MISO's Path to Resource Adequacy

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Executive Summary

- Aggressive decarbonization strategies and accelerated policies are driving rapid change in our region.
- The evolving resource fleet is altering the operational paradigm with increasing variability & uncertainty with a reduction in reserve margins and reliability attributes.
- MISO is accelerating its efforts to help address the changing reliability risk profile through several resource adequacy reforms.

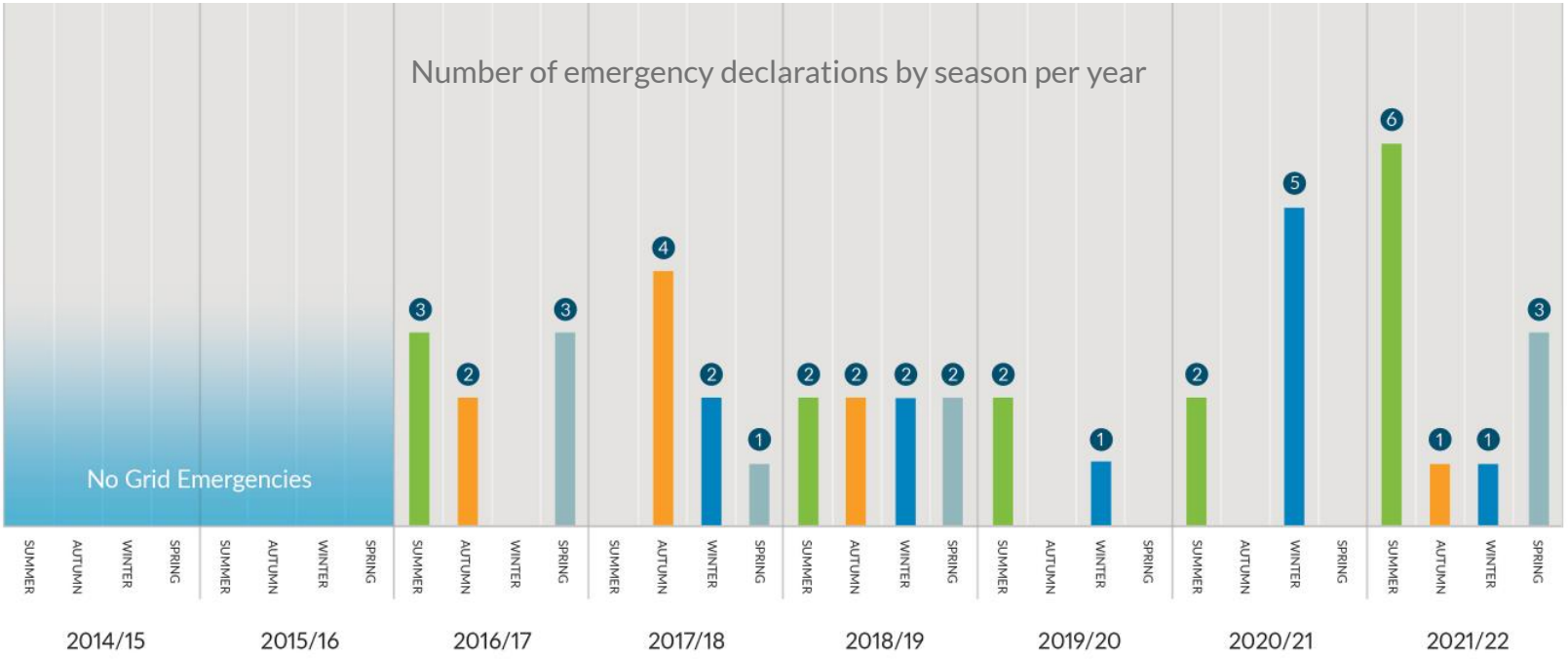
Members and States in the MISO Region continue to set ambitious deep decarbonization goals

17 utilities have energy goals greater than 80%

4 states have 100% clean energy goals

1 state with 100% clean energy law

The region's energy landscape is transitioning toward a more complex, less predictable future



