UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Implementation of Dynamic Line Ratings	:	**Docket No. AD22-5-000**

MOTION FOR LEAVE TO COMMENT AND COMMENTS OF PJM INTERCONNECTION, L.L.C.

Pursuant to the Federal Energy Regulatory Commission's ("Commission") Notice of Inquiry,[1] PJM Interconnection, L.L.C. ("PJM") submits[2] these comments on questions and issues relating to the implementation of dynamic line ratings ("DLR").

PJM appreciates this opportunity to comment on the Commission's exploration of the potential value of DLR implementation. Today, PJM is prepared to assist any Transmission Owners that may elect to implement DLR on their transmission lines. This readiness builds upon PJM's collaboration with its Transmission Owners and other stakeholders in support of exploring DLR technology since at least 2016, when PJM, American Electric Power, and Genscape (LineVision) piloted DLR implementation on two transmission lines.[3] Currently, PJM and PPL Electric Utilities ("PPL") are working on the first full-fledged implementation of DLR on transmission lines for use in PJM's day-ahead and real-time systems, which is anticipated to be online in Summer 2022.[4] PJM's readiness is also enabled by the collaboration with its

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[1] *See* Notice of Inquiry, *Implementation of Dynamic Line Ratings*, Docket No. AD22-5-000 (Feb. 24, 2022) ("NOI").

[2] PJM respectfully seeks leave to file these comments beyond the indicated period but before the deadline for reply comments. No party will be prejudiced by this request which is necessary due to the press of work in other ongoing Commission and PJM matters, including but not limited to Order No. 881 compliance efforts.

[3] See *Speaker Comments of PJM Interconnection, L.L.C.*, Transmission Line Ratings and Related Practices, Docket No. AD19-15-000 (Sept. 17, 2019).

[4] *See, e.g.*, PJM Interconnection, L.L.C., Dynamic Line Ratings (DLRs) – Frequently Asked Questions, Questions 9 and 10 (Apr. 28, 2021), available at: https://www.pjm.com/-/media/library/reports-notices/special-reports/2021/dynamic-line-ratings-q-and-a.ashx; PJM Operating Committee December 2,

stakeholders to develop procedures and tools that will pave the way for other transparent DLR deployments in the future.[5]

Consistent with PJM's commitment to exploring new technologies and maintaining system reliability and efficient, cost effective markets, operations, and planning, PJM's comments here strongly support DLR use in targeted, cost beneficial circumstances. DLR can yield benefits in near real-time system optimization by addressing a limited set of operational constraints on actual limiting equipment, principally thermal conductor limits. DLR deployment can also inform economic/market efficiency regional planning under certain conditions. On the other hand, it would not be accurate to view DLR as a "silver bullet" that obviates the need for long term regional transmission planning, most especially reliability criteria-based transmission planning. Indeed, DLR deployment to address significant congestion could actually mask the need for potential reliability upgrades, potentially exacerbating reliability needs. In addition, broad and rapid DLR deployment should not be assumed to have the potential to radically change the grid's capability. DLR technology may lead to more accurate real-time ratings and reduce congestion overall, but there could also be instances where congestion will still be realized or higher congestion may result even with DLR deployment. Such situations may arise

2021, Agenda Item 5 Presentation – Dynamic Rating, at slide 4 (summarizing the history of dynamic rating projects in PJM), available at: https://pjm.com/-/media/committees-groups/committees/oc/2021/20211202/20211202-item-05-dynamic-rating-presentation.ashx.

[5] *See* PJM Markets & Reliability Committee April 27, 2022, Agenda Item 5 (First read of PJM Manual revisions to address Interim Measures to Facilitate the Integration of Dynamic Line Ratings into PJM Operations"), available at: https://www.pjm.com/-/media/committees-groups/committees/mrc/2022/20220427/20220427-item-05-1-interim-measures-to-facilitate-the-integration-of-dynamic-line-ratings-into-pjm-operations-presentation.ashx.

if the DLR use is not strategically placed because, for example, it is located on a facility where the conductor is not the most restrictive element or it merely shifts congestion.[6]

In the months ahead, PJM anticipates that valuable lessons will emerge from the actual PJM-PPL DLR deployment and likely other anticipated voluntary DLR deployments in the PJM region. PJM looks forward to continued engagement with the Commission and stakeholders on these issues, and invites interested parties to monitor these developments so that any policy determinations can be informed by actual experience with DLR implementation in day-ahead and real-time systems.

I. COMMENTS

The Commission has asked for comment on a variety of different questions and issues in this proceeding, and the record contains examples of proposed criteria to guide potentially mandated DLR deployment.[7] PJM offers some general and specific reactions to the Commission's discussion of potential DLR implementation criteria and other matter. PJM encourages the Commission to consider these principles when crafting any notice of proposed rulemaking in this docket.

