UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Co-Located Load Technical Conference

Docket No. AD24-11-000
November 1, 2024

For Public Use

Overview of Large Co-Located Load Issues
Docket No. AD24-11-000
Statement of Frederick S. "Stu" Bresler on Behalf of PJM Interconnection, L.L.C.

I am pleased to present this statement on behalf of PJM Interconnection, L.L.C. (PJM). This technical conference offers a specific case study that continues the Reliability Technical Conference's discussion on managing reliability risks and challenges, and resource adequacy and expected load growth.[1]

As Executive Vice President – Market Services and Strategy for PJM, I oversee all aspects of PJM's market functions and corporate strategy. My responsibilities cover all of the markets operated by PJM, including those for Capacity, Day-Ahead and Real-Time Energy, Ancillary Services, Financial Transmission Rights, and Demand Response operations. I am also responsible for the continued evolution of the PJM markets. In addition, I am responsible for establishing and maintaining PJM's forward-looking strategic objectives and initiatives, and driving their progress across the organization. I have worked at PJM since 1994, previously holding other leadership and management positions within the Markets Division, as well as engineering positions in the Operations Division.

I hold a bachelor's degree in electrical engineering and a Master of Management degree, both from Penn State University.

Introduction

Developers have requested that PJM study nearly 8.5 GW of large loads to be co-located with existing generator interconnections. Absent regulatory guidance to the contrary from the Commission or the states, it is reasonable to assume some amount of this load will appear on the system in the configurations proposed – although the precise amount is uncertain.

PJM has been working with its stakeholders on co-located load issues since at least 2022,[2] but those efforts have resulted in no governing document revisions. Given the impasse, PJM issued a guidance document[3] that explains processes and optionality for co-located load under PJM's existing governing documents. Under the existing regulatory regime, PJM has been analyzing each proposed generator interconnection modification on a case-by-case basis, informed by the necessary study process contemplated by the interconnection service agreement.[4] Pursuant to this process, PJM has been filing for Commission review terms and conditions addressing

[1] *Reliability Technical Conference*, Second Supplemental Notice of Commissioner-Led Technical Conference on October 16, 2024, Docket No. AD24-10-000 (Oct. 7, 2024).

[2] *See* Capacity Offer Opportunities for Generation with Co-Located Load (initiated January 12, 2022; completed August 9, 2023), materials available at: https://www.pjm.com/committees-and-groups/issue-tracking/issue-tracking-details.aspx?Issue=6897c7e7-d8b7-438e-9e3f-b6099f9dd7ec.

[3] *PJM Guidance on Co-Located Load* (posted Mar. 22, 2024; updated Apr. 17, 2024), available at: https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/pjm-guidance-on-co-located-load.ashx.

[4] Some are seeking clarity on the proper process parties should follow. *See Baltimore Gas & Elec. Co. & PECO Energy Co.*, Petition for Declaratory Order, Docket No. EL24-149-000, at page 15 (Sept. 30, 2024) (contending that the necessary study

reliability concerns, novel legal issues, and/or other unique factors to the interconnection. The procedural history in at least one pending docket raises questions about the efficiency and manageability of this approach going forward given the diversity of interests, electrical configurations, and federal and state regulatory constructs involved.[5] The Commission should explore the development of a uniform approach to this issue that promotes certainty and clarity to entities interested in pursuing co-located load configurations and those entities potentially impacted by such configurations.

To assist the Commission's efforts in this regard, PJM continues to strategically approach co-located load by focusing on three primary domains: resource adequacy, reliable system operations, and equitable alignment of transmission system usage and compensation. PJM reiterates its prior recommendation that large co-located loads should be in front of the meter and designated as PJM Network Load. Network Load status offers the most robust reliability benefits and holistic planning efficiencies, minimizes the need for one-off operational procedures (both interim and longer term), and offers a cost allocation framework that assesses charges for use of and reliance on the transmission system.

Given impacts on wholesale electricity rates on account of the rise in behind the meter co-located load as discussed in this statement, there is an opportunity for the Commission to clarify its jurisdiction over such configurations in light of existing precedent recognizing the Commission's authority under the Federal Power Act to regulate the interstate wholesale electricity market by implementing rules and practices that directly affect wholesale electricity rates, terms, and conditions.

PJM remains committed to working with the Commission, the states, and stakeholders on exploring existing and novel paradigms in light of continued industry innovation and evolving regulatory constructs.