Past

Focus on providing energy in *the worst peak load hour* during the summer

Present

Focus on providing energy on ***the worst day in each season***

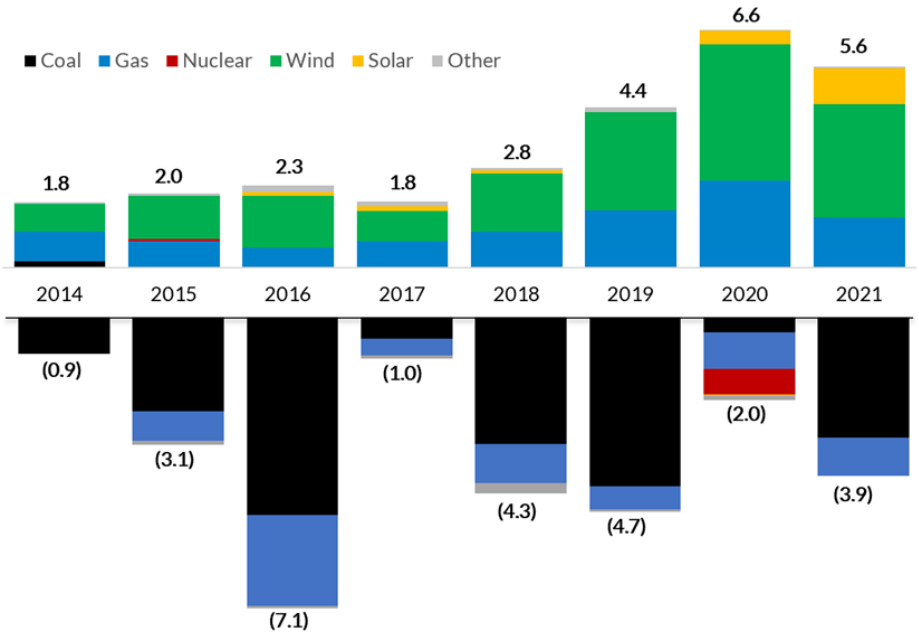
Future

Focus on providing energy for *the worst week in each season*

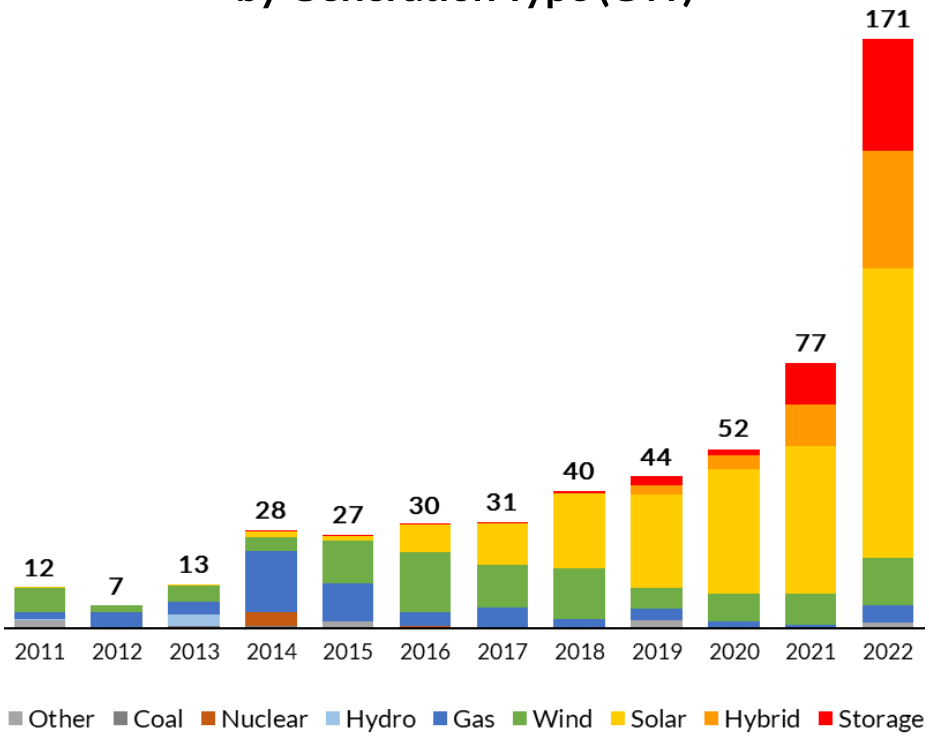
Policy drivers such as EPA regulations, ESG criteria, State Energy Policy, and the Inflation Reduction Act are accelerating the fleet transition and associated risks