[6] In addition, if a Transmission Owner's ambient adjusted rating ("AAR") methodology assumes wind cooling that is not present on a particularly hot day, such conditions may, at times, drive the DLR to be more restrictive than the existing rating thus exacerbating congestion on the system.

[7] *See* NOI at P 10 ("WATT proposed that the Commission require 'sensor-based DLRs' on all thermally limited transmission lines rated 69 kV or greater when: (1) market congestion totaling over $1 million has occurred within the past year; (2) the transmission line is identified as being a constraint projected to have market congestion over $1 million over the coming three years as a part of the current RTO/ISO transmission planning cycle process, which can be economic or reliability based; (3) thermally limited transmission lines show up as limiting in generator interconnection system impact studies; or (4) generation curtailed by more than 10% on average for one year due to factors that include transmission line capacity." (citing WATT Coalition, Comments, Docket No. RM20-16-000, at 10-11 (filed Mar. 22, 2021))).

A. General Principles For Consideration Regarding DLR

1. *DLR implementation is not a substitute for upgrades needed for system reliability.*

DLR should not be treated as a substitute for upgrades needed for reliability purposes. DLR is a tool of near real-time optimization that addresses thermal line limits. It provides useful information that can inform economic/market efficiency planning and operations. Nevertheless, DLR is ultimately a tool that provides additional information. It would not be appropriate to simply deploy DLR in a location where it does not already exist as a substitute for directly addressing a reliability criteria violation. Nor should its deployment be seen as a means to delay addressing an identified reliability criteria violation. DLR's limitations in these situations is especially evident when the reliability need for a planning solution is independent of thermal line limits. Planning upgrades for reliability criteria are implemented to address reliability issues at peak or light load for the planning future (one to fifteen years forward). Implementing DLR to mitigate this reliability scenario and associated reliability criteria violations would be relying on the ideal wind and temperature conditions at some forward time interval far into the future in the hopes that the ambient conditions could trigger the higher DLR. Thus, PJM urges caution in suggesting DLR can or should be used as a substitute for (or to delay) addressing identified reliability criteria violations.

2. *DLR implementation should be driven by case-specific determinations, not blanket rules.*

Any blanket adoption of DLR implementation criteria like those proposed in this docket overlooks the need for use-case-specific analysis. Congestion is a potentially valid driver for DLR deployment, but the reasons and levels of congestion on the system can vary and wax and wane over time depending on other changes in system topology. For DLR deployment to be useful, the congestion targeted for mitigation should be clearly driven by a conductor's thermal

limit, not some other factors. In addition, DLR use may be helpful to mitigate congestion associated with long term outages which can be associated with planning upgrades, long term repairs, storm damage, and other similar conditions.

3. *DLR implementation should be cost beneficial.*

Any criteria for DLR deployment should ensure its use is and remains cost beneficial. To that end, criteria should focus on persistent congestion (historical and projected) to identify areas where such deployment will likely realize actual benefits. Any DLR congestion mitigation benefits must also be assessed against the capital and maintenance costs (and other potential unique costs and risks), in a manner comparable to the 1.25 benefit-to-cost ratio methodology used in economic planning today.[8] In addressing congestion mitigation as part of the economic/market efficiency planning process, this analysis can be performed.

4. *The full range of DLR implementation costs should be considered to ensure cost beneficial deployment.*

The Commission's cost-benefit analysis for DLR deployment should appreciate the full range of costs associated with DLR deployment. Because of the potential for increased cyber vulnerability of particular transmission facilities on account of DLR deployment, any cost-benefit analysis related to a proposed DLR deployment should include a careful consideration of the unique costs and risks associated with DLR use on particular facilities. The cost-benefit proposition of DLR deployment must also account for the costs to Transmission Owners and regional transmission organizations ("RTOs") in updating their systems to accommodate the full range of DLR mandates they might face. By way of example, PJM's new Energy Management System can only accommodate a certain number of DLR, largely on account of the data volume.

[8] Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("Operating Agreement"), Schedule 6, section 1.5.7 ("Development of Economic-based Enhancements or Expansions").

Significant upgrades and increased capability are likely needed if any future DLR implementation mandate is not narrowly targeted, potentially adding significant additional cost to DLR implementation. It is anticipated that Transmission Owners would be expected to make similar additional upgrades to their systems above and beyond the significant investments being made in furtherance of Order No. 881.

5. *The Commission should consider taking an incremental approach to any mandated DLR deployment*.

To promote the cost beneficial nature of targeted DLR deployment, care should be taken to ensure its costs do not eclipse the potential benefits. The Commission could consider taking steps to pilot the implementation of targeted DLR deployment criteria on an incremental basis, coupled with informational reporting requirements to track DLR deployment and confirm the realization (or not) of benefits from deployment. Such interim measures could be crafted to afford opportunities to test the viability and cost beneficial nature of the use on especially promising facilities. It could also be crafted to temper in the shorter term the need for largescale investment for DLR implementation compliance. This incremental approach would also allow the industry to realize the benefits achieved from the Order No. 881 implementation of ambient adjusted ratings ("AAR").