Background and Terminology

Clear definitions and mutual understanding about the meaning of terms like "Network Load" and "co-located load" will promote consistency and understanding across the industry. In PJM, load has traditionally been added by the local transmission owner/electric distribution company on an annual basis as Network Load.[6] This load is

provision in Appendix 2, section 3.1 of the interconnection service agreement "is inapplicable to requests to interconnect end-use load facilities at the interconnection sites of existing generators").

[5] In some jurisdictions, there may be disputes under state law about what entities may provide service and what service they may be authorized to provide. *Compare* Public Conference 61: Senate Bill 1 Co-location Study, Additional Comments of Southern Maryland Electric Cooperative, Inc. on Co-Located Load Configuration, Docket No. PC61, Docket Entry 42, at 3-5 (Md. PSC) (Oct. 16, 2024) (asserting only an "electric company" is authorized to serve "retail electric customers" in Maryland), *and* Public Conference 61: Senate Bill 1 Co-location Study, Response Comments of Constellation Energy Generation, LLC and Constellation NewEnergy, Inc., Docket No. PC61, Docket Entry 41, at 23-28 (Md. PSC) (Oct. 16, 2024) (asserting neither Maryland case law nor the Maryland Code support PSC regulation of private sales to co-located entities).

[6] The PJM Open Access Transmission Tariff ("Tariff"), Part I, Definition of "Network Load" means "the load that a Network Customer designates for Network Integration Transmission Service under Tariff, Part III."

incorporated into the PJM Load forecast, studied, and identified system enhancements are constructed pursuant to a transparent planning process, including transmission services and energy and ancillary services.

Front of the Meter Network Load: PJM Network Load is considered in front of the meter and may or may not be co-located with a generator. In the left illustration of Figure 1, the traditional PJM Network Load is served from the broader PJM system. However, PJM Network load may also be co-located on the same physical site as a generator as in the right diagram of Figure 1. In either of these configurations, there can be a financial bilateral contract to facilitate the exchange of funds between the load and a generation supplier. As represented in Figure 1, as a matter of physics, the load's needs are met without preference to whether the actual physical power is coming from the co-located generator or the broader PJM system. Importantly, if the co-located generator is out of service, the load will not be interrupted because the load will continue to be served by the broader PJM system. Both configurations in Figure 1 result in the load being served reliably, included in future planning forecasts, and accounted for holistically in forward-looking planning processes. As a result, this configuration is best differentiated as "front of the meter load" even though a generator may physically be "co-located" on the same site as a generator.

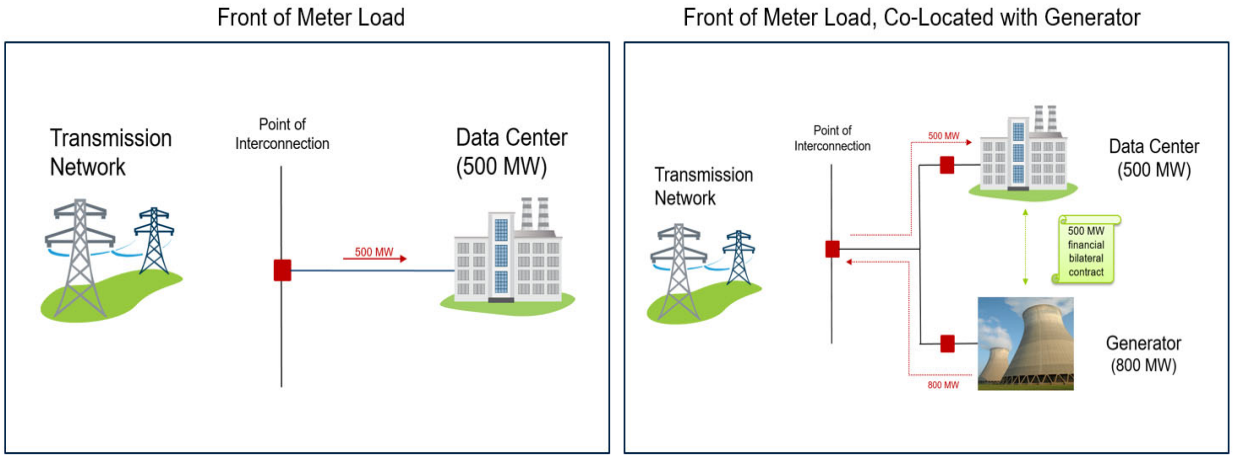

Figure 1: Front of Meter: Load fully served by grid and therefore pays transmission services and energy and ancillary service charges while being incorporated into and accounted for in future planning processes.

