UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

Electric Storage Participation in Markets	Docket No. RM16-23-000
Operated by Regional Transmission Organizations	Docket No. AD16-20-000
And Independent System Operators	

COMMENTS OF PJM INTERCONNECTION, L.L.C.

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I. INTRODUCTION AND EXECUTIVE SUMMARY

PJM Interconnection, L.L.C. ("PJM") is supportive of the Federal Energy Regulatory Commission ("Commission") issuing the Notice of Proposed Rulemaking ("NOPR")[1] as an affirmative step toward "remov[ing] barriers to the participation of electric storage resources and distributed energy resource aggregations in the organized wholesale electric markets."[2] As will be outlined below, electric storage resources[3] ("ESRs") have already flourished in a number of PJM markets, and through its stakeholder process, PJM is working to expand its market rules to allow for additional opportunities for ESRs and distributed energy resources[4] ("DERs").[5] Nevertheless, through these comments PJM focuses on two overarching areas where changes

[1] *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Notice of Proposed Rulemaking, Docket No. RM16-23-000, et al. (Nov. 17, 2016).

[2] *See* NOPR at P 1.

[3] Unless otherwise specified, PJM adopts the definition of electric storage resources established in the 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. 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.") *See* NOPR at P 1, n. 1.

[4] Unless otherwise specified, PJM adopts the definition of distributed energy resources ("DERs") established in the 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. These resources may include, but are not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment.") *See* NOPR at P 1, n. 2.

[5] Specifically, a special session of PJM's Markets Implementation Committee is currently focusing on the participation of DERs in PJM. *See e.g.* http://pjm.com/committees-and-groups/committees/mic.aspx.

should be considered between the NOPR and any resulting Final Rule: 1) key threshold issues, such as potential jurisdictional issues related to the charging and discharging of behind the meter[6] resources, for which the Commission needs to speak clearly and provide direction considering the entities involved, which include but are not limited to states, electric distribution companies, asset owners and Regional Transmission Organizations and Independent System Operators (collectively, "RTOs/ISOs"); and 2) the need for sufficient flexibility on key implementation details to accommodate for distinct RTO/ISO characteristics.

PJM recognizes that there is a healthy tension between these two competing areas. On one hand, certain key threshold matters should be decided on a national basis so as to avoid each RTO/ISO having to determine legal and policy issues that are best left to regulators at the state and federal levels to decide. On the other hand, flexibility in implementation is needed to accommodate RTO/ISO differences, while at the same time respecting the overall interest in enabling a nascent industry to flourish across the country, and not just in select geographic pockets.

Moreover, in PJM's opinion, the NOPR is in effect comprised of two distinct parts. Specifically, the first part addresses participation of ESRs that largely reflect policies and rules already in place or under development in PJM, while the second part of the NOPR addresses DERs, in particular behind the meter DERs. The second part of the NOPR related to behind the meter resources is, by definition, more complex given issues surrounding jurisdiction, aggregation, operational visibility and dispatchability of those resources in today's paradigm. While the issues prevalent in this second part of the NOPR can be largely addressed under PJM's

[6] For purposes of these comments, "behind the meter" resources refer to resources that are wired behind a load meter and whose output is generally used to serve end-use customers' load. Relatedly, "front of the meter" resources refer to resources that have gone through PJM's queue and offer to sell in PJM's markets.

current market rules, and in particular PJM's rules related to demand response resources [7] and generation resources, new rules and procedures will need to be developed by PJM to account for behind the meter DERs seeking to inject power onto the grid. Accordingly, requirements related to payment for such injections, among other issues, requires consideration of the applicability of certain rules that today apply solely to generation resources that operate in front of the meter. Thus, PJM provides constructive suggestions and highlights key areas which require up front Commission determination to ensure that behind the meter DERs can participate in wholesale electric markets in a manner that will maximize their full economic potential in the future, while also ensuring the safe and reliable operation of the bulk electric system. To aid the Commission in its analysis, PJM has attached to these comments an Appendix A containing suggested revisions to the language of the proposed Final Rule to best address these, and other, specified issues.

PJM has a longstanding history of supporting innovation in the electric industry and has led initiatives to incorporate demand response resources and ESRs in wholesale electric markets. Accordingly, PJM feels its experience with these types of resources is relevant, and that its existing rules and procedures can be leveraged and built upon to enhance the participation of ESRs and DERs in a safe, efficient, and reliable manner.

II. ELECTRIC STORAGE RESOURCES AND DISTRIBUTED ENERGY RESOURCES IN PJM

A. ESRs in PJM

There is a long history of pumped storage hydropower resources participating in PJM's energy, ancillary services, and capacity markets. The historical operation of these resources has

[7] References herein to "demand response resources" refer to resources that facilitate the reduction of end-use customers' load and that participate in any of PJM's markets. Such resources fall under the "behind the meter" resource definition described previously. *See id.*

allowed for the development of specific bidding parameters, modeling assumptions, and respect for hydrologic conditions that are considered in the scheduling of these resources in PJM.[8]

More recently, approximately 300 MW of new types of ESRs have entered PJM's Regulation[9] market in the form of battery and flywheel technologies. Battery and flywheel ESRs operating in PJM today are generally distinguished by their fast response time, limited quantity of energy storage, and small megawatt output relative to pumped storage resources. These characteristics present unique advantages and challenges for integration of such resources into RTO/ISO wholesale electric markets. The growth of battery and flywheel ESRs has required PJM to make certain modifications to ensure that these resources are able to participate as any other resource would, without advantage or disadvantage over other resource types, in PJM's energy, ancillary, and capacity markets.[10] However, given the still nascent status of the industry and factors related to technology and cost, there is no history of operating battery and flywheel ESRs in PJM's energy or capacity markets. Thus, any proposed participation model establishing new parameters and rules for ESRs' participation in PJM's wholesale markets based on a Final Rule in this proceeding is bound to evolve over time as experience is gained.

