Executive Summary

Proposal Overview

The goal of PJM's proposal at the Effective Load Carrying Capability Senior Task Force (ELCCSTF) is to continue building upon and further improve the risk modeling framework and ELCC accreditation methodology approved by the Commission in Docket No. ER24-99. The proposal is targeting implementation with the 2028/2029 BRA and includes the following key elements:

Weather Rotation Alignment	Generator Winter Ratings	Performance Weighting
Improves the alignment of weather, load profiles, and resource performance in the risk model and ELCC analysis.	Provides the set of rules to incorporate incremental winter capability of thermal generation in the resource adequacy studies and market.	Establishes an approach to more quickly reflect demonstrated improved resource performance and changes in system operation in the risk and accreditation model without dismissing historical performance data.

1 | Weather Rotation Alignment

A core design objective when moving to the enhanced risk modeling and ELCC accreditation framework for all resources was to capture the relationship between weather, load, and resource performance in the analysis, as history has shown that more severe weather conditions, particularly in the winter, can result in both higher system demand and increased correlated outage risk and unavailability of generation resources. Modeling this relationship is important in assessing resource adequacy risk in the PJM system.

This element of the proposal improves the modeling of that relationship by better aligning the different weather scenarios and days used to create the load forecast profiles with those used to draw resource performance in the analysis. This provides a better representation of the potential load scenarios and resource performance patterns that may be observed under the weather history used in the study.

2 | Generator Winter Ratings:

Historically, the installed capacity (ICAP) and studied deliverability or Capacity Interconnection Rights (CIRs) of thermal generation has been based on expected capability during PJM summer peak conditions, consistent with the traditional perspective that nearly all resource adequacy risk fell during system peak hours. However, the more sophisticated and recent studies now show a significant amount of the risk during the winter season, as has been observed in operations, particularly during periods of extreme cold and high correlated outage risk. This shift in seasonal risk patterns is further influenced by the forecasted demand growth in the winter outpacing summer demand growth in PJM.

To improve the assessment of winter risk and the ELCC accreditation of certain generation resources, this element of the proposal incorporates the incremental capability above summer capacity that many generators can provide under winter ambient conditions within the resource adequacy studies and market rules. The two main components of this proposed reform are as follows:

- Establish the rules and processes to track Winter ICAP values of generation resources, assess their deliverability in the winter, incorporate those MW in the relevant resource adequacy studies and ELCC, as well as update the relevant market rules, must offer obligations, and testing assessments in the winter.
- Improve the ability for incremental winter capability to be recognized and cleared in the annual market construct by allowing a generator's annual Accredited UCAP to exceed its summer CIRs (while continuing to

respect seasonal CIRs and assessed deliverability in the underlying ELCC analysis). This allows the full annual Accredited UCAP of generators to be offered in the capacity auctions and removes the need for seasonal offers, much of which has not paired or cleared in recent auctions.

3 | Performance Weighting:

There are certain competing interests when determining the appropriate historical period to use for resource performance in the risk analysis and capacity accreditation. On the one hand, the types of weather conditions and performance events that drive resource adequacy risk on the system are inherently rare. As such, the use of a longer performance history is beneficial to help ensure those types of events and performance profiles are considered in the analysis even when they have not occurred in recent years. On the other hand, the resources on the system and performance of resources change over time, where the use of a shorter history can provide benefit in capturing those changes in performance more quickly within the analysis.

Today, the performance history used in the risk analysis and ELCC accreditation goes back to June 1, 2012, incorporating the performance profiles that have been observed during some of the more extreme weather conditions in PJM. This element of the proposal would retain that history in the analysis and accreditation, but now apply a higher weight to more recent observations of performance within each temperature bin. This gradually reduces the impact of older performance patterns in the model and accreditation as more recent performance patterns are observed under similar weather conditions.

