# Kickoff Discussion on Potential Solution Options for the Accreditation Issue Charge

ELCCSTF

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# Today's Presentation

## Begin discussion on potential solution options for the Accreditation Issue Charge

- Share our thoughts on key accreditation design principles
- Review the primary drivers in moving to the marginal ELCC accreditation and discuss some of the concerns raised in the Issue Charge surrounding investment incentives
- Discuss potential approaches to improve investment incentives within the current accreditation framework
- Touch on the additional topics within the Accreditation Issue Charge

# Key Accreditation Design Principles

- Reflects resources' expected contribution to resource adequacy and ability to perform during periods of reliability risk during the Delivery Year
- Captures correlated outage risks and the relationship between weather, load, and resource performance
- Compensates resources in a manner that incentivizes cost-effective investment and retirement of resources
- Accredits different resource types and resources in a non-discriminatory manner
- Sufficiently transparent and stable to enable investors to make informed decisions when considering going forward investments

# ER24-99 Accreditation Reforms

The accreditation methodology approved in the ER24-99 FERC proceeding addressed a number of shortcomings under the prior approach:

1. Replaced the average accreditation metric (e.g. EFORd for thermals) to one more closely aligned with resources' expected contribution to resource adequacy and performance during critical periods

2. Captured correlated outage risks and how resource performance varies with temperature, particularly during extreme winter weather conditions

3. Applied a more consistent accreditation methodology across different resource types

4. Provided a framework to capture changes in resources' contribution to reliability as the fleet composition, load profiles, and patterns of reliability risk evolve over time

# Concern of Diluted Investment Incentives

The Accreditation Issue Charge discusses the marginal ELCC approach as a necessary step forward in moving to and having accreditation more closely align the value of capacity with the performance of resources during critical periods, but raises concerns of diluted investment incentives under the new methodology with three main areas of focus.

**Historical look-back period**: Today, a large proportion of the reliability risk and accreditation is based on performance from 10 years ago during a few days of the 2014 Polar Vortex, raising concerns and uncertainty about what investors can do to improve their resource accreditation going forward.

| Performance Day | LOLH Share |
|---|---|
| 1/7/2014 | 43.2% |
| 12/24/2022 | 11.9% |
| 1/8/2014 | 4.2% |
| 1/28/2014 | 2.1% |
| 12/26/2022 | 1.9% |
| 1/22/2014 | 1.8% |
| 7/18/2012 | 1.7% |
| 12/25/2022 | 1.5% |
| 7/17/2012 | 1.2% |
| 6/29/2012 | 0.9% |
| 10/30/2012 | 0.9% |
| 1/31/2019 | 0.7% |
| 12/23/2022 | 0.5% |
| 6/29/2021 | 0.4% |
| 7/25/2016 | 0.4% |
| 8/25/2020 | 0.4% |
| 7/7/2012 | 0.4% |
| 7/19/2012 | 0.3% |
| 7/18/2013 | 0.3% |
| 7/17/2013 | 0.3% |

About 75% of the LOLH is concentrated in 20 **performance days**:

- 9 in the winter
- 11 in the summer

**Unit-specific performance adjustments**: The current performance adjustment relies on historical performance hours beyond those that experience loss-of-load risk, which can dampen the impact of future performance on accreditation and the investment incentive for the resource.

**New resource accreditation**: New resource accreditation relies on historical class average performance for the missing years back to 2012, which can understate the expected performance and resource adequacy value of newer, more advanced technology, thereby dampening the incentives for new resource investment.

# Historical Look-back Periods

**Current Weather History:** Historical weather scenarios captured back to 1993 (~ 30 years), consistent with the weather history used in PJM's Load Forecast Model

- Discussed extending the weather history in the model beyond 30 years during the CIFP stakeholder process and explored potential approaches to calibrate the extended history for climate change, but ultimately landed that more time and work was needed in this area

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**Current Performance History:** Historical observations of class and resource performance captured back to 2012

There is a natural tension and competing design interests when considering longer vs. shorter performance histories in the risk analysis and accreditation of resources.

Benefits of a **longer performance history:**

Improves the model's ability to capture the types of extreme weather events and system conditions driving resource adequacy risk that are inherently infrequent, which enables the risk analysis and accreditation to better capture the correlated outage risks and performance of resources during those events.

Benefits of a **shorter performance history:**

Directionally enables more immediate feedback of resource investment and changes in resource performance over time into accreditation. The provided benefit of this depends on if and the extent to which changes in performance observed during the shorter history align with expected changes in performance during critical risk periods.

