

UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION

Managing Transmission Line Ratings

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Docket No. AD19-15-000

**POST-TECHNICAL CONFERENCE COMMENTS OF THE INDEPENDENT MARKET  
MONITOR FOR PJM**

Pursuant to the Notice Inviting Post-Technical Conference Comments issued in this proceeding on October 2, 2019, Monitoring Analytics, LLC, acting in its capacity as the Independent Market Monitor (“Market Monitor”) for PJM Interconnection, L.L.C. (“PJM”), offers these comments for the Commission’s consideration on issues related to managing transmission line ratings.<sup>1</sup>

**I. COMMENTS**

Transmission line ratings, and more broadly transmission facility ratings, are the metric for the ability of transmission lines to transmit power from one point to another. Transmission line ratings have significant and frequently underappreciated impacts on competitive wholesale power markets like PJM. These include direct impacts on energy and capacity prices, the frequency and level of congestion in the Day-Ahead and Real-Time Energy Market, day-ahead nodal price differences and the associated value of FTRs, real-time nodal price differences, locational price differences in the capacity market, the need to invest in additional transmission capacity, the need to invest in additional generation

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<sup>1</sup> See also Technical Conference Comments of the Independent Market Monitor for PJM, Docket No. AD19-15-000 (September 4, 2019). <[http://www.monitoringanalytics.com/Filings/2019/IMM\\_Comments\\_Docket\\_No\\_AD19-15\\_20190904.pdf](http://www.monitoringanalytics.com/Filings/2019/IMM_Comments_Docket_No_AD19-15_20190904.pdf)>.

capacity, the location of new power plants, and the interconnection costs for new power plants. The impact of transmission facility ratings on markets is a function both of the line ratings directly and the use of those ratings by the RTO/ISO. While this technical conference focuses on the line ratings directly, the actual use of those ratings by the market operator and the impacts of those uses should also be examined.

Congestion payments by load result when lower cost generation is not available to meet all the load in an area as a result of limits on the transmission system. When higher cost local generation is needed to meet part of the local load because of transmission limits, 100 percent of the local load pays the higher price while only the local generation receives the higher price. The difference between what the load pays and generators receive is congestion. Since 2008, congestion costs in PJM have ranged from \$0.5 billion to \$2.05 billion per year. Congestion costs were significantly higher during extreme winter weather conditions such as January 2014, when the congestion costs in PJM were \$825.1 million for one month.

LMP may, at times, be set by transmission penalty factors. When a transmission constraint is binding and there are no generation alternatives to resolve the constraint, system operators may allow the transmission limit to be violated. When this occurs, the shadow price of the constraint is set by transmission penalty factors. The shadow price directly affects the LMP. Transmission penalty factors are administratively determined and can be thought of as a form of locational scarcity pricing. Transmission penalty factors were fully implemented in PJM pricing effective February 1, 2019.

Transmission line ratings can result in short term, significant increases in prices as a result of the application of transmission penalty factors. For example, violation of a transmission constraint, meaning that the flow exceeds the line limit, could result in a \$2,000 per MWh price. As the power flows approach their rated limits, PJM dispatchers may reduce the limits. Violation of these reduced line ratings results in penalty factors setting prices. In 2018, there were 163,319 transmission constraints in the real time market with a non-zero shadow price. For nearly 11 percent of these transmission constraints, the

line limit was violated, meaning the flow exceeded the line limit and prices were set by transmission penalty factors. In 2018, the average shadow price of transmission constraints when the line limit was violated was nearly six times higher than when transmission constraint was binding at its limit.

Capacity market prices separate locally when transmission capability into Locational Deliverable Areas (LDA) is not adequate to meet the LDA capacity requirement with the lowest cost capacity. The available transmission capability into LDAs is defined as the Capacity Emergency Transfer Limit (CETL). Higher cost LDAs are the equivalent in the capacity market of congestion in the energy market. Load in the higher cost LDAs pay more for capacity than those in lower cost LDAs. For example, the clearing price for the BGE LDA in the 2021/2022 Base Residual Auction was \$200.30 per MW-day. The clearing price for the EMAAC LDA was \$165.73 per MW-day.

Transmission line ratings for a given transmission facility vary by the duration of the power flow, by ambient temperatures, by wind speed and by other conditions. Transmission lines can operate with higher loads for shorter periods of time. This is significant when a contingency is expected to last for only a short period. The transmission line rating can mean the difference between substantial congestion costs and no congestion costs. The transmission line rating can mean the difference between a transmission penalty factor and no penalty factor.