B. DERs in PJM

Among organized wholesale electric markets, PJM has been a leader in facilitating market participation by DERs. PJM fully integrated demand response resources into wholesale markets in 2007, and demand response resources now provide capacity, energy, and/or ancillary

[8] *See e.g. PJM Interconnection, L.L.C.*, Clarifications Related to Pumped Storage, Docket No. ER17-957-000 (Feb. 10, 2017).

[9] Capitalized terms used and not otherwise defined herein have the meaning set forth in the PJM Open Access Transmission Tariff ("Tariff") and Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("Operating Agreement").

[10] *See e.g. Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Response of PJM Interconnection, L.L.C, Docket No. AD16-20-000, at 3-7 (May 16, 2016).

services in PJM. Notably, currently in PJM there are over 1,100 MW of nameplate capacity demand response resources consisting of batteries, reciprocating engines, combustion turbines, and other technologies that are physically capable of producing electric power. Furthermore, today's demand response resource market rules provide significant flexibility which enables both aggregates of small DERs and large individual DERs to participate in PJM's markets.

Additionally, many DERs participate in PJM as front of the meter resources. PJM's Wholesale Market Participation Agreement ("WMPA") facilitates access for generation resources and ESRs connected to distribution facilities to sell capacity, energy, and/or ancillary services into PJM's markets. In fact, more than 100 generators and ESRs totaling over 700 MW of nameplate capacity, connected to various distribution systems across 10 states, have rights to sell in PJM's markets by way of WMPAs.[11]

III. GENERAL CONSIDERATIONS FOR ELECTRIC STORAGE RESOURCES AND DER AGGREGATION

A. Current Market Participation Frameworks and Path Forward

The frameworks[12] for market participation in PJM can generally be described as the "generation" framework and "demand response" framework. The generation framework is applied to a Market Participant using any resource type connected directly to the transmission or distribution system that will inject energy onto the grid for the purposes of engaging in a wholesale transaction. The demand response framework is applied to a Market Participant using any resource type connected behind a customer's load meter that will reduce, or in certain instances increase, that customer's load for the purposes of engaging in a wholesale transaction.

[11] Further, many more distribution-connected resources have executed Interconnection Service Agreements.

[12] In the NOPR, the Commission defines "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." *See* NOPR at P 2, n. 5. PJM uses the term "framework" herein to generally describe the different ways in which ESRs and DERs participate in PJM wholesale markets today, irrespective of technology type.

Provided a Market Participant meets the applicable rules and requirements associated with each of these frameworks, and for each market in which they seek to participate, Market Participants using ESRs and DERs are eligible to use either framework to provide capacity, energy, and/or ancillary services.

Importantly, PJM is actively discussing a new set of rules in the PJM stakeholder process that would apply to Market Participants offering behind the meter resources in PJM's markets as both a customer load reduction, or "demand response," and an energy injection onto the grid, or "generation," among other issues.[13] The key feature of such rules is that they would allow behind the meter resources to serve load and also inject energy, which is currently limited in PJM. Given that much work still needs to be done to develop these rules, PJM asks that any Final Rule be flexible enough to accommodate the ongoing work by stakeholders to address these, and other, new market rules and requirements.

Moreover, PJM requests that the Commission clarify that any Final Rule does not automatically apply to, or otherwise alter, PJM's current rules and procedures pertaining to resources that seek to continue participating in PJM's markets solely as demand response resources (i.e. through the demand response framework), even if such resources technically fall under the definitions of ESRs or DERs, as defined in the NOPR. PJM, its stakeholders, and the Commission have carefully developed the demand response framework over the past decade, and PJM does not feel it is prudent or necessary to alter this framework for Market Sellers that wish to continue participating under this model solely as a consequence of any Final Rule that arises in this proceeding.

[13] *See* note 5, *supra*.

B. Need for Commission Guidance Related to Jurisdictional Considerations

It is important to note that participation of ESRs and DERs will likely have retail and wholesale market, operational and jurisdictional impacts, particularly those resources located behind the meter that seek to inject power past the applicable retail meter and onto the transmission or distribution system. PJM believes it is necessary to work with its stakeholders and states to carefully develop technical requirements and methods to separate retail and wholesale transactions in order to ensure that behind the meter resources are eligible to provide the full array of retail and wholesale services that they are capable of providing, while also guaranteeing that such resources are not "double compensated" or "double charged" for services in the wholesale and retail markets, and further guaranteeing that retail and wholesale market jurisdiction and integrity are respected. To aid these discussions that are beginning to take place in PJM's stakeholder processes, PJM believes that it is important for the Commission, working with the states, to provide guidance on certain foundational questions of federal and state jurisdiction, while leaving implementation details to each RTO/ISO and their stakeholders. These issues include, but are not limited to:

- Rate treatment for energy used to charge an ESR located behind a retail meter, particularly as it relates to charging at wholesale Locational Marginal Price ("LMP") for such energy usage;
- Rate treatment for front of the meter ESRs that occasionally serve retail load through a separate connection to a retail customer;
- Clarity in the ability of RTOs/ISOs to develop requirements associated with metering, visibility and dispatchability of resources, whether in front of or behind

the meter, to the extent those resources choose to sell energy in the wholesale electric markets;

- Clarity in detailing the ability of RTOs/ISOs to provide certain threshold requirements, such as metering and operational parameters, associated with resources which seek to participate in the wholesale electric markets as an aggregation of behind the meter resources;
- Clarify that DERs participating in state energy net metering programs are not automatically and unconditionally prohibited from participating in the wholesale electric markets, provided that accounting and metering rules and procedures can be developed that account for distinct retail and wholesale jurisdictional services. Rather, these matters should be resolved by either the Commission or the states in the context of specific net metering programs after consideration is given by the applicable state as to whether changes in the design of individual net metering programs are needed in light of DERs' potential participation in the wholesale electric markets; and
- Provide guidance on how and where disputes between the RTO/ISO and individual electric distribution companies regarding coordination of DERs are to be resolved.

