Capacity Market Reform - Design Concepts and Solution Options for Discussion

RASTF

August 31, 2022

Objective of this Presentation

- Share our perspectives on some high-level solution options for various Key Work Activities (KWAs)
- Promote discussion and get stakeholder feedback on design concepts
- Provide a baseline with which some stakeholders may find helpful to use for development of alternative solutions

Key Market Design Objectives

- **Reliability:** Supports procurement of sufficient capacity to meet our resource adequacy targets
- **Efficiency:** Embraces competitive principles, and provides transparent price signals for efficient entry and exit of resources
  - Facilitates competitive, least-cost procurement of resources

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- Design concepts and solution options focused on reforms to better achieve these objectives

Topics for Today's Discussion

KWAs that we touch on in this presentation:

- Reliability Risks in the Capacity Market (KWA #2)
- Reliability Target and Metric (KWA #3)
- Performance Assessments (KWA #4)
- Qualification and Accreditation (KWA #5)
- Energy Market Obligations (KWA #6)
- Seasonal Capacity Construct (KWA #8 + others)

Other KWAs in Issue Charge:

- ~~Clean Procurement (KWA #1)~~
- Procurement process (KWA #7)
- Supply-side market power mitigation rules (KWA #9)
- FRR Rules (KWA #10)

Reliability Risks in the Capacity Market

Resource Adequacy (RA)

Ensuring adequate resources are available to meet future load, accounting for uncertainty in supply and demand

Proposed Solution Option(s)

- **Enhance RA models to better capture future risk profiles**
  - Load Forecast enhancements, including move to hourly forecast
  - Move to hourly RA models for RTO and LDA reserve studies, consistent with ELCC analysis
  - Improve modeling of winter risk
- **Account for all supply-side uncertainties consistently in the accreditation of resources**

Status quo accounting of reliability risks

Risks	Source	Accounting of Risk
Load Uncertainty	Demand	Demand-side (FPR)
Random Thermal Forced Outages	Supply (thermals)	Accreditation (EFORd)
Variable Resource Risks	Supply (e.g. wind/solar)	Accreditation (ELCC)
Limited Duration Resource Risks	Supply (e.g. battery)	Accreditation (ELCC)
Normal Variability in Random Thermal Forced Outages	Supply (thermals)	Demand-side (FPR)
Thermal Planned & Maint. Outages	Supply (thermals)	Demand-side (FPR)
Thermal Winter Correlated Outages	Supply (thermals)	Demand-side (FPR)
Ambient De-rates (Summer)	Supply (thermals)	Demand-side (FPR)

Reliability Target and Metric

Current Reliability Target and Metric

1 day in 10 years Loss of Load Expectation (LOLE) for the RTO; 1 day in 25 years LOLE for LDAs

As the drivers and patterns of reliability risk shift into the future, there's a question on if the reliability standard we've had for decades is still right for the future…

Why might it not be?

- An LOLE metric does not capture the magnitude or duration of events
- This may have been OK in the past given patterns of outage risk that were generally driven by peak loads and random generator outages
- However, may not be the case in the future under changing risk profiles / resource mix and greater correlated outage risks

Severity of different load shed events can appear quite similar, or very different, depending on the metric

Event Characteristic	Metric Affected	California Aug 2020	Texas Feb 2021	Difference
Number of Events	LOLEv	2 events	1 event	-50%
Number of Days	LOLE	2 days	3 days	+50%
Number of Hours	LOLH	6 hours	71 hours	+1,083%
Unserved Energy	EUE	2,700 MWh	990,000 MWh	+36,567%
Max Shortfall	-	1,072	20,000+	+1,766%

Reliability Target and Metric (cont'd)

