FERC Technical Conference, Prepared Remarks of Shaun Murphy, Sr. Engineer, PJM Interconnection

PJM Comments on Dynamic Line Rating Technologies

PJM is pleased to share our experience with Dynamic Line Rating technologies and we look forward to an engaging discussion in this panel.

Pilot Projects and Economic Analysis

In October 2016, PJM participated in a pilot project organized by Oak Ridge National Lab with Genscape (now LineVision) and American Electric Power (AEP) to deploy Genscape DLR sensors on AEP's Cook – Olive 345 kV transmission line. This pilot project was conducted for one year and focused on developing an understanding of the technology, but did not affect the ambient air temperature ratings used in real-time AEP / PJM operations. The project collected conductor loading, clearance, temperature, and dynamic ratings and identified additional capacity on the transmission asset consistent with other DLR installations. The three project participants published a paper documenting the distribution of dynamic ratings as well as other lessons learned in this pilot project. [1]

Later in 2017, PJM conducted a production cost forecasting study of a hypothetical DLR installation on a heavily congested and thermally limited transmission line in the PJM footprint. Genscape assisted in this study by collecting historic weather data surrounding the target line and together with conductor design data, estimated historic DLRs for the congested line. Theses dynamic ratings were loaded into PJM's PROMOD economic forecast tool and a one-year economic dispatch study was performed. Compared to a static rating base case run, study results [2] estimated a yearly net congestion savings of $4.2M as a result of the DLR installation. Again, the project participants published a paper sharing the results of this study [2].

Following the success of this first pilot, PJM also participated in a DLR pilot project with Lindsey and AEP in 2018. This pilot installed DLR sensors on a 138 kV line near a wind farm in AEP to investigate co-convection (shared benefit) between DLRs and wind farm output. This project lasted nearly 6 months and indeed showed a correlation between dynamic ratings and nearby wind generation.

Operational Considerations and Challenges

From a technical perspective, PJM and most of PJM Transmission Owners have already implemented ambient adjusted facility ratings in our Energy Management System (EMS), and our EMS is capable of receiving dynamic ratings as well. PJM is supportive of DLR and recognizes the additional value brought by the technology in two ways. First, there is an obvious economic value brought when dynamic ratings are above the static rating and congestion is reduced or entirely mitigated [2]. Second, during the fraction of time that a dynamic rating is lower than the line's static rating, a reliability risk is monitored and controlled accordingly. PJM feels that this point addresses well the concern related to reliability margins noted in the DLR FERC staff paper.

PJM has demonstrated its support for field testing and piloting this technology and sees promise that the technology can help make real-time markets and operations more efficient and more optimally utilize existing transmission assets.

It's important to note in these discussions that transmission projects are driven by either a reliability need or by projected economic savings. Because DLR technologies passively report the intermittent transmission capacity available above a line's static rating, these devices would not be considered in long-term reliability planning models. However, the DLR economic study demonstrated that the technology fits well in PJM's market efficiency planning process. PJM also recognizes the challenges noted in the Commission's staff paper. Consistent with concerns for sensor placement and limiting element modelling, PJM strongly believes that the transmission asset owner must provide such DLR engineering requirements to provide assurance of asset protection. PJM also agrees with the staff paper that accurate DLR forecasting is necessary for assuring market alignment and to identify possible volatility in real-time ratings. Risk associated with market misalignment, as well as any impact to localized reserve requirements must be modeled and assigned to the proper market participant.

Areas of Further Work

PJM believes that two key areas require further exploration before the technology can be fully utilized in the RTO environment:

First, the Commission is already examining its transmission incentive policy and how deployment of advanced technologies can be appropriately compensated under that policy. However, that policy is right now focused on incentives for building new transmission assets and does not have a clear focus on how to better utilize existing transmission assets. The level of revenue recovery from deploying these new technologies simply does not compare with those associated with a new transmission build.

The second area of exploration lies with NERC initiatives associated with transmission line thermal ratings. The electric utility industry needs to further develop a cohesive philosophy on developing static and ambient adjusted transmission ratings. These initiatives should also include implementation guidelines and acceptable operating margins for dynamic line rating technologies.

PJM looks forward to continued engagement with FERC and the industry on the further development and use of Ambient Temperature Adjusted Facility Ratings and Dynamic Line Rating technologies.

[1] 1 Marmillo, J, Mehraban, B, Murphy, S, and Pinney, N. A Non-Contact Sensing Approach for the Measurement of Overhead Conductor Parameters and Dynamic Line Ratings. CIGRE US National Committee 2017 Grid of the Future Symposium, Cleveland, OH

[2] Dumitriu, N, Marmillo, J, Mehraban, B, Murphy, S, and Pinney, N. Simulating the Economic Impact of a Dynamic Line Rating Project in a Regional Transmission Operator (RTO) Environment. CIGRE US National Committee 2018 Grid of the Future Symposium, Reston, VA