barriers to the ability of fast-acting resources to provide frequency regulation service), MISO and SPP continue to rely on the slow ramping automatic generation control signal developed for traditional generation resources for regulation service.[89] NextEra notes that advanced electric storage technologies can respond faster than these slower regulation signals allow. NextEra points out that, in contrast, NYISO matches the dispatch of regulation resources to the specific ramping capabilities of each resource.[90]

43. Other commenters contend that reliability standards may preclude electric storage resources from providing certain ancillary services. Specifically, Energy Storage Association states that NYISO suggested that the Northeast Power Coordinating Council's (NPCC) qualification criteria may prohibit grid-connected electric storage

[72] PJM Response at 4.

[73] Advanced Energy Economy Comments at 10–11; NextEra Comments at 5.

[74] EEI Comments at 4.

[75] Alevo Comments at 8.

[76] SolarCity Comments at 5.

[77] AES Companies Comments at 9–10 (citing MISO Response at 3).

[78] *Id.* at 2, 14.

[79] Minnesota Energy Storage Alliance Comments at 2, 4. For example, Minnesota Energy Storage Alliance contends that MISO's Demand Response Resource—Type I classification is inappropriate for advanced electric storage resources because it is designed for resources that respond as a single block, on or off, and cannot provide regulating reserve and ramping products.

[80] Manitoba Hydro Comments at 4.

[81] NY Battery and Energy Storage Consortium Comments at 5.

[82] NY Transmission Owners Comments at 3.

[83] Energy Storage Association Comments at 28.

[84] NextEra Comments at 5 (citing MISO Response at 7; ISO NE Response at 3; NYISO Response at 7).

[85] NRECA Comments at 6–7.

[86] APPA Comments at 10–11.

[87] NY Battery and Energy Storage Consortium Comments at 6.

[88] Viridity Comments at 3–4.

[89] NextEra Comments at 9 (citing *https://www.misoenergy.org/Library/Repository/Communication%20Material/Market%20Enhancements/Market%20Roadmap/Market%20Roadmap%20Priorities.pdf*) (noting that MISO is pursuing an automatic generation control enhancement that would implement a faster signal similar to those used by other RTOs/ISOs).

[90] *Id.* at 9.

resources from providing synchronized reserves because inverter-based resources like electric storage cannot comply with the required settings inherent to synchronous generators.[91] Similarly, ISO–NE states that demand response resources are precluded from providing 10-minute spinning reserve per the ISO–NE tariff definition, which is based on the NPCC requirement that loads cannot provide synchronized reserve if the reduction in load is dependent on starting a generator.[92]

44. National Electrical Manufacturers Association argues that, in ancillary service markets, spinning reserves are limited to online, synchronized spinning generation resources. According to National Electrical Manufacturers Association, electric storage systems capable of providing fast-reacting, synchronized electricity should be allowed to compete fully to provide spinning reserves.[93] Wellhead asks the Commission to require changes to NERC definitions so that non-synchronous resources are not categorically excluded from providing reserves. Wellhead notes that, under the NERC definition of ''Spinning Reserves,'' the phrase ''unloaded generation that is synchronized'' does not clearly allow electric storage resources to participate as spinning reserves. Wellhead also notes that NERC's definition of ''Operating Reserves—Spinning'' also does not clearly allow for market participation of electric storage resources because they are not generation synchronized to the system.[94]

45. Commenters also note that the requirement in some RTOs and ISOs to have an energy schedule to provide ancillary services is a barrier to electric storage resource participation in ancillary service markets. Commenting on MISO's market rules, Energy Storage Association argues that electric storage resources should not have to offer energy to participate in certain ancillary service markets because, unlike traditional generators, electric storage resources are able to ramp immediately to provide spinning reserve and ramping service without having to provide energy to do so.[95] Energy Storage Association explains that requiring an electric storage resource to offer energy greatly diminishes its capability to provide services in the ancillary service markets because storage resources are energy-limited.

46. For the capacity markets, commenters ask the Commission to clarify that an electric storage resource should be allowed to de-rate its capacity (*i.e.,* offer a quantity less than its nameplate capacity) to ensure it can satisfy the minimum run-time requirement.[96] Energy Storage Association states, for example, that, in the NYISO and MISO capacity markets, an electric storage resource with a run-time duration of less than four hours relative to its nameplate capacity should be able to qualify for capacity at a lower power level than it would be able to sustain for four hours at nameplate output. More specifically, NY Battery and Energy Storage Consortium states that a 10 MW/2-hour storage resource should be able to qualify for 5 MW of capacity as long as it can sustain 5 MW for 4 hours.

47. In contrast, some commenters, such as APPA, state that eligibility is not a significant problem for electric storage resources.[97] Similarly, Electric Power Supply Association argues that the RTO/ISO responses to the Data Requests show that electric storage resources can fully participate in the organized wholesale electric markets.[98] The PJM Market Monitor also claims there are no market rules that artificially preclude participation by electric storage resources in any of PJM's markets.[99] The PJM Market Monitor states that electric storage resources can make offers directly into PJM's wholesale markets to provide energy, capacity, and ancillary services or can participate as demand response resources.

iv. Proposed Reforms

48. We propose to require RTOs/ISOs to modify their tariffs to establish a participation model consisting of market rules for electric storage resources under which a participating resource is eligible to provide any capacity, energy, and ancillary service that it is technically capable of providing in the organized wholesale electric markets. In addition, we propose that electric storage resources should be able, as part of the participation model, to be eligible to provide services that the RTOs/ISOs do not procure through a market mechanism, such as blackstart, primary frequency response, and reactive power, if they are technically capable. Where compensation for these services exists, electric storage resources should also receive such compensation commensurate with the service provided.

49. We also propose to require each RTO/ISO to revise its tariff to clarify that an electric storage resource may de-rate its capacity to meet minimum run-time requirements to provide capacity or other services. This proposed requirement will help ensure that electric storage resources are able to provide all services that they are technically capable of providing by accommodating their physical and operational characteristics, while still maintaining the quality and reliability of services they seek to provide. In RTOs/ISOs with capacity markets, we propose that the de-rated capacity value for electric storage resources be consistent with the quantity of energy that must be offered into the day-ahead energy market for resources with capacity obligations. We preliminarily find that this reform will remove a barrier to the participation of electric storage resources in the organized wholesale electric markets related to minimum run-time requirements and help ensure that the resources that do de-rate their capacity will be able to meet their capacity supply obligations if called upon.

50. We preliminarily conclude that a market participant's eligibility to provide a particular reserve service should not be conditioned on requirements that were designed for synchronous generators, specifically the requirement to be online and synchronized to the grid to be eligible to provide ancillary services. Newer technologies, particularly electric storage resources, tend to be capable of faster start-up times and higher ramp rates than traditional synchronous generators and are therefore able to provide ramping, spinning, and regulating reserve services without already being online and running. Therefore, we preliminarily find that participation in ancillary service markets should be based on a resource's ability to provide services when it is called upon rather than on the real-time operating status of the resource.

51. However, we acknowledge that all of the RTOs/ISOs co-optimize energy and ancillary services dispatch and pricing and therefore may condition eligibility to provide ancillary services on having an energy schedule. As a result, it is not clear whether

[91] Energy Storage Association Comments at 14, 27.

[92] ISO–NE Response at 11.

[93] National Electrical Manufacturers Association Comments at 3.

[94] Wellhead Comments at 3–4.

[95] Energy Storage Association Comments at 13–14 (citing MISO Response at 11, n.9 (referring to Business Practice Manual sections that describe requirements for these products, which state ''Committed Generation Resources'' are eligible to provide these products), 14, 27).

[96] *Id.* at 22–23; NY Battery and Energy Storage Consortium Comments at 6; RES Americas Comments at 4.

[97] APPA Comments at 10.

[98] Electric Power Supply Association Comments at 9.

[99] PJM Market Monitor Comments at 4.

eliminating the requirement for a resource to be online and synchronized to the grid would be impactful given the continued need to have an energy schedule. Therefore we seek comment on whether the requirement to have an energy schedule to provide ancillary services could be adjusted so that electric storage resources and other technically-capable resources could participate in the ancillary service markets independent of offering energy to the RTO/ISO. Specifically, we seek comment on whether dispatch and pricing of energy and ancillary services would continue to be internally consistent if a resource were not required to offer to provide energy in order to offer to provide ancillary services. Further, we seek comment on whether the capability of resources to provide an ancillary service absent an energy schedule can be determined in the regular performance tests that the RTO/ISO conducts and whether a resource's start-up time and ramp capability are generally represented in bidding parameters and would adequately guarantee the resource's ability to provide other services absent energy market participation. Additionally, we seek comment on the extent of software changes necessary to factor the elimination of such an energy schedule requirement into the RTO/ISO co-optimization models.

52. Several commenters also identified concerns with how definitions in the Glossary of Terms used in NERC reliability standards could potentially limit participation of electric storage resources and other non-synchronous resources in the reserve markets. While it appears that some of the Glossary of Terms definitions were created for synchronous generation, it is unclear the extent to which these definitions could potentially limit participation of non-synchronous resources in the organized wholesale electric markets. Therefore, we seek comment on whether and to what extent the Commission-approved NERC Glossary of Terms and associated Reliability Standards or regional reliability requirements may create barriers to the participation of electric storage resources or other non-synchronous technologies in the organized wholesale electric markets.

b. Bidding Parameters for Electric Storage Resources

i. Introduction

53. Bidding parameters allow resources participating in the organized wholesale markets to identify their physical and operational characteristics so that the RTO/ISO can model and dispatch the resource consistent with its operational constraints. Due to an electric storage resource's ability to both receive and provide electricity at varying speeds and duration and to transition between operating modes, it may be more efficient for the RTOs/ISOs to model, optimize, and dispatch electric storage resources differently than they do traditional generation. By requiring electric storage resources to use bidding parameters developed for traditional generators or other supply resources, RTOs/ISOs may fail to effectively utilize these resources, possibly precluding electric storage resources from providing all of the services that they are physically and technically capable of providing in a way that optimizes their operational capabilities and maximizes the benefits they provide. This barrier to electric storage resource participation in organized wholesale electric markets could lead to over-procurement of less efficient resources and increased cost to load.

ii. Current Rules

54. Under current market rules, resource bidding parameters vary greatly between the RTOs/ISOs. Some RTOs/ISOs require the same bidding parameters from all resources offering into a specific market, regardless of the participation model under which these resources participate, while others tie bidding parameters to specific participation models. For example, ISO–NE requires the same bidding parameters from all resources, including electric storage resources, participating in its capacity, forward reserve, and regulation markets.[100] In ISO–NE's energy market, bidding parameters reflect the physical characteristics of each participation model such as maximum daily starts, maximum consumption for dispatch asset related demand, and minimum time between reduction for demand response resources. Similarly, SPP requires all resources participating in its day-ahead and real-time markets under any participation model to provide a specific set of bidding parameters to validate their offers.[101]

55. CAISO's market rules also require a defined list of parameters for all bids. In addition, however, CAISO requires supplemental parameters depending on the participation model under which a resource is participating in its market (*i.e.,* Participating Generator, Participating Load, or Non-Generator Resource).[102] Specifically, CAISO explains that bids for participating loads, which include pumping load or Pumped-Storage Hydro Units, may include pumping level (in megawatts (MW)), minimum load bid (generation mode of a pumped-storage hydro unit), load distribution factor, ramp rate, energy limit, pumping cost, and pump shut-down costs.[103] CAISO notes that, unlike under the generator resource model, these resources must submit lower and upper charge limits. Moreover, the Commission recently accepted revisions to CAISO's tariff to allow scheduling coordinators representing non-generator resources to include state-of-charge as a bidding parameter.[104]

56. Electric storage resources participating in NYISO's markets must generally submit the same bidding parameters as other resources, with some exceptions.[105] Limited Energy Storage Resources providing regulation service exchange a ''state of charge management'' signal with the NYISO to facilitate the efficient use of their capabilities. NYISO does not require Limited Energy Storage Resources, unlike other generators, to provide regulation capacity response rates, normal response rates, or emergency response rates with their regulation service bids. In addition, in NYISO, electric storage resources acting as a component of a Demand Side Ancillary Services Program resource may only submit one normal response rate equaling the electric storage resource's emergency response rate, while traditional generators may submit up to three normal response rates.

57. In MISO, bidding parameters vary between markets and participation models. MISO's market rules allow common bidding parameters for each participation model, with a few exceptions.[106] For example, since MISO manages the state of charge for Stored Energy Resources, it requires the following additional bidding parameters for these resources: Hourly maximum energy storage level; hourly maximum energy charge rate; hourly maximum energy discharge rate; hourly energy

[100] ISO–NE Response at 24–25.

[101] SPP Response at 5–6.

[102] CAISO Response at 13–14 (citing CAISO Tariff, section 30).

[103] *Id.* at 13–14 (citing CAISO Tariff, section 30.5.2.3).

[104] *California Indep. Sys. Operator Corp.,* 156 FERC ¶ 61,110.

[105] NYISO Response at 12 (citing NYISO's Market Participant User's Guide (Dec. 2015)).

[106] MISO Response at 14–15 (citing MISO FERC Electric Tariff, section 4.2.6 (Stored Energy Resource Offer)).

storage loss rate; and hourly full charge energy withdrawal rate.