Metrics	Description	Considerations
LOLE (days/year)	Average days per year with shortfall	• Well established standard for the industry with 1 day in 10 years criteria (and status quo) • Major limitation is that it does not consider duration or magnitude (MWh) of events
LOLH (hours/year)	Average hours per year with shortfall	• Captures duration of events; does not inform on frequency or magnitude
EUE (MWh/year)	Average amount of unserved energy, in MWh, per year	• Captures magnitude of events; does not explicitly inform on frequency or duration • Arguably the metric most representative of changes in reliability as a change in frequency, duration, or magnitude of events will have an impact on EUE
Normalized EUE (% of load/year)	Similar to EUE, but reported as expected % of unserved energy relative to system load	• Similar to EUE • May provide more "consistent" level of reliability with changing RTO size or load levels
Multiple Metrics (e.g. LOLE + EUE)	Considers multiple metrics in setting the criteria and uses most limiting	• No single metric may fully capture types of shortage events; increases number of targets that need to be agreed upon and adds complexity to planning studies

Proposed Solution Option(s)

- **Use EUE (or normalized EUE) as the primary metric** for target criteria to better capture severity of events in the future (minimal impact expected in near term), but don't lose sight of beneficial information from other metrics
- **Report out on all metrics** in our RA studies; continue to consider other factors / metrics when setting the demand curve
- Set EUE (or other) targets based on the "equivalent" EUE seen in our models today when at 1 in 10 LOLE

QUALIFICATION

- Specific rules to qualify as capacity differ by resource type, but generally require Capacity Resources be physical (existing or meet planned requirements) and deliverable to load
- Capacity Performance (CP) filing generally set the requirement for resources to be available year-round, but did not add explicit eligibility requirements to firm up ability to perform in winter (e.g. no winterization)
  - Instead, designed to incentivize needed investment and performance through high penalties for non-performance and bonus revenues during stressed conditions on the system

Proposed Solution Option(s)

- At this point, not proposing specific winter eligibility requirements for generation beyond the NERC winterization standard under review (EOP-012-1) following the February 2021 Cold Weather report
- Under a seasonal construct, single-season resources would be eligible to qualify and participate in respective seasons on a standalone basis (i.e. summer-only DR)
- Have DR availability periods align with hours of system reliability risk and/or account for any misalignment in accreditation

Qualifications and Accreditation (cont'd)

ACCREDITATION

- Status quo of ELCC for variable and limited duration resources; EFORd for other generation; FPR for DR

Proposed Solution Option(s)

- Move to a "marginal" accreditation framework for all resource types using a single consistent model (e.g. ELCC)
- Account for all uncertainties sourced by supply-side resources in the accreditation
- Class definitions to capture resource types or characteristics that are expected to impact marginal reliability value (e.g. fuel security or run time limitations)
- Review current ELCC dispatch methodology and assumptions for enhancements
- Accredit on a seasonal basis (under a seasonal design)

Accreditation in other regions:

- **NYISO** recently filed and had changes approved to use a Marginal ELCC or Marginal Reliability Impact (MRI) approach for all generators types and with defined classes
- **ISO-NE** is currently discussing accreditation changes with its stakeholders; recent straw proposal supportive of an MRI approach for all units
- **MISO** filed for a seasonal construct that would base accreditation for "Schedule 53" resources on historical seasonal availability from prior 3 years, with a weighting system to focus on hours of highest risk / lowest operating margin

Capacity Performance Assessments

SOME OF THE ISSUES / CONCERNS RAISED WITH THE CURRENT DESIGN

- Lack of clarity and transparency in the rules (e.g. what units fall into the assessment, treatment of ancillary services in actual performance calculations, rules on excusals from shortfalls, etc.)
- Potential misalignment in real-time incentives from energy market pricing and PAI penalty/bonus
- Concerns with the current penalty rate

Proposed Solution Option(s)

- Maintain performance-based assessment focused on times of system stress
- Use a nodal, LMP-based trigger for performance assessments that gets triggered when price goes above $X (e.g. $850)
  - Or alternatively, consider dual trigger where PAIs only assessed when both LMP and event-based trigger are in effect
  - Intended to improve real-time alignment in LMP and PAI penalty/bonus incentives, as well as provide more transparency for what units will be included in the assessment
- Set PAI expected performance for gen based on compensated level (UCAP under marginal accreditation)
- Thinking through and support improvements to other areas of CP (e.g. excusals, penalty prices, etc.)