IV. RESPONSE TO THE NOPR

This section discusses detailed considerations for ESRs and DERs in the context of the NOPR, comments on particular aspects of the NOPR, and answers specific questions outlined in the NOPR. In addition, as noted previously, PJM proposes specific suggested changes to the draft Final Rule for the Commission's consideration in the attached Appendix A.

The following are thoughts on how PJM believes it could achieve the Commission's goals in the NOPR. PJM notes that any final set of rules proposed by PJM, either in response to a Final Rule in this proceeding and/or arising from its stakeholder process, may differ from the responses offered below.

A. Response to ESR Rules

While PJM agrees that some changes to its current market rules are warranted in order to fully realize the potential of ESRs in the wholesale electric markets, it is PJM's position that, in general, its current set of rules related to ESR participation, and in particular front of the meter ESR participation, should be largely carried forward. In other words, ESRs should be allowed to participate in all markets and provide all services which they are capable of providing in a manner comparable to generation resources of similar size and with similar operational characteristics, or if applicable, comparable demand response resources. Moreover, PJM believes that any new rules that are applied specifically to ESRs should reflect their unique operational characteristics which may differ from other types of resources. On this issue, PJM recognizes the distinct value of collecting additional bid parameters from ESRs.

i. General Considerations

a. Energy Market Participation for Front of the Meter ESRs

In order to enable front of the meter ESRs to better reflect their capabilities, the Commission proposed that each RTO/ISO "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."[14] Notably, the Commission proposes including state of charge among the required bidding parameters. In enforcing any similar requirement in the Final Rule, the

[14] *See* NOPR at P 67.

Commission should be mindful that "*incorporating*" a state of charge bidding parameter does not necessarily mean that the RTO/ISO must *manage* the state of charge of an individual ESR. There may be significant and unique implementation challenges associated with fully managing an ESR's state of charge for scheduled charging and scheduled discharging, with different technical considerations in day-ahead energy markets and in real-time energy markets. These technical requirements may also vary if there are many small ESRs versus a few large ESRs in a particular area. Moreover, it has not traditionally been the RTO/ISO's role to manage resources' ability to participate in wholesale electric markets.

Accordingly, PJM requests that any Final Rule clarify that the RTO/ISO does not have an obligation to actively manage or guarantee the state of charge for ESRs, nor mandate the details of how the RTO/ISO should utilize state of charge and other proposed bidding parameters. This is important because RTOs/ISOs have distinct market designs and may want to respect/accommodate state of charge and other parameters differently. For example, PJM is aware that CAISO actively manages and optimizes an ESR's state of charge in its regulation market, and that NYISO is experimenting with managing state of charge for ESRs. By contrast, ESRs have successfully participated in PJM's Regulation market by managing their own state of charge for several years. In PJM's opinion, it will be more effective to allow Market Participants of ESRs to manage their own state of charge in the vast majority of situations going forward, although PJM recognizes that there may be situations in the future where PJM may want to explore more actively managing the state of charge of an ESR on a case-by-case basis.[15]

[15] One possible example would be if an ESR were to provide both transmission-related services and ancillary services at some point in the future.

b. Different Accounting Treatment for Behind the Meter and Front of the Meter ESRs and Jurisdictional Considerations

1. The Different Accounting Treatments

ESRs can be accounted for in one of four broad ways depending on how they seek to participate in wholesale and/or retail markets, some of which touch on issues of state and federal jurisdiction:

Behind the meter load reductions only: First, if an ESR is only acting to reduce load, the resource already is eligible to participate in PJM's markets under the current demand response framework, as many do today. Because the charging and discharging of an ESR participating as a demand response resource is always captured by a retail meter, the impact of that activity is always effectively settled at retail. PJM does not believe there are any needed changes to its demand response framework to account for when an ESR is being used *solely* to reduce load. As discussed, PJM requests that the Commission clarify that any Final Rule does not automatically apply to ESRs that seek to continue participating in PJM solely under its existing demand response framework.

Behind the meter load reductions with wholesale power injections: Second, if a behind the meter ESR seeks to participate in wholesale markets by offsetting load *and* potentially injecting energy onto the grid at wholesale, it would be ineligible to access markets through PJM's current demand response framework (which effectively prohibits injections). Such a resource might access markets through the generation framework under today's rules by way of a "sell excess" approach,[16] in which case the resource's charging would necessarily be at retail

[16] One consequence of the foregoing definitions of behind the meter and front of the meter resources is that some resources can effectively be both. One example of such a resource could be a generator that serves its site load (e.g., non-power related facilities, offices, etc.) with the first increments of its output, but (having met applicable requirements) sells into PJM's markets any generation that exceeds site load. Such a scenario is referred to here as a "sell excess" arrangement and occurs infrequently today in PJM.

because of the necessary metering arrangement. The portion of the output of an ESR in a "sell excess" configuration that serves on-site load is not included in wholesale accounting or performance measurement today, which limits the functionality of this approach going forward.