58. Bidding parameters in PJM also vary between markets and participation models.[107] Additionally, pumped storage resources offering into the PJM energy markets may either self-schedule or have PJM dispatch their unit pursuant to the pumped storage optimization tool. In either case, the resource must submit the following parameters: initial storage; final storage; maximum storage; minimum storage; pumping efficiency factor; and min/max generating and pumping limits.[108]

iii. Comments

59. Some commenters focus on the current bidding parameters for electric storage resources. NRECA states that the Commission should not mandate bidding parameters for specific electric storage resources.[109] APPA states that, at this early stage of electric storage resource development, the required bidding parameters should not be so prescriptive as to determine the technologies allowed to deploy, which may constrain the ability of load-serving entities to adopt the least-cost solution.[110]

60. In contrast, NextEra suggests that each RTO/ISO evaluate how bidding parameters could allow electric storage resources to participate fully in the energy, ancillary service, and capacity markets.[111] NextEra states that the specific bidding parameters developed for pumped hydro are inadequate for batteries and other advanced electric storage technologies. California Energy Storage Alliance also urges evaluation of existing market bidding parameters to identify revisions focused on the unique characteristics of electric storage resources and their ability to act as both generation and load.[112] Energy Storage Association and NY Battery and Energy Storage Consortium agree, recommending that RTOs/ISOs establish a participation model that incorporates appropriate bidding parameters and resource modeling for electric storage resources.[113]

61. Some commenters address the physical and operational characteristics of electric storage resources that create a need for bidding parameters in a participation model for electric storage resources that may differ from those required under participation models for more traditional resources. For example, Alevo argues that electric storage resources are not certain that they can participate in RTO/ISO markets given modeling and bidding parameter limitations in the current RTO/ISO market clearing and dispatch engines.[114] Alevo and Energy Storage Association state that the RTOs'/ISOs' market modeling, which Alevo argues is based on traditional resource types that only withdraw electricity from or inject electricity to the grid, does not accommodate electric storage resources' charge and discharge cycles.[115] Alevo further contends that no current bidding parameters offer charge and discharge signals that would allow electric storage resources to provide peaking services.[116] Similarly, RES Americas contends that accounting for injections and withdrawals of energy to and from the grid in bidding parameters would improve optimization and dispatch across all asset classes.[117]

62. A few commenters address bidding parameters in specific organized wholesale electric markets. Energy Storage Association states that MISO's Stored Energy Resource, ISO–NE's Alternative Technology Regulation Resource, and NYISO's Limited Energy Storage Resource participation models explicitly allow electric storage resource participation.[118] According to Energy Storage Association, these participation models offer the bidding parameters and modeling mechanisms (such as energy-neutral signal or state-of-charge management) necessary for electric storage resource participation. Minnesota Energy Storage Alliance and AES Companies, however, believe that MISO's current dispatch algorithms do not effectively use electric storage resources because they were designed for flywheels, while advanced battery systems have the ability to continuously charge and discharge.[119]

63. Other commenters discuss bidding parameters that relate to specific services in the organized wholesale electric markets. National Hydropower Association states that bidding parameters should reflect electric storage resources' ability to respond to transients with automatic voltage regulation, power system stability, and generator droop.[120] National Hydropower Association claims that the NERC standards often require these services, but RTOs/ISOs do not include them in any bid evaluation parameters.

64. Some commenters focus on state of charge as a bidding parameter for electric storage resources. Alevo, NextEra, SolarCity, and Energy Storage Association agree that bidding parameters need to reflect an electric storage resource's state of charge.[121] Alevo states that the inability of the RTOs'/ISOs' dispatch and clearing engines to manage hourly and sub-hourly dispatch and consider electric storage resources' states of charge is a barrier to electric storage resource participation.[122] Alevo and Energy Storage Association recommend including a state of charge bidding parameter in market engine optimization and dispatch modeling because an electric storage resource's energy level at any given moment affects the services it is capable of providing in the subsequent interval.[123] NextEra asserts that, although some RTOs/ISOs manage batteries' state of charge when providing regulation service, it is unclear how electric storage resources (or the RTOs/ISOs) can reflect their state of charge in the unit commitment and dispatch algorithms when providing other services.[124]

65. Some commenters focus on the ability of electric storage resources to manage their own state of charge. SolarCity states that RTOs/ISOs should allow electric storage resources to manage their state of charge rather than relying on RTO/ISO accounting estimates of their state of charge, which could lead to faulty dispatch instructions.[125] Likewise, NextEra recommends that the RTOs/ISOs should allow electric storage resources to choose between RTO/ISO-management and self-management of state of charge.[126] Energy Storage Association asks that RTOs/ISOs clarify how they would model, optimize, dispatch, and settle electric storage resources using

[107] PJM Response at 18 (citing PJM Operating Agreement, Schedule 1, section 6.6(f)).

[108] *Id.* (citing PJM Manual 11, Attachment B).

[109] NRECA Comments at 7.

[110] APPA Comments at 11.

[111] NextEra Comments at 10–11.

[112] California Energy Storage Alliance Comments at 1–2.

[113] Energy Storage Association Comments at 8–12; NY Battery and Energy Storage Consortium Comments at 5.

[114] Alevo Comments at 20.

[115] *Id.;* Energy Storage Association Comments at 9.

[116] Alevo Comments at 20.

[117] RES Americas Comments at 4.

[118] Energy Storage Association Comments at 9–10.

[119] Minnesota Energy Storage Alliance Comments at 4; AES Companies Comments at 21.

[120] National Hydropower Association Comments at 4.

[121] Alevo Comments at 20; NextEra Comments at 10; SolarCity Comments at 9; Energy Storage Association Comments at 11.

[122] Alevo Comments at 20.

[123] *Id.;* Energy Storage Association Comments at 11.

[124] NextEra Comments at 10–11. NextEra points to CAISO's proposal to allow energy storage resources to submit their state of charge as a bid parameter in the day-ahead market. This proposal was accepted by the Commission. *See California Indep. Sys. Operator Corp.,* 156 FERC ¶ 61,110 at P 10.

[125] SolarCity Comments at 9.

[126] NextEra Comments at 10–11. *See also* Ormat Comments at 3.

negative generation and state of charge parameters so that electric storage resources understand how they will bid into the market, receive dispatch signals, respond to those signals, and be compensated.[127] AES Companies state that electric storage resources should be permitted to optimize their own state of charge because MISO's operating software ignores the benefits of constant charge and availability.[128]

iv. Proposed Reforms

66. We propose to require each RTO/ISO to revise its tariff to include a participation model for electric storage resources that incorporates bidding parameters that reflect and account for the physical and operational characteristics of electric storage resources. The lack of a state-of-charge bidding parameter and the lack of ability for electric storage resources to identify their maximum energy charge rate and maximum energy discharge rate could result in electric storage resources being dispatched in a manner that limits their operational effectiveness. While some existing bidding parameters were developed for older electric storage technologies (such as pumped-hydro facilities), newer storage technologies (such as battery storage) have greater flexibility to transition between charging and discharging. Therefore, bidding parameters designed for slower storage technologies or other types of generation resources that are not capable of charging and discharging energy may limit the opportunity for faster electric storage resources to participate in the organized wholesale electric markets. Appropriate bidding parameters will allow electric storage resources to provide all services they are technically capable of providing and allow the RTOs/ISOs to procure these services more efficiently.

67. Specifically, we propose that the RTOs/ISOs establish state of charge, upper charge limit, lower charge limit, maximum energy charge rate, and maximum energy discharge rate as bidding parameters for the participation model for electric storage resources that participating resources must submit, as applicable. The state of charge will allow resources using the participation model for electric storage resources to identify their forecasted state of charge at the end of a market interval,[129] as defined by the RTO/ISO, while the upper and lower charge limits will prevent the operator from trying to give or take too much energy from the resource. We expect that the state of charge would be telemetered in real time when the RTO/ISO is managing the state of charge, as discussed further below, so that the upper and lower charge limits are not exceeded, but do not propose any specific telemetry requirements. The maximum energy charge rate and maximum energy discharge rate will be used to indicate how quickly the resource can receive electricity from or inject it back to the grid. We preliminarily find that these are the minimum bidding parameters necessary for RTOs/ISOs to effectively dispatch electric storage resources because they provide the RTOs/ISOs with the information about the physical and operational characteristics of electric storage resources that allow these resources to provide the services that they are technically capable of providing.

68. We also propose to require that the participation models for electric storage resources include the following bidding parameters that market participants may submit, at their discretion, for their resource based on its physical constraints or desired operation: minimum charge time, maximum charge time, minimum run time, and maximum run time.[130] We preliminarily conclude that these optional bidding parameters are necessary to reflect the wide range of physical and operational characteristics of existing and future electric storage technologies. Specifically, electric storage technologies such as pumped-hydro facilities that seek to provide energy in the organized wholesale electric markets have some physical and operational characteristics that are closer to those of traditional generation than those of small electric storage resources designed primarily to provide regulation service. The optional bidding parameters that we propose here would allow electric storage resources to indicate their operational constraints to the RTO/ISO and would help these resources to manage any costs or operational constraints that they incur when transitioning between charging and discharging electricity. For example, the opportunity to submit these optional bidding parameters could allow an electric storage resource to prevent excessive variability in its operations to help optimize the services that it is available to provide and to preserve the life of the electric storage resource.

69. Also, where the RTO/ISO has reserved for itself the right to manage the state of charge of an electric storage resource, we propose to require that the RTOs/ISOs allow electric storage resources to self-manage their state of charge and upper and lower charge limits. An electric storage resource that opts to self-manage its state of charge and upper and lower charge limits would keep its state of charge at an optimal level through its own bidding strategy, rather than the RTO/ISO market processes ensuring that dispatch does not violate its physical constraints. The Commission recently accepted revisions to the CAISO tariff that allow non-generator resources to self-manage their energy limits and state-of-charge in real-time.[131]

70. Of course, an electric storage resource that self-manages its state of charge is subject to any penalties for deviating from a dispatch schedule to the extent the resource manages its state of charge by deviating from the dispatch schedule. While RTOs/ISOs may be in a better position to effectively manage the state of charge for an electric storage resource that, for example, exclusively provides regulation service in the organized wholesale electric markets, some electric storage resources may be interested in providing multiple service or providing services to another party, such as to a load with which it is co-located. Affording electric storage resources the option to manage their state of charge would allow these resources to optimize their operations to provide all of the services that they are technically capable of providing, similar to the operational flexibility that traditional generators have to manage the wholesale services that they offer. However, we seek comment on whether there are conditions under which an RTO/ISO should not allow an electric storage resource to manage its state of charge and upper and lower charge limits.

71. While the inclusion of these bidding parameters would allow for more efficient use of electric storage resources, their implementation also requires the RTOs/ISOs to program these bidding parameters into their modeling and dispatch software. The difficulty of implementing these bidding parameters would likely vary from RTO/ISO to RTO/ISO. Therefore, we seek

[127] Energy Storage Association Comments at 7.

[128] AES Companies Comments at 21.

[129] *See, e.g.,* CAISO Tariff, Att. A, section 30.5.6 (stating that scheduling coordinators representing Non-Generator Resources may submit bids including the state of charge for the day-ahead market to indicate the forecasted starting physical position of the Non-Generator Resource.).

[130] We acknowledge that some of these optional bidding parameters may not be necessary for resources participating under the proposed participation model for electric storage resources that provide certain information to the RTO/ISO through telemetry.

[131] *California Indep. Sys. Operator, Corp.,* 156 FERC ¶ 61,110 at P 10.

comment on the time and resources that would be necessary for the RTOs/ISOs to incorporate these bidding parameters, including the optional bidding parameters, into their modeling and dispatch software.

c. Eligibility To Participate as a Wholesale Seller and Wholesale Buyer

i. Introduction

72. The ability of electric storage resources to receive and provide electricity positions them to be both buyers and sellers in the organized wholesale electric markets. As the Commission has previously recognized, a market functions effectively only when both supply and demand can meaningfully participate.[132] Improving electric storage resources' opportunity to participate as both wholesale sellers of services and wholesale buyers of energy could improve market efficiency by allowing the RTO/ISO to dispatch these resources in accordance with their most economically efficient use (*i.e.,* as supply when the market clearing price for energy is higher than their offer and as demand when the market clearing price is lower than their bid). Moreover, allowing electric storage resources to participate in the organized wholesale electric markets as dispatchable load would allow these resources, under certain circumstances, to set the price in these markets, better reflecting the value of the marginal resource and ensuring that electric storage resources are dispatched in accordance with the highest value service that they are capable of providing during a set market interval.

ii. Current Rules

73. Each RTO's/ISO's market rules that govern the eligibility of electric storage resources to participate in the organized wholesale electric markets as a demand resource are different. For example, CAISO explains that an electric storage resource interconnected to the CAISO grid with a participating generator agreement and participating load agreement can submit offers to sell and bids to buy energy in the wholesale market.[133] According to SPP, submitting bids to purchase energy in its market is within the resource owner's discretion.[134] SPP notes that electric storage resources may submit virtual bids in the day-ahead market at any location and a fixed or price-sensitive bid at their registered load. In contrast, PJM explains that electric storage resources do not submit wholesale bids to buy electricity.[135]

74. ISO–NE states that, because it is dispatchable, an electric storage resource participating as a Dispatchable Asset Related Demand resource may submit bids to buy energy in both the day-ahead and real-time energy markets; however, if it is participating as a load asset or an Asset Related Demand, it may submit bids to buy energy in the day-ahead market but would be a price taker in real-time.[136]

75. MISO explains that, in the day-ahead market, electric storage resources may submit bids to buy energy at the LMP when they need to recharge as dispatchable demand or may submit virtual bids.[137] MISO further explains that in the real-time market, most load buys energy as fixed demand and only Demand Response Resources—Type II can submit demand response offers to buy energy.