# Unit-Specific Performance Adjustments

**Current Unit-Specific Performance Adjustment Methodology:** Reflects each resources' weighted average historically-observed performance, in those hours and weather conditions (temperature bins) in which the system sees reliability risk, relative to class average historically-observed performance in those same hours and weather conditions.

The hours considered in the performance adjustment factors include both hours that see loss-of-load risk in the model, as well as additional hours of observed performance during days within the temp. bins that see reliability risk. Temperature bins that experience more loss-of-load risk have greater weighting in the performance adjustment and within each temperature bin, each day of historical performance has equal weighting.

Similar to the look-back period, there are **competing design interests** when considering having the unit-specific performance adjustment include the additional hours in the temp. bins that see loss-of-load risk vs. having it solely focus on risk hours in the model (which would be similar to a unit-specific ELCC accreditation)

Benefits of including the additional hours:

It can reduce volatility of individual unit accreditations within a class and may provide a better representation of resources' capacity value by including observations of the unit's performance in hours that face similar weather conditions as those driving resource adequacy risk, thereby avoiding reliance on a very limited sample size of performance from any single resource during risk hours.

Benefits of solely focusing on risk hours:

Puts greater emphasis on the observed performance of individual resources during the hours of risk in the model, which can provide stronger investment incentives and may provide a better representation of certain resources' capacity value - particularly when there is systematic differences in performance during the additional hours within the temp. bin vs. what's observed in the risk hours.

# Potential Approaches to Increase Investment Incentives

| | |
|---|---|
| **Shorten Performance History** | May provide more immediate feedback of resource investment and performance changes into accreditation, but PJM has concerns in entirely removing a portion of the already limited number of performance observations we have back to 2012 during extreme weather conditions. |
| **Weighting Approach** | This approach puts greater emphasis in the risk and accreditation analysis on more recent observations of performance within each temperature bin, thereby increasing the impact of more recent observations of performance during periods of extreme weather or reliability risk to each resource's capacity value. |
| **Administrative Review** | This approach would enable resource owners to provide support or evidence of investments made in their units for review, and allow changes to past outage and performance history for the unit to reflect the investment. |
| **Unit-Specific ELCC** | This approach would move from a class-based ELCC accreditation approach to a unit-specific approach for all resources, which narrows the sample size of performance observations used to derive each resource's accredited value and puts greater emphasis on each individual unit's performance during hours of risk. At this time, PJM is concerned that the drawbacks of this approach (decreased sample size of performance and increased volatility) outweighs the benefits. |

# Weighting Approach

- Currently, PJM draws resource performance from a temperature bin assigning the same probability/weight to each day in the bin regardless of the "age" of each observation
  - For example, if there are 10 days in a temperature bin (some older, some newer), each observation has a 10% chance of being drawn
- Under a weighted sampling approach, observations in a bin could be drawn assigning higher probabilities/weights to those observations that are more recent
  - In the context of the example above, the newer observations would have greater than 10% chance of being drawn while the older observations would have less than 10% chance
- The outcome of such a weighting approach would alter the current rank of historical performance days driving risk in the model. For example:

| Performance Day | LOLH Share |
|---|---|
| 1/7/2014 | 37.5% |
| 12/24/2022 | 13.3% |
| 1/8/2014 | 9.1% |
| 1/22/2014 | 3.3% |
| 7/18/2012 | 2% |

From June 2024 Run

| Performance Day | LOLH Share |
|---|---|
| 12/24/2022 | X1% |
| 1/7/2014 | X2% |
| 12/25/2022 | X3% |
| 1/8/2014 | X4% |
| 1/31/2019 | X5% |

X1 > X2 > X3 > X4 > X5

# Weighting Approach (cont'd)

- ELCC Class Ratings are driven by the ranking of historical performance days and therefore, ELCC Class Ratings would be impacted by the weighting approach
- A corresponding weighting scheme would be applied to the resource-specific performance adjustment calculation

**Analysis:**

- PJM will follow up with the ELCC analysis and impact of a weighting approach to performance history at a future meeting, and will include sensitivities / examples to help inform the investment incentives this approach may have relative to status quo

# Administrative Review of Investments

**Potential Approach:** Allow resource owners to provide PJM with supporting documentation and evidence of investments that have been made on their unit to improve expected performance during periods of reliability risk, and following a detailed review, account for such investment by adjusting the resource' historical performance in the ELCC analysis.