In PJM, transmission owners use a range of ratings by duration. PJM requires transmission owners to provide thermal ratings under normal operating conditions, long term emergency operating conditions, short term emergency operating conditions and the extreme load dump conditions. But there is no requirement that the ratings differ for these operating conditions. PJM typically uses normal line ratings for precontingency (base case) constraints and long term emergency line ratings (four hours) for contingency constraints. PJM requires transmission owners to provide temperature based line ratings separately for night and day times. The temperature ranges from 32 degree Fahrenheit or below to 95 degree Fahrenheit or above in nine degree increments. But there is no requirement that the

ratings differ for these operating condition temperatures. In PJM, transmission owners are responsible for developing their own methods to compute line ratings subject to a range of NERC guidelines and requirements. PJM does not review or verify the accuracy of transmission owners' methods to compute line ratings. In PJM, transmission owners have substantial discretion in the approach to line ratings.

Given the significant impact of transmission line ratings on all aspects of wholesale power markets, ensuring and improving the accuracy and transparency of line ratings is essential. Line ratings should incorporate ambient temperature conditions, wind speed and other relevant operating conditions. PJM real-time prices are calculated every five minutes for thousands of nodes. PJM prices are extremely sensitive to transmission line ratings. For consistency with the dynamic nature of wholesale power markets, line ratings should be updated in real time to reflect real-time conditions and to help ensure that real-time prices are based on actual current line ratings. The ongoing analysis of dynamic line ratings is a promising area that should be pursued.

The Market Monitor recommends that the Commission require that all PJM transmission owners use the same methods to define line ratings, subject to NERC standards and guidelines, subject to review by NERC and approval by FERC. The same facilities should have the same basic ratings under the same operating conditions regardless of the transmission owner. Transmission owner discretion should be minimized or eliminated. The current FAC-008 process provides excessive discretion and should be reviewed and clarified as part of this process. The line rating methods should be based on the basic engineering facts of the transmission system components and reflect the impact of actual operating conditions on the ratings of transmission facilities, including ambient temperatures and wind speed when relevant. The line rating methods should be public and fully transparent.

The Market Monitor recommends that the Commission require PJM to routinely review all transmission facility ratings and any changes to those ratings to ensure that the normal, emergency and load dump ratings used in modeling the transmission system are

accurate and reflect standard ratings practice. All line rating changes and the detailed reasons for those changes should be public and fully transparent.

The Market Monitor recommends that the Commission require all PJM transmission owners to use hourly ambient-adjusted ratings (AAR) line ratings and that this requirement be included in FAC-008. The failure to use AAR means that the line ratings in actual use are wrong much of the time. That should not be acceptable.

The Market Monitor recommends that when the Commission reconsiders FAC-008, standards be established for the definition and use of shorter term line ratings than the continuous value. There is a significant opportunity to use shorter term line ratings that would eliminate the unnecessary binding of constraints for transient or short term increases in the flow on transmission facilities. Both the required duration of the ratings and the methods for defining the shorter duration ratings should be clearly defined.

The Market Monitor recommends that the Commission require all RTO/ISOs to define their use of line ratings in a transparent manner. RTOs should not, for example, arbitrarily reduce line ratings in operations below the levels filed by transmission owners. The actions of RTO/ISOs with respect to line ratings are generally nontransparent, not rule driven, and have a significant impact on prices, including triggering transmission penalty factors.

The Market Monitor recommends that the Commission require that transmission owners identify each transmission facility's most limiting element and that, subject to appropriate CEII confidentiality rules, make that data available to the RTO/ISO, potential competitors, and market monitors. For example, in cases where transmission companies choose to not make low cost, high impact investments, competitors should be permitted to do so.

The Market Monitor recommends that the Commission require all PJM transmission owners to implement dynamic line rating (DLR) pilot programs on significant transmission facilities, provide analysis of the results and the applicability of the results, to be completed within a defined time period. The Market Monitor recommends that the Commission

consider a requirement to implement at least some DLR in the near future. The Market Monitor recommends that the Commission open the provision of DLRs to competition with the result that the lowest cost provider would make the investment, subject to revenue caps and performance guarantees. DLRs provide real-time information about the actual status of individual transmission facilities. A smarter grid requires more information. DLRs are a source of such information that could contribute to the efficient operation of the grid.

If existing transmission companies are not willing to add DLR devices, it is not appropriate to further increase the regulated rate of return on these or other assets. The incentives to existing transmission owners should not be designed to overcome the large disincentives created by the current cost of service regulatory paradigm applied to transmission companies. There are potential competitors who would be willing to invest in DLRs and that first small step towards a market paradigm, of allowing competitors to install and receive compensation for DLRs subject to appropriate rules to ensure competition, should be taken in the near future.

The Market Monitor believes that the role of market monitors in RTOs and ISOs in monitoring issues related to transmission competition, including line ratings and the implementation of new technologies to improve the efficiency of the transmission system, and access to all data, is part of existing market monitoring responsibilities.

## II. CONCLUSION

The Market Monitor respectfully requests that the Commission afford due consideration to these comments as the Commission considers the issues raised in this proceeding.

Respectfully submitted,



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Dated: November 4, 2019