76. NYISO states that Energy Limited Resources obtain charging energy through negative MW value generation offers, rather than a bid to buy energy.[138] NYISO explains that demand-side resources participating in the Special Case Resource Program, Emergency Demand Response Program, Demand Side Ancillary Services Program, or Day-Ahead Demand Response Program do not submit bids to buy energy in the wholesale markets unless the resource is a load-serving entity, in which case it purchases its entire load. NYISO states that a demand-side resource may submit price-responsive load bids to take advantage of off-peak prices to charge its electric storage resource. NYISO adds that electric storage resources are not required to bid to buy electricity from the NYISO market, but, like any load, may bid into the day-ahead market as a price cap load bid.[139]

77. The eligibility for an electric storage resource to set the price in the organized wholesale electric markets also varies among the RTOs/ISOs. For example, CAISO states that an electric storage resource that is the marginal resource may set the price of energy and ancillary services in CAISO's markets based on its economic bid.[140] PJM states that, with the exception of demand-side resources in the non-synchronized reserve market, electric storage resources may set the price as either a generation or as a demand-side resource in the capacity, energy, and ancillary service markets.[141] SPP states that any resource, including an electric storage resource, qualified to participate in an SPP market may set the price for the relevant market.[142]

78. ISO–NE states that, in each of its markets, electric storage resources may be able to set the clearing price, depending on the participation model that they are using to participate.[143] ISO–NE explains that only dispatchable resources (*i.e.,* dispatchable generator assets and dispatchable asset related demand) may set the clearing price in the real-time energy market. ISO–NE explains that, in the day-ahead energy market, an electric storage resource may set the price by offering into the market as a generator resource, Asset Related Demand, or Dispatchable Asset Related Demand. ISO–NE adds that, by qualifying as a new generator resource or as a demand resource, an electric storage resource may bid its qualified MWs into the capacity market and set the clearing price. ISO–NE notes that an electric storage resource or aggregation of electric storage resources may set the regulation market clearing prices by offering as an Alternative Technology Regulation Resource. ISO–NE states that an electric storage resource may also set the market-clearing regulation price by offering into the regulation market as a generator resource or Dispatchable Asset Related Demand.

79. MISO states that electric storage resources may set prices for products in the market(s) in which they are eligible to participate. MISO explains that, for example, an electric storage resource registered as a Load Modifying Resource may set the price in the capacity market. MISO states that an electric storage resource registered as a Stored Energy Resource may set the price for regulating reserve.[144]

80. NYISO explains that supply offers of electric storage resources that participate as Energy Limited Resources may set the price for capacity, energy, and ancillary services; Limited Energy Storage Resources may set the price for regulation service. NYISO explains that Special Case Resources and Emergency

[132] *Demand Response Compensation in Organized Wholesale Energy Markets,* Order No. 745, FERC Stats. & Regs. ¶ 31,322, at P 1, *order on reh'g,* Order No. 745–A, 137 FERC ¶ 61,215 (2011).

[133] CAISO Response at 16.

[134] SPP Response at 7.

[135] PJM Response at 22.

[136] ISO–NE Response at 28 (citing ISO–NE Tariff, section I.2.2).

[137] MISO Response at 16.

[138] NYISO Response at 14–15.

[139] *Id.* at 15 (citing NYISO Services Tariff, section 21.1).

[140] CAISO Response at 10.

[141] PJM Response at 10.

[142] SPP Response at 4.

[143] ISO–NE Response at 12–13. ISO–NE explains that, today, Real-Time Demand Response assets are price-takers in the real-time energy market but that, 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.

[144] MISO Response at 10.

Demand Response Program resource energy offers do not directly set the price; rather, when these resources are dispatched, the NYISO's scarcity pricing rules are triggered in the zone(s) in which they are activated and may alter energy and certain ancillary services prices.[145]

iii. Proposed Reforms

81. We propose to require each RTO/ISO to revise its tariff to ensure that electric storage resources can be dispatched and can set the wholesale market clearing price as both a wholesale seller and wholesale buyer consistent with existing rules that govern when a resource can set the wholesale price. This proposal includes the requirements that the RTOs/ISOs accept wholesale bids from electric storage resources to buy energy so that the economic preferences of the electric storage resources are fully integrated into the market, the electric storage resource can set the price as a load resource where market rules allow, and the electric storage resource can be available to the RTO/ISO as a dispatchable demand asset. However, we note that these requirements must not prohibit electric storage resources from participating in organized wholesale electric markets as price takers, consistent with the existing rules for self-scheduled load resources. We also clarify that, while resources are not dispatched when they clear the capacity markets, we are proposing that resources using the participation model for electric storage resources be able to set the price in the capacity markets, where applicable.

82. To optimize the capabilities of electric storage resources and for the RTOs/ISOs to use them efficiently, it is important for the RTOs/ISOs to be able to symmetrically utilize the capabilities of these resources to both receive electricity from the grid and inject it back to the grid. In other words, they must be able to dispatch electric storage resources as supply when the market clearing price exceeds their offers to sell and to dispatch electric storage resources as demand when their bids to buy exceed the market clearing price. The bidirectional capabilities of electric storage resources are what make them unique, and allowing electric storage resources to participate in the organized wholesale electric markets as both wholesale sellers and wholesale buyers will help optimize the value that they provide and enhance price formation, as they will be dispatched in accordance with their most economic use.

83. We preliminarily conclude that the proposed requirement to participate as a supply and demand resource simultaneously (*i.e.,* submit bids to buy and offers to sell during the same market interval) is necessary to maximize the value that electric storage resources can provide in the organized wholesale electric markets, allowing the markets to identify whether it is more economic to dispatch an electric storage resource as supply or demand during a given market interval. We expect that, through its bidding strategy, a resource using the electric storage resource participation model would be able to prevent any conflicting dispatch signals to itself. However, we seek comment on whether there should be a mechanism that identifies bids and offers coming from the same resource that ensures the price for the offer to sell is not lower than the price for the bid to buy during the same market interval so that an RTO/ISO does not accept both the offer and bid of a resource using the electric storage resource participation model for that interval.

84. Generally, in the organized wholesale electric markets, resources that cannot be dispatched by the RTO/ISO do not set wholesale prices. This is because the marginal clearing prices are based on the shadow price of the next unit of incremental production, and a resource that cannot be dispatched by the RTO/ISO cannot provide that incremental unit of production. Therefore, we propose that, for a resource using the proposed participation model for electric storage resources to be able to set prices in the organized wholesale electric markets as either a wholesale seller or a wholesale buyer, it must be available to the RTO/ISO as a dispatchable resource. We believe this proposal is consistent with RTO/ISO rules on price setting and are further proposing that the ability for resources using the participation model for electric storage resources to set the price be consistent with existing rules that govern when a resource can set the wholesale price. However, we seek comment on whether any existing RTO/ISO rules may unnecessarily limit the ability of resources using the participation model for electric storage resources to set prices in the organized wholesale electric markets.

85. We note that resources using the proposed participation model for electric storage resources that elect to submit economic bids as a wholesale buyer and participate as dispatchable demand resources would still be able to self-schedule their charging and be price takers. However, it is also possible that the RTO/ISO could dispatch an electric storage resource as load when the wholesale price for energy is above the price of their bid to buy (a circumstance under which they would lose the opportunity to earn greater revenues as a supply resource). Therefore, to help alleviate any potential financial risk to these resources when being dispatched as a demand resource, we seek comments on whether the proposed participation model for electric storage resources should allow make-whole payments when a resource participating under this participation model is dispatched as load and the price of energy is higher than the resource's bid price.

d. Minimum Size Requirement

i. Introduction

86. Depending on the technology, electric storage resources range in size from 1 kW to 1 GW,[146] and most of them tend to be under 1 MW.[147] RTO/ISO market rules may restrict electric storage resources from participating in the organized wholesale electric markets based on minimum size requirements [148] that may have been designed for different types of resources. This is particularly true for smaller electric storage resources, which may be limited to participating in the organized wholesale electric markets as demand response resources. Such restrictions can limit these resources' ability to employ their full operational range because they are prohibited from injecting electricity into the grid in excess of their host load and preclude them from providing services such as reserves.

ii. Current Rules

87. Under existing market rules, minimum capacity, minimum offer and minimum bid requirements for electric storage resources to participate in the organized wholesale electric markets vary across the RTOs/ISOs, with minimum size requirements ranging from 100 kW to 5 MW. PJM and SPP have minimum offer requirements of 100 kW for all resources, with other

[145] NYISO Response at 8.

[146] Sandia Report at 29, Figure 19 (Positioning of Energy Storage Technologies).

[147] U.S. Department of Energy, *Grid Energy Storage* at 12 (Dec. 2013) (stating that most storage systems are in the 10 kW to 10 MW range, with the largest proportion of those resources in the 100 kW to 1 MW range).

[148] We use the term ''minimum size requirement'' to collectively describe minimum capacity requirements to qualify to use a given participation model, ''minimum offer requirements'' for offers to sell services in the organized wholesale electric markets, and ''minimum bid requirements'' for bids to buy energy in these markets. When we are referring to a specific category of minimum size requirement, we will use that specific term.

RTO/ISO minimum size requirements varying across participation models and markets.[149]

88. CAISO states that the minimum capacity requirement for demand response resources is 100 kW and that all resources other than demand response have minimum capacity requirements of 500 kW. Resources can meet these minimum capacity requirements through aggregation.[150] Alternatively, ISO–NE minimum capacity requirements range from 100 kW for demand response resources, to 1 MW for Alternative Technology Regulation Resources, to 5 MW for generators seeking to provide demand response in the regulation market.[151] Under MISO tariff rules, minimum capacity requirements vary from 100 kW for Load Modifying Resources, to 1 MW for demand response resources, to 5 MW for generators.[152] MISO states that it has not determined a minimum size for Stored Energy Resources but believes a minimum of 1 MW is appropriate.[153] In NYISO, the minimum size requirement is 100 kW for demand response resources and 1 MW for Energy Limited Resources and Limited Energy Storage Resources.[154]

89. The RTOs/ISOs also define minimum bid requirements for load resources to buy energy from the organized wholesale electric markets. In CAISO, the minimum bid requirement is 10 kW, the same as for traditional generators.[155] In MISO and SPP, the minimum bid requirements are 100 kW.[156] In ISO–NE, energy market bids cannot be smaller than 100 kW.[157] In NYISO, the minimum bid requirement is 1 MW, with the option to aggregate to meet that requirement.[158] Electric storage resources do not submit bids to buy energy in the PJM wholesale markets.[159]

iii. Comments

90. Several commenters address the minimum size requirements to participate in the RTO/ISO markets, questioning whether the RTOs/ISOs based those standards on technological requirements and system needs. For example, NY Battery and Energy Storage Consortium argues that the minimum size requirement for participation in organized wholesale electric markets should be lowered.[160] Public Interest Organizations claim that minimum size requirements for electric storage resources to participate in the organized wholesale electric markets may be a barrier to distributed electric storage resources, especially those that are small. Public Interest Organizations contend that, while the opportunity to offer distributed energy resource aggregations into the markets could help mitigate this concern, that opportunity is lacking or unclear in some RTOs/ISOs.[161]

91. Several commenters specifically cite the variability in the minimum size requirements of the various RTO/ISO market participation models as a barrier to electric storage resource participation. Energy Storage Association contends that minimum size requirements for electric storage resources may prohibit storage participation and lead to inconsistencies across regions.[162] Advanced Energy Economy argues that it is not clear why the minimum size requirements for providing services should vary from RTO/ISO to RTO/ISO and that these market rule variations are a barrier to electric storage resource participation in the organized wholesale electric markets.[163] Public Interest Organizations assert that disparate requirements in the RTO/ISO reports indicate that some of these minimum limits may be arbitrary.[164]

92. Other commenters identify specific minimum size requirements in certain RTO/ISO markets as barriers to the participation of electric storage resources in those markets. Minnesota Energy Storage Alliance claims that MISO's 1 MW minimum size requirement for demand response resources is not appropriate due to the lower minimum size requirements in other RTOs/ISOs.[165] Minnesota Energy Storage Alliance further states that removing this requirement would allow electric storage resources to more readily participate, providing economic justification for project development and increasing MISO's operational flexibility. NY Battery and Energy Storage Consortium asserts that NYISO's 1 MW size requirement limits behind-the-meter electric storage resources from participating in NYISO's day-ahead market, despite having the technical capability to perform.[166]

93. Solar City and Viridity ask the Commission to consider requiring all RTOs/ISOs to set a minimum requirement of 100 kW for electric storage resource participation in their markets.[167] Solar City argues that a 100 kW minimum size requirement will ensure that electric storage resources can provide value to markets at relatively modest levels of penetration and participate in organized wholesale energy markets even when locational requirements reduce the area over which resources can be aggregated.[168]

iv. Proposed Reforms

94. We propose that the minimum size requirement to participate in the organized wholesale electric markets under the proposed electric storage resource participation model must not exceed 100 kW. While we acknowledge that minimum size requirements may be necessary to ensure that the RTOs/ISOs can effectively model and dispatch the resources participating in their markets, large minimum size requirements create a barrier to the participation of smaller electric storage resources. We preliminarily conclude that requiring that the minimum size requirement not exceed 100 kW balances the benefits of increased competition with the ability of RTO/ISO market clearing software to effectively model and dispatch smaller resources often located on the distribution system. Thus, we propose to require each RTO/ISO to revise its tariffs to include a participation model for electric storage resources that establishes a minimum size requirement for participation in the organized wholesale electric markets that does not exceed 100 kW. This would include any minimum capacity requirements, minimum offer requirements, and minimum bid requirements for resources participating in these markets under the electric storage resource participation model.

[149] PJM Response at 10 (citing PJM Tariff, Att. DD, section 5.6); SPP Response at 5 (citing SPP Tariff, Att. AE section 1.1 (definition of ''Offer'')).

[150] CAISO Response at 10–11 (citing CAISO Tariff, App. K, Part A 1.1.1; Part B1.1; Part C1.1).

[151] ISO–NE Response at 13–14 (citing ISO–NE Tariff, App. E2, section I–III).

[152] MISO Response at 10.

[153] *Id.* at 16–17.

