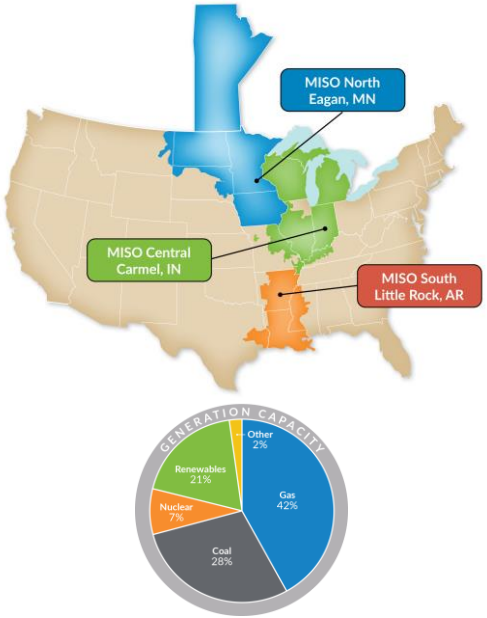
Resource Adequacy Evolution & Probabilistic Modeling

ESIG Spring Technical Workshop

March 26, 2024

Tucson, AZ

MISO drives value creation through reliable and efficient markets, operations, and planning



MISO VALUE PROPOSITION

$4 billion

Annual Value in 2022
to the MISO Region

$40 billion

Total Value Over Time
to the MISO Region

12:1

Benefit to Cost Ratio

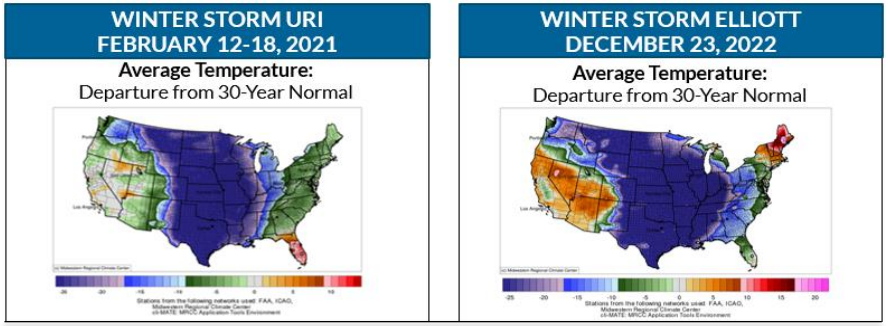
MISO manages the flow of high voltage electricity across 15 US states and the Canadian province of Manitoba through improved system management, more efficient use of existing assets, and reduced need for additional assets.

The Value Proposition measures this effort.

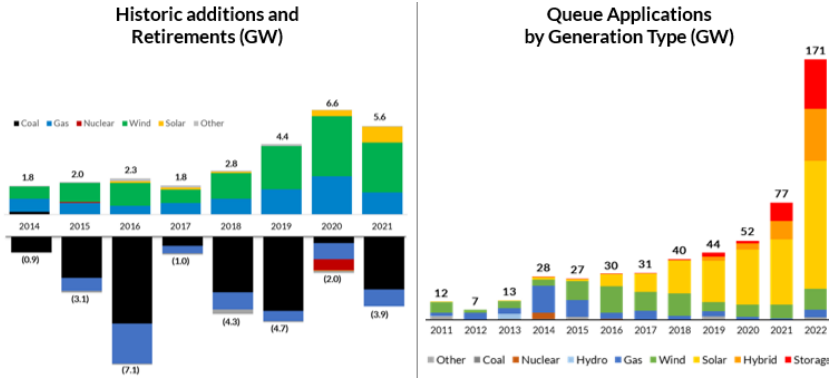
MISO by the numbers
15 states, 45 million customers
$40 billion energy market
Peak demand: 127.1 GW
Generation capacity: 187 GW
75,000 miles of transmission lines
190 members, 500+ market participants

MISO is entering into a different operating & risk paradigm with increasing extreme weather events and transition to renewables

