Reflecting Winter Capability in Accreditation: Analysis & Initial Proposal

ELCCSTF

May 30, 2025

Today's Presentation

Discussion on reflecting deliverable winter capability in accreditation:

- Recap of initial proposal presented on 5/22/2025.
- Highlight new details and clarifications added (slides 9, 10, 17-24).
- Discuss feedback and questions.

Note: Related design components and solution options have been added to the matrix.

Recap of Status Quo & Opportunity to Enhance Methodology

- The modeled hourly output of resources has historically been limited to levels assessed in PJM RTEP deliverability studies, which is equivalent to a Summer ICAP / CIRs for some resources all year around. This approach may underrepresent some resources' full winter capability.
- Capturing winter capability of all resources in accreditation would allow the capacity market to more fully reflect the reliability benefit of those resources.
- Changes to winter deliverability test procedures in the RTEP and interconnection process will study higher winter output, presenting an opportunity to do the same in resource adequacy modeling.

Deliverability Caps	Unlimited	Limited Duration	Variable & Combination
Summer	CIRs	CIRs	CIRs
Winter Daytime	**CIRs**	**CIRs**	Assessed Deliverability
Winter morning & evening peaks	**CIRs**	**CIRs**	Assessed Deliverability

* CIRs include transitional capability awarded for the delivery year

* Changes that require a sub-annual market are out of scope per the issue charge.

Winter Capability Analysis Approach

PJM performed analysis to determine how much winter capability can be reasonably relied upon for resource adequacy.

For each Unlimited Resource in the 2026/27 portfolio:

1. Estimated **"Winter ICAP"** as the maximum Winter Net Capability Test since 22/23 DY, capped at Maximum Facility Output (MFO).

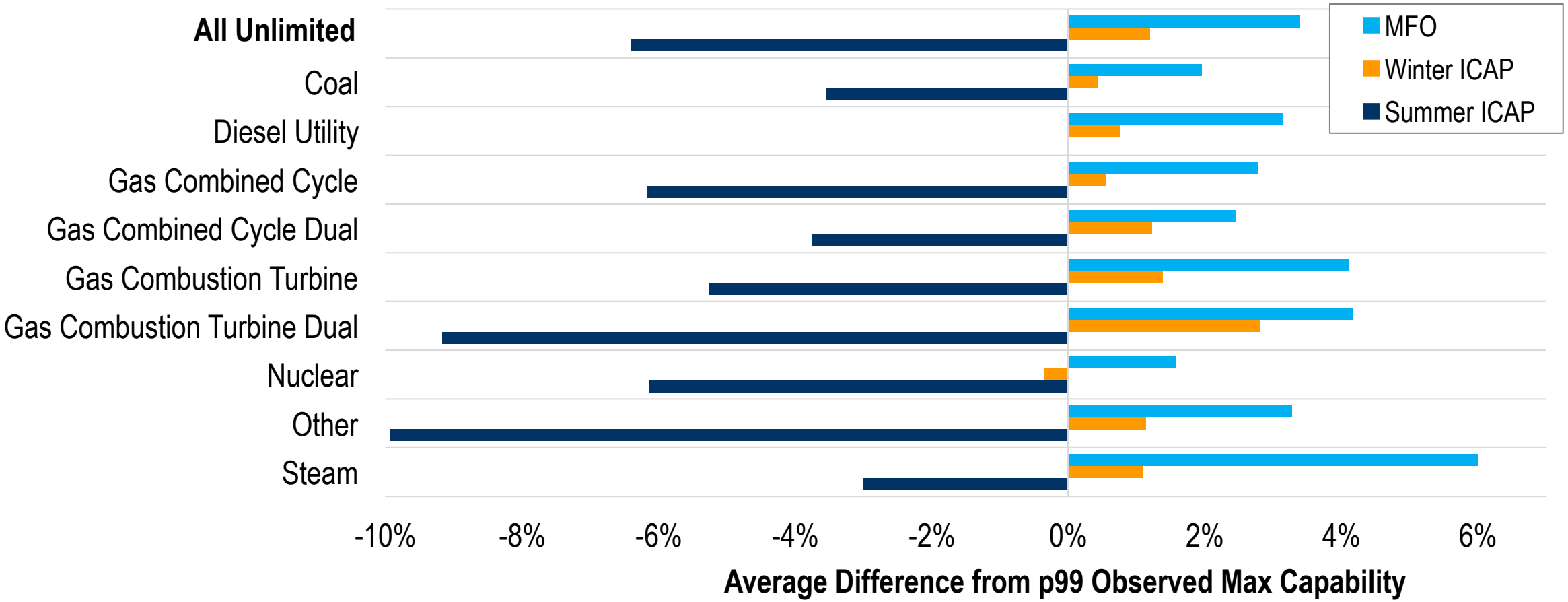
2. Calculated hourly **"Observed Max Capability"** as the maximum of actual output or emergency max, in hours where the unit had no outages. This was calculated using all available data for each unit back to 2012, November through April.