Special accounting and metering rules may be developed for an ESR located behind the meter and whose Market Seller elects to participate in PJM by way of any newly developed market rules that would allow such resources to reduce a customer's load *and* inject power onto the grid at wholesale.[17] These special rules will pertain to settlement procedures needed to account for the complexity of wholesale verses retail charging, and the restrictions that will have to go along with appropriate accounting and jurisdiction over associated transactions. Given that the development of such rules touch heavily on issues of state and federal jurisdiction, PJM believes that it is important for the Commission, working with states, to provide guidance on such issues, as discussed further below in subsection 3.

Primarily front of the meter resources that occasionally serve load: Third, a front of the meter ESR that is primarily dedicated to participating in wholesale markets might be configured to occasionally serve an on-site load (for example, in the event of a grid outage or in order to reduce retail demand charges). In this case, a retail transaction does occasionally take place. This must be accounted for under appropriate rules, considerations for which are described in detail below in subsection 2.

Wholesale injections only: Fourth, if an ESR is front of the meter and produces more than 100 kW, it is eligible to be treated under the generation framework if it is used solely to inject power onto the grid at wholesale. Under this scenario, no retail transaction is implicated, and the charging and discharging of such an ESR is appropriately settled at wholesale rates under

[17] *See* section III.A, *supra*.

today's rules. In PJM's opinion, these ESRs should continue to be accounted for under these same rules in the future.[18]

2. The Need for Commission Guidance on Respecting Jurisdiction for Front of the Meter ESRs with Occasional Retail Use

In PJM, the energy used to charge Energy Storage Resources (i.e. front of the meter ESRs that solely transact in PJM) is considered a wholesale transaction and is settled at the wholesale LMP. However, if an ESR discharges energy directly used for an end-use, then a retail transaction is implicated, which requires commensurate accounting. PJM believes that in the Final Rule, the Commission should provide guidance on the issue of how to account for energy used to charge front of the meter ESRs that occasionally serve retail purposes. Providing this guidance is important and will help aid in the establishment of more consistent accounting rules for these resources across the country.

On this particular issue, PJM believes that its Station Power rules serve as a sound foundation for establishing such rules in any Final Rule promulgated by the Commission. Station Power addresses situations where generation resources dedicated primarily to wholesale transactions are also implicated in retail transactions, and is defined as "energy used for operating the electric equipment on the site of a generation facility located in the PJM Region or for the heating, lighting, air-conditioning and office equipment needs of buildings on the site of such a generation facility that are used in the operation, maintenance, or repair of the facility." [19] Since front of the meter generation resources often generate power, Station Power is often self-

[18] Of course, any new rules related to bidding parameters for ESRs developed in a Final Rule would also apply to these resources. Further, if this type of ESR were to be included in a DER aggregation, rules related to such aggregation would also apply to this category of ESRs.

[19] *See* Tariff, Section 1 (Definitions). Notably, the definition of Station Power excludes energy "used for charging an Energy Storage Resource or a Capacity Storage Resource." *See id.*

supplied. However, if there is more Station Power use over a period of time (often one month) than there is generation to offset it (a net load), the front of the meter resource typically must purchase the Station Power in a retail transaction. Since the metering of front of the meter generation resources is generally accounted for by RTOs/ISOs, it is often the RTO/ISO that tracks which Station Power is self-supplied, and which is to be directed to the process under local jurisdiction for settlement at retail rates.

PJM suggests the Commission adopt the procedures for Station Power to address charging of ESRs that are primarily dedicated to wholesale use but occasionally engage in retail transactions in any Final Rule. PJM believes that this approach is appropriate and logical because the energy used to charge a front of the meter ESR is used to "operat[e] the electric equipment on the site of a generation facility [the battery being the generation facility in this case]," and is fair because it would treat front of the meter ESRs in a manner that is comparable to traditional front of the meter generation resources. Further, from a practical standpoint, PJM already has the necessary processes, experience and expertise required to effectuate this arrangement. Last, PJM suggests that the Commission clarify the criteria under which ESRs qualify as "front of the meter with occasional retail use."

3. The Need for Commission Guidance on Respecting Jurisdiction for Behind the Meter ESRs That Seek to Inject Power Onto the Grid

As discussed, because the charging and discharging of an ESR participating solely as a demand response resource is captured by a retail meter, the impact of that activity is effectively settled at retail. Accordingly, PJM does not believe there are any needed changes to its demand response framework to account for when an ESR is being used *solely* to reduce load. However, a related question arises for behind the meter ESRs that would participate through the generation

framework or any future DER framework. Given that the Commission seems to have proposed rules requiring that all ESRs pay wholesale LMP for charging,[20] PJM believes that Commission guidance is important to address how to account for energy used to charge behind the meter ESRs, since such energy would simultaneously register as a retail transaction. Should the Commission reverse what seems to be its position and instead indicate that charging of behind the meter ESRs is to be at retail rates in all instances, this too should be clear in any Final Rule. In any event, clarification is needed as RTO/ISOs and their stakeholders should not be put in the primary position of resolving these purely regulatory and legal issues. Commission guidance on this subject will be especially helpful to PJM and its stakeholders as they discuss participation of these types of ESRs in its ongoing stakeholder process.

Finally, just as it is important to ensure that ESRs that participate in retail and wholesale markets are not over compensated for their services, it is equally important that they are not overcharged or that the combined regulatory paradigms do not create an uncompetitive "price squeeze" given the differences between retail and wholesale rates.[21] Accordingly, Commission guidance, in consultation with the states, on this subject is important and necessary going forward.[22]

[20] *See* NOPR, Proposed Final Rule ("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.").