[154] NYISO Response at 9.

[155] CAISO Response at 16.

[156] MISO Response at 17; SPP Response at 8.

[157] ISO–NE Response at 29.

[158] NYISO Response at 15.

[159] PJM Response at 22.

[160] NY Battery and Energy Storage Consortium Comments at 6.

[161] Public Interest Organizations Comments at 5.

[162] Energy Storage Association Comments at 29.

[163] Advanced Energy Economy Comments at 10–11.

[164] Public Interest Organizations Comments at 5.

[165] Minnesota Energy Storage Alliance notes that size restrictions do not apply to the load-modifying resource classification, but such resources are only eligible to provide capacity for MISO-declared emergency events and cannot provide energy or ancillary services. Minnesota Energy Storage Alliance Comments at 3–4.

[166] NY Battery and Energy Storage Consortium Comments at 5–6.

[167] SolarCity Comments at 9; Viridity Comments at 3.

[168] SolarCity Comments at 9.

e. Energy Used To Charge Electric Storage Resources

i. Introduction

95. Electric storage resources must absorb electricity (*i.e.,* charge) to sell that electricity, net of losses, back to an RTO/ISO as energy or ancillary services. The manner in which an electric storage resource charges (consumes) energy and discharges (produces) energy will determine whether the electric storage resource is engaging in a sale for resale subject to our jurisdiction.

ii. Current Rules

96. For the most part, the RTOs/ISOs indicate that electric storage resources that are charging to later provide wholesale services in their markets already pay LMP for that electricity. CAISO states that all electric storage resources participating in its wholesale markets pay LMP for their charging energy.[169] ISO–NE states that electric storage resources purchasing energy directly from the wholesale market pay the LMP for the electricity they receive.[170] MISO states that any resources eligible to participate in MISO's capacity, energy, and ancillary service markets pay LMP for the electricity they receive.[171] NYISO states that Energy Limited Resources using electric storage resource technology and Limited Energy Storage Resources will pay the wholesale price for the electricity they consume to meet a regulation service schedule or to charge the resource if the resource is either in front-of-the-meter (a generator) or a direct NYISO customer (a load-serving entity). NYISO notes that, if the resource is behind-the-meter and served by a separate load-serving entity, then it would pay the load-serving entity's retail rate.[172] PJM states that an electric storage resource would pay wholesale LMP if the resource is taking power off the system solely to inject into the energy or ancillary service markets at a later time.[173] SPP states that, in its real-time market, electric storage resources pay the real-time LMP for their load consumption, although they may also be subject to retail rules for electric consumption.[174]

iii. Comments

97. Several commenters address the issue of the price that electric storage resources should pay for charging electricity when that electricity is for later use in the organized wholesale electric markets. For example, Alevo argues that it is not clear whether an electric storage resource connected at the distribution level will pay the LMP for its charging electricity, even if it is charging to provide a wholesale service.[175] Electric Vehicle R&D Group and NextEra contend that current RTO/ISO tariffs do not provide enough clarity on the price that storage pays for electricity,[176] and that the RTOs/ISOs should revise their tariffs to settle discharging and recharging resources at LMP.[177] Similarly, Tesla asks the Commission to clarify that electricity stored for resale is not a retail sale and thus should be settled at the wholesale LMP.[178]

98. In contrast, Manitoba Hydro asserts that dispatchable electric storage resources should either pay a lower LMP than non-dispatchable resources or should receive a storage capacity credit for their services because a MWh received by a storage resource for later injection is different than a MWh consumed by traditional load.[179] Minnesota Energy Storage Alliance similarly requests that dispatchable electric storage resources pay a lower LMP or be compensated for the service.[180] AES Companies contend that it is inappropriate for an electric storage resource to pay LMP when it is directed to charge and that such a payment is a disincentive to new storage installation.[181]

99. SoCal Edison argues that behind-the-meter electric storage resources should not be allowed to charge at a wholesale rate and discharge to serve a retail customer to allow the retail customer to avoid paying the retail rate for its consumption.[182] Addressing this concern, some commenters suggest that metering and accounting practices can be designed to delineate between wholesale and retail activities.[183]

iv. Proposed Reforms

100. The Commission has found that the sale of energy from the grid that is used to charge electric storage resources for later resale into the energy or ancillary service markets constitutes a sale for resale.[184] As such, the just and reasonable rate for that wholesale sale of energy used to charge the electric storage resource is the RTO/ISO market's wholesale price for energy or LMP. We thus propose to require each RTO/ISO to revise its tariff to specify that the sale of energy from the organized wholesale electric markets to an electric storage resource that the resource then resells back to those markets must be at the wholesale LMP.

101. The proposed clarification also provides developers and operators of electric storage resources certainty about the price that they will be charged for purchasing charging electricity in the organized wholesale electric markets when they will use that electricity to provide wholesale services. We note that this proposed clarification is consistent with most current RTO/ISO practices as reflected in their responses.

102. We recognize SoCal Edison's concern that behind-the-meter electric storage resources should not be allowed to charge at a wholesale rate and discharge to serve a retail customer as a means for the retail customer to avoid paying the retail rate. This situation could be even more complex if the retail customer in question also uses a behind-the-meter generator in conjunction with its storage device. Given the comments in the record indicating that metering and accounting practices can be designed to delineate between

[169] CAISO Response at 17.

[170] ISO–NE Response at 29–30.

[171] MISO Response at 17.

[172] NYISO Response at 16.

[173] PJM Response at 23.

[174] SPP Response at 7.

[175] Alevo Comments at 29.

[176] Electric Vehicle R&D Group Comments at 13.

[177] NextEra Comments at 13.

[178] Tesla Comments at 5–6.

[179] Manitoba Hydro Comments at 10–12.

[180] Minnesota Energy Storage Alliance Comments at 5.

[181] AES Companies Comments at 23.

[182] SoCal Edison Comments at 8.

[183] Independent Energy Producers Association Comments, Att. at 7; Minnesota Energy Storage Alliance Comments at 5.

[184] *See Norton Energy Storage, L.L.C.,* 95 FERC ¶ 61,476, at 62,701–02 (2001) (citations omitted) (''[T]he use of compressed air as a medium for the storage of energy in an energy storage facility is a new technology. However, we find that a compressed air energy storage facility is analogous to a pumped storage hydroelectric facility, in that compressed air is used in a conversion/storage cycle just as water is used in a pumped storage hydroelectric facility in the conversion/storage cycle. . . . [T]he Commission views the pumping energy not as being consumed, but rather as being converted and stored, as water in the upper reservoir, for later re-conversion . . . back to electric energy. It is this conversion/storage cycle that distinguishes energy storage facilities, whether pumped storage hydroelectric facilities or compressed air energy storage facilities, from facilities that consume electricity (in the form of station power or otherwise). The fact that pumping energy or compression energy is not consumed means that the provision of such energy is *not* a sale for end use that this Commission cannot regulate. Rather, based on Norton's representations in its petition, we find that deliveries of compression energy to the Norton energy storage facility as part of energy exchange transactions employing the conversion/storage cycle are wholesale transactions subject to our exclusive authority under the FPA.''). *See also PJM Interconnection, L.L.C.,* 132 FERC at 62,053 (''Like pumping energy and compression energy, the energy used to charge Energy Storage Resources will be stored for later delivery and not used for operating the electric equipment on the site of a generation facility or associated buildings as Station Power is used.'').

wholesale and retail activities,[185] we seek comment on whether such metering and accounting practices would need to be established in the RTO/ISO tariffs to facilitate compliance with this proposal or whether it is possible to determine the end use for energy used to charge an electric storage resource under existing requirements.

B. Participation of Distributed Energy Resource Aggregators in the Organized Wholesale Electric Markets

1. Introduction

103. There has been significant industry attention paid to the development of distributed energy resources and the potential for such resources to contribute to grid services. More recently, the discussion has focused on new distributed energy resources that are smaller, interconnected to lower voltage networks, and geographically dispersed. These new distributed energy resources are enabled by increasing deployment of and improvements in metering, telemetry, and communication technologies. With such advances, more localized power and energy services and more supply resources and potential market participants have emerged. We are interested in removing barriers in current RTO/ISO market rules that would prevent these new, smaller distributed energy resources that are technically capable of participating in the organized wholesale electric markets from doing so.

104. As noted above, in this NOPR, we define distributed energy resources as a source or sink of power that is located on the distribution system, any subsystem thereof, or behind a customer meter.[186] These resources may include, but are not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment.[187]

105. As a general matter, distributed energy resources tend to be too small to participate directly in the organized wholesale electric markets on a stand-alone basis. First, they often do not meet the minimum size requirements to participate in these markets under existing participation models. Second, they may have difficulty satisfying all of the operational performance requirements of the various participation models due to their small size. Allowing these resources to participate in the organized wholesale electric markets through distributed energy resource aggregations can help to remove these barriers to their participation, providing a means for these resources to, in the aggregate, satisfy minimum size and performance requirements that they could not meet on a stand-alone basis.

106. The Commission recently accepted CAISO's proposal[188] to allow distributed energy resource aggregations in its markets. In addition, the RTOs/ISOs have implemented some models for aggregated resources to participate in their organized wholesale electric markets. These are described in more detail below but are generally for demand response resources, with a few exceptions. As a result, the majority of distribution-connected electric storage and other distributed energy resources that seek to access the organized wholesale electric markets must do so by participating as behind-the-meter demand response. While these demand response programs have helped reduce barriers to load curtailment resources, they often limit the operations of other types of distributed energy resources, such as electric storage or distributed generation, as well as the services that they are eligible to provide.

2. Current Rules

107. The RTOs/ISOs describe the opportunities for electric storage resources connected to the distribution system and electric storage resource aggregations to participate in their capacity, energy, and ancillary service markets. CAISO supports the aggregation of distributed energy resources, including storage, seeking to participate in the CAISO markets.[189] In addition, CAISO states that electric storage resources that wish to aggregate into a resource that can participate in the wholesale markets can participate by providing load curtailment as Proxy Demand Resources or Reliability Demand Response Resources.[190]

108. ISO–NE explains that, under each participation model, a single resource may be composed of multiple resources if those resources are either physically in the same location or require coordinated control.[191] ISO–NE explains that Alternative Technology Regulation Resources may include aggregations of multiple end-use customers, each with less than 1 MW of regulation capacity.[192] ISO–NE adds that Asset Related Demands may be aggregated if they are served by the same point of electrical connection and meet a 1 MW threshold.[193]

109. ISO–NE states that electric storage resources that meet its definition of Distributed Generation (*i.e.,* behind-the-meter resources with an aggregate nameplate capacity of less than 5 MW or the demand of the end-use customer, whichever is greater) may qualify as Real-Time Demand Response Assets, which allows for participation in the forward capacity market, the transitional price-responsive demand program, and the regulation market if it is also registered as an Alternative Technology Regulation Resource.[194] ISO–NE explains that, for the capacity market, demand resources may consist of an aggregation of multiple end-use customers, though they must be at least 100 kW and located within a dispatch zone or load zone as required under the participation model through which they are participating.[195] ISO–NE further explains that for the energy and reserve markets, demand response resources may also be aggregated as long as they are individually at least 10 kW, have an expected maximum interruptible capacity of 5 MW or less, and are located within a dispatch zone and reserve zone.[196]

110. MISO states that Stored Energy Resources and Demand Response Resources—Type II are allowed to aggregate under a single elemental pricing node. MISO adds that Demand Response Resources—Type I and Load Modifying Resources are allowed to aggregate within one local balancing authority.[197]

111. NYISO states that aggregated resources can participate in the Emergency Demand Response Program, Day-Ahead Demand Response Program, Demand Side Ancillary Services Program, and Special Case Resource Programs. NYISO notes that aggregated electric storage resources may be used to generate demand reductions in any of those programs.[198]

112. PJM states that aggregated electric storage resources can participate in the capacity, energy, and ancillary service markets. In the capacity market, PJM states that demand-side resources

[185] Independent Energy Producers Association Comments, Att. at 7; Minnesota Energy Storage Alliance Comments at 5.

[186] *See supra* note 2.

[187] *Id.*

[188] *See California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229.

[189] CAISO Response at 2–3. *See also California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229.

[190] CAISO Response at 7.

[191] ISO–NE Response at 26 (citing ISO–NE Operating Procedure 14, section II.A).

[192] *Id.* (citing ISO–NE Tariff, section III.14.2(c)).

[193] *Id.* at 27 (citing ISO–NE Operating Procedure 14, section I.2.2).

[194] *Id.* at 6–7.

[195] *Id.* at 27 (citing ISO–NE Operating Procedure 14, section III.13.1.4.1).

[196] *Id.* (citing ISO–NE Operating Procedure 14, section III.E2.1.1).

[197] MISO Response at 15.