3. Compared these metrics to Summer ICAP and MFO.

The delta between Summer ICAP and "Winter ICAP" for Unlimited Resources in this portfolio is 8,561 MW. See sensitivity analysis, slides 16-18.

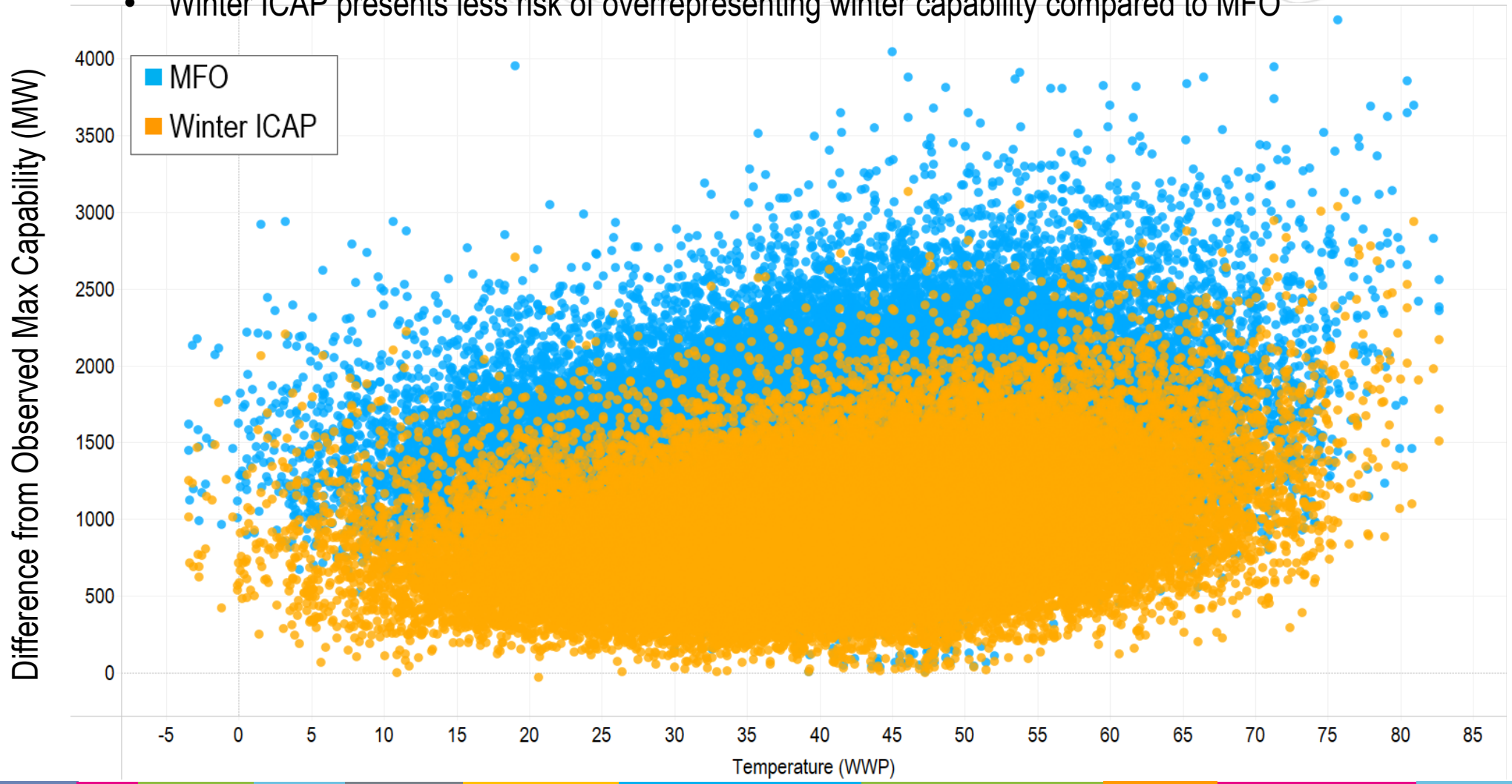
Winter ICAP is Most Aligned with Observed Winter Capability