[21] *See Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Comments of Stem, Inc., Docket No. RM16-23-000, at 11 (Feb. 10, 2017) (describing how requiring payment at wholesale for all energy charging could result in "double paying" for such energy charging.).

[22] PJM discusses concerns related to the dispatchability and operability of behind the meter DERs below in section IV.B.

ii. Baseline Requirements in the Proposed Rule for ESRs

Given the foregoing, PJM requests that the Commission address the below issues related to ESRs participating in RTOs/ISOs as part of any Final Rule in this proceeding, as discussed previously:

- Clarify that the Commission is not mandating precisely how RTOs/ISOs manage ESRs' state of charge and other additional bidding parameters;
- Clarify that any Final Rule related to ESR participation does not automatically apply to ESRs that seek to continue participating solely through PJM's demand response framework;
- Establish rules for accounting and metering for front of the meter ESRs with occasional retail use. As discussed, PJM suggests the Commission adopt the previously described Station Power approach to address these types of ESRs;
- Clarify the aforementioned jurisdictional issues associated with charging of behind the meter ESRs.

iii. Responses To Other Specific Questions in the NOPR Related to ESRs

This section provides PJM's responses to certain questions the Commission outlined in the NOPR related to the participation of ESRs, and that have not been substantively answered previously:

(NOPR P 51)*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 . . . 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.

PJM Answer: PJM already allows Market Participants of various resource types to offer ancillary services without a corresponding energy offer. No further software changes would be needed for PJM to effectuate this outcome.

(NOPR P 71) *[W]e seek 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.*

PJM Answer: One approach to "incorporating" an ESR's state of charge in a way that balances functionality and implementation complexity is to focus solely on offers to sell energy in the Real-time Energy Market, and "respecting" an ESR's state of charge by not committing an ESR on a schedule that it could not perform to given its state of charge limitations. Assuming the scope of changes needed to comply with this part of the proposed rule is limited to changes in PJM's Real-time Energy Market, is limited to offers to sell energy, and that PJM only needs to respect, and not manage, an ESR's state of charge, PJM believes that it can implement the necessary system changes in approximately 12 months at a cost of under $1 million. However, if more extensive system changes are necessary to comply with a Final Rule, the cost could be significantly more expensive and will likely take more time to implement. Further, given the timing of PJM's upcoming implementations of 5-minute settlements and hourly offers,[23] PJM could not realistically begin working on the necessary system changes until at least early 2018.

[23] PJM has recently proposed fully implementing 5-minute settlements by February 1, 2018. *See PJM Interconnection, L.L.C.*, Order No. 825 Compliance Filing, Docket No. ER17-775-000, at 2 (Jan. 11, 2017). PJM will propose an effective date for implementing hourly offers by March 6, 2017, which it expects to be sometime around November 1, 2017. *See e.g. PJM Interconnection, L.L.C.*, 158 FERC ¶ 61,133, P 126 (2017).

(NOPR P 84) *[W]e 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.*

PJM Answer: PJM does not believe that any of its rules unnecessarily prohibit ESRs from setting prices in its markets, as ESRs that qualify to participate in any of PJM's markets are also eligible to set prices. PJM allows behind the meter ESRs to set price through a demand response bid, but does not recognize offers from behind the meter ESRs that would seek to inject power onto the grid, as discussed previously. Developing rules that will allow behind the meter ESRs to inject power onto the grid and be eligible to set wholesale prices in this manner will be part of PJM's upcoming work with its stakeholders.

(NOPR P 85) *[T]o 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.*

PJM Answer: Implicit in the Commission's question is the fact that in order for ESRs to be eligible for make-whole payments as described, PJM would need to dispatch increases in load. PJM does not engage in this practice today, and before engaging in this practice, PJM would require significant consultations with its stakeholders and careful analysis of whether the benefits to the system would be justified by the costs required accomplish it. Accordingly, PJM

does not support making ESRs eligible for make-whole payments as proposed by the Commission in this question at this time.[24]

B. Response to DER Aggregation Rules

In the NOPR, the Commission sets forth a proposal to allow all DER to be aggregated together in order to participate in wholesale markets. PJM provides the following comments.

i. Current Aggregation Rules in PJM

As discussed, PJM's demand response framework has been developed successfully under intense scrutiny and stakeholder-driven refinement over the course of a decade. Today's rules reflect the benefit of that experience. An overview of these aggregation rules is helpful for reference in later sections responding to the Commission's proposed DER aggregation framework.

Currently in PJM, aggregation rules vary according to the following general characteristics:

- PJM demand response framework versus generation framework; [25]
- the purpose for which resources are aggregating; and
- the market in which the aggregated resources are participating.

Most aggregation of resources in PJM takes place in the demand response framework, and there are several aggregation constructs that exist, such as:

Meeting the minimum size threshold: The first type of aggregation relates to allowing several resources smaller than 100 kW to aggregate together in order to meet the 100 kW

[24] PJM notes that ESRs are and will continue to be eligible for make-whole payments when being offered by Market Sellers as supply side resources. ESRs are also eligible to set price as load, although as noted, load is not dispatched today.

[25] While there is some limited amount of aggregation under today's generation framework, they are not relevant to the discussion herein.

minimum size threshold for participating in PJM's markets, provided they are located within a certain geographic area.[26] Once these smaller demand response resources aggregate together to meet the 100 kW threshold, they collectively form a "registration" and this demand response registration effectively becomes a single demand response resource that is eligible to participate in PJM's markets. Notably, this type of aggregation has been successful in facilitating the participation of residential and small commercial customers in PJM's markets. However, it bears emphasis that the majority of PJM demand response resources have a capacity of 100 kW or more, and therefore are not aggregated in this way.