The main benefits of this proposed reform are that it (a) allows investments or changes in fleet, class, and resource performance to be more quickly recognized in the risk analysis and accreditation relative to status quo, (b) continues to rely on demonstrated performance of resources during extreme weather conditions and does not require erasing or re-writing of history, or making assumptions of improved performance in future, and (c) increases the incentives for resource owners to invest or improve performance of their resources, given the most recent observations of performance during the more extreme weather conditions that drive resource adequacy risk will have the greatest weight on accreditation value and compensation going forward. A potential impact of this reform that is worth noting for stakeholder consideration is that it can increase volatility of accreditation values relative to status quo, given recent events, or the next event to occur, would now have a greater impact on going forward accreditation values. This was one of the considerations in choosing a lower alpha value or speed at which newer observations of performance are given more weight in the analysis than older observations.

We recognize that this element of the proposal may not go as far as some stakeholders may be seeking with regard to capturing the impact of more recent conservative operations during cold weather conditions and/or reflecting resource investments in the risk analysis and accreditation. However, PJM believes it is a reasonable incremental improvement. In our view, any update to past performance or assumptions of improved future performance for resources should be grounded in analysis and able to be implemented in a systematic manner. As discussed at the ELCCSTF meetings, PJM is supportive of continued discussion and analysis of this topic to explore additional reforms in a next phase of the task force.

Proposal Components

Weather Rotation Alignment

The PJM Load Forecast Model is used to construct the hourly load scenarios from historical weather years that feed into the official Load Forecast, as well as the risk analysis and ELCC model. When PJM develops those load scenarios, weather rotations are applied where the historical weather is shifted 6 days forward and 6 days backward to create 12 additional load scenarios (13 in total) for each historical weather year. The purpose of weather rotations is to capture the fact that a given weather pattern that historically occurred on a certain month and day in the past may very well occur on a nearby day in the future Delivery Year, and experiencing that weather on a weekday vs.

weekend vs. holiday can result in significantly different load profiles to consider. This practice of rotating weather days when simulating the weather and potential distribution of load outcomes was reviewed and supported by the independent consultant hired to review PJM's Load Forecast Model in 2022[1].

In the ELCC analysis today, the load scenarios that reflect a weather rotation (+/- 6 days) are not fully aligned with the historical weather day and corresponding temperature bin used to sample resource performance in the model, and instead rely on a surrounding weather day where weather conditions may have been different. For example, the "M2010" load scenario for the forecast date of August 9, 2026 is based on the 2010 historical weather year with a 6 day shift backwards, and therefore the load profiles are based on the weather conditions observed on August 3, 2010. However, the resource performance for the "M2010" load scenario would still be based on the temperature bin corresponding to August 9, 2010 weather conditions under status quo. The result of this misalignment for certain load scenarios is that the relationship between weather, load, and resource performance tends to be underrepresented in the current model.

The proposed enhancement for this component is to fully align the weather days used to draw resource performance with the weather days used for each load scenario and weather rotation in the model to better capture the relationship between weather, load, and resource performance. In the example provided above for a forecast date of August 9, 2026, this change would align the weather used to derive the load profile in the "M2010" scenario with the sampling of resource performance by having both based on August 3, 2010 weather conditions.

Generator Winter Ratings

The following provides a summary of the proposed reforms to incorporate the incremental winter capability above summer capacity for generation resources in the risk and ELCC analysis, as well as the market rules:

- **Winter ICAP:** Winter ICAP will be defined and set for generation resources based on their rated capability under average ambient conditions at the site during the PJM winter coincident peaks of the last 15 years, consistent with the current conditions prescribed in M21B today for winter net capability verification testing. Winter ICAP values will be capped at MFO and may not exceed the studied winter deliverability or granted Winter CIRs for the Delivery Year. Owners will be required to submit their Winter ICAP values to PJM for review prior to their use in the ELCC study[2].
- **Winter Deliverability Studies and CIRs:** Deliverability of incremental Winter ICAP above summer capacity and CIRs will be confirmed based on winter deliverability studies performed by PJM Planning. The RTEP and interconnection process will both study up to higher winter generator deliverability test levels for all resources beginning with 2024 RTEP cycle, with full alignment for the 2029/2030 Delivery Year. A transitional study will be run for the 2028/2029 Delivery Year to assess the deliverability of incremental winter capability of generators and allocate available system headroom ahead of the ELCC study for the 2028/2029 BRA.
- **Application in ELCC Model:** During the winter period (November through April), capability of thermal generation will be based on Winter ICAP in the risk analysis and ELCC model, adjusted for any outages. This change will incorporate the incremental winter capability of resources that has been available in the past