Unlimited resources' 99th percentile observed max capability in winter is on average **6.4% (11 GW) higher than Summer ICAP**, **3.4% (6 GW) lower than MFO**, and **1.2% (2 GW) lower than Winter ICAP**.

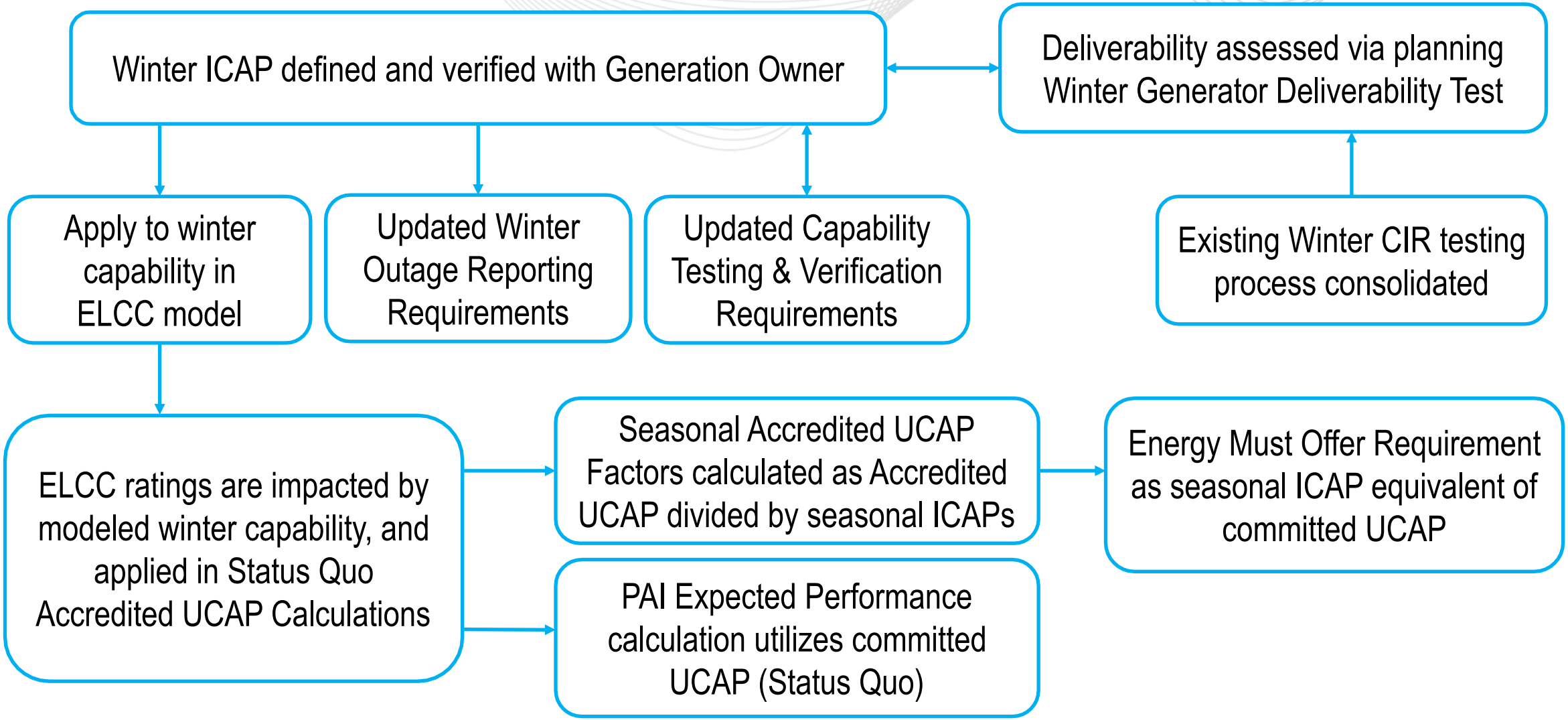


Comparison of Winter ICAP and MFO to Observed Max Capability

- Some decreased variability between observed max capability and ratings as temperature decreases
- Winter ICAP presents less risk of overrepresenting winter capability compared to MFO



Outline of Proposed Winter ICAP in Accreditation



Unlimited Resources: Proposed Definition of Winter ICAP

Winter ICAP set to winter rated capability for capacity resources based on a specified set of winter conditions defined in M21B today:

- Winter rated capability determined by adjusting the generator capability for generator site conditions coincident with the dates and times of the last 15 years PJM winter peaks.
- These are the conditions currently prescribed under the Winter Net Capability Verification Test.
- A review and verification process would require Generation Owner to submit Winter ICAP. PJM would review against Winter Net Capability Verification Test data to confirm the value.
- Winter ICAP may not exceed MFO or studied winter deliverability and granted Winter CIRs.

This approach is consistent with the definition and application of Summer ICAP.

Deliverability of Winter ICAP

Deliverability of Winter ICAP would be confirmed via results of PJM planning winter generator deliverability tests.

- RTEP and interconnection process will both study up to higher winter generator deliverability test levels for all resources (see Appendix slides 22 & 23) beginning with 2024 RTEP cycle, with full alignment for the 2029/30 delivery year.
  - RTEP studies up to the new test levels beginning in 2029 winter RTEP model
  - Interconnection studies up to the new test levels beginning with Transition Cycle 2 (2028 winter model)
- A transitional study will be needed for winter deliverability for 2028/29 delivery year.

Deliverability of Winter ICAP (Continued)

Status Quo

- Winter CIRs only available to Intermittent Resources and Environmentally Limited Resources which seek to obtain additional CIRs related to the winter period for purposes of submitting sell offers as winter-period capacity.
- Requested Winter CIRs are studied and granted based on values submitted through a solicitation process ahead of each delivery year.
- More details in Appendix slide 24