Dispatch group: Another type of aggregation relates to aggregating several individual demand response registrations together to form a "dispatch group" for the purposes of dispatching several smaller registrations for operational needs. Individual registrations are allowed to aggregate to form a dispatch group if they are all participating in the same market. For example, if five 100 kW registrations are all seeking to provide Regulation service, a Curtailment Service Provider ("CSP") could pool those individual registrations into a single dispatch group and offer them together into the Regulation market. Depending on the specific market a dispatch group is participating in and where the resources that comprise a registration are located, CSPs may be eligible to form larger or smaller dispatch groups.[27]

Demand Resource aggregation: Additionally, individual demand response registrations are allowed to aggregate together for the purpose of forming a single Demand Resource in order to participate in PJM's Reliability Pricing Model capacity market. Specific rules related to allowing registrations to form a single Demand Resource aggregation are driven by the location

[26] *See e.g.* PJM Manual 11: Energy & Ancillary Services Market Operations, rev. 86, section 10.5 (Feb. 1, 2017).

[27] *See e.g. id.* at section 10.

of such registrations and the ability to dispatch such resources during emergencies or for other specified actions.[28]

ii. General Considerations

a. Path Forward For DER Aggregations in PJM

In general, PJM believes that it can build upon its existing rules for aggregating demand response resources to establish a framework for aggregating DERs. As discussed, PJM's rules related to aggregating demand response resources have been developed through approximately ten years of stakeholder and Commission efforts, and have enabled behind the meter resources to participate in PJM's capacity, energy, and ancillary services markets as demand response resources. Accordingly, PJM believes that these rules are an excellent foundation to develop similar aggregation rules for DERs. Of course, there are differences between behind the meter demand response resources and DERs that would seek to inject power past the applicable meter, and PJM and its stakeholders have begun to develop specific rules related to, *inter alia*, safety, transparency, dispatchability, interconnections, and protecting against overcompensation and double charging from the retail and wholesale electric markets for this category of DERs.

Given the foregoing, PJM supports a rule that establishes clear foundational principles related to DER aggregation but allows for RTOs/ISOs to place appropriate requirements for DER aggregation that comport with the specific requirements of each respective market**.** As discussed previously, aggregation can occur for different purposes in RTOs/ISOs, and depending on that purpose, different rules related to different levels and types of aggregation may be appropriate. However, the Commission can provide valuable guidance for these upcoming stakeholder discussions on the minimum criteria required for dispatching DERs that may be part of any future aggregation, as discussed in more detail below.

[28] *See id.*

b. Technical Requirements for Behind the Meter DER That Can Inject Power

Generally, PJM believes that it is reasonable and fair for Market Sellers of behind the meter DERs that seek to inject power onto the grid (either individually or as part of a DER aggregation) in order to participate in PJM's markets to follow existing rules from the generation framework regarding technical specifications for telemetry, metering, meteorological data, dispatchability, price setting, scheduling, etc. This is because when and if such Market Sellers of behind the meter DERs elect to participate in the wholesale markets by *injecting power*, they should generally be held to the same operational and market standards as front of the meter generation resources (including front of the meter DERs).

Accordingly, in order to avoid later disputes, the Commission should clearly establish in any Final Rule the right of RTOs/ISOs to require metering, telemetry and other necessary requirements of behind the meter DERs (or DER aggregations) that seek to inject power onto the grid that are consistent with RTO/ISO requirements *applicable to front of the meter generation resources of comparable size and that have similar operational characteristics*. Establishing such a right for the RTO/ISO in a Final Rule will help to avoid seams issues, inconsistent industry roll-out across the nation and unnecessary litigation. Notably, PJM and the Commission have already established that metering and telemetry rules for generation may vary by resource size, including lower-cost solutions for smaller resources.[29] Promulgating generally applicable criteria in a similar manner for behind the meter DER aggregations, while leaving detailed technical implementation of such criteria to RTOs/ISOs and their stakeholders, would be ideal in PJM's opinion.

[29] *See e.g.* PJM Manual 14D: Generation Operational Requirements, rev. 40, section 4.2.2 (Jan. 1, 2017).

c. Administrative Requirements for DER Aggregations

PJM believes that the existing administrative rules for demand response resources, such as the registration process, limits related to size in aggregations, the method for offering in markets, etc., serve as an excellent template, or even by reference, as the source for similar rules for DER aggregations, particularly behind the meter DER aggregations. Accordingly, PJM requests that the Commission not establish any criteria in a Final Rule that would unreasonably preclude PJM from utilizing the administrative rules from its demand response framework as a basis for adopting similar or identical rules for DER aggregations, as appropriate and after consultation and discussion with its stakeholders.

d. Accounting for Load Reductions From Behind the Meter DER Aggregations

As discussed, accounting and settlement rules will need to be established to account for the fact that depending on whether a behind the meter resource is injecting power onto the grid or offsetting (or increasing) load, these actions may have retail and wholesale market implications. Importantly, the Commission should consider that existing rules for demand response resource participation in the wholesale energy markets have already settled the matter of how behind the meter resource accounting of load reductions offered into the wholesale markets should work. PJM believes that these accounting rules should be applied to the load-offset portion of DER aggregations. Specifically, any non-retail energy injected by the DER aggregation past the applicable meter can be accounted for using the generation framework rules. As long as the retail-impacted energy is flagged as such, the RTO/ISO can properly account using either the demand response framework or the generation framework. Given this, PJM requests that any Final Rule not prohibit PJM from utilizing these accounting rules to delineate between a behind the meter DER aggregation's wholesale and retail transactions, as applicable.

