UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

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

INITIAL COMMENTS OF THE
EDISON ELECTRIC INSTITUTE

I. INTRODUCTION

The Edison Electric Institute ("EEI") respectfully submits the following initial comments in response to a Notice of Inquiry ("NOI") issued by the Federal Energy Regulatory Commission ("FERC" or "Commission") in the above-captioned proceeding on February 17, 2022.[1] On December 16, 2021, the Commission issued Order No. 881 in Docket No. RM20-16-000.[2] While addressing the use of ambient adjusted ratings ("AAR"),[3] the Commission declined to require the implementation of dynamic line ratings ("DLRs")[4] on transmission lines in Order No. 881, and instead noted its intention to open this proceeding in order to further explore DLR

[1] *Implementation of Dynamic Line Ratings*, 178 FERC ¶ 61,110 (2022).

[2] *Managing Transmission Line Ratings*, Order No. 881, *Federal Register*, 87 Fed. Reg. 2244 (Jan. 13, 2022), 177 FERC ¶ 61,179 (2021) ("Order No. 881"). Note that EEI has filed a request for rehearing and clarification with respect to Order No. 881. *See* Request for Rehearing and Clarification of the Edison Electric Institute, Docket No. RM20-16-000 (filed Jan. 18, 2022) ("EEI Request for Rehearing"). The Commission has stated that it will address rehearing requests on Order No. 881 and will modify or set aside any or all of the order in response to such requests. Notice of Denial of Rehearings by Operation of Law and Providing for Further Consideration, *Managing Transmission Line Ratings*, 178 FERC ¶ 62,104 (February 18, 2022).

[3] The Commission has defined an AAR as a transmission line rating that "(1) applies to a time period of not greater than one hour; (2) reflects an up-to-date forecast of ambient air temperature across the time period to which the rating applies; (3) reflects the absence of solar heating during nighttime periods where the local sunrise/sunset times used to determine daytime and nighttime periods are updated at least monthly, if not more frequently; and (4) is calculated at least each hour, if not more frequently." Order No. 881 at P 4.

[4] Pursuant to the NOI, a DLR is a transmission line rating that: "'(1) applies to a time period of not greater than one hour; and (2) reflects up-to-date forecasts of inputs such as (but not limited to) ambient air temperature, wind, solar heating intensity, transmission line tension, or transmission line sag.'" NOI at n.1 (*quoting* Order No. 881 at P 7).

implementation.[5] Through the instant NOI, the Commission seeks comment on: whether the lack of DLR requirements renders current wholesale rates unjust and unreasonable; potential criteria for DLR requirements; the benefits, costs, and challenges of implementing DLRs; the nature of potential DLR requirements; and potential timeframes for implementing DLR requirements.[6]

EEI is the association that represents all investor-owned electric companies in the United States. Our members provide electricity for more than 220 million Americans and operate in all fifty states and the District of Columbia. As a whole, the electric power industry supports more than seven million jobs in communities across the United States. EEI's member companies include electric companies that own and operate transmission assets ("TOs") in all regions of the country, including some that deploy DLRs on limited portions of their transmission systems. Accordingly, EEI members are directly affected by and can provide a broad-based perspective on the issues raised in the NOI.

EEI member companies invest more than $120 billion annually to make the energy grid smarter, cleaner, more dynamic, more flexible, and more secure to provide affordable and reliable electricity to customers. This includes investments to make sure that the existing grid is operated efficiently and reliably, which includes deployment of advanced technologies, including DLRs, as appropriate. These investments are made as needed and appropriate based on the needs of the individual transmission systems. Going forward, TOs will be making the investments and changes needed to implement Order No. 881. As discussed herein, it is premature for the Commission to address DLRs requirements. Accordingly, the Commission

[5] Order No. 881 at P 8.

[6] NOI at P 1.

should encourage, but not require, TOs to consider DLR technology as an option to weigh against other methods of reducing congestion. This will help ensure that TOs continue to have the flexibility to use DLRs as needed to provide reliable service to their customers.

II. COMMENTS

A. General Comments

As discussed below and in response to the specific questions in the NOI, the Commission should not mandate the use of DLRs due to the need for flexibility, operational differences between transmission systems, and the need to gain experience with AAR implementation.

First, due to the numerous costs and challenges associated with DLR implementation, the TO is in the best position to understand and evaluate its transmission system to determine where and when the implementation of DLRs is appropriate, if at all. For example, for lines that are lightly loaded and never, or rarely, approach static limits in transmission planning studies, implementation of DLR technology likely has little to no benefit. The costs and challenges associated with DLR implementation will vary depending on unknowns including the number of monitoring points per line, the frequency of real time and forecast weather updates, how data will be transferred to Regional Transmission Organizations ("RTOs") or Independent System Operators ("ISOs") for day ahead and real time market uses,[7] and the equipment and installation lead times required for field and Energy Management System ("EMS") system changes. The expected benefits of DLR technology will vary depending on the specific attributes of a given transmission line; as a result, not all transmission lines will receive benefits from the

[7] The expanded use of DLR technology will also have unknown impacts on other market products, contracts, and settlements.

implementation of DLRs or receive benefits that exceed the cost of implementation.[8] In addition, limitations on vendor availability will also impact the ability of all TOs to simultaneously implement DLRs across their entire systems.

While the implementation of DLR technology may, in specific instances, result in limited benefits to transmission systems in the form of increased rating granularity for real-time operations. As ratings adjust dynamically, up or down, granularity of transmission line ratings is increased with the potential for greater or lesser power flows.[9] End-use customers may benefit from cost-effective implementation of DLRs if lower energy prices result from more granular ratings. In some cases, existing interconnected generators may also benefit from more granular ratings. These benefits will vary widely and are difficult to quantify. While DLRs can provide some benefits, the implementation of DLRs will increase both field and EMS related operation and maintenance costs and present significant challenges for reliability[10] and cybersecurity.[11]

Due to the numerous costs and uncertain benefits associated with DLR implementation, the Commission should employ a flexible approach that encourages, rather than mandates, DLRs as an option to weigh against other methods of reducing congestion.[12] Universal application of a specific practice or operational requirement would eliminate the flexibility TOs require to address their transmission operational needs and unique circumstances.

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[8] For example, DLRs will only bring potential net benefits when the thermal limit of the transmission conductor is the most limiting element in the line.

[9] NOI at P 11 (noting Order No. 881's recognition of such benefits).

[10] Please see response to Questions 2 and 10, below, for discussion of reliability issues associated with DLRs.