[1] https://www.pjm.com/-/media/DotCom/planning/res-adeq/load-forecast/pjm-model-review-final-report-from-itron.pdf
[2] Current estimates of incremental Winter ICAP above summer capacity for thermal generation is about 8,500 MW based on past verification testing.

within the ELCC analysis and recognize the contribution of those resources in the resulting Accredited UCAP values.

- **Energy Market Must Offer Requirements and Verification Testing:** During the winter period of the Delivery Year, generators will be required to make the Winter ICAP equivalent of committed UCAP available in their energy market offers. Furthermore, those resources will be assessed against the higher winter committed ICAP in their winter verification testing.
- **Accredited UCAP and Auction Offers:** To more fully recognize the resource adequacy value of generation resources that have incremental winter capability above summer CIRs, the annual Accredited UCAP of generators will not be capped at summer CIRs and will be eligible to offer into the capacity market (note that the underlying ELCC analysis will continue to respect the relevant seasonal CIRs and assessed deliverability levels of resources). The current seasonal products and pairing would be sunset under this proposal given the seasonal capability of resources would be fully recognized in their annual Accredited UCAP[3].
  - Similarly, Demand Resources with incremental summer-only capability will have that value recognized in their annual Accredited UCAP value that may be offered in the auction. To facilitate this, PJM will calculate an annual equivalent ELCC rating for summer-only Demand Resources.

Performance Weighting

The final element of the PJM proposal is implementing performance weighting where more recent observations of historical performance of the fleet, classes, and individual resources within each temperature bin will have greater weight than older observations within the risk analysis and ELCC accreditation. This means that those more recent observations will be sampled more frequently in the model. This will impact both ELCC Class Ratings as well as individual resource performance adjustments, such that resources that demonstrate improved performance during the more severe weather days that drive resource adequacy risk will have that improved performance recognized in their capacity accreditation values more quickly than under status quo.

The proposed performance weighting would utilize exponential smoothing, a common method used in time series weighting of historical observations to forecast future values, with an alpha value or smoothing factor set equal to 0.2. The smoothing factor controls the rate at which the weights decrease for older observations, where a higher value gives more weight to recent data. There are tradeoffs to consider when selecting the alpha value. The proposed value of 0.2 is intended to provide a reasonably balanced approach of (a) gradually reducing the impact of older performance patterns in the risk analysis and accreditation, and (b) more quickly reflecting the impact of recent performance patterns in ELCC/RRS without making such recent performance patterns the overwhelming driver of the results[4].

[3] For example, a 100 MW nameplate wind generator may have 20 MW of summer CIRs and receive an annual ELCC rating of 40% or 40 MW UCAP given its significantly higher level of expected performance and assessed deliverability during the winter. Today, the annual Accredited UCAP of such resource would be capped at the 20 MW of summer CIRs, and be limited to offering any incremental winter capability in the auction as a winter-only sell offer which may not pair or clear in the auction. Under this proposal, the resource would instead be accredited with the full 40 MW of annual Accredited UCAP to be offered and compensated in the auction if cleared.

[4] Additional details on performance weighting and sensitivity analyses can be found on slides 31-36 of the following presentation: 20250707-item-03a---elccstf-accreditation-reforms---pjm-proposal.pdf.

