

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

**Grid-Enhancing Technologies**

**:**

**Docket No. AD19-19-000**

**POST-WORKSHOP COMMENTS OF  
PJM INTERCONNECTION, L.L.C.**

Pursuant to the Federal Energy Regulatory Commission’s (“Commission” or “FERC”) Notice Inviting Post-Workshop Comments,<sup>1</sup> PJM Interconnection, L.L.C. (“PJM”) submits<sup>2</sup> responses to questions 1, 3, 5, and 6 in the Notice relating to grid-enhancing technologies (“GETs”). In summary, PJM’s comments:

- emphasize the value of using pilot programs to promote the deployment of GETs and the need for Commission guidance on how a regional transmission organization (“RTO”) or independent system operator (“ISO”) may conduct pilot programs given implementation challenges under Order No. 1000 planning processes;
- express concerns that the proposed “shared savings” incentive would cause PJM to occupy a new, unwanted, and statutorily unauthorized role in the ratemaking process, and it would pose other practical implementation challenges; and
- explain that PJM needs the ability to observe and control GETs that are deployed on the system, and these needs will likely cause PJM to make technology-specific software and other changes to accommodate this deployment.

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<sup>1</sup> See Notice Inviting Post-Workshop Comments, *Grid-Enhancing Technologies*, Docket No. AD19-19-000, at 5 (Jan. 17, 2020) (“Notice”).

<sup>2</sup> PJM respectfully seeks leave to file these comments beyond the indicated period, due to the press of other matters. No party will be prejudiced by this request.

## I. COMMENTS

1. **Question 1: Workshop participants identified several types of technologies that are currently capable of being deployed, such as power flow control and transmission switching technologies, dynamic line ratings, and storage as transmission. What other technologies that increase the capacity, efficiency, or reliability of transmission facilities are ready for deployment?**

To further facilitate the strategic implementation of grid-enhancing technologies within its footprint, PJM (and other RTOs/ISOs) should first be given the opportunity to gain operating experience with such technologies, particularly through the use of pilot programs.<sup>3</sup> Whether there are other technologies “ready for deployment” is not a question that necessarily lends itself to a single, straightforward answer. Independent of the particular technology at issue (in other words, regardless of whether a technology relates to storage, power flow control, or line ratings), the benefits and limitations of a particular technology depend on how the technological solution fits a particular grid-related need. Therefore, an answer to the deployment readiness question should be developed in the context of the use case for which the particular technology is proposed. Pilot programs will help RTOs and ISOs gain useful experience and knowledge regarding technological deployment in specific use cases, and this experience could ultimately promote scalability of new technologies (among other possible benefits). Pilot programs will also afford RTOs and ISOs the opportunity to gain experience (and, in appropriate circumstances, comfort) with risks associated with new technologies.<sup>4</sup>

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<sup>3</sup> See Post-Technical Conference Comments of PJM Interconnection, L.L.C., *Transmission Line Ratings and Related Practices*, Docket No. AD19-15-000, at 1, 4-5 (Nov. 5, 2019); see also Post-Technical Conference Reply Comments of PJM Interconnection, L.L.C., *Transmission Line Ratings and Related Practices*, Docket No. AD19-15-000, at 1-2 (Nov. 27, 2019).

<sup>4</sup> PJM’s pre-workshop testimony highlights additional issues related to risk and liability that RTOs and ISOs will need to work through before directing the deployment of grid enhancing technologies. Testimony of Craig Glazer, *Grid-Enhancing Technologies*, Docket No. AD19-19-000, at 5-6 (Nov. 6, 2019); see also Day 2 Workshop Transcript, *Grid-Enhancing Technologies*, Docket No. AD19-19-000, at 325:3-10 (Nov. 6 2019) (“Day 2 Workshop Transcript”).