[11] Please see response to Question 15, below, for a discussion of cybersecurity issues associated with DLRs.

[12] As noted below in response to Question 19, the Commission should take a technology-neutral approach to reducing congestion.

Second, as noted above, if DLRs are appropriate to implement they will provide the most benefits in real-time. DLRs rely on variable and unpredictable factors such as wind speed, solar heating intensity, and transmission line tension. The inherent variability and unpredictability associated with these factors make DLRs inappropriate for addressing longer-term system planning objectives. DLR technology should only be used to resolve real-time temporary congestion on the system. For this reason, DLRs provide the most benefits situationally, in real time, and their use should be limited to real-time dispatch operations.

System planning includes but is not limited to, the needs identified as part of transmission planning studies and market efficiency analysis. Consistent with their purpose, these North American Electric Reliability Corporation's ("NERC") Reliability Standard planning studies consider a range of worst-case scenarios using appropriate static or seasonal ratings to determine the needed and/or required infrastructure investment and ensure the capacity of the transmission system is sufficient to serve all load during any weather scenario including times when the temperature is high.[13] It would be unrealistic and could negatively impact reliability to estimate ever-changing local weather conditions (e.g., wind, precipitation, ambient temperature) in the ratings used in a long-term planning study as these cannot be predicted with sufficient accuracy years into the future.[14] Accordingly, as noted below in response to Question 10 from the NOI, DLRs should not be used in long-term planning, and are not a replacement for needed

[13] For example, in studying a solar generator interconnection a DLR may give a higher rating in the Spring, but good utility practice requires that the studies consider Summer ratings.

[14] In Order No. 881, the Commission made it clear that AARs, which also incorporate ambient air temperature forecasting, should not be used for longer-term planning considerations. *See* Order No. 881 at P 5 (requiring seasonal line ratings be used "as the basis for the determination of the necessity of curtailment, interruption, or redispatch of transmission service that is anticipated to occur more than 10 days in the future.").

infrastructure investment. Put differently, the implementation of DLRs, and AARs, will not obviate the need for new transmission development to maintain a reliable electric grid.

Third, TOs and RTOs/ISOs need to gain experience through the implementation of AARs, as required by Order No. 881, before the Commission can evaluate the need for DLR requirements. DLRs and AARs are both tools that can be used to establish transmission line ratings. The key difference between AARs and DLRs is that DLRs gather a myriad of real-time data points relating to variables such as local weather conditions, solar irradiance, and/or line tension, whereas AARs rely primarily on air temperature forecasting.[15] Due to these differences, as acknowledged by the Commission[16] and documented by Commission Staff,[17] DLRs represent a significantly greater technical, logistical, and financial commitment than AARs.

In Order No. 881, the Commission required transmission providers to use AARs as the basis for evaluation of transmission service requests that will end within 10 days of the request, and to use AARs as the basis for their determination of the necessity of curtailment, interruption, or redispatch of transmission service anticipated to occur within those 10 days.[18] The Commission required each transmission provider to submit a compliance filing within 120 days of the effective date of Order No. 881 revising their Open Access Transmission Tariff, and further required that all requirements adopted in Order No. 881 be fully implemented no later

[15] FERC Staff Whitepaper, *Managing Transmission Line Ratings*, Docket No. AD19-15-000 (August 2019) at 7 ("Whitepaper").

[16] *Managing Transmission Line Ratings*, 173 FERC ¶ 61,165, P 100 (2020)

[17] Whitepaper at 17 ("while the benefits of DLRs *may* be greater than the benefits of AARs, the use of DLRs has greater challenges and costs") (emphasis added); *id.* at 21 ("Many of the challenges to advanced line rating methodology implementation are unique to DLRs. Challenges unique to DLR implementation relate to sensor placement, sensor maintenance, and physical and cyber risks, as well as its tendency to cause line rating fluctuations.").

[18] Order No. 881 at P 4.

than three years from the compliance filing due date.[19] Implementation of AARs will require substantial resources, time, and investment and, as noted in the EEI Request for Rehearing, may not provide benefits on all lines.[20]

As an initial matter, before considering DLR requirements, the Commission should fully resolve all rehearing issues related to Order No. 881.[21] In addition, prior to considering DLR implementation, the Commission should allow AARs to be fully implemented by the industry and then evaluate the impact of AARs on the system. This time and information will allow the Commission to evaluate whether requiring implementation of AARs on all transmission lines provided the benefits that the Commission expected for all lines or whether a flexible approach would have been more appropriate. The Commission should use this information to inform any subsequent decision of whether to propose to require the implementation of DLRs.[22] The Commission especially should not consider requiring the use of DLRs when efforts to implement AARs in accordance with Order No. 881 have just begun, and before the impacts of such widespread AAR implementation can be fully studied and appreciated. Additional data on the implementation of AARs may show that the incremental benefit of DLR over AAR is not adequate to justify broad adoption of DLRs.

Given the considerations highlighted above regarding challenges such as increased operations and maintenance costs, the inapplicability of DLRs in certain circumstances, and ongoing efforts to comply with the implementation of AARs under Order No. 881, a requirement

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[19] Order No. 881 at P 12.

[20] *See e.g.*, EEI Request for Rehearing at 4-5. As noted in the EEI Request for Rehearing, Order No. 881 imposes substantial new requirements on TOs on which additional clarity is needed. *Id.* at 3-4.

[21] *See supra* n.2.

[22] As noted below in response to Question 20, if the Commission does decide to impose a DLR requirement, it should at a minimum maintain the same exceptions for DLR implementation that it promulgated for AAR implementation in Order No. 881.

to implement DLR technology will not ensure just and reasonable rates. Thus, the Commission should not proceed with a proposal to generically require DLR implementation, and instead should employ a pragmatic, flexible strategy that encourages TOs to implement DLR technologies where beneficial. In light of the pending implementation of AARs, any analysis of the benefits of DLRs should be based on the marginal benefit of DLRs over AARs, rather than the benefits of DLRs over existing seasonal ratings.

EEI provides the following responses to specific questions posed by the Commission in the NOI. EEI has not provided answers to questions that may be premature at this time, for the reasons discussed herein.

B. Responses to Selected Commission Questions

1. As a threshold matter, even for transmission lines that incorporate AARs, is there a need to further increase the accuracy of transmission lines ratings through the implementation of DLRs to ensure just and reasonable wholesale rates? Why or why not? If yes, please explain whether a requirement by the Commission to adopt DLRs is needed.