[198] NYISO Response at 13.

can be aggregated to provide load reductions.[199] Under PJM's capacity performance proposal, electric storage resources are eligible to aggregate with other electric storage resources, Intermittent Resources, Demand Resources, Energy Efficiency Resources, and Environmentally-Limited Resources to provide capacity.[200] In the PJM regulation market, PJM states that all resources, including electric storage resources, may elect to be part of a performance group for the purpose of improving their overall performance score.[201] In the PJM energy market, PJM adds that multiple batteries located behind a single node and owned by the same entity would be eligible to offer into the energy market as one resource.[202]

113. SPP states that resources at the same point of injection may register at the unit or plant level and electric storage resources may be aggregated if the resources are electrically equivalent from the transmission system perspective (*i.e.,* use the same point of injection).[203]

3. Comments

114. Many commenters note that it is important for distributed energy resources to be allowed to fully participate in organized wholesale electric markets. For example, Advanced Energy Economy contends that, absent legitimate technical needs, distributed energy resources should be allowed to fully participate in organized wholesale electric markets.[204] Advanced Energy Economy claims that certain RTOs/ISOs have excluded these resources through artificial classifications (*e.g.,* the inability of multiple behind-the-meter generation and electric storage resources to provide frequency regulation in PJM). Similarly, SolarCity asks the Commission to require RTOs/ISOs to revise or implement rules to ensure that behind-the-meter resources, including electric storage resources, have a clear path for participation in all wholesale energy markets.[205]

115. Energy Storage Association agrees that distribution-connected electric storage resources, including aggregation across multiple storage assets and sites, should be able to participate in the organized wholesale electric markets to enhance competition needed for just and reasonable rates.[206] Energy Storage Association asks the Commission to consider extending the best practices learned in CAISO to all organized wholesale electric markets to address common barriers in metering, telemetry, and resource eligibility. RES Americas supports Energy Storage Association's comments and encourages the Commission to investigate the barriers to the participation of distributed energy resources in organized wholesale electric markets.[207] NY Battery and Energy Storage Consortium argues that behind-the-meter energy storage resources should be able to participate in organized wholesale electric markets directly or in aggregate form, and points out that behind-the-meter storage participating in NYISO as a demand side ancillary services program resource is not allowed to bid into the day-ahead demand response market, even though it is technically capable of doing so.[208]

116. Some commenters cite the inability for distributed energy resources to inject energy when participating as demand response as a barrier to distributed energy resources. SolarCity states that this inability hinders the ability of behind-the-meter resources to provide energy services and limits their capacity.[209] Advanced Energy Economy and Solar Grid Storage argue that PJM's restriction on the injection of energy past a customer's retail meter during operations for providing ancillary services in its markets is a barrier to electric storage resources.[210] Energy Storage Association and NextEra argue that no RTO/ISO allows behind-the-meter storage to net inject power to provide wholesale generator services.[211] NextEra agrees that this prohibition effectively limits the size of electric storage resources designed for customer applications. Energy Storage Association notes that NYISO recently received the Commission's conditional acceptance of its behind-the-meter net generator enhancement, but Energy Storage Association asserts that it still effectively excludes participation of electric storage resources because it does not include electric storage functionality (*e.g.,* state of charge management).[212]

117. Other comments focus on the benefits of allowing distributed energy resources to participate in the organized wholesale markets as aggregations. RES Americas contends that aggregation of electric storage resources, either within the asset class or across other resources that can be limited in their ability to offer a breadth of market products (*i.e.,* renewables or demand response), could be a means to realize market efficiencies and other policy objectives without creating entirely new market products or otherwise disrupting grid operations.[213] Electric Vehicle R&D Group states that third-party aggregators are the most practical approach to utilizing distributed electric storage resources connected to the low- and medium-voltage system.[214] Electric Vehicle R&D Group argues that, given the value that distributed electric storage resources provide to both transmission and distribution system operators and the lack of technical abilities of a distribution system operator to-date to build, qualify, and cost-effectively operate a distributed storage system aggregator, rules should not prohibit third-party aggregators or require distribution operators to manage them. Electric Vehicle R&D Group adds that the Commission should allow third-party aggregators to provide service to both RTOs and distribution system operators.

118. National Electrical Manufacturers Association states that organized wholesale electric markets should accommodate aggregated electric storage resources, including electric storage resources installed behind-the-meter, without imposing excessive requirements that would preclude the participation of smaller resources (*e.g.,* arduous study processes and/or expensive data telemetry requirements).[215] Similarly, NY Battery and Energy Storage Consortium argues that NYISO should avoid creating metering and telemetry requirements with prohibitively high transaction costs and imposing undue burdens on behind-the-meter storage participation.[216] Energy Storage Association agrees that metering and telemetry requirements and

[199] PJM Response at 20 (citing PJM Tariff, Attachment DD, sections 11, 11A).

[200] *Id.* (citing PJM Tariff, Attachment DD, section 5.6.1(h)).

[201] *Id.* at 20–21 (citing PJM Manual 12, section 4.5.7).

[202] *Id.* at 21.

[203] SPP Response at 7.

[204] Advanced Energy Economy Comments at 16–18.

[205] SolarCity Comments at 4.

[206] Energy Storage Association Comments at 30 (citing *California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229).

[207] RES Americas Comments at 4–5.

[208] NY Battery and Energy Storage Consortium Comments at 6.

[209] SolarCity Comments at 4.

[210] Advanced Energy Economy Comments at 16–17; Solar Grid Storage Comments at 2.

[211] Energy Storage Association Comments at 29; NextEra Comments at 12.

[212] Energy Storage Association Comments at 29–30.

[213] RES Americas Comments at 5.

[214] Electric Vehicle R&D Group Comments at 2.

[215] National Electrical Manufacturers Association Comments at 5.

[216] NY Battery and Energy Storage Consortium Comments at 6.

interconnection processes can pose prohibitively high transaction costs for the small project sizes that characterize behind-the-meter electric storage resources, creating undue burdens on their participation in most RTOs/ISOs.[217]

119. Similarly, California Energy Storage Alliance claims that the overhead costs of registering individual resources within an aggregation can be burdensome and costly.[218] Specifically, California Energy Storage Alliance argues that the registration of individual customer sites with load-serving entities, the California Public Utilities Commission, and CAISO can impose significant costs that discourage participation as proxy demand response and other wholesale market resources. California Energy Storage Alliance asserts that a separate administrative process under a behind-the-meter electric storage resource-specific model, or a streamlined version under existing constructs, could reduce these administrative costs by standardizing forms and processes across all individual resources and allowing the submission of a single application.

120. Some commenters identify problems with opportunities for aggregations in the RTOs/ISOs. Energy Storage Association is concerned that aggregated distributed energy resources are not permitted to offer into some RTO/ISO markets, while it is not clear how they can offer into others.[219] Energy Storage Association claims that market rules present barriers to aggregation (particularly minimum size requirements) because they are often designed around individual sites as a resource, rather than the capabilities of an aggregated set of sites.[220] NextEra asserts that, to enable aggregators to participate effectively in the organized wholesale electric markets, more work is needed by the RTOs/ISOs, like the recent CAISO initiative that led to new aggregation opportunities for small distributed resources.[221]

121. Public Interest Organizations agree that the opportunity to aggregate distributed energy resources could help mitigate minimum size or duration requirements, but state that this opportunity is lacking or unclear in some RTOs/ISOs.[222] NY Battery and Energy Storage Consortium and NY Transmission Owners point out that NYISO rules do not allow smaller resources with a capacity less than 1 MW to aggregate and provide generation above their host loads, though they can participate as an aggregated demand response resource.[223] Similarly, Minnesota Energy Storage Alliance states that MISO's market rules prevent robust participation of distributed electric storage resources in its energy and ancillary service markets because they do not permit the aggregation of these resources to meet the 5 MW minimum capacity requirement for a Demand Response Resource.[224]

122. Solar Grid Storage states that, while PJM's 100 kW minimum size requirement to participate in its ancillary service markets allows electric storage resources to aggregate their dispatch, aggregated resources must be part of a ''performance group'' in the same location.[225] Solar Grid Storage asserts that, because some ancillary services like frequency regulation are not site specific and can be provided with equal value to PJM over vastly different areas within the ISO, this locational restriction is unreasonable.

123. Some commenters stress the need to ensure that grid reliability concerns are addressed in rules governing behind-the-meter resources, including aggregations of such resources. EEI states that, because behind-the-meter resources are interconnected to the distribution grid and ultimately impact the transmission system, EEI members are interested in ensuring that any actions the RTOs/ISOs take to allow these resources, including aggregated resources, to participate in the organized wholesale electric markets do not negatively affect the electric distribution company's ability to maintain the reliability of the distribution system.[226] EEI claims that electric distribution utilities need to have visibility and input/control of the resources that are integrated to the distribution system for planning and operating purposes. SoCal Edison states that safety and reliability needs must take precedence over wholesale market dispatch and asks the Commission to consider the safe and reliable operation of the distribution system as a key principle when addressing the participation of distribution system-connected electric storage resources in the organized wholesale electric markets.[227]

4. Proposed Reforms

124. We are interested in removing barriers in current RTO/ISO market rules that would prevent these new, smaller distributed energy resources that are technically capable of participating in the organized wholesale electric markets from doing so. It is clear from the comments that the ability to meaningfully participate in the organized wholesale electric markets for these smaller distributed energy resources is through aggregations. Thus, we propose to require each RTO/ISO to revise its tariff as necessary to allow distributed energy resource aggregators to offer to sell capacity, energy, and ancillary services in the organized wholesale electric markets. Specifically, we propose to require each RTO/ISO to revise its tariff to define distributed energy resource aggregators as a type of market participant that can participate in the organized wholesale electric markets under the participation model that best accommodates the physical and operational characteristics of its distributed energy resource aggregation. This proposal is similar to CAISO's market rules that establish a distributed energy resource provider as a new type of market participant.[228] Our proposal would expand the types of resources that are eligible to participate in the organized wholesale electric markets through aggregators and require the RTOs/ISOs to remove any unnecessary limitations on how the distributed energy resources that participate in such aggregations must be operated.

125. Distributed energy resources may be unable or unwilling to participate in the organized wholesale electric markets absent the opportunity to participate as part of a distributed energy resource aggregation. Distributed energy resources are generally smaller than other resources connected to the grid and therefore may be unable to meet all of the qualification or performance requirements for participation in the organized wholesale electric markets. Specifically, they may be too small to satisfy minimum size requirements on a stand-alone basis and, as small resources, may face operational constraints that prevent them from satisfying minimum performance

[217] Energy Storage Association Comments at 29.

[218] California Energy Storage Alliance Comments at 7.

[219] Energy Storage Association Comments at 29 (citing ISO–NE Response at 26; NYISO Response at 13).

[220] *Id.* at 27–28.

[221] NextEra Comments at 12–13 (citing *California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229 at P 60).

[222] Public Interest Organizations Comments at 5.

[223] NY Battery and Energy Storage Consortium Comments at 6; NY Transmission Owners Comments at 3 (citing NYISO Installed Capacity Manual at 108, 110).

[224] Minnesota Energy Storage Alliance Comments at 4.

[225] Solar Grid Storage Comments at 4.

[226] EEI Comments at 5.

[227] SoCal Edison Comments at 2, 5–6.

[228] *See, e.g., California Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,229 at PP 3–7.

requirements.[229] However, if these distributed energy resources were permitted to aggregate with other distributed energy resources to participate in the organized wholesale electric markets, they may be able to, in the aggregate, meet any minimum size and performance requirements, particularly if the operational characteristics of different distributed energy resources in a given distributed energy resource aggregation complement each other.

126. Distributed energy resource aggregations will also help to address the commercial and transactional barriers to distributed energy resource participation in the organized wholesale electric markets. Owners and operators of individual distributed energy resources may be reluctant to incur the significant costs of participating in the organized wholesale electric markets, such as the costs of the necessary metering, telemetry and communication equipment. The smaller a resource is, the more likely the transaction costs to sell services into the organized wholesale electric markets outweigh the benefits that the prospective market participant may realize from selling wholesale services. However, some of these costs can be reduced by participating in the organized wholesale electric markets through a distributed energy resource aggregation, for example the time and resources necessary to learn the market rules and actively submit bids and/or offers into the organized wholesale electric markets.

127. We also believe that some of the restrictions placed on aggregators in the RTOs/ISOs, such as the types of resources that can participate in those aggregations and the inability to inject energy onto the grid, may limit the operation and effectiveness of existing RTO/ISO programs for aggregations. Therefore, as discussed further below, we propose to expand the types of distributed energy resources that are eligible to participate in the organized wholesale electric markets through aggregators and require RTOs/ISOs to remove any unnecessary limitations on how the distributed energy resources that participate in such aggregations must be operated.

128. Our proposal requires the RTOs/ISOs to define distributed energy resource aggregators as a type of market participant that can participate in the organized wholesale electric markets under the participation model that best accommodates the physical and operational characteristics of its distributed energy resource aggregation. This proposed requirement means that the distributed energy resource aggregator would register as, for example, a generation asset if that is the participation model that best reflects its physical characteristics. While we expect efficiencies to be gained by allowing distributed energy resources aggregations to participate under existing participation models, we also acknowledge that the use of existing participation models may not be possible in every RTO/ISO based on how market participation is structured. However, where this is possible, we emphasize that the distributed energy resource aggregation must still satisfy any eligibility requirements of the applicable participation model before it can participate in the organized wholesale electric markets under that participation model. Therefore, to accommodate the participation of distributed energy resource aggregations under the various participation models, we propose that each RTO/ISO modify the eligibility requirements for existing participation models as necessary to allow for the participation of distributed energy resource aggregators.

129. The costs of distributed energy resources have decreased significantly,[230] which when paired with alternative revenue streams and innovative financing solutions, is increasing these resources' potential to compete in and deliver value to the organized wholesale electric markets. Moreover, integrating these resources' capabilities into the organized wholesale electric markets will help the RTOs/ISOs to account for their impacts on installed capacity requirements and day-ahead energy demand, thereby reducing uncertainty in load forecasts and reducing the risk of over procurement of resources and the associated costs.

130. We believe that our proposal will provide numerous supplementary benefits to the RTO/ISO systems. For example, by removing barriers to the participation of distributed energy resources in organized wholesale electric markets through aggregators, these resources may locate where price signals indicate that new capacity is most needed, potentially helping to alleviate congestion and congestion costs during peak load conditions and to reduce transmission investment costs for transmitting energy into persistently high-priced load pockets. Moreover, unlike larger fossil fuel generators that often are not able to locate in load pockets due to environmental or other citing concerns, distributed energy resources are more able to co-locate with load and provide associated benefits. We also believe that the shorter lead time to develop many forms of distributed energy resources compared to traditional generators or transmission lines allows them to rapidly respond to near-term generation or transmission reliability-related requirements, further improving their ability to enhance reliability and reduce system costs.