MISO's interconnection queue reveals continued shift to renewables & storage and fewer resources with long duration dispatchability

Historic additions and Retirements (GW)



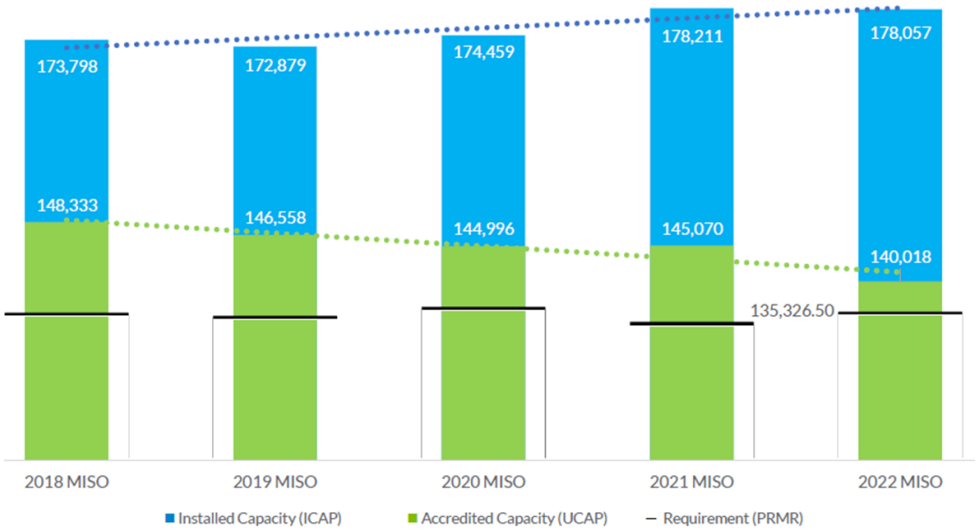
Queue Applications* by Generation Type (GW)



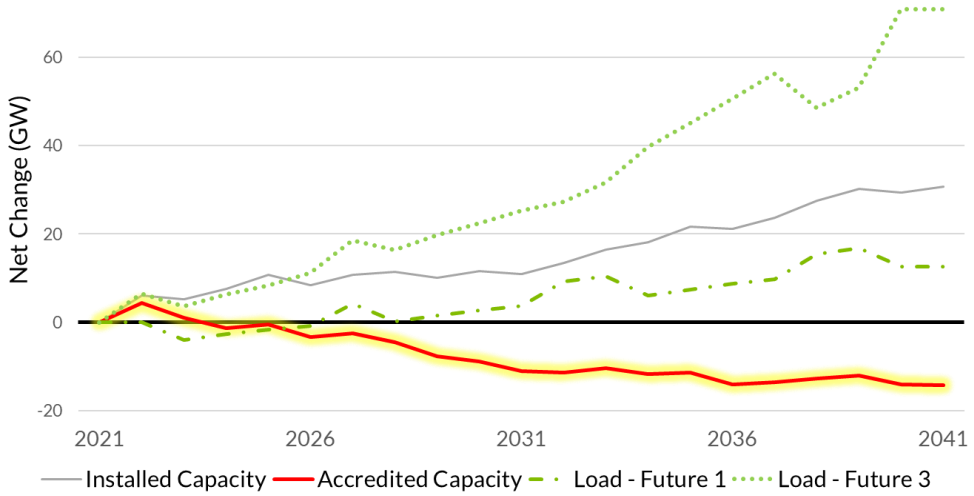
*Not all project applications will enter the active queue. Historically, 10% to 30% have been withdrawn/removed during the application review phase.

