

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

<b>Implementation of Dynamic Line</b>	)	<b>Docket No.</b>	<b>RM24-6-000</b>
<b>Ratings</b>	)		

**COMMENTS OF ISO NEW ENGLAND INC.**

ISO New England Inc. (“ISO-NE”)<sup>1</sup> respectfully submits these comments in response to the Advanced Notice of Proposed Rulemaking (“ANOPR”) that the Federal Energy Regulatory Commission (“Commission”) issued on June 27, 2024, in Docket No. RM24-6-000.<sup>2</sup> In the ANOPR, the Commission seeks comment on preliminary findings regarding the need to require Transmission Providers to use dynamic line ratings (“DLRs”) to improve the accuracy of transmission line ratings,<sup>3</sup> And “reforms that would require implementation of certain DLR practices.”<sup>4</sup> These would include: “requiring transmission line ratings to reflect solar heating based on the sun’s position and forecastable cloud cover; [and] requiring transmission line ratings to reflect forecasts of wind conditions – wind speed and wind direction – on certain transmission lines.”<sup>5</sup>

ISO-NE appreciates the opportunity to comment on the Commission’s initial findings regarding the use of DLRs. This ANOPR represents a next phase in the Commission’s efforts to examine and reform transmission line ratings. The first step culminated in the issuance of Order

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<sup>1</sup> Capitalized terms used but not defined in this filing are intended to have the meaning given to such terms in the ISO New England Inc. Transmission, Markets, Services Tariff (“Tariff”). Section II of the ISO Tariff contains the Open Access Transmission Tariff (“ISO OATT”).

<sup>2</sup> *Implementation of Dynamic Line Ratings*, 187 FERC ¶ 61,201 (2024) (“ANOPR”).

<sup>3</sup> ANOPR at P 1.

<sup>4</sup> *Id.*

<sup>5</sup> *Id.* at P 69.

No. 881,<sup>6</sup> in which the Commission required, among other things, that all Transmission Providers implement ambient adjusted line ratings (“AARs”) as well as unique seasonal and emergency ratings, and that Independent System Operator/Regional Transmission Organization (“ISO/RTO”) adopt systems and procedures capable of accepting electronically transmitted line ratings at least hourly (including DLRs).

Implementation efforts in connection with the Tariff changes that the Commission accepted in compliance with Order No. 881 are ongoing. While the expectation is that the Order No. 881 compliance changes will improve the granularity of transmission line ratings that ISO-NE uses, the ISO understands the Commission’s goal of ensuring that line ratings are as accurate as possible while balancing cost/benefit for implementation efforts. However, before proposing new rules requiring the use of DLRs, as the ANOPR contemplates, the Commission should consider that AARs have not yet been deployed and that Transmission Providers, including the ISO, do not yet have experience with systems allowing ratings to be adjusted hourly. Adding additional parameters to line ratings in the manner described in the ANOPR may not yield benefits beyond those associated with AARs, particularly in regions with little thermal congestion. This is especially salient given the significant cost and effort already underway with implementation of AARs. For these reasons, ISO-NE respectfully requests that the Commission not move forward with a NOPR requiring the use of DLRs at this time. However, if the Commission determines that it is appropriate to issue proposed rules, the ISO requests that the Commission consider these comments in the development of those proposed rules.

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<sup>6</sup> *Managing Transmission Line Ratings*, Order No. 881, 177 FERC ¶ 61,179 (2021), *Federal Register*, 87 Fed. Reg. 2244 (Jan. 13, 2022).

## **I. IDENTIFICATION OF ISO NEW ENGLAND; COMMUNICATIONS**

ISO-NE is a private, non-profit entity that serves as the RTO for New England. ISO-NE operates the New England bulk power system and administers New England's organized wholesale electricity market pursuant to the ISO-NE Tariff and the Transmission Operating Agreement. In its capacity as an RTO, ISO-NE also has the objective to assure that the bulk power system within the New England Control Area conforms to the proper standards of reliability as established by the Northeast Power Coordinating Council and the North American Electric Reliability Corporation.

All correspondence and communications concerning these comments should be sent to the following persons, who should be added to the official service list, at the addresses shown:

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## **II. COMMENTS**

ISO-NE provides the following responses to certain questions posed in Parts IV(A)(1-3) of the ANOPR.