131. Additionally, we agree with the comments of Advanced Energy Economy and Public Interest Organizations that electric storage resources and other resources connected to the distribution system should be able to participate in all of the organized wholesale electric markets in which they are technically capable of participating and that barriers that unnecessarily prevent distributed energy resources from providing certain services may be caused by market rules that are unduly discriminatory. The most commonly cited example of these barriers to participation in the comments we received are market rules that relegate electric storage resources, particularly behind-the-meter electric storage resources, to market participation using demand response programs. We agree with commenters that existing RTO/ISO demand response programs may restrict the ability of electric storage and other distributed energy resources from providing the full suite of services that they are capable of providing, and therefore propose this alternative path for distributed energy resources to access the organized wholesale electric markets.

132. As such, we propose to require each RTO/ISO to revise its tariff to allow distributed energy resource aggregators to participate directly in the organized wholesale electric markets and to establish market rules to accommodate the participation of distributed energy resource aggregations, consistent with the following:

a. Eligibility to participate in the organized wholesale electric markets through a distributed energy resource aggregator;

b. Locational requirements for distributed energy resource aggregations;

c. Distribution factors and bidding parameters for distributed energy resource aggregations;

[229] For example, combining the discharge times of multiple electric storage resources and/or combining them with distributed generation resources could allow aggregated resources to meet minimum run-time requirements that individual electric storage resources may not be able to meet.

[230] *See, e.g., Revolution . . . Now, The Future Arrives for Five Clean Energy Technologies,* 2016 Update, at 1; and *Tracking the Sun VIII,* Lawrence Berkeley National Lab, at 15 (Aug. 2015).

d. Information and data requirements for distributed energy resource aggregations;

e. Modifications to the list of resources in a distributed energy resource aggregation;

f. Metering and telemetry system requirements for distributed energy resource aggregations;

g. Coordination between the RTO/ISO, the distributed energy resource aggregator, and the distribution utility; and

h. Market participation agreements for distributed energy resource aggregators.

a. Eligibility To Participate in the Organized Wholesale Electric Markets Through a Distributed Energy Resource Aggregator

133. We preliminarily find that limiting the types of technologies that are allowed to participate in the organized wholesale electric markets through distributed energy resource aggregator would create a barrier to entry for emerging or future technologies, potentially precluding them from being eligible to provide all of the capacity, energy and ancillary services that they are technically capable of providing. While some individual resources or certain technologies may not be able to meet the qualification or performance requirements to provide services to the organized wholesale electric markets on their own, they may satisfy such requirements as part of a distributed energy resource aggregation where resources complement one another's capabilities.[231] To help ensure that the market rules that the RTOs/ISOs develop to comply with any Final Rule issued in this proceeding are sufficiently flexible to accommodate the participation of new distributed energy resources as technology continues to evolve and to acknowledge the potential for distributed energy resources to satisfy qualification or performance requirements through a distributed energy resource aggregator, we propose that each RTO/ISO revise its tariff so that it does not prohibit the participation of any particular type of technology in the organized wholesale electric markets through a distributed energy resource aggregator. However, to the extent existing rules or regulations explicitly prohibit certain technologies from participating in the organized wholesale electric markets, we do not intend to overturn those rules or regulations.

134. We also propose that it is appropriate for each RTO/ISO to limit the participation of resources in the organized wholesale electric markets through a distributed energy resource aggregator that are receiving compensation for the same services as part of another program. Since resources able to register as part of a distributed energy resources aggregation will be located on the distribution system, they may also be eligible to participate in retail compensation programs, such as net metering, or other wholesale programs, such as demand response programs. Therefore, to ensure that there is no duplication of compensation, we propose that distributed energy resources that are participating in one or more retail compensation programs such as net metering or another wholesale market participation program will not be eligible to participate in the organized wholesale electric markets as part of a distributed energy resource aggregation.

135. With respect to the capacity of the individual distributed energy resources that can participate in the wholesale electric markets through a distributed energy resource aggregator, we propose not to establish a minimum or maximum capacity requirement. We believe participation in the organized wholesale electric markets through a distributed energy resource aggregator should not be conditioned on the size of the resource, but we recognize that existing organized wholesale electric market rules may require resources to meet certain minimum or maximum capacity requirements under certain participation models. Therefore, we seek comment on whether we should establish a minimum or maximum capacity limit for individual resources seeking to participate in the organized wholesale electric markets through a distributed energy resource aggregator, or whether we should allow each RTO/ISO to propose such a minimum or maximum capacity requirement on compliance with any Final Rule issued in this rulemaking proceeding. To the extent that commenters think that we should adopt a minimum or maximum capacity requirement for individual distributed energy resources participating in the organized wholesale markets through a distributed energy resource aggregator, we seek comment on what that requirement should be.

136. With respect to the size of the distributed energy resource aggregations themselves, we propose that these aggregations meet any minimum size requirements of the participation model under which they elect to participate in the organized wholesale electric markets. For example, if a distributed energy resource aggregator decides to register using the participation model for electric storage resources proposed above given the cumulative physical and operational characteristics of the distributed energy resources in its aggregation, then its distributed energy resource aggregation would be required to meet the 100 kW minimum size requirement we propose for that participation model. Alternatively, if the distributed energy resource aggregator decides to register as a generator, then its aggregation would be required to meet the minimum size requirement for the generator participation model in the relevant RTO/ISO market. We seek comment on this proposal to require distributed energy resource aggregations to meet the minimum size requirements of the participation model that they use to participate in the organized wholesale electric markets.

137. Consistent with Order No. 719, we also propose that each RTO/ISO revise its tariff to allow a single qualifying distributed energy resource to avail itself of the proposed distributed energy resource aggregation rules by serving as its own distributed energy resource aggregator.[232]

b. Locational Requirements for Distributed Energy Resource Aggregations

138. Some RTO/ISO market rules permit only those resources that are located behind the same point of interconnection or at a single pricing node to aggregate. These limitations could be the result of several concerns. For instance, an RTO/ISO may be concerned that geographically dispersed resources participating in the organized wholesale electric markets through a distributed energy resource aggregation may exacerbate a transmission constraint or otherwise cause a reliability concern if dispatched as a single resource by the RTO/ISO. Similarly, an RTO/ISO may be concerned about price formation for services with geographically specific prices if geographically dispersed resources participating in the organized wholesale electric markets through a distributed energy resource aggregation were dispatched as a single resource by the RTO/ISO. That said, we are concerned that some existing

[231] Combining electric storage resources with distributed generation could allow the aggregate resource to achieve performance requirements (such as minimum run times) that an electric storage resource could not meet on its own and provide services (such as regulation) that distributed generation may not be able to provide on its own.

[232] *See* Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 158(d) (''An [aggregator of retail customers] can bid demand response either on behalf of only one retail customer or multiple retail customers.'').

requirements for aggregations to be located behind a single point of interconnection or pricing node may be overly stringent and may unnecessarily restrict the opportunities for distributed energy resources to participate in the organized wholesale electric markets through a distributed energy resource aggregator. We also note that recent improvements in metering, telemetry, and communication technology should facilitate better situational awareness and enable management of geographically disperse distributed energy resource aggregations, potentially rendering such restrictive locational requirements unnecessary.

139. Therefore, we propose to require each RTO/ISO to revise its tariff to establish locational requirements for distributed energy resources to participate in a distributed energy resource aggregation that are as geographically broad as technically feasible. Our proposal would give each RTO/ISO flexibility to adopt locational requirements that both allow for the participation of geographically disperse distributed energy resources in the organized wholesale electric markets through a distributed energy resource aggregation, where technically feasible, and account for the modeling and dispatch of the RTO's/ISO's transmission system. We further acknowledge that the appropriate locational requirements may differ based on the services that a distributed energy resource aggregator seeks to provide (*e.g.,* the locational requirements for participation in the day-ahead energy market may differ from those for participation in the ancillary service markets).

140. To the extent that commenters would prefer that we require the RTOs/ISOs to adopt consistent locational requirements, we seek further comment on what locational requirements we could require each RTO/ISO to adopt that would allow distributed energy resources to be aggregated as widely as possible without threatening the reliability of the transmission grid or the efficiency of the organized wholesale electric markets. We note that, in some RTOs/ISOs and for some services, the only geographic limitations imposed on distributed energy resource aggregations are by zone or due to modeled transmission constraints.[233]

141. We seek comment on potential concerns about dispatch, pricing, or settlement that the RTOs/ISOs must address if the distributed energy resources in a particular distributed energy resource aggregation are not limited to the same pricing node or behind the same point of interconnection. We also note that, as discussed in Section III.B.4.g, we propose to allow the relevant distribution utility or utilities to review the list of distributed energy resources in a distributed energy resource aggregation, which will also help ensure that dispatch of the aggregated distributed energy resources as a single resource will not cause any reliability concerns.

c. Distribution Factors and Bidding Parameters for Distributed Energy Resource Aggregations

142. RTOs/ISOs need to know which resources in a distributed energy resource aggregation will be responding to their dispatch signals and where those resources are located. This information is particularly important if the resources in a distributed energy resource aggregation are located across multiple points of interconnection, multiple transmission or distribution lines, or multiples nodes on the grid.

143. We, therefore, propose that the market rules governing distributed energy resource aggregations allow the RTOs/ISOs to require sufficient information from the resources in a distributed energy resource aggregation to reliably operate their systems. Specifically, we propose to require each RTO/ISO to revise its tariff to include the requirement that distributed energy resource aggregators (1) provide default distribution factors[234] when they register their distributed energy resource aggregation and (2) update those distribution factors if necessary when they submit offers to sell or bids to buy into the organized wholesale electric markets. In turn, we propose to require each RTO/ISO to revise the bidding parameters for each participation model in its tariff to allow distributed energy resource aggregators to update their distribution factors when participating in the organized wholesale electric markets. In addition to comments on this proposal, we seek comment on alternative approaches that may provide the RTOs/ISOs with the information from geographically or electrically disperse resources in a distributed energy resource aggregation necessary to reliably operate their systems.

144. Moreover, we preliminarily find that the bidding parameters for each participation model in the RTO/ISO tariffs may have to account for the physical and operational characteristics of distributed energy resource aggregations. Therefore, we seek comment on whether bidding parameters in addition to those already incorporated into existing participation models may be necessary to adequately characterize the physical or operational characteristics of distributed energy resource aggregations.

d. Information and Data Requirements for Distributed Energy Resource Aggregations

145. The RTOs/ISOs need sufficient information about the distributed energy resource aggregation and the individual resources in a distributed energy resource aggregation to effectively model, dispatch, and settle the aggregation. We preliminarily find that the information and data requirements that apply to distributed energy resource aggregations must not pose barriers to the participation of small distributed energy resources or distributed energy resources relying on any specific technology in the organized wholesale electric markets through a distributed energy resource aggregator. We refer to information and data requirements as the information that the distributed energy resource aggregator is required to provide to the RTO/ISO when the distributed energy resource aggregator and its list of resources register as a market participant as well as the information and data necessary for settlement and auditing purposes. In this NOPR, we seek to balance the information needs of RTOs/ISOs with information requirements so burdensome that they could limit the benefit of these proposed changes. The RTO/ISO will require certain information for the distributed energy resource aggregation as a whole, as well as the individual resources in the aggregation. While some of this information may be replicated in bidding parameters, we propose that the distributed energy resource aggregator

[233] *See, e.g.,* CAISO Tariff, Att. A, section 4.17.3 (e) (''Each Distributed Energy Resource Aggregation must be located in a single Sub-LAP.''). CAISO defines a sub-LAP as a subset of pricing nodes within a default load aggregation point. *See* CAISO Tariff, Appendix A, Master Definitions and Supplement. *See also* NYISO Market Administration and Control Area Service Tariff, section 2.4 (Definitions–D) (''Demand Side Ancillary Service Program Resource (DSASP Resource): A Demand Side Resource or an aggregation of Demand Side Resources located in the [New York Control Area (NYCA)] with at least 1 MW of load reduction that is represented by a point identifier (PTID) and is assigned to a Load Zone or Subzone by the ISO . . . .''); NYISO Day-Ahead Demand Response Program Manual at 2.16.4 (''A process and procedures will be drawn to . . . set limits to aggregation projects by zone, provider, program, or any other category.'').

[234] For purposes of this NOPR, distribution factors indicate how much of the total response from a distributed energy resource aggregation would be coming from each pricing node at which one or more resources participating in the aggregation are located.

initially provide to the RTO/ISO a description of the physical parameters of the distributed energy resource aggregation, including (1) the total capacity; (2) the minimum and maximum operating limits; (3) the ramp rate; (4) the minimum run time; and (5) the default distribution factors, if applicable. We propose to require each RTO/ISO to revise its tariff to require distributed energy resource aggregators to provide the RTO/ISO with a list of the distributed energy resources in the distributed energy resource aggregation that includes information about each of those distributed energy resources, including each resource's capacity, location on the distribution system, and its operating limits.

146. Electric Vehicle R&D Group identifies PJM's requirement for resources in a distributed energy resource aggregation to provide a one-line diagram of the resource as too cumbersome, especially for small resources at residential locations.[235] Additionally, in CAISO's distributed energy resource provider filing, CAISO declined to require renewable generation resources in an aggregation to provide the same meteorological data that standalone intermittent generators are required to provide because they believed the requirement would create an undue burden on individual distributed energy resources.[236] We agree that certain information requirements may be so burdensome for individual distributed energy resources that they pose a barrier to the participation of these distributed energy resources in the organized wholesale electric markets through aggregations. We therefore seek comment on whether there are information and data requirements imposed by RTOs/ISOs that apply to other market participants that should not apply to individual distributed energy resources participating in the organized wholesale electric markets through a distributed energy resource aggregation.