MISO's evolving fleet has resulted in a steady decrease in accredited capacity – a trend anticipated to continue in the future.

2018-2022:
Installed capacity:
Accredited capacity:
RA requirement:



2021-2041*:
Installed capacity:
Accredited capacity:



* Projected capacity change based on member-announced plans

Declining accredited capacity was evident in MISO's 2022 PRA which demonstrated capacity shortfalls resulting in prices up to CONE

MISO's North/Central sub-region

Capacity Shortage: 1200 MW

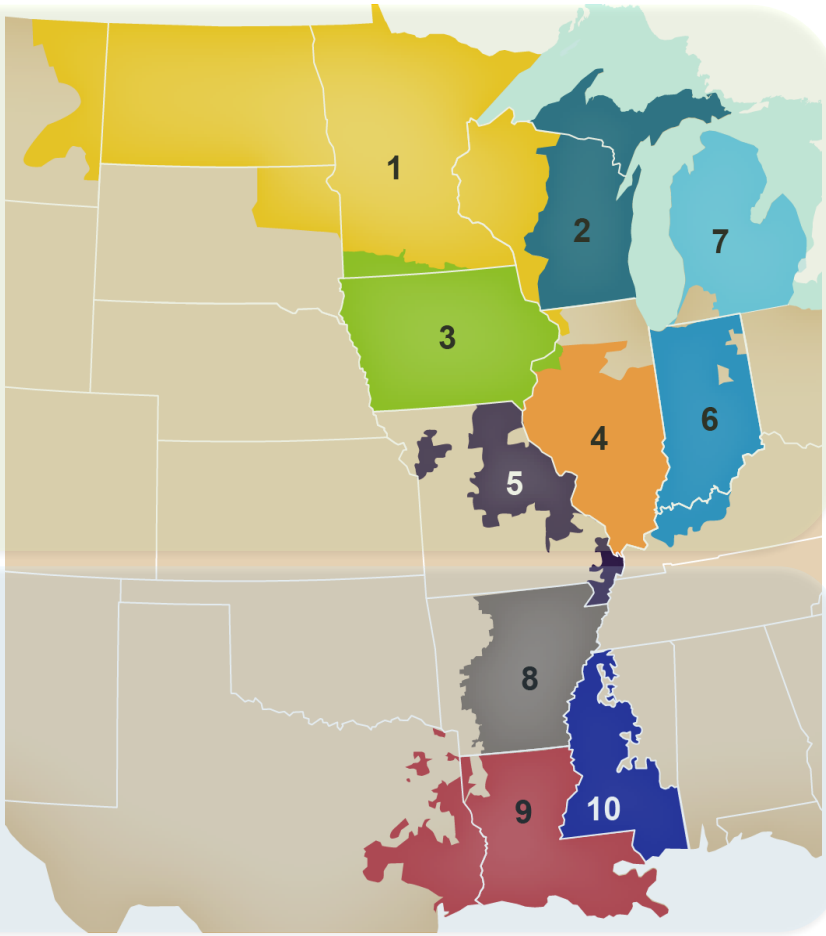
Auction clearing price: $236.66(CONE)

Load exposed to CONE: 8,000 MW

MISO's South sub-region

Capacity surplus: 2800 MW

Auction clearing price: $2.88



MISO footprint and its ten local resource zones

PRA: Planning Resource Auction
CONE: Cost of new entry

MISO has been working on several resource adequacy reforms, the first of which were approved by FERC in September 2022

Sub-annual construct

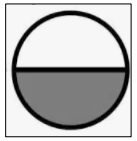
Approved

Change from traditional annual summer-based construct to four distinct seasons

Improved accreditation

Approved

Align resource accreditation with availability in the highest risk periods



Minimum capacity requirement

Rejected

Require at least 50% of capacity to be secured for each Load Serving Entity, prior to the Planning Resources Auction

These reforms revise planning requirements and resource accreditation, & help improve visibility into capacity sufficiency