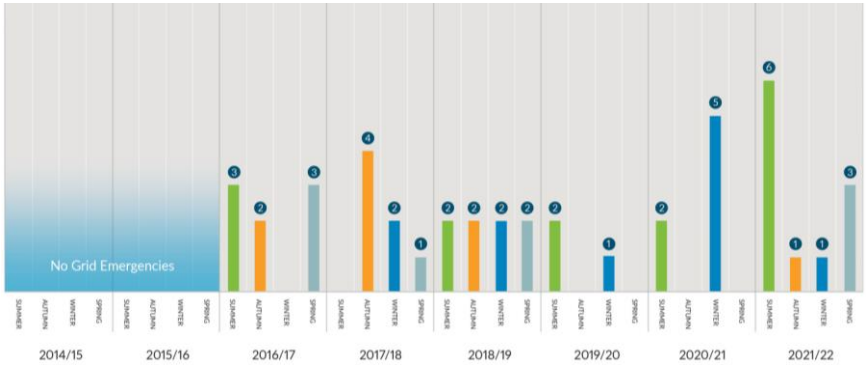
Extreme Weather events



Fleet transition



Non-summer, frequent emergencies

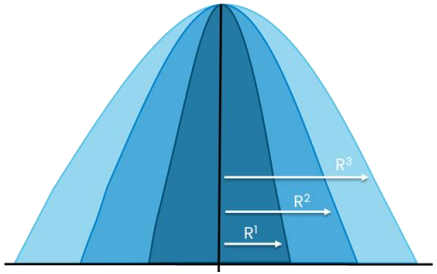


Resource adequacy continues to be based on traditional reliability criterion…

RELIABILITY CRITERION =

METRIC

Summarizes representation of risk into a single statistic



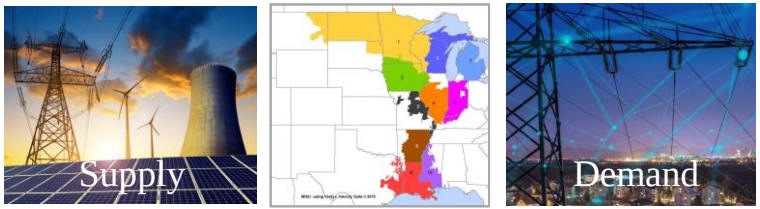
[value]

…such as LOLE

-and-

TARGET

Balance between acceptable risk and investment decisions



…such as 1 day in 10 years

…which is foundational to key components of resource adequacy

Requirements

What is needed for reliability

Measures
- Seasonal Planning Reserve Margin Requirements
- Local Reliability Requirement
- Local Clearing Requirement

Probabilistic modeling need
- LOLE study to establish MW needed to ensure no load shed more than one day in 10 years

Accreditation

How resources are counted

Measures
- Availability during historical risk periods
- Availability during modeled risk periods*

Probabilistic modeling need
- ELCC study to assess reliability contribution from wind
- LOLE study to establish critical hours used to set accreditation for all resources*#