As discussed above, the Commission should encourage, but not require, TOs to consider DLR technology as an option to weigh against other methods of reducing congestion. TOs understand the needs of their system including topology, climate, and normal system performance of their transmission facilities. TOs must operate their transmission systems to serve customers reliably, preserve their systems' integrity, and comply with NERC mandatory reliability standards.

In determining whether to implement DLR technology, TOs must keep these obligations in mind. While the appropriate application of DLRs may enable a slightly higher real-time transmission line rating than would be achieved through AARs, there are challenges associated

with mandating the use of DLRs that could reduce these potential benefits. These challenges include potential reliability, cybersecurity and physical security concerns.

Reliance on DLRs could lead to reliability concerns. For example, if use of DLR technology results in a higher rating on a line, that higher rating could mask the potential for a system overload. During operations, a scenario could arise where the line's rating is actually lower than the rating derived from DLR technology.[23] The resulting reduction in expected line capacity could jeopardize a TO's ability to reliably serve its customers' load (due to system outages and/or reduced power quality). In addition, inaccurate/false readings from DLR sensors could result in overloads and repairs to DLR sensor equipment that may require that transmission lines be taken out of service.[24] Adverse weather conditions that cause reliability issues can also make it challenging to access DLR equipment for repair in emergency situations. These challenges could be further compounded if the DLR equipment is located in remote, hard-to-access locations.

In addition to potential reliability risks, system-wide implementation of DLR technology will result in increased operation and maintenance costs, such as the need to purchase and implement complicated software to analyze data, install DLR sensors and telecommunications connections in remote areas, and hire additional technicians to repair DLR sensors.[25] Furthermore, there are significant cyber and physical security concerns stemming from the installation of sensors requiring secure communications back to the TO's EMS.[26] Typically,

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[23] This scenario could arise as a result of, for example, inaccurate forecasting related to DLR inputs.

[24] *See* Whitepaper at 22. Note that the reliability impacts of this scenario would be amplified where DLRs are implemented on lines that are heavily utilized and face significant congestion.

[25] *Id.*

[26] *Id.*

secure communications require a private network. Therefore, to implement secure communications there must be enough capacity on existing networks, as well as the ability for sensors to access private communication networks when located in remote areas. There are also physical security concerns; sensors can be placed on locations that are not physically secured, and thus susceptible to potential tampering. The added cost to provide secure communications infrastructure and to protect those assets may mean that the implementation of DLR on a particular line does not pass a cost/benefit analysis to justify the potential incremental increase to ratings in real-time operations under certain circumstances.[27]

In addition to the reliability, economic, and security issues noted above, the expected operational and economic benefits of DLRs are dependent on the specifics of a given transmission line. Some transmission lines may not benefit from DLR implementation at all, highlighting the importance of adhering to good utility practice in assessing the potential implementation of DLRs. For example, for lines that are lightly loaded and never, or rarely, approach static limits in transmission planning studies, implementation of DLR technology likely has little to no benefit. In addition, DLR technology will only provide benefits for conductors or paths where power transfer capacity is limited by concerns about conductor temperature or thermally induced conductor sag/clearance. Geospatial issues must also be considered when determining if DLRs provide value on a particular transmission line. For example, wind will help reduce the heat of a transmission line conductor, which could in turn allow the line to carry more capacity.[28] While conditions on the windy portions of the line may suggest that the line can handle increased capacity, portions of that same line which are not in windy areas may not

[27] In addition, it bears emphasizing that TOs are still working through how to cost-effectively and securely implement the Commission's requirements for the use of AARs.

[28] *See* Whitepaper at 5.

be able to support that increased capacity. In these scenarios, the true limit to the line's capacity may not be the line reading from a DLR sensor in a windy area; instead, the entire line may be limited in its capacity by what the non-windy portion of the line can support.[29]

The type of limit on a transmission line will also determine whether DLRs can in fact provide benefits to the line. Transmission lines can be limited by their by their thermal rating, a voltage limit, or a stability limit.[30] However, DLRs will only bring potential net benefits when the thermal limit of the transmission conductor is the most limiting element in the line and the line is thermally constrained during periods when DLRs can result in increased transfer capability in comparison to AARs.[31] Even in these situations, the benefit to be gained by applying DLRs may not materially exceed incremental benefits from use of AARs. Furthermore, even if a conductor is the limiting element and a DLR identifies more available capacity, this margin of capacity could be restricted if a second or third element (such as a wave trap or circuit breaker) limits the circuit before the conductor's capacity can be reached.[32] The TO is in the best position to understand and evaluate where on its system these applications may be appropriate, if at all. However, should a TO determine that DLRs provide sufficient benefits in excess of the costs for a particular application, they should be permitted to implement them. For these reasons, a requirement by the Commission to implement DLR technology is not needed.

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[29] *See* Whitepaper at 23 (discussing the impact of differing wind conditions on DLR efficacy). Another example of a geospatial limitation is a transmission line that changes orientation over the course of its path such that it benefits from a cross-breeze in certain locations but not in others.

[30] *Id.* at n.8.

[31] *See id.* at n.8, 9. Relatedly, it is worth noting that inadequate DLR sensor coverage might result in a failure to detect the most limiting element of the line, jeopardizing the accuracy of the DLR.

[32] This is further complicated by the fact that the most limiting element on any given line could change as temperature fluctuates.

Furthermore, as discussed above in Section II.A, prior to considering DLR implementation the Commission should provide time to implement and evaluate AARs and their impacts on the transmission system and use this information to inform any subsequent decision of whether to propose to require the implementation of DLRs. The Commission especially should not consider requiring the use of DLRs when efforts to implement AARs in accordance with Order No. 881 have just begun, and before the impacts of such widespread AAR implementation can be fully studied and appreciated. Additionally, and in light of the pending implementation of AARs, any analysis of the benefits of DLRs should be based on the marginal benefit of DLRs over AARs, rather than the benefits of DLRs over existing seasonal ratings.

2. What, if any, barriers to DLR implementation exist today? Are potential requirements to implement DLRs necessary to address these existing barriers? Why or why not?