Behind the Meter, Off System Load Served from a Specific Generator: In contrast to the configuration represented in Figure 1, **the emerging configuration for large co-located load integrations assumes a behind the meter, off system construct.** In this configuration, the load is not designated PJM Network Load and is co-located with the generation and served exclusively by that generation as is shown in Figure 2.[7] The left illustration of Figure 2 shows the behind the meter configuration with co-located load that is presenting some of the biggest challenges discussed in greater detail in this statement. In the left illustration of Figure 2, the load is fully off-system and protection mechanisms are installed to avoid the load being served from the grid. If the generator is out of service, as shown on the right illustration of Figure 2, the load will not be served from the broader system.

[7] There could be behind the meter co-located load configurations where part of the load is in front of the meter and part is behind the meter. For sake of simplicity, this scenario will not be specifically discussed.

Practically, this means that the load will not be served at all unless the load has a sufficient back-up generator on-site. The load would at least theoretically be curtailed if the serving generator or generators fail to supply the load as PJM would not be obligated to serve that load from other resources in the PJM region.

In the Figure 2 configuration, any financial arrangement between the generator and the load is conducted outside of the PJM settlements system. Under existing governing document rules, for purposes of the Figure 2 configuration, neither the generator nor the co-located load is assessed charges for transmission services or energy and ancillary services. The load is not included in future planning forecasts, and is not accounted for holistically in forward-looking planning processes. If the load is desired to be served by the PJM system at some point in the future, additional studies would be necessary to identify potential system upgrades on the transmission system. There appears to be an industry perception that pursuit of the Figure 2 configuration may offer a faster path to commercial operation for the large co-located loads when compared to the Figure 1 configuration.

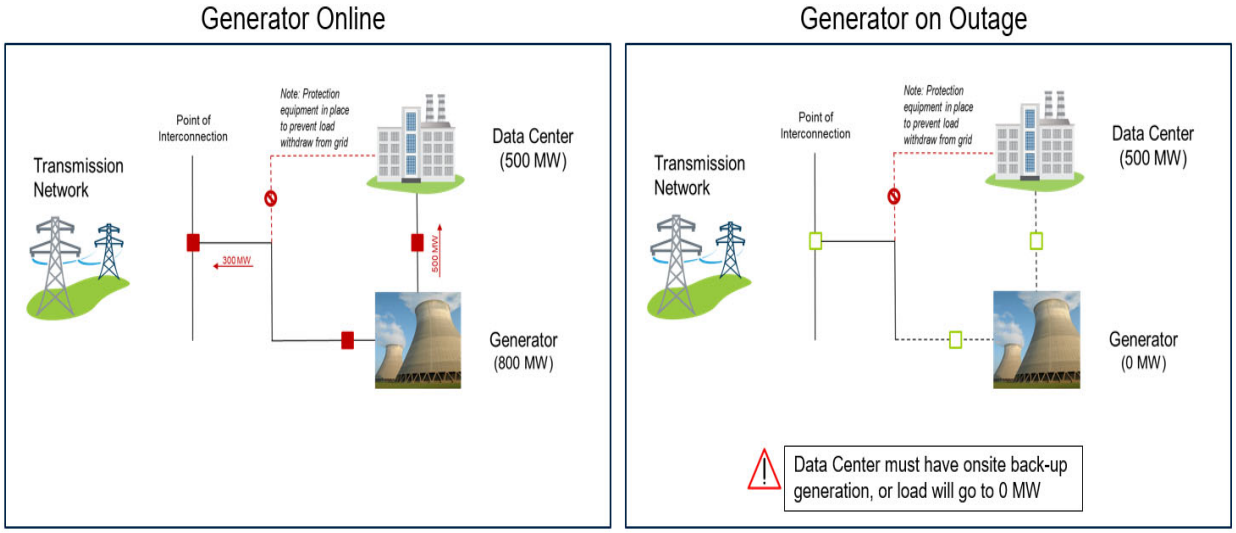

Figure 2: Behind the Meter: Load served by a dedicated generator. Load cannot be served by the broader network and under existing governing document rules, neither the co-located generator or load pay transmission or energy and ancillary service charges.

In an effort to promote clarity, as noted above, there are variations within the overall description of "co-located load" that have different impacts which is why it is important to clarify if a configuration is "in front of the meter" or "behind the meter, off system."