Proposal

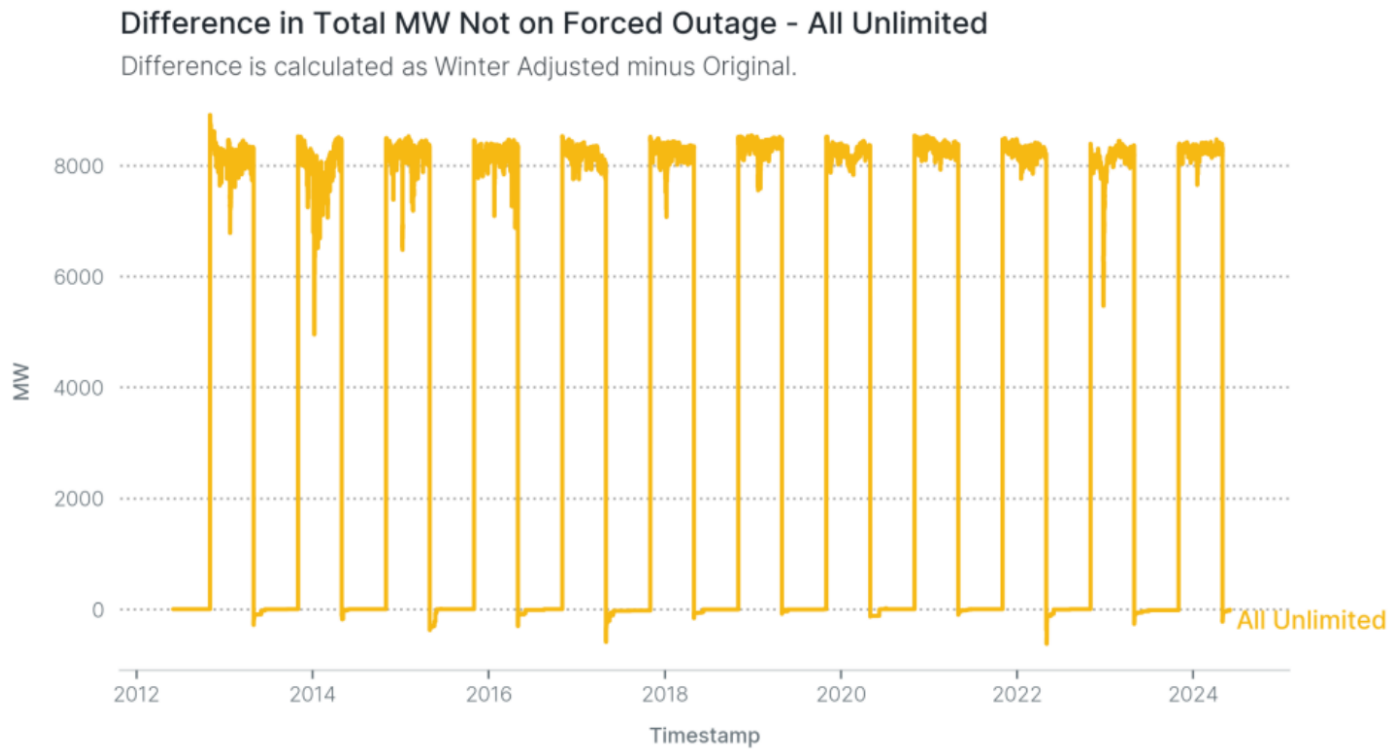
- For purposes of ensuring deliverability of Winter ICAP to be represented in the calculation of Accredited UCAP, Winter CIRs granted to all Generation Capacity Resources based on assessed winter generator deliverability.
- Status quo solicitation and study process would be sunset.

Unlimited Resources: Application in Accreditation Model

During the winter period (November through April) resource capability will be based on Winter ICAP, adjusted for outages.

- In hours with no outages, resource will be available up to Winter ICAP.
- Winter ICAP will be used to calculate outage rates used in the ELCC model during the winter. Outages will be applied in the same manner as today.

Example of availability from sensitivity analysis, slides 16-18:



Unlimited Resources: Downstream Requirements

Reporting Requirements

- eDART reporting reflective of Winter ICAP
- GADS reporting should reflect higher capability during winter months

Winter Testing and Verification Requirements

- Winter Net Capability Verification Test compared to committed Winter ICAP

Energy Must Offer Requirement

- Seasonal ICAP equivalent of cleared UCAP, defined utilizing seasonal Accredited UCAP Factors

Variable, Combination and Limited Duration Resources

To apply a consistent application of winter capability across resources types, some additional modeling and process changes would be needed for variable, combination, and limited duration resources:

- Winter ICAP would be defined as Equal the Effective Nameplate Capacity of the resource, not to exceed studied winter deliverability and granted Winter CIRs.
- The separate Winter CIR request and study process would be consolidated with new process utilized to assess winter deliverability for all resource types.

Converting Seasonal ICAP to Seasonal Accredited UCAP Factors All Resources

Today, resource Accredited UCAP Factors are calculated as Accredited UCAP / Installed Capacity and are utilized in auction clearing and calculation of daily positions. Under this proposal, Seasonal Accredited UCAP Factors would be calculated to apply downstream in RPM:

- Summer Accredited UCAP Factor = Accredited UCAP / Summer ICAP
- Winter Accredited UCAP Factor = Accredited UCAP / Winter ICAP