As discussed in response to Question 1 above, there are many challenges associated with the implementation of DLRs that could reduce the value of potential benefits and result in DLR projects not passing a cost/benefit analysis. One notable challenge to DLR implementation is that it will result in increased operation and maintenance costs. For example, in addition to the cost of the DLR technology itself, DLRs will require the use of new software to analyze data which does not exist in some EMS implementations today, and repairs to DLR sensors and other equipment often require specially trained technicians.[33] TOs will need to upgrade their RTO/ISO-communications interfaces to properly relay increased quantities of line rating data. DLR maintenance activities include the calibration of sensors, replacement of equipment, and periodic upgrades to software and hardware. DLR sensors typically have a limited life span of 5-10 years, which will result in ongoing replacement costs for any given transmission line. TOs

[33] *See* Whitepaper at 22.

will need to have dedicated personnel able to handle DLR installation, maintenance, and response to DLR monitoring alerts or communication failures. A single transmission line will likely require a significant number of DLR monitors. The failure of only a few, or possibly even one of the DLR monitors could render the DLR invalid. This can result in an instantaneous step change in the rating of a transmission line, creating real-time reliability concerns.

Another potential limiting factor for increased implementation of DLR technology is the availability of vendors. Third party vendors are often necessary to design, manufacture, and install DLR equipment and provide the software and EMS integration needed to implement DLR technology. Given the relatively limited application of DLR technology in the United States currently, there may be a limited number of vendors who are able to provide these critical design and installation services if the Commission implements a widespread DLR requirement. Not all DLR vendors may be able to provide the necessary services associated with particular transmission lines for technological or geographical reasons.[34] Existing DLR vendors would need to be able to significantly ramp up their operations and be able to accommodate a broad range of vendor requirements in accordance with various TOs' procurement policies, and ensure adequate supplies at reasonable costs.[35] The DLR vendor industry may lack the requisite maturity to have developed accurate pricing models for the various DLR technologies that are available. In addition, any vendors relied on to comply with a DLR requirement would need to be able to meet NERC's security standards requirements. As noted above, the Commission

[34] For example, a vendor may not have the technical capability to implement DLR technology on remote stretches of transmission lines that require satellite communications, rather than cellular communications, to relay sensor data. Additionally, some vendors may not possess the necessary experience or certifications necessary to install DLR sensors in particular types of terrain or in certain parts of the country.

[35] Prices for DLR equipment and installation and/or repair services could increase significantly in the wake of a DLR requirement if there are not enough vendors to meet demand.

should employ a prudent, flexible strategy on DLRs that encourages TOs to implement such technologies where beneficial without requiring them to do so.

However, if the Commission decides to proceed with any sort of DLR requirement, it should first gather adequate information on the availability and capability of DLR vendors that are able to service TOs in the United States. This information should be used to inform any such DLR requirement as well as any proposed implementation timeframes. Without properly considering this potentially limiting factor, the ability for TOs to comply with a future DLR requirement could be significantly hindered. It could also unnecessarily raise cost and create inventory shortages of DLR equipment if the Commission requires TOs to implement DLRs and few qualified, secure vendors are available. This would hamper TO efforts to focus on customer affordability.

Other challenges to DLR implementation include potential reliability issues. As discussed above in response to Question 1, if use of DLR technology results in a higher rating on a line, that higher rating could mask the potential for a system overload, potentially jeopardizing a TO's ability to reliably serve its customers' load (due to system outages and/or reduced power quality). In addition, inaccurate/false readings from DLR sensors could result in overloads and repairs to DLR sensor equipment that may require that transmission lines be taken out of service.[36] Furthermore, as described more fully in response to Question 15, DLRs pose cyber and physical security concerns stemming from the installation of sensors requiring secure communications back to the TO's EMS.[37] These challenges illustrate the need for familiarity

[36] *See* Whitepaper at 22.

[37] *Id.*

and experience with DLR technology in order to best apply it and prevent unintended consequences.

Presently, there is limited industry experience with DLR technology and best practices for DLR implementation, and the benefits associated with DLR implementation are difficult to quantify. Some TOs have tested DLRs through pilot programs, and others have implemented the technology on certain transmission lines, with experiences and views to date generally varying among TOs. The complexity of DLR technology and the lack of experience that many TOs have with DLR implementation necessitates a flexible approach. Once industry experience with DLR technology increases, the TO will be in the best position to understand and evaluate where on its system these applications may be appropriate, if at all. When the costs associated with these challenges are taken into account for a particular DLR project, that project may not pass a cost/benefit analysis to justify the potential incremental increase in ratings under certain real-time conditions. However, should a TO determine that DLRs provide sufficient benefits in excess of the costs for a particular application, they should be encouraged to implement them. Universal application of a specific practice or operational requirement eliminates the flexibility of TOs to address their transmission operation needs and unique circumstances. A flexible program would better serve customer needs than universal adherence to a specific practice irrespective of its efficacy. Encouraging DLR use, rather than mandating it, will facilitate the development of this experience and knowledge in a prudent manner.

3. **If the Commission were to require DLR implementation, should it require the implementation only on certain transmission lines, and, if so, what set of criteria should be considered to identify transmission lines for DLR implementation? Examples of such criteria could include congestion, curtailment levels, voltage levels, infrastructure, and/or geography/terrain. Explain why such criteria would identify the set of transmission lines on which DLRs need to be implemented in order to produce just and reasonable wholesale rates.**

TOs should continue to be able to determine where it is appropriate to install DLR technology by engaging in a cost/benefit analysis to justify any targeted deployment. As noted above in response to Question 1, only a subset of transmission lines may benefit from the implementation of DLRs. For example, DLRs will only bring benefits when the thermal limit of the transmission conductor is the most limiting element in the line, the DLR rating is materially higher than the AAR rating, and the line is thermally congested during times DLRs result in higher transfer capability. If another system element is the most limiting, then the rating of the transmission line must be set to reflect the limiting element.[38] Using a DLR rating in this instance could inaccurately suggest that the line is capable of handling more capacity than it actually can, which could result in the system dispatch being set in a way that damages the asset or otherwise creates reliability issues. In addition, as noted above, implementation of DLR technology likely has little to no benefit for lines that are lightly loaded and never, or rarely, approach static limits in transmission planning studies. Furthermore, when evaluating the benefits associated with DLR implementation, it is crucial that TOs consider the *incremental* benefits that DLRs would have over the AAR technology implemented pursuant to Order No. 881. In light of the Commission's decision to require AAR implementation in Order No. 881, it

[38] As noted above in response to Question 1, this is complicated by the fact that the most limiting element on any given line could change as temperature fluctuates.

would be inappropriate for TOs to determine the benefits of DLR implementation by using seasonal line ratings as a comparison point.