Pricing

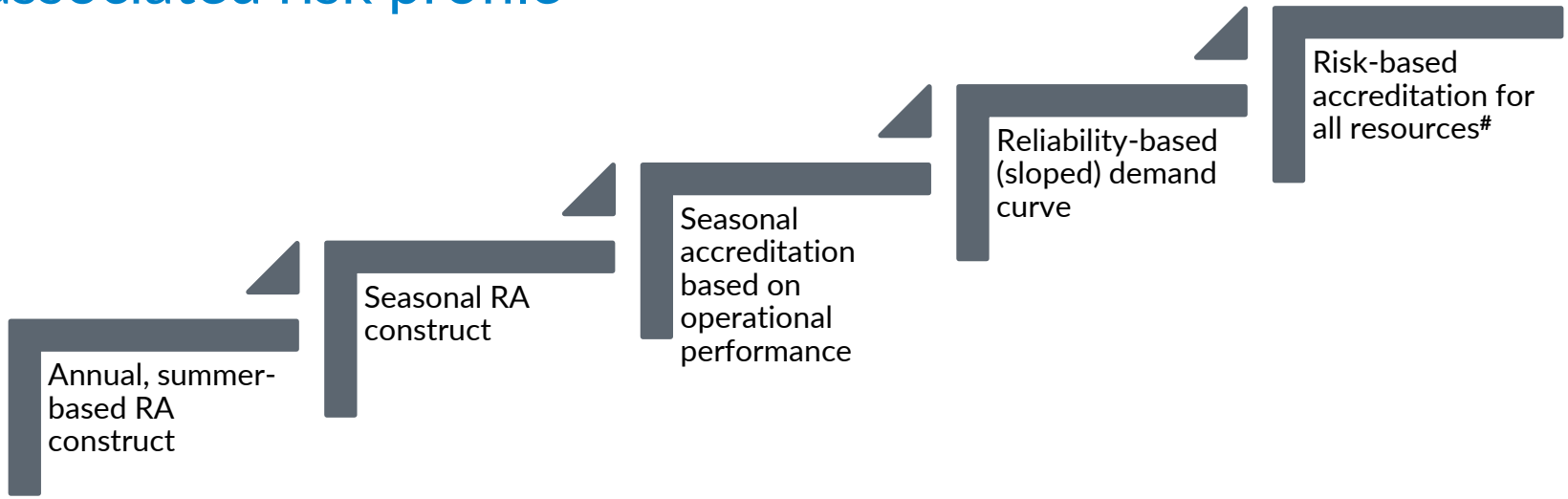
What is the price of capacity

Measures
- Supply offers
- Demand curve*
- Planning Resource Auction (PRA)

Probabilistic modeling need
- LOLE study to establish reliability-based demand curves for use in the PRA*

* Proposed, based on ongoing/future reforms, yet to be implemented
# All resources, except for Load Modifying Resources

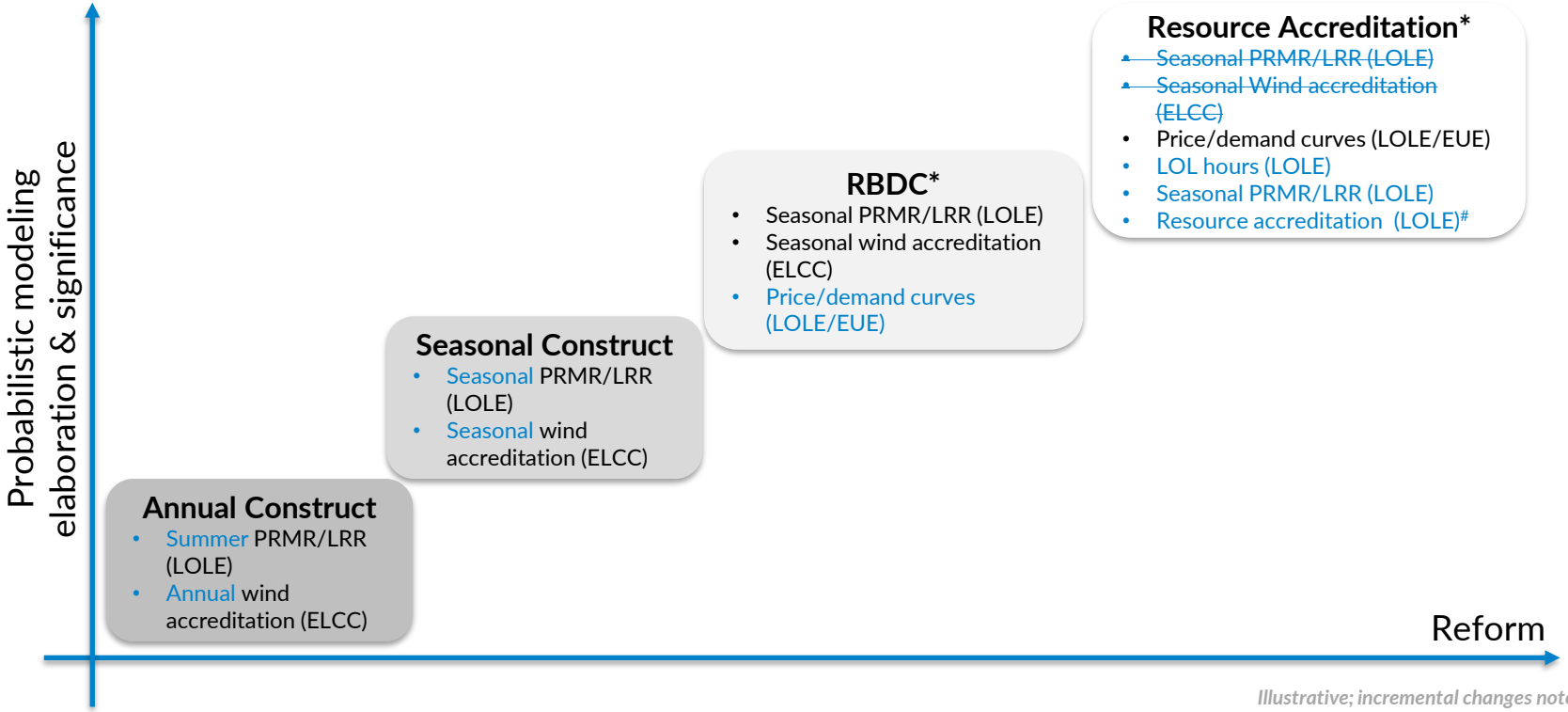
MISO continues to evolve its resource adequacy construct to meet the needs of the changing operating paradigm and associated risk profile