Example

- Summer ICAP = 90 MW CIR
- Winter ICAP = 100 MW Winter ICAP
- Accredited UCAP = 60 MW
- Summer AUCAP Factor = 60 MW / 90 MW = 0.667
- Winter AUCAP Factor = 60 MW / 100 MW = 0.6

Potential Approaches for When Accredited UCAP > CIRs

Status Quo

- Annual offers are allowed up to annual AUCAP, which utilizes an annual AUCAP factor multiplied by annual ICAP and may not exceed annual CIRs.
- Intermittent resources with accredited capability above annual CIRs are eligible to reflect incremental winter capability as winter-period capacity, which may offer into RPM auctions as winter-only offers and may clear if matched with summer-only offers. In practice, this primarily applies to wind.
- In recent auctions, we have observed a significant portion of winter-only offers not being matched and not clearing the auctions. For example, ~1 GW UCAP of winter offers were not matched with summer offers in the 2025/26 BRA.

Option 1: Recognize Winter Capability in Accreditation while Retaining Status Quo Auction Rules

- Annual AUCAP and annual offer capped at annual CIRs, with additional incremental winter capability offered as winter-period capacity.
- Expand eligibility for all resources to reflect the increment of AUCAP > CIR as seasonal capacity.

Option 2: More Fully Recognize Winter Capability in Annual Auction Construct

- Allow annual AUCAP and annual offers to exceed annual CIRs.
- Sunset seasonal matching, with annual offers more fully capturing seasonal capability.

Potential Approaches for When Accredited UCAP > CIRs

Wind Resource Example

ENC = MFO = 100 MW | Winter Deliverability = Winter ICAP = 70 MW

Summer ICAP = 20 MW | CIR = 20 MW | ELCC Rating = 40%

Option 1: Winter Capability in Accreditation, Status Quo Auction Rules

- Accredited UCAP = 20 MW
- Annual Offer = 20 MW
- Incremental Winter-Only Offer = 20 MW

Option 2: More Fully Recognize Winter Capability in Annual Auction Construct

- Accredited UCAP = 40 MW
- Annual Offer = 40 MW

Winter Accreditation - Option 2

Primary Benefits

(relative to status quo rules that limit incremental UCAP above annual CIRs to just the winter season)

- More fully recognizes the resource adequacy value provided by resources that have incremental winter capability above annual CIRs
- Enables more winter capacity to clear and take on a capacity obligation during the Delivery Year, particularly given the relatively low amount of seasonal matching that has occurred in recent auctions
- Simplifies certain aspects of the market construct we have in place today that were added to facilitate participation by certain resources with significant differences in seasonal performance prior to moving to ELCC accreditation

Winter Accreditation - Option 2: Current Thinking

Q: Does allowing annual Accredited UCAP to exceed annual CIRs present a reliability concern from a Planning studied deliverability perspective?

A: No, we do not believe this creates a reliability concern given the level of studied deliverability and CIRs for generation will still be respected in the underlying risk analysis for the respective time periods. Annual CIRs are based on a summer generator deliverability test, and those CIRs will continue to set the cap on availability or performance during summer months in the ELCC analysis as it does today. For resources that are studied and deliverable in the winter at a level above annual CIRs, that higher level of studied deliverability will be respected in the ELCC analysis during the winter months. As such, the risk analysis used in the Reserve Requirement Study and ELCC accreditation is not relying on hourly output from generation above studied deliverability for the respective season or time period.

Winter Accreditation - Option 2: Current Thinking (cont'd)

Q: If the ELCC analysis limits performance to studied deliverability, how can a resource receive an annual ELCC rating and Accredited UCAP greater than its annual CIRs?

A: Generally speaking, annual ELCC ratings and AUCAP values reflect resources' **average expected performance during hours of resource adequacy risk** on the system across the year. The underlying analysis used in determining those values is hourly and considers the differences in resources' availability or expected performance throughout the year under different weather conditions and studied deliverability. Today, most risk falls in the winter season, and for resources that are studied to be deliverable and perform considerably above annual CIRs during winter risk hours, the higher winter performance can result in an annual average expected performance that exceeds annual CIRs.