### *A. Preliminary Findings: The Commission Should Assess the Benefits of AAR Implementation Before Requiring the Use of DLRs*

In the ANOPR, the Commission preliminarily finds “that transmission line ratings that do not reflect solar heating based on the sun’s position and up-to-date forecasts of forecastable cloud cover may result in unjust and unreasonable wholesale rates,” that “transmission line ratings that

do not reflect up-to-date forecasts of wind conditions on certain transmission lines may also result in unjust and unreasonable wholesale rates.”<sup>7</sup> Given these findings, the Commission is “considering reforms that would require implementation of certain DLR practices, including: requiring transmission line ratings to reflect solar heating based on the sun’s position and forecastable cloud cover; [and] requiring transmission line ratings to reflect forecasts of wind conditions – wind speed and wind direction – on certain transmission lines.”<sup>8</sup>

With the reforms adopted by the Commission in Order No. 881 and incorporated in Attachment Q to the ISO’s OATT, the ISO will be capable of accepting DLRs if provided by the equipment owners once Attachment Q becomes effective. This is because the ISO will not be relying on the use of temperature tables to look up ratings, but rather, will accept line ratings transmitted directly to the ISO by Transmission Owners in New England. In other words, the calculation of ratings that include the additional variables would be managed by the Transmission Owners, consistent with the Commission’s statements in Order No. 881 regarding responsibilities for line ratings.<sup>9</sup>

Because the ISO does not calculate transmission line ratings, the ISO does not have the expertise to discuss the additional costs or complications associated with calculating ratings that include additional forecast variables, the potential costs of the installation of sensors, and the calculation and communication of DLRs and any additional physical or cyber security aspects of sensor installation and use. However, based on its experience to date implementing Order No. 881, the ISO recommends that the Commission wait to pursue additional line rating variables until

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<sup>7</sup> ANOPR at P 72.

<sup>8</sup> *Id.* at P 69.

<sup>9</sup> *Id.* at P 173.

the cost/benefit impacts of AARs can be assessed and Transmission Providers are able to conduct lessons learned analyses and determine best practices regarding the implementation of hourly ratings structures. The current earliest implementation deadline for Order No. 881 is July 2025, with some areas implementation deadlines currently extended beyond that date.<sup>10</sup> Allowing Transmission Owners and ISOs/RTOs to gain experience with new ratings exchange protocols and the markets and operational dynamics with ARRr will reveal both whether, and where, additional accuracy is warranted.

AARs and DLRs will adjust thermal ratings primarily on transmission line overhead conductors, which may or may not be the limiting factor on line ratings because the line may be limited by voltage, stability, or other equipment that is not affected by ambient conditions. As such, additional changes to thermal limits on overhead conductors may not actually change line ratings. AARs should first be used to determine how often these other factors limit the ratings of the transmission line before investing in DLRs. Recent industry guidance supports this position. CIGRE Brochure 299 states that “continually ambient-adjusted ratings” are not recommended for lines designed to operate at conductor temperatures of 100°C or higher (which includes most Pooled Transmission Facilities (“PTF”) in New England) because continually varying AARs do not provide technically justified benefits for these types of lines.<sup>11</sup>

Accordingly, rather than require the implementation of DLRs, the Commission should, as it suggested in the original NOI discussion of DLRs,<sup>12</sup> request that the North American Electric Reliability Corporation (“NERC”) undertake an analysis regarding the reliability and security

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<sup>10</sup> See e.g. *NYISO*, Letter Order, 186 FERC P 61,237 (2024); see also *Southern Company Services*, Letter Order, 187 FERC P 61,055 (2024).

<sup>11</sup> See CIGRE Brochure 299, Section 1.5.3.1.

<sup>12</sup> Implementation of Dynamic Line Ratings, 178 FERC P 61,110 (2022) at P 11.

impacts of DLR implementation after the implementation and derived benefits captured from the use of AARs have been realized. This analysis, coupled with operational experience gained from the implementation of AARs (including the ability of transmission providers to better determine which lines may be thermally congested), will provide the Commission with a better record upon which to determine the necessity of DLRs, including which variable(s) should be included and in which situations DLRs may be best utilized.