e. Reliability, Jurisdictional and Efficiency Considerations in RTO-EDC Coordination

There are currently many DERs in PJM that are connected to the distribution system, including at 12 kV and lower voltages, that require coordination between PJM and electric distribution companies in the interconnection process, and as part of PJM's overall planning process for the bulk electric system. Ongoing operational coordination between PJM and electric distribution companies is less common, but there are still several types of interactions that happen regularly. For example, in certain limited circumstances, PJM monitors distribution facilities and dispatches wholesale generation resources to ensure that limits on those facilities are not exceeded. Distribution network operators also occasionally request redispatch of wholesale generation resources to alleviate potential overload on distribution facilities. In other cases, PJM may have a reliability need that can be supported from the activity of a non-wholesale generator. In all of these and other scenarios, PJM has found that a diversity of approaches is needed to deal with idiosyncratic network configurations, particular reliability needs, business preferences, and regulatory circumstances, when coordinating with electric distribution companies.

The promulgation of DERs, either individually or as part of an aggregations, will necessitate even more ongoing coordination between the RTO/ISO and local electric distribution companies. While many details related to this coordination need to be further developed in each RTO/ISO's stakeholder process and elsewhere, PJM believes that the Commission can and should provide more guidance as to the role of the electric distribution company in reviewing interconnection and coordination requests and provide more guidance on how and where disputes between RTOs/ISOs, DER owners and electric distribution companies are to be resolved going forward. As this is fundamentally a question of state and federal jurisdiction,

RTOs/ISOs should not be put in the middle of disputes between owners of ESRs and DERs and electric distribution companies over whether or not to accept a given interconnection and/or the impact of a given DER (individually or as part of an aggregate) on the distribution grid absent further guidance.[30] Simply requiring "coordination" without spelling out the respective roles of the RTOs/ISOs *vis-a-vis* the electric distribution companies and a process for dispute resolution simply invites unnecessary litigation that could be prevented if the Final Rule were clearer in this area.

f. RTOs/ISOs Need Visibility of Both Wholesale and Non-Wholesale DER

The Commission has an essential reliability interest in establishing minimum RTO/ISO observability requirements for all DERs, both wholesale and non-wholesale. While not explicitly addressed in the NOPR, PJM believes that any Final Rule should establish criteria for information sharing between RTOs/ISOs and electric distribution companies so that RTOs/ISOs can have more visibility into the distribution system, including into DERs that are not within the Commission's jurisdiction. PJM believes that the data gathered from enhanced information sharing between RTOs/ISOs and electric distribution companies will be, and has been,[31] valuable in ensuring operational and reliability efficiencies as DER penetration increases nationwide.

iii. Baseline Requirements in Proposed Rule for DER Aggregation

Given the foregoing, PJM requests that the Commission address the below issues related to DER aggregation as part of any Final Rule in this proceeding, as discussed previously:

[30] At this time, PJM believes it would be appropriate for such disputes to be resolved by the Commission, with appropriate input from the relevant state authority.

[31] *See e.g.* PJM Interconnection, L.L.C., *Technical Analysis of Operational Events and Market Impacts During the September 2013 Heat Wave* (Dec. 23, 2013), http://www.pjm.com/~/media/library/reports-notices/weather-related/20131223-technical-analysis-of-operational-events-and-market-impacts-during-the-september-2013-heat-wave.ashx.

- Clearly establish that any Final Rule on DER aggregation does not automatically apply to, or would otherwise alter, PJM's current rules and procedures pertaining to resources that seek to continue participating in PJM's markets solely as demand response resources;
- Not prohibit PJM from adopting or expanding upon its existing demand response framework aggregation rules for the purposes of applying such rules to DERs, and in particular behind the meter DERs, that seek to aggregate;
- Clearly establish in any Final Rule the right of RTOs/ISOs to require metering, telemetry and other necessary requirements of behind the meter DERs (or DER aggregations) that seek to inject power onto the grid that are consistent with RTO/ISO requirements applicable to front of the meter generation resources of comparable size and that have similar operational characteristics;
- Provide further guidance on the role of the electric distribution company in reviewing interconnection and coordination requests, and provide more guidance on how and where disputes between RTOs/ISOs, DER owners and electric distribution companies are to be resolved; and
- Establish criteria for information sharing between RTOs/ISOs and electric distribution companies so that RTOs/ISOs can have more visibility into the distribution system, including into DERs that are not within the Commission's jurisdiction, for the purposes of ensuring reliability across the bulk electric system.

iv. Answers to Other Specific Commission Questions Related to DER Aggregation

This section provides PJM's responses to selected Commission questions outlined in the NOPR that relate to DER aggregation and have not been substantively answered previously:

(NOPR P 135) *[W]e 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.*

PJM Answer: PJM agrees with the 100 kW minimum size limit proposed by the Commission, and already implements this today in all of its markets. PJM could also support the concept of establishing a maximum size limit for DERs, although the precise size should be decided by each RTO/ISO, as each RTO/ISO's system and reliability considerations are different. Accordingly, the Commission should not mandate a particular maximum size limit for DER resources.

(NOPR P 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.*

PJM Answer: PJM already dispatches demand response resources across varying levels of geographic areas, including across different pricing nodes, depending on different needs and pursuant to carefully developed rules. Accordingly, PJM believes that it can leverage these rules as a foundation for developing similar rules in its stakeholder process for dispatching DERs seeking to inject past the applicable retail meter.