By way of further response, and as discussed in PJM’s pre-workshop comments,<sup>5</sup> dividing GETs into “buckets” based on the state of a particular technology could assist the Commission in developing regulatory approaches for each category, including identifying technologies that may be ripe for involvement in a pilot program. PJM previously identified three possible buckets for consideration:

“Bucket No. 1” relates to fully developed and proven technologies with disparate use and deployment across the nation.<sup>6</sup> A minimum standard of deployment should be considered for technologies that fall into this category, with attention given to how reducing the disparity in deployment of a technology across different transmission owners and RTOs/ISOs would benefit regional and interregional planning and operations. In regions where “Bucket No. 1” technologies are under-deployed, pilot projects could be a helpful first step in supporting broader adoption and deployment.

“Bucket No. 2” relates to technologies for which incentives should be considered. This category could include technologies that enhance existing transmission facilities and thus forestall or obviate the need for a new greenfield project or more expensive upgrade. Technologies in this category have been tested and proven in the field, but are not widely deployed due to incentive structure. This type of technology may not be particularly well-suited to a pilot program because there is not necessarily an operational experience issue associated with deployment.

“Bucket No. 3” relates to new or emerging technologies. For those technologies that have minimal industry experience (and thus are unproven to address potential reliability criteria violations or market efficiency drivers) but exhibit high potential for benefits, RTOs and ISOs

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<sup>5</sup> See Testimony of Craig Glazer, *Grid-Enhancing Technologies*, Docket No. AD19-19, at 5 (Nov. 6, 2019).

<sup>6</sup> Ambient-adjusted line ratings (“AARs”), addressed in Docket No. AD19-15-000, provide an example of a technology that would fit into “Bucket No. 1.”

can lead by example to provide a neutral, independent review and transparent proof of concept as to the viability of such new technologies through, among other things, the use of pilot projects.

In another docket, PJM has offered a “Bucket No. 3” example relating to its experience using pilot projects for dynamic line rating (“DLR”) technology.<sup>7</sup>

**2. Question 3: In discussion at the workshop of the “shared savings” approach for the deployment of GETs to existing transmission assets, workshop participants expressed general ratemaking concerns, and identified implementation issues, such as the measurement of benefits and distribution of payments. Please provide comment on the proposed ratemaking structure and any implementation challenges.**

PJM has concerns that the proposed “shared savings” incentives approach would cause PJM to occupy a new, unwanted, and statutorily unauthorized role in the ratemaking process for smaller-scale market efficiency projects. RTOs and ISOs should not be forced into having their planning analyses morphed into a determination and quantification of incentive amounts (and a determinant of rates paid by customers). The “shared savings” incentives approach would transmute RTOs and ISOs into expert witnesses in a yet-unknown number of rate proceedings before the Commission.

PJM understands the proposed “shared savings” incentives approach to center on the deployment of grid-enhancing technologies to existing transmission assets, with a narrow “focus[] on *small projects* [less than \$25 million] that provide *quantifiable congestion reduction benefits*.”<sup>8</sup> As described by others, the “shared savings” incentive would permit transmission owners to keep

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<sup>7</sup> See Comments of PJM Interconnection, L.L.C., *Transmission Line Ratings and Related Practices*, Docket No. AD19-15-000, at 5-6 (Nov. 5, 2019). In this docket, PJM discussed its participation in a pilot project with American Electric Power (“AEP”) to deploy DLR sensors on AEP’s Cook-Olive 345 kV transmission line. AEP deployed a non-contact transmission line monitoring system by Genscape called LineVision that used an array of electromagnetic field (“EMF”) sensors to monitor the line. The purpose of the pilot was to develop an understanding of the technology.

<sup>8</sup> See Comments of Rob Gramlich, Grid Strategies, LLC and WATT Coalition, *Grid-Enhancing Technologies*, Docket No. AD19-19-000, at 2 (Nov. 6, 2019) (emphasis in original).

a portion of the congestion reduction savings from GETs deployment.<sup>9</sup> The “shared savings” incentives proposal also appears to suggest that PJM (and other RTOs/ISOs) would “endorse the project and the award of the shared savings incentive” which “would be a share of the savings multiplied by the net savings.”<sup>10</sup> And “[i]f the utility decides to proceed [with the GETs project] it would include the approved projects along with the shared savings amount transmission revenue requirements filed with FERC, including their Planning Authority’s assessment.”<sup>11</sup>