*B. Solar Position and Cloud Cover: In the Event That The Commission Proposes to Require the Use of Solar Position and Cloud Cover Variables, It Should Consider The Potential For Large Ratings Swings Over Short Periods, and The Need to Clearly Define “Forecastable”*

In the ANOPR, the Commission preliminarily proposes to require that all transmission line ratings for evaluating transmission service that ends not more than ten days after the transmission service request date (referred to as “near-term transmission service”) be subject to a solar requirement to reflect solar heating in two ways: 1) based on solar heating derived from the sun’s position; and 2) based on up-to-date forecasts of forecastable cloud cover, subject to certain exceptions.<sup>13</sup> Specifically, the Commission proposes to replace the daytime/nighttime solar heating requirement set forth in Order No. 881 with solar heating based upon the sun’s position, accounting for the relevant geographic location, date, and hour that would apply to all transmission lines (because it is expected that this component could be included without the need to install sensors).<sup>14</sup> The Commission further “propose[s] to define forecastable cloud cover as cloud cover that is reasonably determined, in accordance with good utility practice, to be forecastable to a sufficient level of confidence to be reflected in transmission line ratings,”<sup>15</sup> and seeks comment on

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<sup>13</sup> ANOPR at P 85.

<sup>14</sup> *Id.* at P 84.

<sup>15</sup> *Id.* at P 92.

the proposed definition of forecastable cloud cover, including the level of confidence that is necessary to incorporate and benefit from a cloud cover forecast and whether sensors are needed to accurately forecast cloud cover.

With respect to the proposed cloud cover component, if the Commission proposes to add this requirement to a future NOPR, the Commission should define what “forecastable” means, including the length of time for the forecast, the potential source of the forecast, and the uses for the forecast. The ISO recommends that the Commission allow the term forecastable to be defined by the individual Transmission Providers such that it include a forecast probability of greater than 90% certainty that cloud cover will reduce the solar heat gain by a significant amount (discussed below) – and further, that cloud cover should not be included in Transmission Line Ratings that are more than four (4) hours prior to the current hour because of the uncertainty of cloud cover forecasting. The ISO also recommends that any measure of cloud cover be region-wide, *i.e.*, clouds on/off similar to how sun on/off was included in Order No. 881. Attempting to make this variable more granular may be complicated and require extensive sensor deployment due to localized nature of some cloud events, as the Commission acknowledged.<sup>16</sup>

More granular cloud cover may also create reliability and market concerns given the potential for large rating variation over short time spans. Even if sensors were deployed to provide these measurements, taking hyper-local cloud cover into account for transmission lines that span potentially hundreds of miles may cause large swings in the ratings over a short time period as a cloud event moves along the transmission line, potentially changing the limiting span. This could create market distortions and operational challenges, or “chasing ratings.” For example, the New England region regularly experiences weather events (thunderstorms, snow squalls, etc.) that

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<sup>16</sup> *Id.* at P 22.

quickly sweep through the region, bringing dense cloud cover (and wind) that would require a DLR adjustment. These events, which can last less than an hour in many cases, maybe followed by cooler weather or a resumption of hot/humid weather. In the latter cases, the ISO could anticipate DLRs responding to sudden/severe changes in weather conditions to cause “chatter” in ratings that does not appreciably improve reliability and may, in fact require actions such as system re-dispatch based on short-lived ratings that won’t be sustained after the storm passes. The ISO recommends that any measure of cloud cover be region-wide in order to provide predictable and consistent outcomes by reducing the potential for large swings in ratings.

However, if the Commission includes in a proposed rule a more granular approach, the ISO requests that the Commission also define what minimum amount of cloud cover is required to be utilized in calculations (*e.g.*, 75% of region covered, 50% of region covered, etc.) or the minimum amount of solar reduction due to cloud cover (*e.g.*, 25%, 50%, 75% forecast reduction in solar heat gain) that would be required to be incorporated. The proposed rule should also include a threshold that makes these levels clear, as well as the thresholds for when ratings must be updated to account for additional solar heat changes, similar to Order No. 881’s requirement that ratings need only change in five-degree increments.