As discussed in response to Questions 1 and 2, the implementation of DLR technology on any given line will entail significant costs and logistical challenges associated with installation of sensors, operations, and ongoing maintenance. In Order No. 881, the Commission recognized the added costs and challenges associated with DLRs, highlighting in particular the "costs and challenges [of] placing sensors in remote locations, ensuring the cybersecurity of sensors, and various additional costs."[39] The costs associated with implementation will also vary depending on the type of DLR technology and the setting in which it would be used. For example, the installation of DLR technology on transmission lines in urban areas will entail different costs and design considerations than the installation of DLR technology on transmission lines located in more rural areas.[40]

These considerations illustrate that the decision to implement DLR technology on any given transmission line entails a highly specific case-by-case analysis of costs and benefits. The TO is in the best position to understand and evaluate where on its system these applications may be appropriate, if at all. A blanket DLR implementation requirement based on a discrete set of factors identified by the Commission would unduly constrain TO discretion and could result in implementation of DLR technology where such implementation would increase, rather than decrease, total customer costs. Rather than requiring TOs to implement DLRs on the basis of

[39] Order No. 881 at P 254.

[40] TOs installing DLR equipment on transmission lines in urban areas may encounter challenges stemming from right-of-way access and disturbance issues. As discussed in response to Question 14(b), sensor installation and maintenance will be more difficult and costly on transmission lines that pass through challenging terrain and remote regions. For example, helicopters may be needed to install and maintain DLR equipment on transmission lines in remote and mountainous areas.

pre-determined criteria, the Commission should continue to permit TOs to implement DLR technology on the basis of case-specific cost/benefit analyses that consider the incremental benefits that DLRs would have over the AAR technology implemented pursuant to Order No. 881.

4. How should transmission lines be evaluated for whether they satisfy such criteria, both initially and going forward? Please estimate the number and proportion of transmission lines that would likely be implicated by any criteria you recommend.

Please see response to Question 3.

9. If the Commission were to require DLR implementation based on certain criteria, should it require that new transmission lines be evaluated to determine whether they must implement DLRs? Are there any characteristics of new transmission lines that warrant different criteria?

As noted above in response to Question 3, TOs should continue to be able to determine where it is appropriate to install DLR technology by engaging in a cost/benefit analysis to assess whether deployment of DLRs on a facility is expected to provide net benefits over AARs. This is a highly facility-specific, case-by-case analysis that will take into consideration the particular attributes of a transmission line. Universal application of pre-determined criteria might miss nuances relevant to a particular transmission line, resulting in the implementation of DLRs on lines where there are no benefits (or where benefits are outweighed by costs), and eliminates the flexibility of TOs to address their transmission operation needs and unique circumstances.

10. If the Commission were to require DLR implementation, how should that requirement be considered in regional transmission planning and interconnection processes?

As explained above, the Commission should encourage, but not require, TOs to use DLR technology, in order to continue to allow TOs the flexibility to implement DLR on their transmission lines as appropriate. In addition, DLRs may not be appropriate at all times and are

most effectively used in real-time operations and not in system planning. This is due to the variabilities associated with the relevant inputs, which may include ambient air temperature, wind speed and direction, solar heating, transmission line tension, and transmission line sag. Making assumptions regarding these inputs during the long-term system planning process raises significant risks and unforeseeable impacts, especially because system planning must account for a range of worst-case scenarios in order to ensure reliability. Incorporating DLR assumptions into long-term planning could result in reliability impacts by undermining the level of conservatism necessary to reliably withstand future unknown operating states. For example, if use of DLR technology during long-term planning results in a higher rating on a line, that higher rating could mask the potential for a future system overload. During operations, a scenario could arise where the line's rating is actually lower than the rating derived from DLR technology during the long-term planning study.[41] The resulting reduction in expected line capacity could jeopardize a TO's ability to reliably serve its customers' load (due to system outages and/or reduced power quality). For these reasons, it is necessary for planning studies to use conservative ratings such as static and seasonal ratings to identify what, if any, infrastructure is needed to support customer demand.

DLR technology is fundamentally a tool that operates on a short-term timescale to enhance the granularity of transmission line ratings in the real-time operating horizon, and potentially relieve congestion by providing a temporary means for additional capacity. However, DLRs should not be viewed as a dependable tool for reducing congestion in the long-term planning horizon. Rather, building firm line capacity or replacing or upgrading limiting equipment as identified through the regional processes and/or interconnection processes provides

[41] This scenario could arise as a result of, for example, inaccurate forecasting related to DLR inputs.

more reliable long-term solutions for congestion than the implementation of DLRs. Chronic congestion on the system should continue to be handled in the transmission planning process by identifying such chronically congested areas and reviewing potential solutions to alleviate that congestion.[42]

11. If the Commission were to require DLR implementation based on certain criteria, what transparency measures should the Commission require? For example, should the Commission consider requiring transmission providers to submit informational reports that show which transmission lines meet any determined criteria for DLR implementation? And/or should the Commission require transmission providers to post the same on their Open Access Same-Time Information System websites?

As explained above, the Commission should encourage, but not require, TOs to use DLR technology, in order to continue to allow TOs the flexibility to implement DLRs on their transmission lines as appropriate. However, if the Commission does decide to require DLR implementation in certain circumstances, it should not require the publication of detailed equipment and contingency specifications that factor into transmission line rating methodologies because of the risk of unintended consequences. Such an approach would significantly deviate from the proven practice of relying on TOs' knowledge and expertise to rate their equipment.

Any requirement to share transmission line ratings must ensure protections for any sensitive or proprietary information. The TO should be able to limit access to this information to entities with a certified business need and require a non-disclosure agreement to be executed. The reliability and security of the transmission grid is of paramount importance to both FERC's mission as well as to EEI's member companies. Appropriate limitation on access to this sensitive information will help ensure that bad actors do not readily get access to information

[42] DLR has limited applications in the advanced RTO energy markets to address congestion as more complex and chronic congestion is not due to thermal limitations.

related to where DLR technology is deployed so that they cannot target such equipment for sabotage, theft, or other illegal purposes. Thus, any mechanism for sharing information with other parties must guarantee that critical energy infrastructure information is not disclosed to any third party.

In addition, should the commission choose to require the use of DLRs, the Commission should not require TOs to post real-time transmission line ratings on their Open Access Same-Time Information System pages, but instead provide the methodologies used for determining DLRs. Specific facility ratings should not be disclosed other than to the Commission and other transmission providers.

12. For any DLR requirement criteria you identified in response to question Q3 above, please explain and, if possible, quantify the potential annual gross market benefits that would be expected to result from such a requirement.

c. To what extent might DLR implementation shift congestion to new areas? How would these shifts in congestions patterns affect the overall benefits of DLR implementation?