The review would likely need to be fact-specific with consideration of the investment being made and how such an investment would have expected to impact the historical availability of the resource during periods of risk in the analysis.

Primary benefit of this approach:

- Able to quickly account for resource investment and expected improvements to performance in accreditation, helping to incentivize behavior and resource investments that benefit the individual unit during periods of system stress

Key Challenges:

- Expected to require a very detailed, fact-specific review of the investments and their expected impact on resource availability, which can be highly subjective
- Administrative burdens due to needing to certify and review each investment that is submitted, potentially costly
- Concerns if observed performance during future reliability events fails to match the expected improvement in performance
- Realized accreditation improvements may be diminished

# Topics for Future Discussion

- **New Resource Accreditation**
- **Winter Deliverability for Thermal Resources**
  - PJM is analyzing the amount of additional capacity this change could result in
  - We ask that stakeholders begin to think on some of the various design decisions for this issue, including:
    - Should thermal resources be required to be studied at levels higher than their CIRs or should it be by election like it is done for wind resources today?
    - What level of capacity above CIRs should be assessed? MFO or a different value?
    - How should the energy market must offer requirement be updated, which is based on cleared ICAP for thermals and limited by annual CIRs today?
    - If the full transmission capability available / requested is not deliverable, how should it be allocated?
- **Potential Updates to ELCC Class Definitions**

# Appendix: Education Materials on the ELCC Resource Performance Adjustment

# ELCC Resource Performance Adjustment

**Summary:** ELCC resource performance adjustment factor reflects each resources' average historically-observed performance, in those hours and weather conditions (temperature bins) in which the system experiences reliability risk, relative to class average historically-observed performance in those same hours and weather conditions

**Details of computation:**

- For each temperature bin *(b)* and hour of day *(h)*:
  - Calculate unit's *(u)* average availability across all observations in that bin & hour: $A_{ubh}$
  - Calculate class's *(c)* average availability across all observations in that bin & hour: $A_{cbh}$
  - Calculate relative risk weighting of the bin & hour (as a share of total risk): $R_{bh}$
- Compute weighted average of unit availability across all bin/hour pairs: $A_u = \sum_{b,h} R_{bh} \cdot A_{ubh}$
- Compute weighted average of class availability across all bin/hour pairs: $A_c = \sum_{b,h} R_{bh} \cdot A_{cbh}$
- Compute Resource Performance Adjustment: $RPA_u = \frac{A_u}{A_c}$

# ELCC Unit-Specific Performance Adjustment: Example

| Bin $b$ | Hour of day $h$ | Weight $R_{bh}$ | Unit's average availability $A_{ubh}$ | Class's average availability $A_{cbh}$ |
|---|---|---|---|---|
| winter1 | 1 | 0 | 0.98 | 0.80 |
| **winter1** | **2** | **0.3** | **0.95** | **1.00** |
| **winter1** | **3** | **0.2** | **0.95** | **0.89** |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| winter1 | 24 | 0 | 0.84 | 0.99 |
| winter2 | 1 | 0 | 0.89 | 0.91 |
| **winter2** | **2** | **0.2** | **0.98** | **0.81** |
| winter2 | 3 | 0 | 0.95 | 0.90 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| winter2 | 24 | 0 | 0.92 | 0.99 |
| winter3 | 1 | 0 | 0.88 | 0.87 |
| winter3 | 2 | 0 | 0.85 | 0.90 |
| winter3 | 3 | 0 | 0.96 | 0.95 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| winter3 | 24 | 0 | 0.94 | 0.96 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| summer34 | 1 | 0 | 0.98 | 0.89 |
| summer34 | 2 | 0 | 0.96 | 0.89 |
| **summer34** | **3** | **0.3** | **0.99** | **0.96** |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| summer34 | 24 | 0 | 0.95 | 0.94 |
| Weighted Averages | | | **0.97** | 0.93 |
| Resource Performance Adjustment | | | | **1.04** |

**Computation Reference:**

- For each temperature bin *(b)* & hour of day *(h)*:
  - Unit's *(u)* average availability across all observations in that bin & hour: $A_{ubh}$
  - Class's *(c)* average availability across all observations in that bin & hour: $A_{cbh}$
  - Relative risk weighting of the bin & hour (as a share of total risk): $R_{bh}$
- Weighted average of unit availability across all bin/hour pairs:

$$A_u = \sum_{b,h} R_{bh} \cdot A_{ubh}$$

- Weighted average of class availability across all bin/hour pairs:

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