	Annual Construct	Sub-annual Construct
Requirements	Annual RA requirements	4 distinct seasonal RA requirements
Accreditation	Conventional resources accredited annually based on a 3-year forced outage rate (UCAP)	Accredited based on resource's* availability during the highest risk periods of the season (SAC)
Planning Resource Auction	Annual Planning Resource Auction to meet annual resource adequacy requirements	Independent auctions for all seasons at one time to meet seasonal resource adequacy requirements

SAC = Seasonal Accredited Capacity RA: Resource Adequacy UCAP = Unforced Capacity

*Applies to thermal resources only

MISO continues to work with stakeholders on wind and solar accreditation enhancements and anticipates a FERC filing in 2023

Existing Approach for Wind

Class Level	Unit Level
Individual ELCC - average	Based on performance in peak hours

Existing Approach for Solar

Class Level	Unit Level
N/A	Based on performance in peak hours

Recommended Approach for Wind and Solar

Class Level	Unit Level
Probabilistic Method Portfolio ELCC or approximation – *Average vs. Marginal TBD*	**RA Hours Method** Based on performance during MISO's recent historical high-risk hours

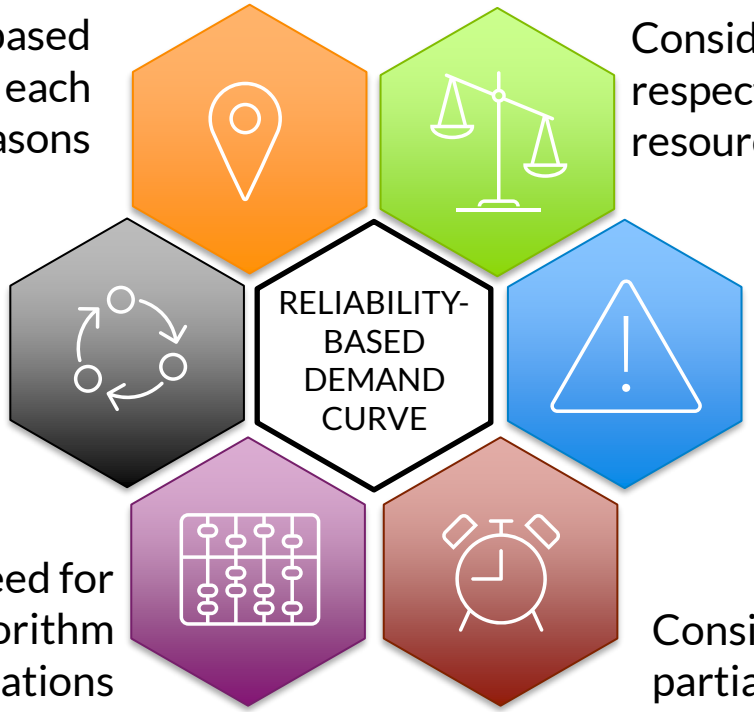
Approach for Thermal

Class Level	Unit Level
Unforced Capacity (UCAP)	RA Hours Method

MISO is considering reliability-based demand curve options to create market-based incentives for investment and retirement decisions

Consider reliability-based demand curves for each location and seasons

Consider FRAP-type provisions, to respect states' rights towards resource adequacy