6. *Multiple years of historical congestion data and future projections of congestion should inform DLR placement decisions.*

The Commission should explore whether multi-year lookback periods (as opposed to a single year lookback) provide a more informed and reliable data set on which to base cost beneficial DLR deployment decisions. In addition, forward-looking analysis should also be performed to ensure that system conditions or approved upgrades are not likely to mitigate the historical congestion, thus reducing the cost beneficial nature of any DLR deployment. The need for

forward-looking projects is particularly strong in light of the Commission's recent directives in Order No. 881 regarding AAR implementation by July 2025. To ensure cost beneficial DLR deployment, the benefits of Order No. 881's mandated use of AARs should be analyzed and accounted for in the analyses used to inform DLR deployment decisions since post-Order No. 881 DLRs will already track closer to actual weather conditions.

7. *If the Commission implements certain DLR requirements, it should use Order No. 881's transparency and exceptions constructs so that RTOs and stakeholders can realize efficiencies from their ongoing compliance efforts in response to that Order.*

If DLR use were to be mandated, the Commission should afford PJM and its stakeholders the opportunity to realize efficiencies from the work they are already doing to comply with Order No. 881. In that vein, PJM would support adherence to transparency measures that are generally consistent with those the Commission has directed in Order No. 881 (e.g., the posting of ratings and underlying methodology on PJM website/OASIS and the sharing of such information with the Market Monitor).[9] Such transparency measures provide notice to the marketplace of what DLR is applied to a particular facility and it promotes accountability in implementation and the accuracy of PJM's models. This transparency is vital to ensuring accurate and efficient market outcomes to support reliability. In the case of mandated DLR usage, the Commission should also recognize an exceptions mechanism consistent with Order No. 881 to ensure safety and reliability of the transmission system. The Commission should also ensure that DLR mandates do not disincentive the use of other analogous technologies that may develop over time.

[9] *See* 18 C.F.R. § 35.28(c)(5)(i), (ii).

8. *Any DLR mandates should apply equally to RTO regions and Non-RTO regions.*

If the Commission were to mandate DLR deployment, such mandates should be fairly and equitably applied to both RTO and non-RTO regions as congestion mitigation, at a minimum, is a national objective.[10]

9. *The Commission should reaffirm that developing transmission line ratings methodologies, calculating such line ratings, and communicating those line ratings remain a right and obligation of the Transmission Owners.*

PJM continues to support the approach set forth in North American Electric Reliability Corporation Reliability Standard FAC-008-5 – Facility Ratings, as affirmed by Order No. 881,[11] under which transmission owners are responsible for developing line ratings methodologies, calculating line ratings, and communicating line ratings to the RTO. Consistent with Order No. 881, if DLR use was mandated, PJM would anticipate continued close collaboration with stakeholders, most especially its Transmission Owners, to implement the targeted criteria and requirements in light of the rights and obligations created under PJM's governing documents (including the Consolidated Transmission Owners Agreement) and related manual provisions. Ratings methodologies and solutions are an integral part of the Transmission Owner's asset management responsibilities, and they are still in the best position to determine their deployment and implementation.

[10] *See* 16 U.S.C. § 824s(a) (directing the Commission to implement by rule incentive rate treatment "for the transmission of electric energy in interstate commerce by public utilities for the purpose of benefitting consumers by ensuring reliability and reducing the cost of delivered power by reducing transmission congestion"); *see also* 18 C.F.R. §35.34(k)(2); Order No. 2000, *Regional Transmission Organizations*, 89 FERC ¶61,285, 65 Fed. Reg. 810, 887-88 (2000).

[11] Managing Transmission Line Ratings, 177 FERC ¶ 61,179, at P 140 & nn. 332 & 333 (2021) (citing Reliability Standards FAC-008-5, Requirement R3 and FAC-008-5, Requirement R6).

B. PJM's Proposal Regarding DLR Implementation and Comments Relating to Certain DLR Criteria Proposed in the Record

1. *PJM's Proposal for DLR Implementation*

If DLR use is mandated, PJM would be supportive of the Commission's exploration of criteria that encourage DLR deployment on thermally limited lines/circuits experiencing:

- at least $2 million if not more per year in market congestion, on average, over some number of prior years; and
- projected congestion of $1 million or more over some future time period identified consistent with current RTO economic planning processes (*e.g.*, five years, or another time period that comports with the current model building protocols of the NERC Multi-Regional Modeling Working Group which builds cases looking ahead one, two, five, and ten years pursuant to NERC TPL-001); and
- a congestion hours per year threshold.[12]

PJM can readily offer the Commission and stakeholders historical and projected congestion levels. PJM believes through its economic/market efficiency planning process it could identify the locations ideal for DLR deployment based on such criteria, and would make such information available in the ordinary course of its Regional Transmission Expansion Planning ("RTEP") process to encourage DLR deployment within its footprint. While these locations may be ripe for DLR-type solutions, PJM's process allows for the Transmission Owners or appropriate developers to propose a myriad of different technologies or approaches that best address planning drivers. Commission mandates should not serve to discourage an approach that considers all potential options.