Additionally, the Commission should only require cloud cover measurements for line rating calculation for the four hours prior to the operating hour due to forecast uncertainty beyond that time period. Day-Ahead applications should not include a cloud cover component because this component would inherently need to be conservative given cloud cover forecast uncertainty. Through its work in solar PV forecasting, the ISO has determined that cloud forecasts more than four (4) hours prior to Real-Time are not necessarily useful due to large uncertainties. Forecasts in these time periods generally should be taken only to indicate whether the period prior to the next



four hours will be generally sunny or generally cloudy. In the Day-Ahead applications of line ratings, this would require the need for conservative assumptions (*i.e.*, ratings would have to be calculated with an expectation of fewer clouds) because the variable nature of cloud cover may create reliability/market issues when cloud cover is significantly less in Real-Time compared to Day-Ahead. Similar to the solar position component discussed above, sensors would be needed in order for the line ratings to entirely accurately reflect cloud cover in Real-Time because of the hyper-local nature of cloud cover events, raising the same concerns described above.

*C. Wind Speed and Direction: ISO-NE Does Not Experience The Levels of Thermal Congestion as Other Regions, and In the Event That The Commission Proposes to Require the Use of Wind Speed/Direction in Transmission Line Ratings, It Should Only Do So In Cases Where Congestion Costs Are Sufficiently High to Justify the Added Complexity/Expense*

In the ANOPR, the Commission preliminarily proposes to require certain transmission lines to reflect up-to-date forecasts of wind conditions, including wind speed and direction for use in 48-hour transmission service.<sup>17</sup> This would be required only for transmission lines that exceed certain thresholds for wind speed.<sup>18</sup> For transmission lines subject to this requirement, Transmission Providers must use transmission line ratings that account for wind speed and direction for hourly and daily point-to-point transmission services under the pro forma OATT that fall within a 48-hour time horizon.<sup>19</sup> The Commission also seeks comment on the accuracy of the forecasting of wind speed and wind direction in the 48-hour time horizon; whether the Commission

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<sup>17</sup> *Id.* at P 90.

<sup>18</sup> *Id.* at P 97.

<sup>19</sup> *Id.* at P 101. The Commission proposes that ISOs/RTOs comply with the wind requirement by using transmission line ratings that reflect up-to-date forecasts of wind speed and direction: (1) in their day-ahead and real-time markets; and (2) for seams transactions, internal point-to-point transmission service, and for through-and-out service that are 48-hour transmission services. *Id.* at P 162. The Commission also proposes to require that wind conditions be reflected in both normal and emergency ratings. *Id.* at P 166.

should require a transmission provider to determine what sensors, if any, need to be installed for forecast validation and forecast training; whether the Commission should mandate sensors at all; what congestion threshold the Commission should establish in ISO/RTO regions for a potential wind requirement, recognizing that the appropriate level of the congestion threshold could vary depending on the method used to calculate congestion costs; and how ISOs/RTOs should measure congestion costs at interties and whether the same congestion threshold should be used for both intertie and internal congestion costs measurements.

With the Order No. 881 implementation, the ISO will be able to accept ratings that include wind direction and speed variables. However, the geography of New England and configuration of the PTF are such that including wind speed/direction as part of line ratings (regardless of congestion levels) may cause more uncertainty in ratings than is beneficial.

New England currently experiences a low level of thermal congestion and therefore changing line rating methodologies will result in little benefit compared with those in other regions. For example, in 2023 the region experienced \$32.3 million in overall congestion costs, which represented 0.67% of total energy costs for the year. Of that total congestion cost, only \$1.9 million was experienced in Real-Time, and very little was the result of thermal congestion in those intervals.<sup>20</sup> In other words, Real-Time and Day-Ahead binding constraints differ, with Day-Ahead constraints causing significantly more congestion as compared to Real-Time constraints. The ISO's External Market Monitor confirmed these results for 2023, and again noted that "ISO-NE experiences significantly less congestion than other RTOs, with an average congestion cost of

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<sup>20</sup> *ISO-NE, Internal Market Monitor, 2023 Annual Markets Report (May 2024), Section 8.1 – Transmission Congestion* available at <https://www.iso-ne.com/static-assets/documents/100011/2023-annual-markets-report.pdf#page=171>.

