Filing Receipt

Received - 2021-12-30 09:49:44 AM
Control Number - 52771
ItemNumber - 10

PROJECT NO. 52771

INVESTIGATION INTO USE OF DYNAMIC LINE RATINGS FOR TRANSMISSION LINES IN TEXAS	**§ § §**	**PUBLIC UTILITY COMMISSION OF TEXAS**

AEP TEXAS INC. AND ELECTRIC TRANSMISSION TEXAS LLC COMMENTS ON COMMISSION STAFF'S QUESTIONS

AEP Texas Inc. (AEP Texas) and Electric Transmission Texas LLC (ETT) (collectively in this proceeding as "AEP Companies") provide these comments in response to the Public Utility Commission of Texas ("Commission") Staff's request for written comments on questions related to the use of Dynamic Line Ratings ("DLRs") for transmission lines in Texas. AEP Texas is a transmission and distribution utility in ERCOT that is a wholly owned subsidiary of American Electric Power Inc. (AEP). ETT is a transmission only utility in ERCOT that is a joint venture between AEP and Berkshire Hathaway Energy Company. The AEP Companies are transmission service providers ("TSP") serving in the ERCOT region.

I. Introduction

The AEP Companies appreciate the opportunity to provide these comments as the Commission explores issues related to Dynamic Line Ratings ("DLRs"). AEP has extensive experience across its 11 state footprint with the implementation of DLR, which can refer to a variety of techniques to adjust facility ratings to reflect the actual system conditions of the grid at any point in time. DLR approaches range from as simple as a utility making seasonal adjustments to facility ratings (Summer and Winter), to more elaborate DLR techniques utilizing specialized measurement devices located on or near the transmission facilities. In between those two extremes is Ambient Adjusted Ratings ("AARs") that are being used by the AEP Companies. AARs use ambient temperature data to adjust ratings to optimize the use of the grid.

AEP has experience in different forms of DLR, and AEP participated in studies with PJM and SPP evaluating DLR technology on AEP transmission lines. However, the AEP Companies do not believe that the implementation of any DLR methodology is a permanent solution to address needs on the transmission system. Long term planning studies can and should continue to utilize conservative assumptions so that the grid is capable of meeting the needs of customers in the event those conditions materialize. While AAR techniques may optimize the use of the grid near real

time, the system must continue to operate reliably under extreme conditions and must be planned accordingly.

The AEP Companies support the continued use of wide scale AARs in real time operations within the ERCOT region. The AEP Companies also believe that evaluation of the use of AARs in the day ahead market could be merited; however, any rules adopted by the Commission should also provide flexibility for implementation. While there may be some distinct situations where a more elaborate DLR implementation can provide targeted benefits, the Commission should not mandate or otherwise require wide scale implementation of elaborate DLRs by transmission owners.

II. Responses to Questions

1. Are you currently using Dynamic Line Rating (DLR) technology or a similar technology on any circuits? If so, how many? What is your experience on the cost, use and value of these investments?

Yes, for nearly two decades, the AEP Companies have been using Ambient Adjusted Ratings ("AAR") in real time operations for transmission lines in ERCOT built after 1978. AAR transmission line ratings are more dynamic than static or seasonal ratings, with rating values changing more frequently using near real time system conditions. The AEP Companies monitor various temperature zones in each of their regions using a third party weather service, and temperature data is retrieved with every state estimation process run to continuously adjust applicable facility ratings. In contrast, more elaborate DLRs rely on a more complex set of data using information such as real time temperature forecasts and current weather conditions (such as wind, cloud cover, precipitation and solar heating intensity), as well as transmission line conditions such as tension or sag.

The AEP Companies strongly believe the implementation of AARs is the most cost-effective DLR approach for our customers in ERCOT and the other regions in which AEP operates. AEP championed the implementation of AARs within the Southwest Power Pool ("SPP") and routinely shares its experience with other utilities in the region in an effort to expand adoption of the approach to maximize the utilization of existing transmission facilities.