Co-Located Load and Resource Adequacy

NERC CEO Jim Robb recently framed the present resource adequacy challenges facing regions across the country in terms of a math problem: unprecedented growth in electric demand is outpacing available capacity to

meet that demand.[8] PJM is projecting a potential shortfall in generation supply by the end of this decade.[9] PJM's most recent base residual auction results reflect the market's recognition of these tighter system conditions.[10] The factors giving rise to these projections and auction results are described in greater detail elsewhere, and I will focus here on how the explosive growth of large load co-location could impact resource adequacy.

The arrival of large load co-location configurations is emblematic of exploding load growth largely due to rapid technological innovation.[11] Putting aside cost allocation issues, PJM anticipates that large loads' demand for service (and its impact on resource adequacy) will exist regardless of whether a large load is behind the meter (i.e., off system) or in front of meter (i.e., Network Load) although the obligations to serve that load may differ as noted above. While load growth in itself is not particularly novel, the speed with which these types of loads may be emerging, whether in front of or behind the meter, marks a change in recent trends.

PJM continues to emphasize its expectation that generation capacity resources, including those intending to serve behind the meter, off system load, must satisfy their obligations until duly excused of them. PJM and Network Load are relying on these resources, and PJM's models for planning purposes and auctions are constructed according to strict timelines based on available capacity. For these reasons, generators must provide advanced notice of an intent to change capacity resource status consistent with tariffed processes.[12]

PJM encourages configurations where the load, co-located or not, is in front of the meter and brings with it the interconnection of new generation. When new load brings with it new generation, the supply and demand sides of the equation remain more balanced and do not necessarily exacerbate resource adequacy concerns. Furthermore, this coordinated approach to load integration may allow for an expedited load integration process subject to appropriate study and construction of necessary system enhancements.

Co-Located Load and Reliable System Operations

Reliable system operations remains PJM's highest priority. PJM's reliability imperative drove enhancements to a pending interconnection service agreement involving a large co-located load. Participants in that proceeding have not sought to impede the reliability enhancements proposed in the revised agreement, and I will not repeat the

[8] *Reliability Technical Conference*, Speaker Materials of Jim Robb, President and Chief Executive Officer, North American Electric Reliability Corporation, Docket No. AD24-10-000 (Oct. 15, 2024).

[9] *See, e.g.*, *Reliability Technical Conference*, Speaker Materials of Aftab Khan, Executive Vice President – Operations, Planning & Security, PJM Interconnection, L.L.C. Docket No. AD24-10-000 (Oct. 15, 2024) ("Aftab Statement").

[10] PJM Interconnection, L.L.C., 2025/2026 Base Residual Auction Report (July 30, 2024), available at: https://pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-base-residual-auction-report.ashx.

[11] Aftab Statement at 2.

[12] Tariff, Attachment DD, section 6.6.

justifications offered for those operational provisions here.[13] I will discuss several observations about reliability considerations unique to the Figure 2 behind the meter co-located load configuration.

A growth in large behind the meter, off system co-located load is likely to be served by dedicated traditional base-load generation capacity resources (nuclear, gas-fired, landfill gas, and coal) no longer available to serve PJM Network Load, and operational protocols and impacts should be assessed.[14] The Commission, PJM, and stakeholders should continue to explore what operational principles and protocols are necessary if traditional base-load generation capacity resources do, in fact, leave the supply stack at an expedited rate to exclusively serve behind the meter, off system co-located load.[15] Equitable and practical impacts to service interruption and curtailment should also be explored as these behind the meter, off system configurations may impact service reliability for Network Load and co-located load in different ways.

Behind the meter co-located, off system loads are not holistically planned for and may not be capable of receiving reliable service from the grid in the event the co-located generation is not available. Behind the meter co-located loads are not part of the PJM load forecast because these loads are off the system despite being in the PJM Region. These loads are electrically connected to the grid via the co-located generator, but should never withdraw power from the PJM system (see Figure 2). Therefore, the PJM planning models will not recognize this load and the grid as a whole will not be planned and enhanced to serve it. Although the initial integration of the load may require system reinforcements, the PJM load forecast and resource adequacy models will not include this load for purposes of service obligations.