roughly \$0.37 per MWh of load. This is just 10 to 20 percent of the average congestion levels in other RTO markets.”<sup>21</sup> Further, the New England system has comparatively few thermal constraints as compared to stability/voltage constraints. For the month of September 2024, for example, of the approximately 100 generic interface constraints identified by the ISO, only 17 included a thermal element, and only nine were thermal only, *i.e.* they did not have a corresponding stability/voltage constraint.<sup>22</sup>

Given this context, incorporating forecasted wind speed/direction into line rating calculations may cause more congestion in Day-Ahead because Transmission Providers will necessarily have to build in additional margin through the use of conservative wind speed/direction assumptions, *i.e.* less wind, to account for forecast uncertainty and to avoid using higher ratings in Day-Ahead versus those in Real-Time. As stated above, the Commission should also determine the impact AARs, which may also require conservative Day-Ahead assumptions, have on this balance between Day-Ahead and Real-Time, as well as overall congestion before moving forward with DLRs as, just like with cloud cover, wind shifts and short lived weather events may change the limiting segment of a line very quickly, leading to operational and market uncertainty.

However, if the Commission moves ahead with a proposed rule, the ISO notes that it shares PJM’s preference<sup>23</sup> of a higher congestion level of \$2 million or more per year on a single line before adding wind speed/direction to line ratings. While the ISO cannot speak to the costs to deploy sensors needed to measure wind speed/direction, it expects that the cost and complexity

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<sup>21</sup> *Potomac Economics*, 2023 Assessment of the ISO New England Electricity Markets (June 2024), at p. vi, available at <https://www.iso-ne.com/static-assets/documents/100012/iso-ne-2023-emm-report-final.pdf>.

<sup>22</sup> See *ISO-NE*, Generic Interface Constraints (Sept. 2024), available at [https://www.iso-ne.com/static-assets/documents/2017/09/generic\\_interface\\_constraints.xlsx](https://www.iso-ne.com/static-assets/documents/2017/09/generic_interface_constraints.xlsx).

<sup>23</sup> ANOPR at P 123, citing PJM Comments, Docket No. AD22-5, at 9 (filed May 9, 2022).

associated with accepting sensor based DLRs, as well as managing and storing the data, will be significant, and therefore the use of DLRs should only occur where congestion levels exceed a sufficiently high level. Most lines in New England have segments that run in multiple directions and transition through multiple geographic features (e.g. through valleys or over hilly terrain), likely resulting in the need for sensors in multiple locations on a single transmission line. Further, unlike the AARs required by Order No. 881, which included static wind assumptions, it is not clear whether, once wind speed/direction is included as a line rating parameter whether elements other than conductors would then become limiting for certain transmission lines. For example, transformers or other line components may limit the transmission line rating and therefore dictate a line rating that does not differ from the AARs required under Order No. 881.

In the ANOPR, the Commission also requests comment on whether, once wind speed/direction is applied to the rating of a line, that practice should continue indefinitely or be removed in certain circumstances.<sup>24</sup> If Commission includes in a proposed rule, the ISO recommends that once wind cooling is applied to a line through a sensor (rather than forecast-based process) that, even if congestion is relieved, the line continues utilizing wind as an input into the line rating calculation. Continuing to utilize a forecast or sensor-based wind component in the DLR calculation after initially meeting the required threshold would allow consistency in ratings practices and minimize the chance that a line would be removed from the wind speed requirement because of lack of congestion only to have congestion return when wind speed is no longer factored into the equation. However, the Commission should also allow Transmission Owners and ISOs/RTOs to except lines from this rule that are rebuilt, upgraded or replaced in a manner that

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<sup>24</sup> ANOPR at P 150.

relieves the congestion that originally required the application of wind speed/direction DLRs to the line.

### **III. CONCLUSION**

ISO-NE respectfully requests the Commission to consider these comments in any future rulemaking issued in this proceeding.

Respectfully submitted,

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Dated: October 15, 2024

## **CERTIFICATE OF SERVICE**

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Holyoke, Massachusetts this 15<sup>th</sup> of October 2024.

/s/ Julie Horgan

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