147. We also propose to require each RTO/ISO to revise its tariff to require distributed energy resource aggregators to maintain aggregate settlement data for the distributed energy resource aggregation so that the RTO/ISO can regularly settle with the distributed energy resource aggregator for its market participation. Finally, we propose to require distributed energy resource aggregators to maintain data for a length of time consistent with the RTO's/ISO's auditing requirements, for each individual resource in its distributed energy resource aggregation so that each resource can verify its performance if audited. We seek comment on these proposed data requirements and on whether distributed energy resource aggregators should be required to provide additional data to the RTO/ISO.

e. Modifications to the List of Resources in a Distributed Energy Resource Aggregation

148. The requirements for a distributed energy resource aggregator associated with modifications to the list of resources in a distributed energy resource aggregation can present a barrier to the participation of distributed energy resource aggregations in the organized wholesale electric markets. Electric Vehicle R&D Group notes that, to modify its distributed energy resource aggregation in PJM, it has to un-register all resources in its aggregation and then re-run the testing protocol for the revised aggregation to re-qualify to participate in the PJM markets.[237] Electric Vehicle R&D Group argues that testing every incremental addition to an aggregation is unnecessary because they are required to continuously report their available capacity and meter their aggregate power response. Because the incremental impacts on the organized wholesale electric markets of the addition or removal of individual distributed energy resources from a distributed energy resource aggregation will likely be minimal, and they are short lead time resources that can be developed and built quickly, we preliminarily conclude that they should be able to enter and exit distributed energy resource aggregations participating in the organized wholesale electric markets without undue burden.

149. We therefore propose that each RTO/ISO revise its tariff to allow a distributed energy resource aggregator to modify the list of resources in its distributed energy resource aggregation without reregistering all of the resources if the modification will not result in any safety or reliability concerns. We emphasize, however, pursuant to the proposed requirements in Section III.B.4.g below, that the relevant distribution utility or utilities must have the opportunity to review the list of individual resources that are located on their distribution system in a distributed energy resource aggregation before those resources may participate in the organized wholesale electric markets through the aggregation, so that they can assess whether the resources would be able to respond to RTO/ISO dispatch instructions without posing any significant risk to the distribution system.

f. Metering and Telemetry System Requirements for Distributed Energy Resource Aggregations

150. While the distributed energy resources in an aggregation will need to be directly metered, the metering and telemetry system, *i.e.,* hardware and software, requirements RTOs/ISOs impose on distributed energy resource aggregators and individual resources in distributed energy resource aggregations can pose a barrier to the participation of these aggregations in organized wholesale electric markets. We recognize that RTOs/ISOs need metering data for settlement purposes, and telemetry data to determine a resource's real-time operational capabilities so that they can efficiently dispatch resources. However, metering and telemetry systems are often expensive potentially creating a burden for small distributed energy resources. While telemetry data about a distributed energy resource aggregation as a whole is necessary for the RTO/ISO to efficiently dispatch the aggregation, telemetry data for each individual resource in the aggregation may not be.

151. While we are not proposing to prescribe specific metering and telemetry systems for distributed energy resource aggregators, we propose to require each RTO/ISO to revise its tariff to identify any necessary metering and telemetry hardware and software requirements for distributed energy resource aggregators and the individual resources in a distributed energy resource aggregation. These requirements must ensure that the distributed energy resource aggregator will be able to provide the necessary information and data to the RTO/ISO discussed in Section III.B.4.d but also not impose unnecessarily burdensome costs on the distributed energy resource aggregators and individual resources in a distributed energy resource aggregation that may create a barrier to their participation in the organized wholesale electric markets. We also note that there may be different types of resources in these aggregations, some in front of the meter, some behind the meter with the ability to inject energy back to the grid, and some behind the meter without the ability to inject energy to the grid. We therefore seek comment on whether the RTOs/ISOs need to establish metering and telemetry hardware and software requirements for each of the different types of distributed energy resources that participate in the

[235] Electric Vehicle R&D Group Comments at 8–9.

[236] *See* CAISO Transmittal Letter, Docket No ER16–1085–000, at 22. (Mar. 4, 2016).

[237] Electric Vehicle R&D Group Comments at 9.

organized wholesale electric markets through distributed energy resource aggregations, as well as whether we should establish specific metering and telemetry system requirements and, if so, what requirements would be appropriate.

152. With respect to telemetry, we believe that the distributed energy resource aggregator should be able to provide to the RTO/ISO the real-time capability of its resource in a manner similar to the requirements for generators, so the RTO/ISO knows the operating level of the resource and how much that resource can ramp up or ramp down over its full range of capability, including its charging capability for distributed energy resource aggregations that include electric storage resources. These telemetry system requirements may also need to be in place at different locations for geographically dispersed distributed energy resource aggregations that have to provide distribution factors or other similar factors, as discussed above. With respect to metering, we recognize that distributed energy resources may be subject to metering system requirements established by the distribution utility or local regulatory authority. Therefore, we propose that each RTO/ISO should rely on meter data obtained through compliance with these distribution utility or local regulatory authority metering system requirements whenever possible for settlement and auditing purposes, only applying additional metering system requirements for distributed energy resource aggregations when this data is insufficient.

g. Coordination Between the RTO/ISO, the Distributed Energy Resource Aggregator, and the Distribution Utility

153. The market rules that each RTO/ISO adopts to facilitate the participation of distributed energy resource aggregations must address coordination between the RTO/ISO, the distributed energy resource aggregator, and the distribution utility to ensure that the participation of these resources in the organized wholesale electric markets does not present reliability or safety concerns for the distribution or transmission system. Thus, we propose to require each RTO/ISO to revise its tariff to provide for coordination among the RTO/ISO, a distributed energy resource aggregator, and the relevant distribution utilities with respect to (1) the registration of new distributed energy resource aggregations and (2) ongoing coordination, including operational coordination, between the RTO/ISO, a distributed energy resource aggregator, and the relevant distribution utility or utilities. We seek comment on the detailed proposals described below.

154. First, we propose that each RTO/ISO revise its tariff to provide for coordination among itself, a distributed energy resource aggregator, and the relevant distribution utility or utilities when a distributed energy resource aggregator registers a new distributed energy resource aggregation or modifies an existing distributed energy resource aggregation to include new resources. The purpose of this coordination would be to ensure that all of the individual resources in the distributed energy resource aggregation are technically capable of providing services to the RTO/ISO through the aggregator and are eligible to be part of the aggregation (*i.e.,* are not participating in another retail or wholesale compensation program, as discussed in Section III.B.4.a above). In addition, we propose that this coordination provide the relevant distribution utility or utilities with the opportunity to review the list of individual resources that are located on their distribution system that enroll in a distributed energy resource aggregation before those resources may participate in the organized wholesale electric markets through the aggregation. The opportunity for the relevant distribution utility or utilities to review the list of these resources would allow them to assess whether the resources would be able to respond to RTO/ISO dispatch instructions without posing any significant risk to the distribution system and to ensure these resources are not participating in any other retail compensation programs. Finally, we propose that this coordination provide the relevant distribution utility or utilities the opportunity to report such information to the RTO/ISO for its consideration prior to the RTO/ISO allowing the new or modified distributed energy resource aggregation to participate in the organized wholesale electric market. We seek comment on whether the RTO/ISO tariffs should provide for any additional review by or coordination with other parties prior to a new or existing distributed energy resource aggregation participating in the organized wholesale electric markets.

155. Second, we acknowledge that ongoing coordination between the RTO/ISO, a distributed energy resource aggregator, and the relevant distribution utility or utilities may be necessary to ensure that the distributed energy resource aggregator is disaggregating dispatch signals from the RTO/ISO and dispatching individual resources in a distributed energy resource aggregation consistent with the limitations of the distribution system. Thus, we propose that each RTO/ISO revise its tariff to establish a process for ongoing coordination, including operational coordination, among itself, the distributed energy resource aggregator, and the distribution utility to maximize the availability of the distributed energy resource aggregation consistent with the safe and reliable operation of the distribution system. To account for the possibility that distribution facilities may be out of service and impair the operation of certain individual resources in a distributed energy resource aggregation, we also propose to require each RTO/ISO to revise its tariff to require the distributed energy resource aggregator to report to the RTO/ISO any changes to its offered quantity and related distribution factors that result from distribution line faults or outages. We seek comment on the level of detail necessary in the RTO/ISO tariffs to establish a framework for ongoing coordination between the RTO/ISO, a distributed energy resource aggregator, and the relevant distribution utility or utilities. We also seek comment on any related reliability, safety, and operational concerns and how they may be effectively addressed.

156. Further, we seek comment on the appropriate lines of communication to require. While it may be commercially efficient for the distributed energy resource aggregator to have the burden of communicating with both the RTO/ISO and the distribution utility, and acknowledging the assumption that the distributed energy resource aggregator will be the single point of contact with the RTO/ISO, are there reasons (*e.g.,* distribution operations or a distributed energy resource aggregator's commercial interest) why this would be insufficient communication? Does a distribution utility that serves distributed energy resources need real-time direct communication with the RTO/ISO, such as in the form of operating procedures or software-enabled communications, in order to operate its distribution system, or can that communication be organized through the distributed energy resource aggregator? Finally, we welcome comments on how the distributed energy resource aggregator model proposed herein would interact with or complement the distribution system operator (DSO) model being discussed in some states, and whether a DSO model might add value to the distributed energy resource aggregator model in terms of facilitating communication among affected entities?

h. Market Participation Agreements for Distributed Energy Resource Aggregators

157. To ensure that a distributed energy resource aggregator complies with all relevant provisions of the RTO/ISO tariffs, it must execute an agreement with the RTO/ISO that defines its roles and responsibilities and its relationship with the RTO/ISO before it can participate in the organized wholesale electric markets. Since the individual resources in these distributed energy resource aggregations will likely fall under the purview of multiple organizations (*e.g.,* the RTO/ISO, state regulatory commissions, relevant distribution utilities, and local regulatory authorities), these agreements must also require that the distributed energy resource aggregator attests that its distributed energy resource aggregation is compliant with the tariffs and operating procedures of the distribution utilities and the rules and regulations of any other relevant regulatory authority.[238] We therefore propose that each RTO/ISO revise its tariff to include a market participation agreement for distributed energy resource aggregators. We do not propose specific requirements for such agreements at this time, but instead seek comment on the information these agreements should contain.

158. While these agreements will define the roles and responsibilities of the distributed energy resource aggregator, they should not limit the business models under which distributed energy resource aggregators can operate. Therefore, we propose that the market participation agreement for distributed energy resource aggregators that each RTO/ISO must include in its tariff does not restrict the business models that distributed energy resource aggregators may adopt. For example, while the third-party aggregator is a common business model, the market participation agreement for distributed energy resource aggregators should not preclude distribution utilities, cooperatives, or municipalities from aggregating distributed energy resources on their systems or even microgrids from participating in the organized wholesale electric markets as a distributed energy resource aggregation.

IV. Compliance

159. We propose to require each RTO/ISO to submit a compliance filing to demonstrate that it satisfies the proposed requirements set forth in the Final Rule within six months of the date the Final Rule in this proceeding is published in the **Federal Register**. While we believe that six months is sufficient for each RTO/ISO to develop and submit its compliance filing, we recognize that implementation of the reforms proposed herein could take more time due to the changes that may be necessary to each RTO's/ISO's modeling and dispatch software. Therefore, we propose to allow twelve months from the date of the compliance filing for implementation of the proposed reforms to become effective.

160. We seek comment on the proposed deadline for each RTO/ISO to submit its compliance filing, as well as the proposed deadline for each RTO's/ISO's implementation of the proposed reforms to become effective. Specifically, we seek comment on whether the proposed compliance and implementation timeline would allow sufficient time for each RTO/ISO to implement changes to its technological systems and business processes in response to a Final Rule. We also seek comment on whether the RTOs/ISOs will require more or less time to implement certain reforms versus others.

161. To the extent that any RTO/ISO believes that it already complies with any of the requirements adopted in a Final Rule in this proceeding, the RTO/ISO would be required to demonstrate how it complies in the filing due within six months of the date any Final Rule in this proceeding is published in the **Federal Register**. The proposed implementation deadline would apply only to the extent that an RTO/ISO does not already comply with the reforms proposed in this NOPR.

V. Information Collection Statement

162. The Paperwork Reduction Act (PRA)[239] requires each federal agency to seek and obtain Office of Management and Budget (OMB) approval before undertaking a collection of information directed to ten or more persons or contained in a rule of general applicability. OMB's regulations,[240] in turn, require approval of certain information collection requirements imposed by agency rules. Upon approval of a collection(s) of information, OMB will assign an OMB control number and an expiration date. Respondents subject to the filing requirements of a rule will not be penalized for failing to respond to these collection(s) of information unless the collection(s) of information display a valid OMB control number.

163. In this NOPR, we are proposing to amend the Commission's regulations under Part 35 to require each RTO/ISO to propose revisions to its tariff to (1) establish a participation model consisting of market rules that, recognizing the physical and operational characteristics of electric storage resources, accommodates their participation in the organized wholesale electric markets and (2) define distributed energy resource aggregators as a type of market participant that can participate in the organized wholesale electric markets under the participation model that best accommodates the physical and operational characteristics of its distributed energy resource aggregation. Accordingly, we encourage comments regarding the time burden expected to be required to comply with the proposed rule regarding the requirement for the RTOs/ISOs to change their tariffs to conform to the proposed rule. Specifically, this NOPR seeks comment on the additional burden and cost (human, hardware, and software) associated with implementation, operation, and maintenance of these new provisions in RTO/ISO tariffs. The Commission will provide estimates for these costs in any future Final Rule, as appropriate.