Historic construct 2011 - 2022	Filed: Nov 2021 Implemented: 2023	Filed: Nov 2021 Implemented: 2023	Filed: Sep 2023 Target Implementation: 2025	Target Filing: Q2 2024 Target Implementation: 2028

All resources, except for Load Modifying Resources

Each reform encourages increased elaboration and lends greater significance to MISO's probabilistic model



Illustrative; incremental changes noted in blue

RBDC – Reliability-based demand curve

* Proposed, based on ongoing/future reforms, yet to be implemented

All resources, except for Load Modifying Resources

In tandem with the evolving RA construct, MISO continues to enhance its probabilistic model

Recent enhancements

- Cold-weather outage adder
- Planned outages
- Seasonal outage rates

Near-term focus

- Correlated events
- Planned outages
- Load forecasting
- Storage modeling
- Demand-side validation

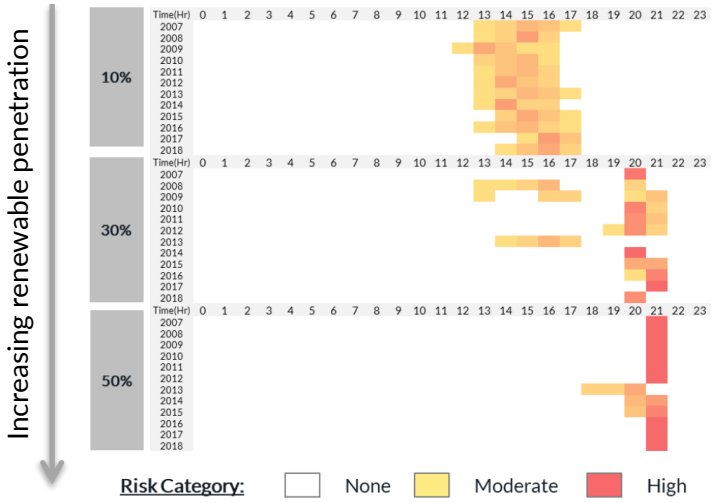
Long-term focus

- Transmission Modeling
- External assistance
- Exploring Economics

What are the considerations for using a criteria other than LOLE in MISO's resource adequacy construct?

Driver

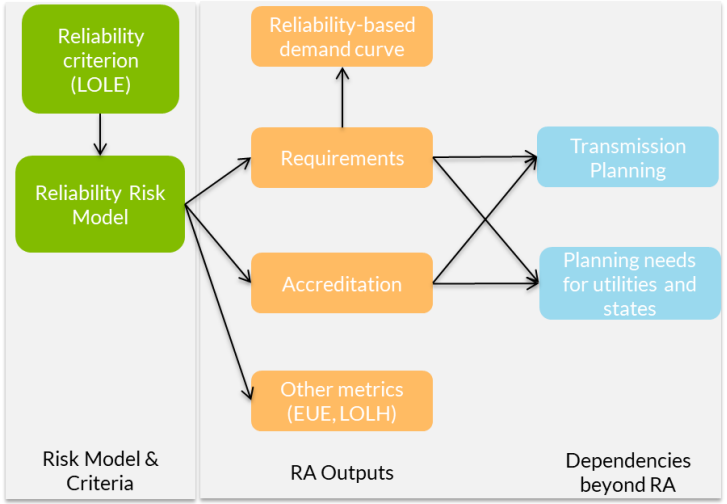
Future portfolios with increasing renewable generation and similar LOLE targets are shown to have very different EUE and LOLH.



Varying EUE/LOLH for similar LOLE with increasing renewable penetration

Tradeoff

Updating the reliability criterion will have a direct impact on many downstream processes.



Risk model dependencies

Many questions, many potential answers…

- What should the new criteria be (metric and target) in the future?
- What is the appropriate timeline?
- What is the impact on ongoing RA reforms and other MISO processes?
- What is the impact to stakeholders and their planning efforts?
- How would a change align with regulatory requirements and obligations?
- What are the benefits and tradeoffs of updating MISO's resource adequacy criterion?
- ….
- ….

It depends…

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