Energy Market Obligations

Proposed Solution Option(s)

Generation Energy Market Must Offer Requirement

- Thermal Resources: Generally same concept as today (committed ICAP adj. for outages) with some changes / clarifications
- Variable Resources (wind/solar/intermittent hydro): Must offer forecast expectation (median or P50).
- Batteries: Require use of PJM central optimizer when it becomes available (with limited exceptions)
- Pumped Hydro: Require use of PJM central optimizer now (with limited exceptions)
- Hybrids: Net of variable profile expectation and storage profile, within MFO. Battery rules apply to storage profile.
- Readily Deployable Hydro (non-pumped): Must be available to PJM for dispatch (within their physical limitations) every hour of every day, unless on forced outage.

DR

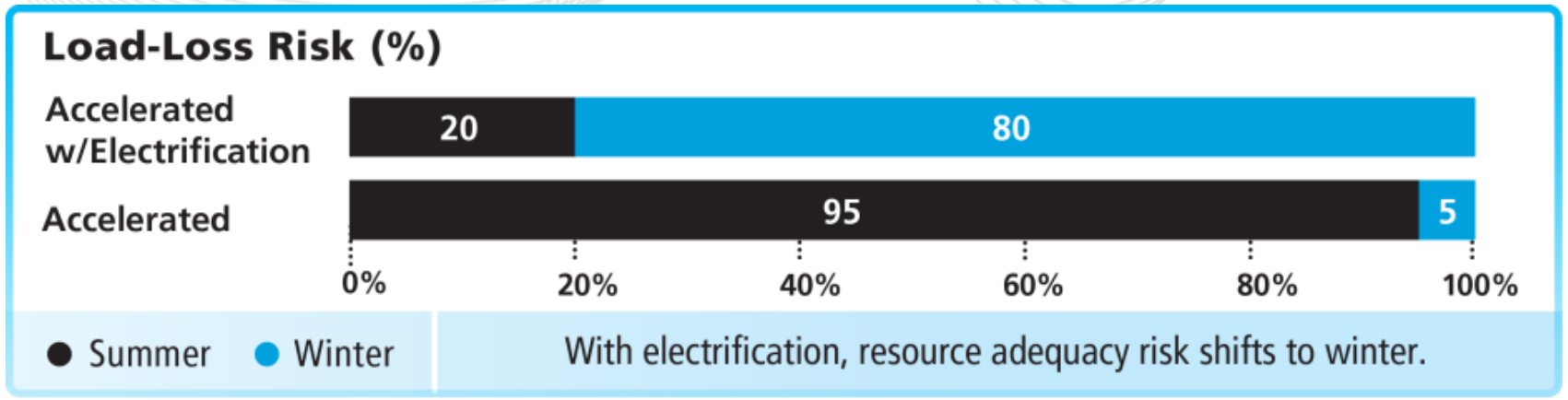
- Thinking through DR "offer" obligations and potential enhancements in this area