The “shared savings” incentive appears to vest PJM (and other RTOs/ISOs) with what is effectively the power to calculate a specific amount of financial recovery, and then endorse this specific amount of financial recovery in a rate proceeding before the Commission. Indeed, one of the incentive’s advocates stated that RTOs and ISOs “would endorse the project, and award the shared savings incentive, or recommend that the shared savings be provided.”<sup>12</sup> PJM does not today have such a role in the ratemaking process, PJM does not desire this proposed role, and it would be inappropriate for an independent RTO like PJM to assume such a rate-setting role. Ultimately, the party proposing a rate must propose and support the reasonableness of its proposed rate before the Commission, and it is up to the Commission, as rate regulator, to then determine whether a proposed rate is just and reasonable (subject to ratepayer input through the complaint process, a protest to a rate filing, or otherwise). PJM (and likely other RTOs/ISOs) does not have the resources available (and should not be forced to marshal the resources necessary) to participate in every rate filing to which an endorsement or assessment of a “shared savings” incentive would be litigated.<sup>13</sup>

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<sup>9</sup> *Id.*

<sup>10</sup> *Id.*

<sup>11</sup> See Comments of WATT Coalition, *Inquiry Regarding the Commission’s Electric Transmission Incentives Policy*, Docket No. PL19-3-000, at 6 of 46 (June 26, 2019); see also Comments of Jon Wellinghoff, GridPolicy, *Grid-Enhancing Technologies*, Docket No. AD19-19-000, at 2, items 5 and 6 (Nov. 12, 2019).

<sup>12</sup> Day 2 Workshop Transcript at 208:14-19.

<sup>13</sup> Day 2 Workshop Transcript at 288:7-289:3.

The ratemaking issues summarized above are in addition to other practical implementation challenges associated with the proposed “shared savings” incentive approach were it to be used to set rates. For example, the level of “savings” used to drive the incentive is subject to a host of assumptions and uncertainties and PJM cannot and should not be placed in the position to “verify” the existence of any savings. The shared savings approach raises a host of related questions: Is the proposed incentive to be based on projected savings? Is the proposed incentive, which then becomes part of the new rate paid by customers, to be based upon a one-time calculation or will it be periodically refreshed through a re-evaluation process? Is there a requirement of a true-up to actual savings (regardless of whether the actual savings exceed or fall short of the calculated savings)? And how should assumptions that go into any calculation of savings be modeled?

PJM raises these issues as Commission direction will be needed should the Commission choose a “shared savings” incentives approach. This direction will help RTOs and ISOs navigate substantial uncertainty, stakeholder debates, and repeated litigation that could consume substantial Commission and RTO/ISO resources.

**3. Question 5: What software or other changes would an RTO/ISO need to make to implement GETs? As more of these technologies come onto the system, what challenges exist for coordinating their control in terms of analytics, automation, and optimization?**

Detailed requirements, including software and other changes, for implementing GETs will likely be technology specific. For example, PJM would have to account for changes in new forecasting models/tools, Security Constrained Economic Dispatch (“SCED”) system optimization engine changes, real time telemetry changes, real time contingency analysis

changes,<sup>14</sup> procedural changes and training, and potentially new reserve products (frequency, system inertia, ramping, etc.). For example, the implementation of dynamic line ratings would likely require Inter-control Center Communications Protocol (“ICCP”) data for real time, and PJM would need to acquire some kind of new forecasting tool to determine what the ratings would be for its day ahead, multi-day and several month out studies. Relatedly, PJM’s planners may also need additional forecasting capabilities for its studies and analyses. In addition, storage as transmission would likely require enhancements to contingency analysis, in addition to further development of state of charge analysis.