As noted above, the use of DLR technology on a transmission line can result in a higher capacity rating for that line. As a result of this increased capacity, that line may no longer be the most congested or limited facility in the system, and instead another facility may become the most limiting. This reality is illustrated by a pilot study conducted by LineVision Inc., American Electric Power ("AEP"), and PJM Interconnection, LLC on AEP's 345 kV Cook-Olive line (the "Cook-Olive Study").[43] The Cook-Olive Study, which was cited and discussed by Commission Staff in the Whitepaper, found that while DLR implementation resulted in certain congestion

[43] 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, available at https://cdn2.hubspot.net/hubfs/4412998/CIGRE%20GOTF%202018%20NGN%20-%20PJM%20AEP%20LineVision%20-%20Final.pdf?t=1540927429509.

savings along the target line, it also resulted in "increased downstream congestion on several nearby 230 kV lines," which considerably reduced the total net congestion savings associated with the project.[44] These kinds of broader effects on the transmission system support EEI's position that consideration and implementation of DLR should not be broadly required but instead should be left to TOs to address on a case-by-case basis. As noted above, the effects of DLRs can only be understood once TOs have deployed and analyzed the effects of AARs on their systems. If installation of DLR technology on one line will increase capacity on that line but the ultimate congestion savings associated with the project will be reduced because of another limiting area in the system, the TO may determine that the DLR project does not pass a cost/benefit analysis. Any action that the Commission takes as a result of this proceeding should provide TOs with the flexibility to make this determination.

14. What are the expected costs and challenges of implementing DLRs (separate from the costs associated with Order No. 881 implementation)?

Please see responses to Questions 1, 2, and 3.

a. How are these costs and challenges divided between initial implementation (e.g., sensor purchase and installation, EMS upgrades, and communications upgrades) and ongoing operations and maintenance (e.g., sensor maintenance, communications maintenance, and forecasting)?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. TOs should continue to be able to determine where it is appropriate to install DLR technology by engaging in a cost/benefit analysis to assess whether deployment of DLR on a facility is expected to provide net benefits over AARs. Importantly, while the Commission explained in Order No. 881 that AAR costs will largely be limited to one-time start-up costs,[45]

[44] Whitepaper at 16.

[45] Order No. 881 at P 94.

this would not be the case with DLRs. DLRs have both high initial deployment costs and on-going operations and maintenance and replacement costs.

b. How might these costs and challenges change with geography/terrain, communication infrastructure, and transmission path?

Sensor placement is an integral aspect of most types of DLR implementation. Sensor installation and maintenance will be more difficult and costly on transmission lines that pass through challenging terrain and remote regions. For example, helicopters may be needed to install and maintain DLR equipment on transmission lines in remote and mountainous areas. Commission Staff also previously recognized in the Whitepaper that "the more turns in a transmission path and/or the more diverse the terrain a transmission line traverses, the greater the number of sensors required and the more difficult it is to use one sensor to extrapolate over multiple spans."[46] The installation of more sensors, whether to provide coverage over transmission lines with many turns or to increase the granularity of data, will increase costs.[47] Furthermore, DLR sensors typically have a limited life span of 5-10 years, which will result in ongoing replacement costs for any given transmission line. Remote terrain can also impact the transfer of data from DLR sensors. For example, transmission lines that go through areas without adequate communications infrastructure may require the implementation of dedicated communication lines, greatly increasing both start-up and operation and maintenance costs to TOs. In order to properly evaluate the net benefits of DLR implementation on any given line, these costs and considerations associated with transmission line path and length will need to be evaluated by the TO in a cost/benefit analysis. As noted above, this cost/benefit analysis should

[46] Whitepaper at 22.

[47] *Id.*

consider the incremental benefits that DLRs would have over the AAR technology implemented pursuant to Order No. 881. Any action that the Commission takes as a result of this proceeding should provide TOs with the flexibility to make this evaluation.

d. Please identify any factors or situations that might cause DLR implementation to be prohibitively expensive, and please describe alternative implementation approaches that could limit those costs.

Please see responses to Questions 1, 2, 3, and 12(b) for discussion of costs associated with DLR implementation. TOs should continue to use a cost/benefit analysis to determine whether DLR implementation can provide net benefits to customers considering these costs. As noted above, this cost/benefit analysis should consider the incremental benefits that DLRs would have over the AAR technology implemented pursuant to Order No. 881.

e. Please describe any advantages or disadvantages related to costs and challenges to implementing DLRs concurrently with the requirements of Order No. 881 (as opposed to after Order No. 881 is implemented). For example, are the EMS and communication upgrades required to implement AARs sufficient to support the use of DLRs?

As more fully described above in response to Question 1, the Commission should refrain from potentially imposing any kind of DLR requirement until the AAR implementation process under Order No. 881 has been completed, so that TOs are able to fully assess the impact of AARs on their systems and better determine the effective use of DLR technology.[48] A delay in consideration of whether DLRs should be required will also permit further evaluation of DLR deployments and allow TOs to benefit from those lessons learned. DLR technology is significantly more complicated than AAR technology, and requires the ability to perform

[48] In response to this question it also bears emphasizing that, as noted above, cost/benefit analyses conducted to ascertain the value of particular DLR projects should consider the incremental benefits that DLRs would have over the AAR technology implemented pursuant to Order No. 881.

calculations based on frequently updated data and an increased number of variables. The implementation of DLRs would require the use of new software and computer systems beyond those required to implement AARs. For example, some of the AAR technology that has already been implemented is based on precalculated values with few changes in parameters (ambient temperature, day/night, summer/winter). With DLR technology, on the other hand, calculations need to be done in real-time due to the large number of frequently changing parameters (ambient temperature, solar radiation, wind speed, precipitation, conductor temperature, etc.). Because these approaches are inherently different from one another, the EMS upgrades to implement DLRs are different, incremental to, and significantly more complicated than those required to implement AARs. Another noteworthy contrast between the two rating methodologies is that AARs can be implemented by using existing weather services to provide weather data in the general area of the transmission line. On the other hand, DLRs will require that weather data specific to each DLR sensor installed on a transmission line be sent back to an EMS system for real-time calculations. As a result, the EMS upgrades to software and data storage capability necessary to implement AARs in accordance with Order No. 881 will not provide the same functionality required to implement DLRs. DLRs will require additional upgrades and data storage capacity in addition to what will be needed to be installed to support AARs.

15. Please describe the cybersecurity challenges of DLR implementation. What are the potential impacts to reliable operations if the digital devices that monitor or communicate line conditions used for establishing DLRs are manipulated or rendered inoperable by a cyber event? What relevant procedural or technical cybersecurity controls exist that would mitigate such risk?