In 2016, AEP participated with PJM in a U.S. Department of Energy and Oak Ridge National Laboratory-funded pilot project evaluating DLR technology on AEP transmission lines.

In 2018, AEP collaborated with the Southwest Power Pool ("SPP") on a similar evaluation. In all cases, including within ERCOT, the studies evaluated several forms of DLR to adjust line ratings on targeted facilities or situations. The results of these projects and other DLR experiences confirmed AEP's decision to implement the systems necessary to utilize AARs on transmission facilities across the entire 11 state AEP system, including ERCOT, rather than wide-scale implementation of elaborate DLR schemes. For nearly two decades, ERCOT has utilized the AAR approach to save millions in congestion costs in the region.

Today, with ERCOT's existing systems, there is virtually no additional cost incurred to implement AARs on a particular AEP transmission facility. AARs are adjusted based on the ambient air temperature that is already being measured for AEP facilities, and ERCOT's existing system is capable of making adjustments without incremental cost for additional lines (other than possible administrative costs). The Department of Energy June 2019 report to Congress ("DOE Report")[1] cited one of the studies AEP conducted on DLR technologies. AEP has also conducted similar tests on its facilities in SPP and within ERCOT (on AEP Texas facilities). In each case, AEP concluded that, as a general application, the implementation of AARs is the most cost-effective DLR approach to maximize the utilization of existing facilities and bring benefits to our customers. Although a detailed cost-benefit analysis has not been conducted, it has been AEP's experience with more elaborate DLR implementation that the equipment installation cost, ongoing maintenance, administration of the additional telemetry, and the additional risks introduced are not justified by the relatively small incremental benefits provided over the AAR approach.

2. Does ERCOT have the appropriate system to take advantage of this real-time technology and is it utilizing this data to expand the use of the power system in a reliable manner?

Although ERCOT is in the best position to respond, the AEP Companies believe ERCOT's systems may already be able to accommodate a variety of DLR approaches. It appears that ERCOT's systems can accommodate either a data curve of AARs based on temperature or the real time telemetering of a facility rating from the TSP. This functionality not only facilitates today's

[1] Dynamic Line Rating, Report to Congress, Department of Energy June 2019 was provided as an attachment to the Memorandum from Commissioner Glotfelty posted in this Project No. 52771.

most cost-effective approach, AARs, but also may be able to facilitate the implementation of other DLR techniques in the future.

Currently, the AEP Companies provide ERCOT a data curve of AARs, which ERCOT uses with its own temperature points to calculate the appropriate AAR adjustment. However, ERCOT does not have as many temperature sensing points as the AEP Companies have near the transmission facilities. ERCOT's temperatures are based on temperature zones that are broad and the AAR adjustments could be more accurate and beneficial if additional ERCOT temperature sensing points were added.

3. Where on your system could additional DLR systems be deployed and at what cost and value to the system and market?

As stated earlier, AAR is currently available on AEP Texas and ETT transmission facilities built after 1978. The AEP Companies believe there could be specific congestion, system conditions, and topology that materialize in the future that may justify more elaborate DLR installations such as the ones described in the response to Questions 1 and 4.

4. What are the challenges that a transmission distribution utility (TDU) may encounter when trying to install or implement this technology on a widespread basis?

As stated earlier, the AEP Companies already utilize AARs on many of their transmission lines within ERCOT. At this time, the AEP Companies believe that widespread adoption of more elaborate DLR facilities is neither necessary nor justified. As stated earlier, the installation cost, ongoing maintenance, administration of and the additional risks introduced are not justified by the relatively small incremental benefits provided over the AAR.

The AEP Companies believe that elaborate DLR technology schemes are best implemented strategically in areas of the system with high congestion and appropriate system conditions and topology. The AEP Companies found such an instance where, during construction of a new transmission line, placing a more elaborate DLR system on some of the nearby existing transmission facilities allowed a greater flow on the existing transmission facilities while the new line was under construction. Importantly, elaborate DLR is most effectively deployed where there is a thermal limitation on the system, and where a meaningful increase in the flow across the overall system will be improved. It may do little good to increase the rating on one element of a

transmission facility with an elaborate DLR scheme if it simply minimally shifts the limitation to another element within the same facility or down to another facility. Therefore, although the AEP Companies are not opposed to elaborate DLR schemes, the AEP Companies do not support widespread implementation.