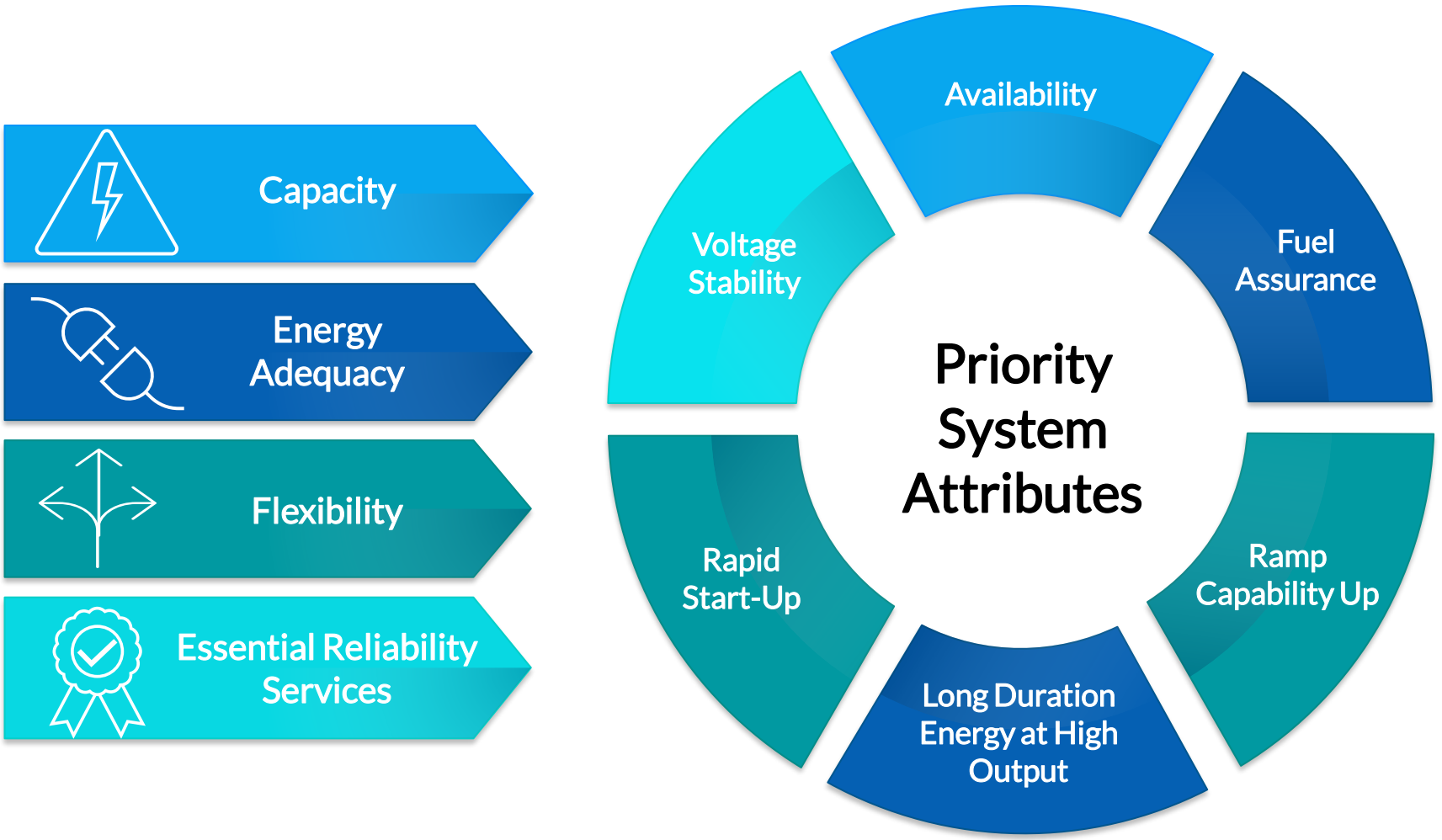
Address the method for estimating Net CONE

Develop methodology to derive the Marginal Reliability Impact to build the curve

Address the need for PRA algorithm modifications

Consider feasibility of partial year implementation

Maintaining reliability with the changing resource portfolio and evolving risks increases the importance of ensuring adequate resource attributes



Other efforts and developments addressing resource adequacy

Effort/Development	Impact
Improved resource accreditation	Aligns resource capabilities and accredited resource value with needs during the highest risk hours in each season
FERC unit retirement process reforms (Attachment Y)	Provides longer-term view and preparation
Regional Resource Assessment and OMS-MISO survey enhancements	Improves visibility on needs and gaps with both near- and longer-term view
Reliability Based Demand Curve	Provides mechanism to value capacity differently under surplus and deficiency situations.
Identify and quantify necessary resource attributes	Ensures reliability with rapid retirements of legacy resources and a future with significant renewable resources and emerging technologies
Long Range Transmission Planning Tranche 1 approval	Enables lower interconnection costs and facilitates Member plans

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