Impact of Proposed Reforms

A significant number of ELCC sensitivities have been run and discussed at the ELCCSTF meetings to help inform the group's understanding of different input assumptions into the analyses and proposed changes. A summary of many of those sensitivities can be found in the following presentations:

- May-22-2025-pjm-presentation-on-sensitivity-analyses.pdf
- May-30-2025-pjm-presentation-on-additional-sensitivity-analyses.pdf
- May-30-2025-pjm-presentation-on-sensitivity-analyses-of-weighting-approach.pdf

The table below provides an overview of the estimated impact of the proposed reforms in PJM's package based on the sensitivity analyses. Please note that any ELCC sensitivity analysis relies on a certain set of input assumptions, as described in the presentations, which may differ from those used in future ELCC studies and therefore result in different outcomes.

Estimated Impact of Proposed Reforms based on Sensitivity Analyses:

Proposed Reform	Relative Impact of the Individual Reform	Combined Impact of Reforms
1. Weather Rotation Alignment	**IRM:** +3.3% **Winter LOLH Risk Share:** +18% **UCAP Margin:** -4,000 MW	
2. Generator Winter Ratings	**IRM:** -1.1% **Winter LOLH Risk Share:** -33% **UCAP Margin:** +1,800 MW [1]	**IRM:** +1% (Combined Impact of 1 + 2) **Winter LOLH Risk Share:** -3% **UCAP Margin:** -1,200 MW [1]
3. Performance Weighting	**IRM:** Near zero impact in short term **Winter LOLH Risk Share:** +4%	**IRM:** +1% (Combined Impact of 1 + 2 + 3) **Winter LOLH Risk Share:** +1% **UCAP Margin:** -1,200 MW [1]

Sensitivity analyses and values above were made relative to a base case using the 2026/2027 BRA analysis with the inclusion of the recently accepted DR reforms, where the resulting IRM was 18.8% and winter LOLH risk share was 78.2% in the base case. UCAP margin reflects the net impact to estimated supply and demand UCAP, where a negative value represents a tightening of supply and demand.

[1] The estimated impacts to UCAP margins in rows 2 and 3 do not include the expected impact of the proposed change to enable generation resources with incremental winter capability to receive an annual Accredited UCAP above summer CIRs when the ELCC rating supports it. This element of the proposal is expected to provide a significant increase in available annual UCAP to be offered in the RPM auctions as it unlocks much of the UCAP value of wind generation that has been required to offer in as winter-only in the past and gone unmatched in the recent BRA (see Table 8 of the BRA report).

- **Weather Rotation Alignment:** The impact of this change alone results in the model showing higher overall system risk, particularly in the winter, and a net tightening of supply and demand. This is primarily driven by the increased alignment of resource performance profiles observed during certain extreme weather days with the higher forecasted demand on those same weather days, which is muted to a certain extent today in the analysis for a number of the load scenarios.
- **Generator Winter Ratings:** The impact of this change alone results in the model showing less overall system risk and a significant decrease in the winter risk share, as well as a relative increase in the UCAP margin (i.e. a decrease in supply / demand tightness). This is driven by the incorporation of the incremental winter capability of thermal generation in the risk and ELCC analysis.

The combined impact of this proposed reform and the weather rotation alignment is shown in the right column of the table where this reform offsets much of the increase in overall system risk and tightening of supply and demand observed in the weather rotation alignment scenario alone, and the UCAP tightening would expected to be further offset by the proposed reform that enables generation with incremental winter capability to have an annual Accredited UCAP above summer CIRs, as noted in the table footnote. The net impact on seasonal risk share shows results very close to the base case with a slight decrease in winter LOLH risk share.

- **Performance Weighting:** The sensitivity runs on performance weighting show little impact in the near-term on overall system risk, with a slight increase in winter risk share. This would likely change over time as more observations of performance during severe weather conditions are observed and rolled into the model. The near-term impact of performance weighting is more prevalent in the individual accreditation of resources where more recent performance observations would now hold greater weight on their accredited values.