Additionally, elaborate DLRs may be prone to reliability issues in areas with fluctuating or inconsistent weather data from field devices (i.e., areas with wind variables). As a result, elaborate DLRs may require much more complex decision making in areas that adjust for numerous weather variables. AARs can prove to be a more efficient, reliable, and simple facility rating calculation because the only variable is ambient air temperatures, which are easily obtainable. AARs do not depend on field device data to determine the impact of numerous weather variables (i.e., wind) for overall facility rating calculations. The simplicity of the AAR calculation, paired with an AAR's ability to accurately reflect real time facility capabilities as ambient air conditions vary, provides efficiency and flexibility that elaborate DLR schemes or seasonal facility ratings cannot match.

5. Are there drawbacks or benefits to utilizing this technology in the ERCOT market?

Implementing elaborate DLRs introduces complications associated with the exchange of information between Transmission Operators and ERCOT, which increases the possibility of the two falling out of sync. While there is minimal risk with the implementation of AARs in use today, the risks increase with the additional volumes of data being retrieved from the field and processed with more elaborate DLR implementations.

Although there is often increased utilization of the system made possible through the use of AARs, it should be noted that the AAR approach also has the possibility of limiting flows across lines and increasing congestion. Absent the use of AARs, summer and winter ratings would ordinarily be used during those seasons. The rating in winter months would be higher because of the typically lower overall ambient temperatures during the month. However, in December 2021, the AEP Companies experienced an unexpectedly warm period with temperatures in Texas. Under such conditions, the AAR implementation recognizes these higher temperatures and lowers the rating of the transmission facilities. As a result, the flow across the line would be more limited and congestion could be more significant as compared to a situation where AARs were not in use. Although the line is more limited, it reflects the actual capability of the system and, therefore, allows the system to be operated in a more reliable state, which benefits the system.

6. Do the current rate structures in ERCOT reward/encourage grid investments such as DLR?

The AEP Companies are aware that several TSPs utilize AARs in the ERCOT region, and contend that the current rate structure in ERCOT neither encourages nor discourages investment in more elaborate DLR technologies. There is no implementation of DLR that can serve as a substitute for construction of needed transmission facilities on the grid. The AEP Companies view DLR as a powerful tool that can allow for the optimization of the use of the system in or very near real time. DLR should not be used to avoid the construction of projects identified as part of the transmission expansion process. The planning of the system is conducted to meet the needs of customers under peak conditions. The facility ratings used in these planning activities utilize ratings commensurate with the study case and period. Any introduction of planned increased DLRs will merely introduce further forecasting error possibility and, in the worst case, introduce risk to the system if a needed project is deferred or eliminated.

7. Is there an unwarranted cybersecurity risk associated with this technology?

The AEP Companies have no cybersecurity concerns with the existing AAR implementation. However, deploying more elaborate DLRs can bring potential cybersecurity risks resulting from data exchange between transmission lines and offsite data storage sites. Elaborate DLRs require an abundance of information exchange between transmission service networks and offsite data storage sites, which can leave transmission lines vulnerable to increased risks. Additional processes for loss of data also need to be developed for elaborate DLR schemes, which adds to the complexity for implementing these types of schemes. More elaborate DLR schemes also require the installation of elements outside the security of a substation fence yard that could be accessed by the public.

8. Will widespread utilization of this technology exacerbate other constraints on the system?

Utilizing either elaborate DLR or AAR techniques to elevate the rating of one facility to allow additional flow in a particular direction may then lead to another facility becoming overloaded elsewhere on the system. However, this fact does not mean that these techniques do not provide substantial benefits to customers. Wide scale implementation of these techniques should minimize the "domino" effect of pushing constraints around on the system because more

and more transmission lines will be being used more efficiently and should also help complement the planning processes to identify true system constraints.