Burden Estimate and Information Collection Costs: We believe that the burden estimates below are representative of the average burden on respondents. The estimated burden and cost for the requirements contained in this NOPR follow.

[238] This may include any laws or regulations of the relevant retail regulatory authority that do not permit demand response resources to participate in the RTO/ISO markets as the Commission considered in Order No. 719. *See* Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 154.

[239] 44 U.S.C. 3501–3520.

[240] 5 CFR 1320 (2016).

FERC–516, AS MODIFIED BY THE NOPR IN DOCKET RM16–23–000

	Number of respondents (1)	Annual number of responses per respondent (2)	Total number of responses (1) × (2) = (3)	Average burden (hours) & cost per response (4)	Total annual burden hours & total annual cost (3) × (4) = (5)	Cost per respondent ($) (5) ÷ (1)
One-Time Tariff Filings (Year 1).	[241] 6	1	6	1,040 hrs; $76,960 [242]	6,240 hrs; $461,760	$76,960

Title: FERC–516, Electric Rate Schedules and Tariff Filings.

Action: Proposed revisions to an information collection.

OMB Control No.: 1902–0096.

Respondents for this Rulemaking: RTOs and ISOs.

Frequency of Information: One-time during Year One.

Necessity of Information: The Commission implements this rule to eliminate barriers to electric storage resource participation in the organized wholesale electric markets and allow for participation of aggregated distributed energy resources in the organized wholesale electric markets.

Internal Review: The Commission has reviewed the changes and has determined that such changes are necessary. These requirements conform to the Commission's need for efficient information collection, communication, and management within the energy industry. The Commission has specific, objective support for the burden estimates associated with the information collection requirements.

Interested persons may obtain information on the reporting requirements by contacting the following: Federal Energy Regulatory Commission, 888 First Street NE., Washington, DC 20426 [Attention: Ellen Brown, Office of the Executive Director] Email: *DataClearance@ferc.gov* Phone: (202) 502–8663; fax: (202) 273–0873. Comments concerning the collection of information and the associated burden estimate(s) may also be sent to: Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission]. Due to security concerns, comments should be sent electronically to the following email address: *oira_submission@omb.eop.gov*. Comments submitted to OMB should refer to FERC–516 and OMB Control No. 1902–0096.

VI. Regulatory Flexibility Act Certification

164. The Regulatory Flexibility Act of 1980 (RFA) [243] generally requires a description and analysis of proposed rules that will have significant economic impact on a substantial number of small entities. The RFA mandates consideration of regulatory alternatives that accomplish the stated objectives of a rule and that minimize any significant economic impact on a substantial number of small entities. The Small Business Administration's (SBA) Office of Size Standards develops the numerical definition of a small business.[244] These standards are provided on the SBA Web site.[245]

165. The SBA classifies an entity as an electric utility if it is primarily engaged in the transmission, generation and/or distribution of electric energy for sale. Under this definition, the six RTOs/ISOs are considered electric utilities, specifically focused on electric bulk power and control. The size criterion for a small electric utility is 500 or fewer employees.[246] Since every RTO/ISO has more than 500 employees, none are considered small entities.

166. Furthermore, because of their pivotal roles in wholesale electric power markets in their regions, none of the RTOs/ISOs meet the last criterion of the two-part RFA definition of a small entity: ''Not dominant in its field of operation.'' [247] As a result, we certify that the reforms required by this NOPR would not have a significant economic impact on a substantial number of small entities.

VII. Environmental Analysis

167. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect on the human environment.[248] We conclude that neither an Environmental Assessment nor an Environmental Impact Statement is required for this NOPR under section 380.4(a)(15) of the Commission's regulations, which provides a categorical exemption for approval of actions under sections 205 and 206 of the FPA relating to the filing of schedules containing all rates and charges for the transmission or sale of electric energy subject to the Commission's jurisdiction, plus the classification, practices, contracts and regulations that affect rates, charges, classifications, and services.[249]

VIII. Comment Procedures

168. The Commission invites interested persons to submit comments on all matters and issues proposed in this Proposal to be adopted, including any related matters or alternative proposals that commenters may wish to discuss. Comments are due January 30, 2017. Comments must refer to Docket No. RM16–23–000 and must include the commenter's name, the organization they represent, if applicable, and their address.

169. The Commission encourages comments to be filed electronically via

[241] Respondent entities are either RTOs or ISOs.

[242] The estimated hourly cost (salary plus benefits) provided in this section is based on the salary figures for May 2015 posted by the Bureau of Labor Statistics for the Utilities sector (*http://www.bls.gov/oes/current/naics2_22.htm#13-0000*) and scaled to reflect benefits using the relative importance of employer costs in employee compensation from June 2016 (*http://www.bls.gov/news.release/ecec.nr0.htm*). The hourly estimates for salary plus benefits are:

Legal (code 23–0000), $128.94

Computer and mathematical (code 15–0000), $60.54

Information systems manager (code 11–3021), $91.63

IT security analyst (code 15–1122), $63.55

Auditing and accounting (code 13–2011), $53.78

Information and record clerk (code 43–4199), $37.69

Electrical Engineer (code 17–2071), $64.20

Economist (code 19–3011), $74.43

Management (code 11–0000), $88.94

The average hourly cost (salary plus benefits), weighting all of these skill sets evenly, is $73.74. The Commission rounds it to $74 per hour.

[243] 5 U.S.C. 601–12.

[244] 13 CFR 121.101.

[245] U.S. Small Business Administration, *Table of Small Business Size Standards Matched to North American Industry Classification System Codes* (effective Feb. 26, 2016), *https://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf*.

[246] 13 CFR 121.201 (Sector 22, Utilities).

[247] The RFA definition of ''small entity'' refers to the definition provided in the Small Business Act, which defines a ''small business concern'' as a business that is independently owned and operated and that is not dominant in its field of operation. The Small Business Administration's regulations at 13 CFR 121.201 define the threshold for a small Electric Bulk Power Transmission and Control entity (NAICS code 221121) to be 500 employees. *See* 5 U.S.C. 601(3) (citing to section 3 of the Small Business Act, 15 U.S.C. 632).

[248] *Regulations Implementing the National Environmental Policy Act of 1969*, Order No. 486, 52 FR 47,897 (Dec. 17, 1987), FERC Stats. & Regs., ¶ 30,783 (1987).

[249] 18 CFR 380.4(a)(15).

the eFiling link on the Commission's Web site at *http://www.ferc.gov*. The Commission accepts most standard word processing formats. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format. Commenters filing electronically do not need to make a paper filing.

Commenters that are not able to file comments electronically must send an original of their comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street NE., Washington, DC 20426.

170. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commenters on this Proposal are not required to serve copies of their comments on other commenters.

IX. Document Availability

171. In addition to publishing the full text of this document in the **Federal Register**, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (*http://www.ferc.gov*) and in the Commission's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street NE., Room 2A, Washington, DC 20426.

172. From the Commission's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number of this document, excluding the last three digits, in the docket number field.

173. User assistance is available for eLibrary and the Commission's Web site during normal business hours from the Commission's Online Support at (202) 502–6652 (toll free at 1–866–208–3676) or email at *ferconlinesupport@ferc.gov*, or the Public Reference Room at (202) 502–8371, TTY (202) 502–8659. Email the Public Reference Room at *public.referenceroom@ferc.gov*.

List of Subjects in 18 CFR Part 35

Electric power rates; Electric utilities.

By direction of the Commission.

Issued: November 17, 2016.

Nathaniel J. Davis, Sr.,

Deputy Secretary.

In consideration of the foregoing, the Commission proposes to amend Part 35 Chapter 1, Title 18 of the *Code of Federal Regulations* as follows:

PART 35—FILING OF RATE SCHEDULES AND TARIFFS

■ 1. The authority citation continues to read as follows:

Authority: 16 U.S.C. 791a–825r, 2601–2645; 31 U.S.C. 9701; 42 U.S.C. 7101–7352.

■ 2. Amend § 35.28 by adding new paragraphs (b)(9) through (12), (g) (9), and (g)(10).

§ 35.28 Non-discriminatory open access transmission tariff.

* * * * *

(b) * * *

(9) *Electric storage resource* as used in this section means a resource capable of receiving electric energy from the grid and storing it for later injection of electricity back to the grid regardless of where the resource is located on the electrical system.

(10) *Distributed energy resource* as used in this section means a source or sink of power that is located on the distribution system, any subsystem thereof, or behind a customer meter.

(11) *Distributed energy resource aggregator* as used in this section means the entity that aggregates one or more distributed energy resources for purposes of participation in the capacity, energy and ancillary service markets of the regional transmission organizations and independent system operators.

(12) *Organized wholesale electric markets* as used in this section means the capacity, energy, and ancillary service markets operated by regional transmission organizations and independent system operators.

* * * * *

(g) * * *

(9) *Electric Storage Resources.* (i) Each Commission-approved independent system operator and regional transmission organization must have tariff provisions providing a participation model for electric storage resources that

(A) Ensures that electric storage resources are eligible to provide all capacity, energy and ancillary services that they are technically capable of providing in the organized wholesale electric markets;

(B) Incorporates bidding parameters that reflect and account for the physical and operational characteristics of electric storage resources;

(C) Ensures that electric storage resources can be dispatched and can set the wholesale market clearing price as both a wholesale seller and wholesale buyer consistent with existing rules that govern when a resource can set the wholesale price;

(D) Establishes a minimum size requirement for participation in the organized wholesale electric markets that does not exceed 100 kW; and

(E) Specifies that the sale of energy from the organized wholesale electric markets to an electric storage resource that the resource then resells back to those markets must be at the wholesale locational marginal price.

(ii) [Reserved]

(10) *Distributed Energy Resource Aggregators.* (i) Each independent system operator and regional transmission organization must have tariff provisions that allow distributed energy resource aggregations to participate directly in the organized wholesale electric markets. Each regional transmission organization and independent system operator must establish distributed energy resource aggregators as a type of market participant and must allow the distributed energy resource aggregators to register distributed energy resource aggregations under the participation model in the regional transmission operator or the independent system operator's tariff that best accommodates the physical and operational characteristics of the distributed energy resource aggregation.

(ii) Each regional transmission operator and independent system operator, to accommodate the participation of distributed energy resource aggregations, must establish market rules on:

(A) Eligibility to participate in the organized wholesale electric markets through a distributed energy resource aggregation;

(B) Locational requirements for distributed energy resource aggregations;

(C) Distribution factors and bidding parameters for distributed energy resource aggregations;

(D) Information and data requirements for distributed energy resource aggregations;

(E) Modification to the list of resources in a distributed energy resource aggregation;

(F) Metering and telemetry system requirements for distributed energy resource aggregations;

(G) Coordination between the regional transmission organization or independent system operator, the distributed energy resource aggregator, and the distribution utility;

(H) Market participation agreements for distributed energy resource aggregators.

Note: *The following appendix will not appear in the Code of Federal Regulations*

Appendix A: Abbreviated Names of Commenters

The following table contains the abbreviated names of the commenters that are used in this Notice of Proposed Rulemaking.

Abbreviation	Commenters
Advanced Energy Economy	Advanced Energy Economy
AEP	American Electric Power Service Corporation

Abbreviation	Commenters
AES Companies	Indianapolis Power & Light Company, The Dayton Power and Light Company, AES Energy Storage LLC, AES ES Tait LLC and all other AES U.S. operating companies that own generation and storage
Alevo	Alevo Analytics
Advanced Microgrid Solutions	Advanced Microgrid Solutions, Inc.
APPA	American Public Power Association
Advanced Rail Energy Storage	Advanced Rail Energy Storage, LLC
Brookfield Renewable	Brookfield Renewable
California Department of Water Resources	California Department of Water Resources
California Energy Storage Alliance	California Energy Storage Alliance
Delaware Commission	Delaware Public Service Commission
Duke Energy	Duke Energy Corporation
EEI	Edison Electric Institute
Enel Green Power	Enel Green Power North America, Inc.
Electric Power Supply Association	Electric Power Supply Association
Electric Vehicle R&D Group	University of Delaware Electric Vehicle R&D Group
Energy Storage Association	Energy Storage Association
FirstLight	FirstLight Power Resources Management LLC
Golden Spread	Golden Spread Electric Cooperative, Inc.
Ice Energy	Ice Energy
Independent Energy Producers Association	Independent Energy Producers Association
Manitoba Hydro	Manitoba Hydro
Minnesota Energy Storage Alliance	Minnesota Energy Storage Alliance
National Electrical Manufacturers Association	National Electrical Manufacturers Association
National Hydropower Association	National Hydropower Association
New York Battery and Energy Storage Consortium	New York Battery and Energy Storage Technology Consortium
NextEra	NextEra Energy Resources, LLC
NRECA	National Rural Electric Cooperative Association
NY Transmission Owners	Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., New York Power Authority, New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., Power Supply Long Island, and Rochester Gas and Electric Corporation
Ormat	Ormat Nevada Inc.
Pacific Gas & Electric	Pacific Gas and Electric Company
Public Interest Organizations	Sustainable FERC Project on behalf of Natural Resources Defense Council and Union of Concerned Scientists
PJM Market Monitor	Independent Market Monitor For PJM
Quanta	Ralph Masiello, Quanta Technologies, LLC
RES Americas	Renewable Energy Systems Americas Inc.
SoCal Edison	Southern California Edison Company
Schulte Associates	Schulte Associates LLC
Solar Grid Storage	Solar Grid Storage, LLC
SolarCity	SolarCity Corporation
Steffes	Steffes
Tesla	Tesla Motors, Inc.
Viridity	Viridity Energy, Inc.
Wellhead	Wellhead Electric Company
Xcel Energy Services	Xcel Energy Services, Inc., on behalf of its operating company affiliates, Northern States Power and Southwestern Public Service Company

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