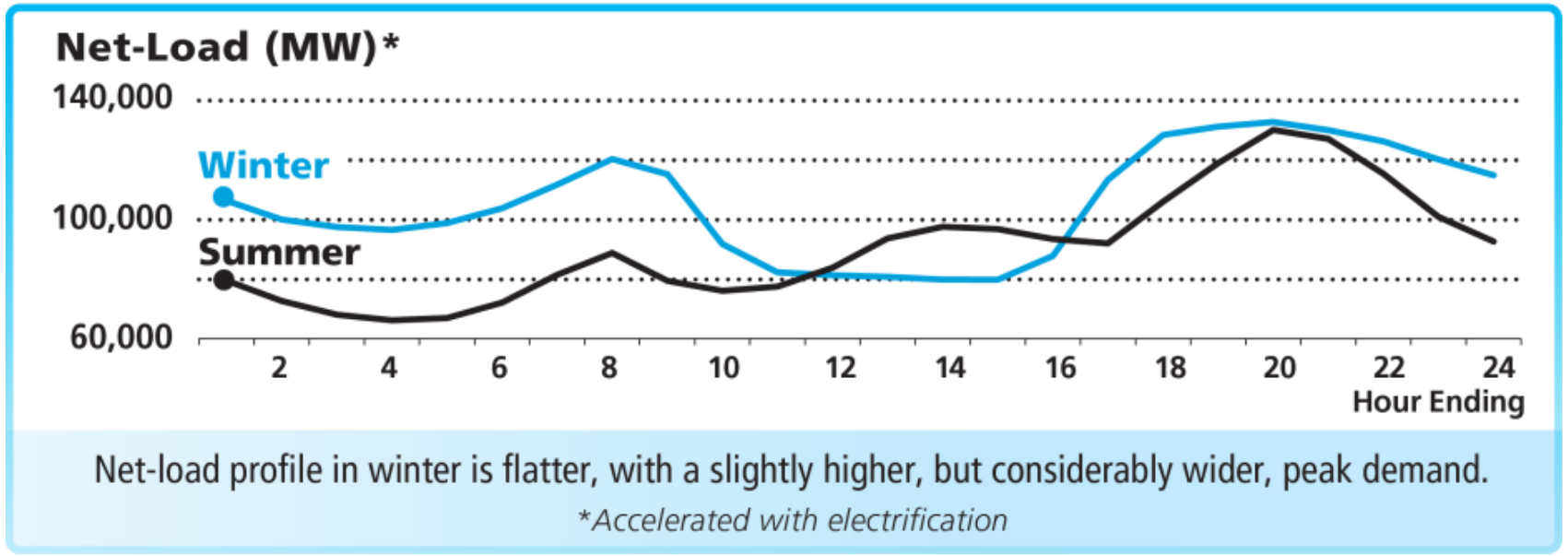
All quantities are pro rata committed MW / total MW, and net of MW on outage. PJM has the right to take over storage schedule when needed for reliability.

Seasonal Market Design

Motivation: Evolving Patterns of Risk

Second phase of "Energy Transition in PJM" study indicates changes on both supply and demand side will increase importance of reliability risks outside of traditional summer season.





Motivation: Opportunities To Improve Efficiency

Seasonal capacity market construct could improve efficiency by lowering costs while maintaining or improving reliability

- More fully recognize seasonal risks
- More fully recognize seasonal resource capabilities
- Incentivize efficient investment in resources that can most contribute to system reliability needs at lowest cost

Seasonal Capacity Market Construct – Main Elements

- Seasonally differentiated **demand side**
  - Annual risks allocated across seasons
  - Then capacity requirements or procurement targets are seasonally differentiated as well
- Seasonally differentiated **supply side**
  - Qualification: Must meet seasonal eligibility requirements (e.g. winterization requirements for winter season; summer-only DR could sell in summer season)
  - Accreditation: Differentiated to capture reliability value in respective season
- Seasonal-aware **market clearing**, with differentiated seasonal prices

Seasonal Market Offers and Clearing

- Seasonal Market **Offers**
  - Allow resources to offer avoidable costs of both annual and seasonal capacity
- Seasonal Market **Clearing**
  - Auction engine chooses set of seasonal and annual resources to meet the individual seasonal capacity constraints (demand curves) at least cost. As today, prices reflect the incremental benefit (from demand curve) and incremental costs (from supply curve) at the clearing quantity and price in each season.
  - Single-season resources that clear receive single-season clearing price for their single-season cleared MW
  - Annual resources that clear receive the sum, across all seasons, of each season's clearing price for their cleared MW in that season. This provides revenue sufficiency to cover offered costs.

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