As noted above in the responses to Questions 1, 2, and 3, there are many challenges associated with the implementation of DLRs that could reduce the value of the potential benefits. This includes cybersecurity concerns stemming from the installation of sensors requiring secure

communications back to the TO's EMS. As the number of sensors and other interconnecting points needed along the grid to implement DLRs increase, so does the opportunity for cybersecurity attacks. The potentially large number of DLR sensors deployed on transmission lines, some of which may be in remote areas, also increases concerns related to physical security, which could include sabotage or theft of DLR sensor equipment. As the Commission Staff noted in the Whitepaper, these cyber and physical security risks are unique to DLR implementation.[49] Furthermore, compliance with potential DLR-specific security requirements will increase costs associated with implementing the technology. The risks of intrusion using these technologies, the associated costs of any cyber or physical security incident, and the costs associated with complying with security requirements must be measured against any potential benefits of DLR technology.

16. If the Commission were to require DLR implementation, should the Commission direct NERC to evaluate how this requirement could introduce new risks to the reliable operation of the BES and whether any standards require modification to address any risks?

If the Commission were to require DLR implementation, the Commission should direct NERC to clarify the impact on the reliability of the bulk electric system and NERC's existing standards. Given FERC and NERC's mandate to ensure the reliability of the grid, any proposed DLR implementation must carefully consider and account for potential reliability impacts in all areas, including system planning, grid operations, facility ratings, operator coordination, physical security, and cybersecurity. All costs to mitigate these reliability impacts pursuant to any additional NERC requirements must also be included in the cost/benefit analysis for DLR implementation.

[49] Whitepaper at 21; *see also* Order No. 881 at P 254 (noting same).

NERC and its technical committees should conduct an analysis of the reliability impacts of DLRs and the impacts on specific NERC Reliability Standards, including but not limited to:

- **FAC-008 (Facility Ratings)**

The expanded use of DLRs would add new complexity to the development, reporting and use of transmission line ratings and thereby impact the requirements in NERC Reliability Standard FAC-008. The potential risks associated with DLRs include increased reliance on the integrity of the software programs calculating rating, the reliability of the sensors and supporting communications, and the accuracy of data mirroring the line type and characteristics. While some of these factors play a part in seasonal ratings and AARs, line sensors, sensor communications, DLR algorithms driven by proprietary systems and programming by non-utility engineers are not included or considered in such rating schemes. Additionally, programming errors that can and do occur could represent new risks for entities. Furthermore, failure of sensors or communication paths will likely result in instantaneous real-time changes in ratings, creating reliability issues.

- **Regional Reliability Standards that address System Operating Limits ("SOLs") and Interconnection Reliability Operating Limits ("IROLs).**

NERC and the Regional Entities should evaluate and consider how DLRs might impact the existing body of Reliability Standards such as FAC-011, FAC-014, TOP-001, TOP-002, IRO-006-EAST-2, and CIP-014. Facility Ratings are essential in determining SOLs and IROLs and given that DLRs are developed dynamically based on system conditions, an assessment of any impacts should be conducted.

- **IRO-008 (Reliability Coordinator Operational Analyses and Real-time Assessments, ("RTA"))**

RTAs require the evaluation of system conditions using Real-time data to assess existing (pre-Contingency) and potential (post-Contingency) operating conditions. Facility Ratings are among the applicable inputs; therefore, consideration must be given to how these assessments are to be conducted should the DLR system or communications from the DLR system fail. This is of particular importance given Requirement R4 of NERC Reliability Standard IRO-008 states that the Reliability Coordinator shall ensure that a RTA is performed at least once every 30 minutes.

- **IRO-018 (Reliability Coordinator Real-time Reliability Monitoring and Analysis Capabilities)**

DLR technology adjusts transmission line ratings dynamically. The loss of the DLR system or its communications could represent the loss of Real-time Reliability monitoring and possibly the loss of analysis capabilities.

> **18. To what extent would it be appropriate to rely on sensor-based measurements of line parameters such as line sag, line tension, or conductor temperature in calculating line ratings, either in addition to, or in lieu of, forecasted weather factors described in Q17? In what circumstances should DLR approaches augment any sensor-based measurements of transmission line parameters with weather forecasts (e.g., from the National Oceanic and Atmospheric Administration or another weather service)? To what extent are sensor-based measurements of line parameters useful in determining longer-term forecasted line ratings (e.g., 2-7 days ahead), rather than just instantaneous or very short-term calculations of line ratings? How does the ability to forecast line ratings compare between DLR approaches that rely primarily upon sensor-based measurements of transmission line parameters and those that rely upon weather data?**

On DLR systems, line sag measurements are typically a function of conductor temperature measurements. Conductor temperature measurements are in turn a function of cumulative weather parameters and the amount of current in the conductor. In practice, a DLR device will measure the actual line sag and use an algorithm to work back and calculate

conductor temperature and, ultimately, a line rating. This reading is instantaneous and varies with changes in the weather and system conditions. As a result, it is very difficult to forecast sensor-based measurements of line parameters such as line sag and tension. EEI is not aware of any commercially proven methods that utilize sensor-based measurements of line parameters for forecasting purposes. Instead, sensor-based measurements such as those noted by the Commission are best suited for real-time operations.

19. Should the Commission consider sensor-based DLR requirements, such as those suggested by WATT? If yes, what level of sensor coverage and performance requirements for such sensors should be required? Please explain whether the Commission would need to specify details like the types of sensors, how many are installed, what they measure, and the quality of their data? Would a sensor-focused requirement that specifies the types of technologies potentially become stale as DLR technologies evolve? Why or why not?

The Commission should take a technology-neutral approach to reducing congestion and not impose requirements for specific technology to be used. While current DLR technology predominantly relies on sensors on or near transmission equipment, other forms of technology may be developed that serve a similar function but are not sensor-based; as such, the Commission should not presume for purposes of this proceeding that sensor-based technology is the only – or necessarily the best – way that DLRs can be deployed. A Commission requirement to implement DLR at this juncture would inevitably result in significant investment in sensors when other developing technologies, such as weather stations and satellite systems, may be more cost-effective and statistically accurate options for managing line ratings in the future. By encouraging TOs to continue using a cost/benefit analysis to dictate DLR implementation, the Commission will help ensure that there is a performance-based system for implementation that is not tied to a specific sensor or type of technology.