Wind Example (100 MW MFO)	Summer	Winter
Seasonal Studied Deliverability (cap on performance)	20 MW (Annual CIRs)	70 MW
Seasonal Average Performance during Risk Hours	10 MW	47.5 MW
Seasonal Percentage Share of Risk Hours	20%	80%
Annual Average Performance during Risk Hours	**40 MW (AUCAP)**	

Winter Accreditation - Option 2: Current Thinking (cont'd)

Q: If annual AUCAP is allowed to exceed annual CIRs, is there a reliability concern that the committed UCAP obligation for a resource can exceed its seasonal ICAP or studied deliverability / CIRs in one of the seasons, or even what the resource can physically provide at certain times of the year?

A: We do not believe this creates a reliability concern for a few reasons:

- The underlying risk analysis used to set the IRM/FPR and ELCC accreditation is not relying on committed UCAP from each resource in every hour, but rather considers the expected differences in performance and studied deliverability throughout the year.
- Committed UCAP represents a financial obligation (not physical) with which resources are assessed against during PAIs and reflects the average expected performance from a resource across hours of risk. It is expected and planned for that resources will underperform relative to their committed UCAP in some hours and over-perform in others. This is the case for all generation, but solar provides one clear example of this where in some risk hours (e.g. summer afternoon), solar is generally expected to exceed their AUCAP while in other hours (e.g. at night), solar would not be able to physically meet it's committed UCAP level.
- Committed resources still have the physical requirement to make their full committed ICAP or capability available to PJM for dispatch (adjusted for any outages). As such, even though some resources are expected to have a UCAP commitment that exceeds their physical capability in certain times of the year, other committed resources are expected and must make available to PJM their capability beyond committed UCAP at those times.

Appendix

Winter Generator Deliverability Test Background

- In early 2023, stakeholders approved changes to PJM's generator deliverability test procedures.
  - Changes started to be implemented with the 2023 RTEP
  - Changes will be implemented starting with Transition Cycle 2 in the interconnection process
- The changes were primarily approved to update the test to better handle the evolving resource mix.
- One of the changes that was approved was consideration of seasonal output capabilities and expected operating levels of generators.
  - Summer, winter and light load
  - Summer single contingency testing continues to be limited to the CIR level
- The next slide provides a comparison of the winter deliverability MW under the old generator deliverability rules to those under the new generator deliverability rules.

Winter Generator Deliverability Test Levels

Capacity Resource Type	Contingency Type	Winter Gen Deliv Test Levels	
		Old	New
All Thermal	single common mode	CIR CIR	MFO MFO
Onshore Wind	single common mode	80% MFO MFO	p90%* p90%*
Solar (Fixed & Tracking)	single common mode	10% MFO MFO	5% MFO 5% MFO
Offshore Wind	single common mode	80% MFO MFO	p80%* p80%*
Batteries	single common mode	CIR MFO	MFO MFO
Pumped Storage / Hydro	single common mode	CIR CIR	MFO MFO
Hybrid Resource	All	Based on test levels for each resource type	MFO

*p90% for onshore wind in 2025 RTEP is 71% MFO for MAAC, 84% MFO for PJM West and 77% MFO for Dominion

*p80% for offshore wind in 2025 RTEP is 95% MFO for MAAC and 97% for Dominion

Status Quo Winter CIR Solicitation & Study Process

Who?

Generation Owners of Intermittent Resources and Environmentally Limited Resources

Existing resources & planned resources eligible for BRA

When are Winter CIRs requested?

Modified auction schedule
10-day request window opening 145 days prior to the BRA

3-Year auction schedule
Request window is Aug. 31 – Oct. 31 of the year prior to the May BRA

What?

Eligible to request additional CIRs for the winter period of each delivery year.

Requests for CIRs greater than 40% of MFO must provide supporting documentation to verify the facility is capable of reliably achieving the requested output

Study details

- Single contingency generator deliverability study is performed
- Winter RTEP model for the delivery year under study (latest winter peak load forecast, winter transmission facility ratings)
- Additional/requested Winter CIRs are found either fully deliverable, partially deliverable, or not deliverable
- Results are published prior to the DR Sell Offer Plan due date

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