9. Should this technology be included in all new high voltage lines within ERCOT?

No, the AEP Companies do not believe a general practice of installing elaborate DLR technology on all new high voltage lines makes sense. Installing such technology on new lines may provide no value at all. Once a new facility is placed in service, that new facility itself is likely not a constraining element. The binding constraint, if any, will have moved further down the line to the next most limiting element. Additionally, the cost of putting more elaborate DLR technology on a line during construction, as opposed to after it is in service, is not materially different. If installed at the time of construction, the equipment may provide no benefit immediately and could be inoperable or obsolete years later before it has demonstrated any material value when the need for the equipment materializes.

The AEP Companies note that FERC, in adopting Order No. 881 in December 2021, and its new rule regarding transmission line ratings, recognized many of the issues addressed by the AEP Companies. Order No. 881 generally requires public utility transmission providers to implement ambient-adjusted ratings on the transmission lines over which they provide transmission service. Following several years of study, evaluation, technical conferences, and public comment, FERC's final rule does not mandate the adoption of dynamic line ratings; however, it does require that organized market operators establish and maintain systems and procedures necessary to allow transmission owners that would like to use dynamic line ratings the ability to do so.

10. Is there system reliability, situational awareness benefits to utilizing this technology?

Yes, as previously addressed, there have been some reliability benefits achieved through the use of these techniques, such as AARs. Prior to their implementation, transmission utilities generally utilize static and/or seasonal ratings based on assumed, albeit extreme, temperature conditions. Using AARs often allows for increased flow across transmission lines, as compared to what would have been possible using static or seasonal ratings. Additionally, in the event those assumed conditions are exceeded, facility ratings can be reduced below those fixed seasonal limits. While such a reduction could lead to increased congestion on the grid, more importantly it will reflect the actual line loading capability consistent with reliability standards.

11. Please provide an overall cost-benefit analysis to addition of this technology.

The AEP Companies do not have a specific cost-benefit analysis to provide to the Commission. As described above, it has been AEP's experience, through multiple test cases, that the implementation of AARs can provide significant benefits at a small fraction of the implementation cost associated with more elaborate DLR technologies. In the experience of the AEP Companies, the additional benefits offered by elaborate DLR technologies are not outweighed by the costs.

III. Conclusion

The AEP Companies appreciate the opportunity to provide these comments and look forward to working with the Commission and other stakeholders to address dynamic line ratings in Texas.

Date: December 30, 2021

RESPECTFULLY SUBMITTED,

/s/ Melissa Gage

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ON BEHALF OF AEP TEXAS INC. AND ELECTRIC TRANSMISSION TEXAS LLC

AEP COMPANIES' EXECUTIVE SUMMARY

AEP has extensive experience across its 11 state footprint with the implementation of DLR, which can refer to a variety of techniques to adjust facility ratings to reflect the actual system conditions of the grid at any point in time. In ERCOT, the AEP Companies use Ambient Adjusted Ratings ("AARs") that use ambient temperature data to adjust ratings to optimize the use of the grid rather than the more rigid seasonal ratings or the more elaborate DLR methodology. In AEP's experience, the more elaborate DLR methodologies introduce complications and higher costs that far exceed the incremental value being provided above the use of AARs.

The AEP Companies do not believe that the implementation of any DLR methodology is a permanent solution to address needs on the transmission system. Long term planning studies can and should continue to utilize conservative assumptions so that the grid is capable of meeting the needs of customers in the event those conditions materialize. While AAR techniques may optimize the use of the grid near real time, the system must continue to be capable of reliable operations under extreme conditions and, therefore, the system must be planned accordingly.

The AEP Companies support the continued use of wide scale AARs in real time operations within the ERCOT region. While there may be some distinct situations where a more elaborate DLR implementation can provide targeted benefits, the Commission should not mandate or otherwise require wide scale implementation of elaborate DLRs by transmission owners. The AEP Companies also believe that evaluating the use of AARs in the day ahead market could be merited; however, any rules adopted by the Commission should also provide flexibility for implementation.