20. In Order No. 881, the Commission adopted exceptions from the AAR requirements to ensure the safety and reliability of the transmission system and for transmission lines with transmission line ratings that are not affected by ambient air temperature or solar heating. Please explain whether the Commission should adopt the same or similar exceptions for DLR requirements. Are there any different/other exceptions from the application of DLR requirements that the Commission should consider? If so, what are these exceptions?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. However, if the Commission does implement DLR requirements, it should not require that companies deploy DLRs on transmission facilities where TOs and transmission providers have determined there is little potential for improved reliable operations, market efficiencies, or cost-effectiveness for customers. At a minimum, the Commission should maintain the same exceptions for DLR implementation that it promulgated for AAR implementation in Order No. 881. As EEI has noted in response to Question 1, some transmission lines may not benefit from DLR implementation at all. DLRs will only bring benefits when the transmission conductor's thermal limit is the most limiting element in the line. EEI therefore supports an exception to any DLR requirement that applies to transmission lines where the conductor is not the most thermally limited element, similar to Order No. 881's exception for transmission lines that are not affected by ambient air temperatures.[50] In addition, TOs have the ultimate responsibility to ensure the safety and reliability of their transmission systems and must be provided the option to decide how to safely and reliably deploy DLR technology. EEI therefore supports an exception to any DLR requirement that would allow a transmission provider to use a transmission line rating different than would otherwise be required in instances where the use of such an alternate rating is necessary to ensure the safety and

[50] Order No. 881 at P 227.

reliability of the transmission system, similar to Order No. 881's safety and reliability exception.[51]

21. In Order No. 881, the Commission established requirements for AARs to be applied to a period not greater than one hour and for AARs to be updated hourly. Is this time resolution and calculation frequency also appropriate for DLR requirements or should an alternative approach be considered? Why?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. However, if the Commission does implement DLR requirements, it should not mandate a particular time resolution and calculation frequency for DLRs. DLR technology will continue to evolve and time resolutions and calculation frequencies will change as technological capabilities expand. Strict requirements for time resolution and calculation frequency will limit TOs' ability to adapt to the efficiencies that can be realized as a result of continued technological evolution. TOs are in the best position to understand the topology, climate, and normal system performance of their transmission facilities. TOs should be given the discretion to craft time resolution and calculation frequency parameters based on the particular needs of their systems.[52] Universal application of specific time resolution and calculation frequency requirements would restrict the flexibility of TOs to address their transmission operational needs and unique circumstances and could result in excessive and unnecessary costs with little to no system benefit.

[51] Order No. 881 at P 228.

[52] As noted above in response to Question 1, there is limited industry experience with DLR technology and best practices for DLR implementation. Encouraging DLR use, rather than mandating it, will facilitate the development of this experience and knowledge in a prudent manner.

22. How might the Commission consider potential requirements for DLR implementation on transmission lines that are on the seam of multiple transmission provider service territories? What additional coordination between neighboring transmission owners and transmission providers, if any, might be necessary?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. However, if the Commission does implement DLR requirements, it should provide flexibility for TOs, in coordination with the relevant RTOs and ISOs, to determine how seams issues should be handled. In addition, if the Commission implements DLR requirements, it should enforce reciprocity conditions for non-jurisdictional entities.

23. In Order No. 881, the Commission required AARs to be used for near-term transmission service, defined as transmission service that ends not more than 10 days after the transmission service request date (i.e., within the next 10 days).

a. Within what timeframes should the Commission require transmission providers to calculate transmission line ratings using DLRs (on transmission lines for which DLRs are required)? Does this depend on which DLR approach (weather-based or line parameter-based) is used for a particular DLR implementation?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. However, if the Commission does implement DLR requirements, their use should be limited to real-time operations only. DLRs rely on highly variable and constantly changing metrics, such as solar heating and wind speeds and direction, which cannot be predicted in advance. This makes DLRs inappropriate for longer-term purposes, including longer-term transmission service requests, and system planning and interconnection processes.

26. What would be the appropriate amount of time, either from your experience or by your estimation, necessary for each of the following DLR implementation steps identified below?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. As noted above in response to Question 1, the Commission should at a minimum refrain from imposing any kind of DLR requirement until the AAR implementation process under Order No. 881 has been completed, so that TOs are able to fully assess the impact of AARs on their systems and better determine the effective use of DLR technology. If the Commission does implement a DLR requirement, it should take a flexible approach that would accommodate the complexity of DLR technology and the lack of experience that most TOs have with respect to DLR implementation. The Commission should allow ample time for study, installation of necessary EMS and cybersecurity upgrades, and data collection and validation associated with DLR systems.

In addition, as noted above in response to Question 2, one potential limiting factor for increased implementation of DLR technology is the availability of vendors. Given the relatively limited application of DLR technology in the United States currently, EEI is concerned that there may be too few vendors who are able to provide critical design and installation services if the Commission implements a widespread DLR requirement. A lack of qualified DLR vendors could make it difficult for TOs to implement DLR technology within a pre-determined timeframe or in a cost-effective manner (if demand for services exceeds supply). If the Commission decides to proceed with any sort of DLR requirement, it should first gather adequate information on the availability and capability of DLR vendors that are able to service TOs in the United States. This information should be used to inform any such DLR requirement.

29. If the Commission required DLRs in certain situations based on transmission line criteria, how frequently should transmission owners consider whether additional lines might meet the criteria for DLR implementation? That is, should the Commission require a periodic restudy of transmission systems to determine if additional transmission lines meet the criteria for DLR implementation? Please explain why or why not. If, during a periodic restudy, the transmission provider determines that additional lines meet the criteria for DLR implementation, when should the Commission require the transmission provider to implement DLRs on those additional lines?

As discussed above, the Commission should encourage, but not require, TOs to use DLR technology. In the event that the Commission decides to impose a DLR requirement, EEI does not support a periodic restudy requirement. RTOs/ISOs already regularly study congestion and possible solutions to congestion in the transmission planning process. As such, TOs have the ability to propose implementation of DLRs to resolve short term and temporary congestion on the system. As noted above in response to Question 10, DLRs are appropriate only for consideration in real-time operations and not for system planning purposes.

III. CONCLUSION

As discussed herein, given considerations such as increased operations and maintenance costs, the inapplicability of DLRs in certain circumstances, and ongoing efforts to comply with the implementation of AARs under Order No. 881, a requirement to implement DLR technology will not ensure just and reasonable rates. The Commission should encourage, rather than require, TOs to consider DLR technology as an option to weigh against other methods of reducing congestion.

Respectfully submitted,

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