[12] For this potential DLR requirement criteria, it is not possible to quantify the potential annual gross market benefits that would be expected to result from such a requirement. For one, the benefits of the implementation of Order No. 881, as well as the next few years of transmission upgrades, will need to be realized before the accuracy of the criteria proposed above could be tested and any congestion mitigation benefits reliably quantified. *See* NOI at Question 12.

Given PJM's obligation to plan the system and select the more efficient or cost effective solution to economic/market efficiency planning needs, PJM would entertain DLR proposals alongside other proposed technologies, non-transmission alternatives, and transmission upgrades.[13] Whether or not this would be done under the Commission's current Order No. 1000 paradigm depends on the outcome of the Commission's reconsideration of the federal right of first refusal issue in its recent transmission planning Notice of Proposed Rulemaking.[14] However, irrespective of the outcome of that proceeding, Transmission Owners would not be foreclosed from proposing DLR deployment on their lines as a proposed solution to a posted economic planning driver as part of the RTEP process even if PJM's list of potential DLR deployment locations did not include the facilities. Such a proposal would still be eligible for consideration if it satisfied the benefit-to-cost ratio of 1.25 and all other applicable project proposal requirements for that system need.

It is important to observe that features of DLR suggest it may not squarely fit in the bucket of potential long-term planning solutions. The time period for DLR use on a particular line may be far less than the fifteen year planning horizon PJM plans to. In addition, DLR deployments addressing significant congestion could actually mask the need for potential reliability upgrades. Thus, benefits from a DLR deployment might be short lived and the costs sunk if the DLR is quickly replaced by a needed baseline reliability solution. Such an outcome would undermine the cost beneficial nature of DLR deployment.[15]

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[13] See Operating Agreement, Schedule 6, section 1.5.

[14] *See, e.g.*, *Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection,* 179 FERC ¶ 61,028, at PP 351-358, 409 (2022), 87 Fed. Reg. 26,504 (May 4, 2022).

[15] PJM anticipates further engagement with the Commission's question about how mandated DLR implementation should be considered (if at all) in the regional transmission planning and interconnection processes in its response to the Notice of Proposed Rulemaking in Docket No. RM21-17-000.

2. *PJM Reactions to Specific Proposals Regarding Criteria Relating to Generation Curtailment and Generation Interconnection Thermal Constraints*

As proposed by the WATT Coalition,[16] PJM does not support certain DLR deployment criteria tied to generation curtailment and generator interconnection thermal constraints. Substantially more analysis and clarity is necessary to assess the viability of a criteria for the targeted deployment of DLR on transmission lines that are limited because they are thermally constrained, thus causing generation curtailments at some specified level on average for specified time periods. Among other things, it is not clear by what standard certain generation curtailment could be identified as potentially mitigated by DLR deployment.

PJM also does not support DLR deployment as a solution to address all thermal constraints identified in generator interconnection system impact studies. Although the cost of such DLR deployments may be cheaper for interconnection customers than the construction of network upgrades, such DLR usage is too short-term, real-time focused to address future projected system conditions and constraints identified in the system impact studies. Any attempt to substitute DLR deployment for network upgrades would likely frustrate PJM's ability to offer the long term deliverability assurance to generators that is at the heart of PJM's queue study process. The long range impact of this approach could lead to pockets of bottled generation dependent on a combination of optimistic DLR or generation curtailment. Although DLR deployment could be explored as an interim measure generators could use pending the completion of network upgrades, it is not certain whether such an interim use case would be cost beneficial.

[16] See note 7, *supra*.

C. Potential Timeframe for Implementing DLR Requirements

PJM is prepared to continue to support the implementation of DLR within its footprint regardless of any Commission directive to do so. If the Commission mandates DLR deployment, it would appear to be premature to require compliance on or before July 2025 at the earliest. DLR implementation decisions made prior to this date would discount the benefits of broader AAR deployment on account of Order No. 881 and the transmission system upgrades set to come in service over the next few years.

From PJM's experience, actual case-specific implementation timeframes may vary depending on a Transmission Owner's existing toolset and its state of readiness to integrate DLR in its own systems. As a basis for comparison, it has taken more than one year to facilitate the integration of PPL's DLR into PJM's systems.

II. CONCLUSION

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

Respectfully submitted,

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