Software or other changes may also be necessary where PJM requires observability and controllability of GETs on the system. In the case of observability of the technology, transmission owners, and RTOs may require modifications to the Energy Management System (“EMS”) in order to consume and utilize new operational measurements and near-term forecasted measurements provided by a new technology. Downstream impacts of these operational measurements and forecasted values on operational analysis and alignment markets would need to be assessed. For example, in the use of dynamic line ratings, forecasting is necessary for addressing potential volatility in real-time ratings and assuring market alignment. Risks associated with market misalignment, as well as any impact to localized reserve requirements, must be modeled and assigned to the proper market participant.<sup>15</sup>

In the case of PJM’s need for controllability of the technology, as the reliability coordinator, balancing authority, and transmission operator for the footprint, PJM must have

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<sup>14</sup> For real time contingency analysis changes, changes would be required to properly solve all of the System Operating Limits (“SOLs”) on the PJM system such that PJM can control them per the North American Electric Corporation’s Interconnection Reliability Operations and Coordination and Transmission Operations standards.

<sup>15</sup> See Prepared Remarks of Shaun Murphy on Dynamic Line Rating Technologies, PJM Interconnection, L.L.C., Docket No. AD19-15, at 2 (Sept. 9, 2019)

control of GETs just as PJM has been given control of all bulk electric system equipment today. To be clear, PJM does not necessarily require direct control of GETs, as PJM would have sufficient control if a proxy (like a transmission owner) only operated the device at PJM's direction (along the lines of capacitor switching, phase angle regulator adjustments, etc.) or via a signal sent from our EMS/SCED (as, for example, PJM does for generation).<sup>16</sup>

- 4. Question 6: Workshop participants discussed the benefits of pilot programs. Should the Commission encourage the testing and deployment of technologies that increase the capacity, efficiency, or reliability of transmission facilities through pilot programs and demonstration projects? If so, is there regulatory support that the Commission could provide to support and encourage such efforts? Could the Commission use its transmission incentives policy to encourage such pilot programs and demonstration projects? If so, please describe how the Commission could do so.**

The importance of having the opportunity to gain operational experience with GETs to facilitate their strategic implementation, and the criticality of pilot programs to gaining this experience, cannot be overstated. As noted in the answer to Question 1, RTOs/ISOs and transmission owners can be a test bed for these pilots in order to build a record for how GETs can be effectively and reliably deployed. Multiple paths could be followed in conducting pilot programs and demonstration projects between RTOs/ISOs, transmission owners, and technology developers. These approaches involve varying levels of transparency, investment, and risk. Such paths include, but are not limited to:

- Table-top engagement comprised of information sharing between entities to discuss detailed considerations for planning, operations, and markets. This may include

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<sup>16</sup> Even if PJM is not controlling a GETs device, the operation of automated devices will require harmonization. As such, PJM would model GETs devices in EMS, real-time and day-ahead so that PJM can coordinate its dispatch with flows on GETs devices.



simulations, but does not involve the installation of equipment and does not impact physical system operations.

- Installation of physical equipment that would provide the opportunity for data collection and simulation, but would not impact physical system operations.
- Installation of physical equipment that would be monitored and studied in physical system operations in a “low risk” area of the system.

There are, however, challenges to pilot programs that the Commission could help address. There is no current tariff means by which PJM may plan projects intended solely for the benefit of developing experience with new technologies. For example, developers of GETs may be reluctant to share proprietary solutions with potential competitors, such as non-incumbent transmission developers or incumbent transmission owners, particularly in an environment where the sponsorship model is utilized. As a result, there has been a decreased willingness by entities to engage in information sharing typically learned from pilot projects.<sup>17</sup> Participants in the workshop discussed the possible creation of a class of pilot projects – separate from an RTEP planning window – that could be put out for bid and open to all entities under appropriate circumstances.<sup>18</sup> This type of pilot program could be beneficial if designed in a way that clarifies roles and responsibilities, and minimizes risk to developers and utilities. Although this issue was raised at the workshop, in PJM’s view, the matter deserves focused vetting.

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<sup>17</sup> Day 2 Workshop Transcript at 283:16-285:18, 287:6-20.

<sup>18</sup> Day 2 Workshop Transcript at 221:7-23, 283:16-289:16.

## II. CONCLUSION

PJM thanks the Commission for this opportunity to submit comments in this matter.

Respectfully submitted,

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February 21, 2020