(NOPR P 156) *[W]e 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?*

PJM Answer: PJM believes that there may be value added if an RTO/ISO were to interact with a DSO in order to ensure reliability of the distribution system for many of the same reasons previously discussed related to RTO/ISO and electric distribution company coordination. However, without a true DSO operating in the PJM Region (or anywhere else in the country), PJM is not in a position to opine on the specific benefits that could be achieved at this time, but will continue to explore this issue.

(NOPR P 157) *We do not propose specific requirements for such [DER aggregator] agreements at this time, but instead seek comment on the information these agreements should contain.*

PJM Answer: Given that PJM needs to develop rules related to what a DER aggregator should be required to do, PJM is not in a position at this time to opine on the specific characteristics or requirements of any agreement that would enable DER aggregators to participate in the PJM markets, although PJM is of the opinion that some type of agreement

enabling DER aggregators to participate must be established in the future. As noted, PJM seeks Commission clarification on the role of the electric distribution company in the interconnection and coordination process, the limits on their authority in this area and clarity on how and where disputes are resolved. Answers to these questions will provide necessary guidance when developing specific criteria that should be included in future agreements enabling the participation of DER aggregators in wholesale markets.

Further, the Commission proposes "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."[32] The language associated with "rules and regulations of any other relevant regulatory authority" is so broad that it could undermine whatever final jurisdictional decision is made by the Commission after consultation with the states on the issues raised in the NOPR relative to behind the meter DERs. This is not to say that the language is *per se* problematic, however without further definition of the respective state and federal roles, the language could just become grist for litigation and delay. Furthermore, such language places some burden of jurisdictional coordination on the DER aggregator, which may be better handled among the Commission, states, and RTO/ISOs. With clear roles and jurisdictional boundaries defined by the Commission, this language would not be necessary.

(NOPR P 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*

[32] *See* NOPR at P 157.

Rule. We also seek comment on whether the RTOs/ISOs will require more or less time to implement certain reforms versus others.

PJM Answer: PJM supports the ISO-RTO Council's proposal that each affected RTO/ISO be required within 120 days of promulgation of the Final Rule to provide for notice and comment a proposed implementation schedule for various aspects of the Final Rule. Reporting could then be done on a scheduled basis so all stakeholders can monitor the progress of the RTO/ISOs' work in this area. PJM believes that such a flexible approach would be preferable to a hard and fast deadline that may lead to multiple "one off" requests for waivers and exemptions. This more disjointed process would make it harder for stakeholders to easily view and monitor progress on these issues across the country.

V. CONCLUSION

PJM respectfully requests that the Commission consider its comments herein. Additionally, PJM respectfully submits alternative language for the Commission to consider which can serve as a basis for a Final Rule in the attached Appendix A.

Respectfully submitted,

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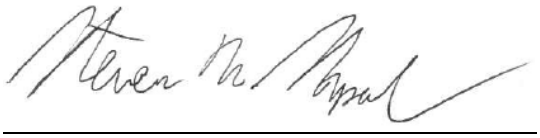
CERTIFICATE OF SERVICE

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

Dated at Audubon, PA this 13th day of February, 2017.



Steven Shparber

Appendix A

Proposed Edits to Final Rule Language

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
Amend § 35.28(b) as follows, by adding new paragraphs (9) through (12).

§ 35.28 (b) Definitions
*****
(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.

Amend § 35.28(g) as follows, by adding new paragraph (9)(i)(A-L).

§ 35.28

(g) Tariffs and operations of the Commission-approved independent system operators and regional transmission organizations.

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(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 consistent with RTO/ISO requirements applicable to front of the meter generation resources of comparable size and that have similar operational characteristics;

b. ~~Incorporates~~ Provide bidding parameters that reflect and account for the physical and operational characteristics of electric storage resources consistent with generally applicable RTO/ISO dispatch procedures;

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~~[1] ~~consistent with existing rules that govern when a resource can set the wholesale price~~ consistent with RTO/ISO requirements applicable to front of the meter generation resources of comparable size and that have similar operational characteristics, including governing when the 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 connected in front of the meter to transmission or distribution[2] that the resource then resells back to those markets must be at the wholesale locational marginal price.

Amend § 35.28(g) as follows, by adding new paragraph (g)(10)(i)(A-I).

§ 35.28

(g) Tariffs and operations of the Commission-approved independent system operators and regional transmission organizations.

(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

[1] Per section IV.B.iv of PJM's comments, PJM does not believe that ESRs should be dispatched as wholesale buyers because PJM does not dispatch load. However, ESRs are and should be eligible to set wholesale LMPs as wholesale buyers or wholesale sellers.

[2] Per section IV.A.i.b of PJM's comments, PJM requests additional clarification from the Commission on jurisdictional issues related to behind the meter ESRs.

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, consistent with RTO/ISO requirements applicable to front of the meter generation resources of comparable size and that have similar operational characteristics.

(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~~, metering, telemetry, and data requirements for both individual distributed energy resources and distributed energy resource aggregations which may vary based on capacity, energy, or ancillary service market participation;

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

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

f~~g~~. Coordination between the regional transmission organization or independent system operator, the distributed energy resource aggregator, and the distribution utility which allows for reasonable distribution utility analysis of the operational and interconnection impacts of distributed energy resources. Disputes related to the coordination activities described in this section shall by resolved by the Commission after consultation with the applicable state regulatory authority;

g~~h~~. Market participation agreements for distributed energy resource aggregators.