If behind the meter co-located loads integrate faster than what can be reliably planned for, the industry should appreciate the potential future risks to reliable system operations. If a co-located generator retires (or has a failure – temporary or otherwise) and this generator was exclusively serving off system, behind the meter load, then PJM will likely be unable to allow the load to be served from the PJM system until the system is properly planned and enhanced with necessary reinforcements (though some exceptions could exist if there is a potential for specifically tailored interim operational procedures and close coordination between the involved entities). It could take a significant amount of time for the off system load to become PJM Network Load based on the system impacts. But think of a scenario where there are large behind the meter loads supporting artificial intelligence that some may deem important for reasons like national security or internet access. Given the significant social and economic impacts if certain large loads were not able to receive service, it is foreseeable that political, regulatory, and other social forces could exert pressure to attempt to secure service to such behind the meter load without interruption even if the exclusively-dedicated co-located generator were to become unavailable.

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[13] *See PJM Interconnection, L.L.C.*, Response to Deficiency Letter by PJM Interconnection, L.L.C., Docket No. ER24-2172-001, at 3, 12, 20, 22-23 (Sept. 3, 2024).

[14] Aftab Statement at 2.

[15] Operations Road Map, PJM Interconnection, L.L.C. (Aug. 8, 2024) (discussing various actions PJM is pursuing given the transition from traditional fuel secure generation to intermittent resources), available at: https://www.pjm.com/-/media/committees-groups/committees/oc/2024/20240808/20240808-item-06---2-external-operations-roadmap-document.ashx.

But providing service to that co-located load in the absence of appropriate long-term planning and construction of upgrades poses potential real time operational risks and challenges to reliability that may not be supportable or sustainable. These risks to the service of behind the meter load are mitigated if the load integrations are accompanied by holistic long-term planning. The Commission could explore clarifying service obligations to behind the meter co-located loads in scenarios like the one discussed here.

Regardless of the existence of protection facilities, if permitted by the Commission, any request to leverage the use of a back-up unit that is a generation capacity resource to support behind the meter, off system co-located load should be subject to coordination, terms and conditions, and advanced authorization. Such back-up units may also be subject to recall due to conditions that may threaten the integrity or reliability of the PJM Region or the regional power system.

Depending upon case-specific circumstances and grid conditions, the operation of studied behind the meter, off system co-located load may nevertheless be subject to specifically-defined interim operational procedures. For example, certain studied co-located load configurations may require the construction and energization of transmission planning solutions identified as part of the Regional Transmission Expansion Planning process. If such solutions are not yet operational, it may be necessary for the studied co-located load to operate subject to interim operational procedures until the solutions are in service.

There are other ongoing reliability considerations relating to large behind the meter co-located loads that PJM will continue to explore in partnership with Reliability First, transmission owners, and project developers. **For example, in addition to compliance, legal/jurisdictional, and financial implications, reliability concerns can materialize if generation with co-located load trips off-line and co-located load inadvertently continues to pull from the grid and intended breakers do not open.** The addition of co-located load at the generating site increases the complexity of associated relaying designed for normal fault clearing and load disconnection that would need to be evaluated on an individual basis as these designs can range widely. If not properly designed and evaluated, power swings and other unintended consequences could occur. Therefore, it is imperative that any and all relay specifications are shared with the local utility and PJM for analysis and evaluation. Additionally, the relaying equipment must be maintained and any degradation in status communicated promptly to all affected parties (generation owner, transmission owner, grid operator).

Behind the meter co-located load tripping due to an internal fault or in response to a grid disturbance could also cause power swings and operational challenges. For example, if there was a local fault on the transmission system, the transient impacts to voltage and frequency may result in a relay action to disconnect the load and swap to back-up power, which would then have direct impacts to the dynamic response of the co-located generator. Again, these relaying settings and timings would all need to be closely coordinated with the generation owner, transmission owner, and grid operator for proper studies analysis and evaluation.

In addition, PJM is aware of the potential cybersecurity concerns raised by Reliability First at a recent Maryland technical conference on co-located load issues. Cybersecurity is very important to PJM, and PJM will continue to work with RF and stakeholders on this issue.

And finally, efforts should be made to promote enhanced situational awareness and communication by and among PJM, the local transmission owner, a co-located generator, and a large co-located load. These efforts would help clarify and assign responsibility and liability to the entities actually operating any behind the meter facilities that have the potential to impact the PJM system. While the existing interconnection service agreement makes the generator the primary point of contact, the Commission should explore whether this construct is sufficient or if more is required from generators and the co-located load. PJM will continue to engage with its stakeholders, reliability organizations, and regulators since generators with co-located load may be assuming certain operational responsibilities as an intermediary between the transmission provider and transmission owner and a co-located load.

Co-Located Load and Equitable Alignment of Transmission System Usage and Compensation

The equitable usage and compensation issue centers on the Commission deciding if there is an appropriate level of compensation for ancillary services and transmission services that would be paid for by a generator and/or behind the meter co-located load. PJM attempted to work with its stakeholders to establish an appropriate rate for transmission or ancillary services charges associated with behind the meter co-located loads. Those efforts resulted in no proposed governing agreement changes, and the issue remains an open one subject to ongoing litigation in a number of pending Commission dockets. PJM has emphasized that any interconnection service agreements reflecting co-located load arrangements are subject to revision under the ordinary just and reasonable standard pursuant to Section 205 of the Federal Power Act in the event such rates (or other changes) are determined appropriate.

Transmission cost allocation is not within the purview of PJM, but rather in that of the Transmission Owners. Clarification of the issues highlighted above, such as whether the transmission system needs to be planned to be able to serve these large loads even if they are co-located and operate behind the meter of a generator, will be instructive as to the question of transmission cost allocation. A load connected behind the meter of a generating unit that remains interconnected with the transmission grid benefits from the ancillary services necessary to maintain the reliability of the transmission grid because the load could not be served from the generator unless transmission grid reliability is maintained. As such, it seems appropriate that the load should pay its ratio share of the costs of ancillary services just like any other load that is interconnected to the transmission grid, even if it is not withdrawing power from the grid, due to the benefit it derives from dependence on grid reliability.

As discussed above, preserving reliable system operations necessarily entails coordination between a transmission provider like PJM, transmission owners, and a generator (and possibly the large co-located behind the meter load) when there are changes in the availability and operations of large, synchronized generators (including back-up units) and large co-located loads. Even with protection facilities in place, this coordination is necessary and essential because the operations of generators with co-located load rely on the grid and impact the grid.

These observations raise an opportunity for the Commission to offer guidance on the appropriate approach to cost allocation involving generators with large co-located load. Historically, use of the transmission system has been measured by taking MW off the system. But does that construct hold under the novel and innovative co-located load configurations under study and discussion today? Should unit specific operational coordination with a transmission owner and a transmission provider like PJM be assessed a charge, and if so, what is a just and reasonable rate? If there is any use of any services, what entity is using those services and should bear the cost of

them: the generator or the behind the meter co-located load? If one unit of a generator is serving as a generation capacity resource and Network Load is paying for it as such, and the Commission permits such a generator to serve in a back-up capacity to potentially dedicate itself to serving a single large, co-located load, is there an impact and cost to the transmission system that should be assessed?

Opportunities for Generic Guidance

Upon consideration of the record developed in this technical conference docket and other related proceedings relating to behind the meter co-located load, the Commission should consider exploring opportunities to provide the industry with generic guidance that addresses issues raised above and, in particular:

- the anticipated pace of large behind the meter co-located load development, including an exploration of whether any conditions can or should be placed on the obligation of a transmission provider to serve such load given grid impacts;
- the potential responsibility of generators with behind the meter co-located loads or the co-located loads themselves to pay for ancillary services and transmission services, and principles as to how such rates should be designed given the nature and impacts of behind the meter co-located load additions (as discussed above);
- the project-specific details and markets, operations, and planning particulars that should be embodied in any implementing interconnection service agreement or other related agreements — any preconditions to modifying Commission-jurisdictional agreements or permitting the taking of certain Commission-jurisdictional, and terms addressing things like the type of generator, the capacity factor of the generation, the nature of the load, the potential for back-up supply, the location of the load and related facilities, and other similar matters; and
- the extent, if any, to which behind the meter co-located load configurations are subject on the one hand to Commission jurisdiction because they involve Commission-jurisdictional agreements and services, and otherwise affect wholesale rates, and on the other hand to state jurisdiction because they may involve state law questions about what entities may provide certain services to behind the meter co-located loads and what services may be provided.

These are complex issues and generic guidance (as opposed to case-by-case determinations) will facilitate efficiency and predictability for developers advancing emerging and evolving technologies in fields like artificial intelligence and data computing and the electric industry being called upon to facilitate and serve this innovation. More work remains to be done. The discussion in this docket could be followed by further examination of questions listed above and posed by others in this docket. PJM is prepared to work with the Commission, its staff, and all affected stakeholders to support the needs of developing technological innovation in a manner that is fair and equitable and enhances reliability for all users of the grid.