

2022 PRE-SYMPOSIUM SESSIONS
WEDNESDAY, MARCH 2, 2022
BREAKOUT B

TEA
2022 ENERGY
SYMPOSIUM
THE FUTURE IS NOW

A VIEW FROM ORGANIZED MARKETS RTO PANEL DISCUSSION

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The MISO Region's Reliability Imperative

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Geographically, MISO is the largest regional transmission and independent system operator in North America

KEY FACTS ABOUT MISO
15 states + Manitoba
42 million customers
\$22 billion market
> 6,700 generation units with 184,000 MW capacity
65,800 miles of high voltage transmission lines
> 180 member utilities
> 470 market participants

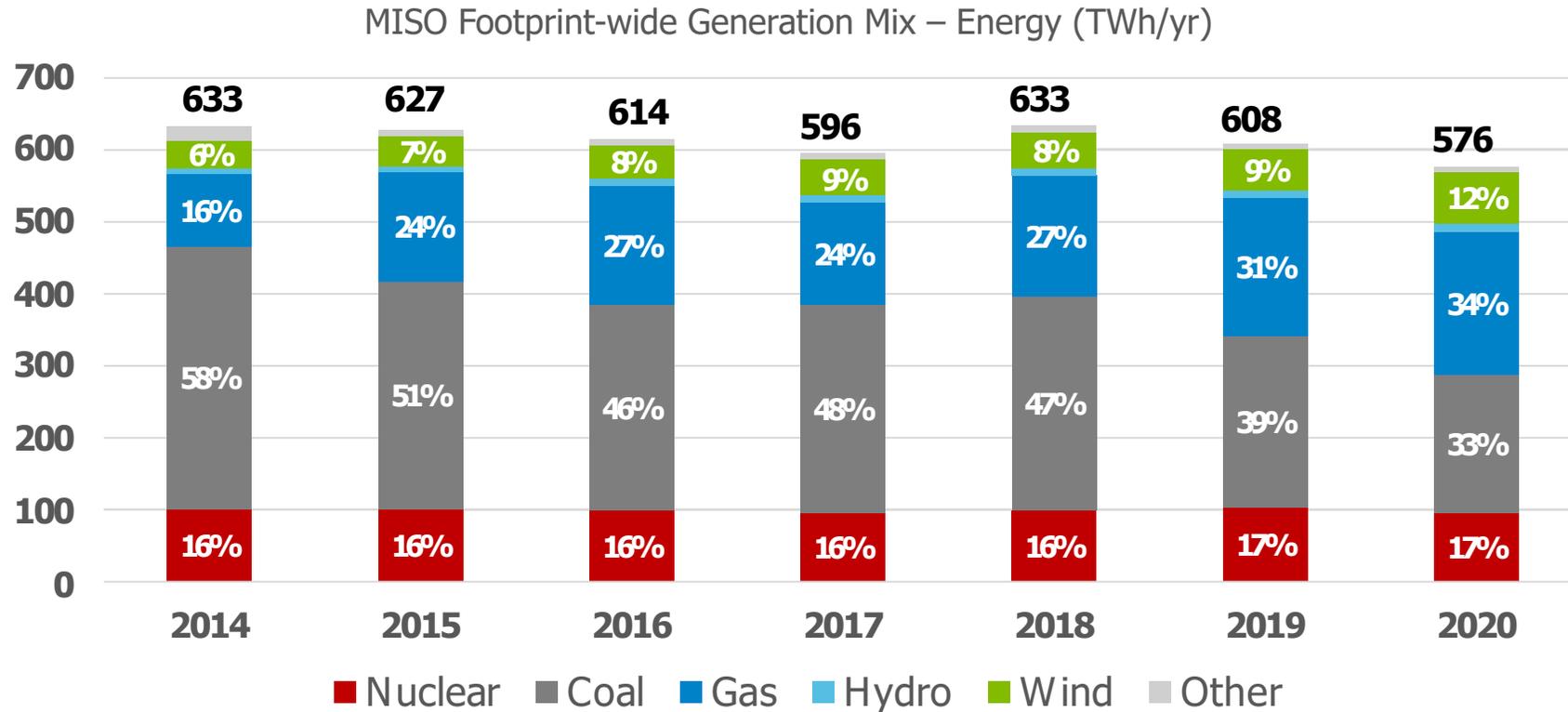


As of 01/2021

MISO's role is concentrated in a few key areas

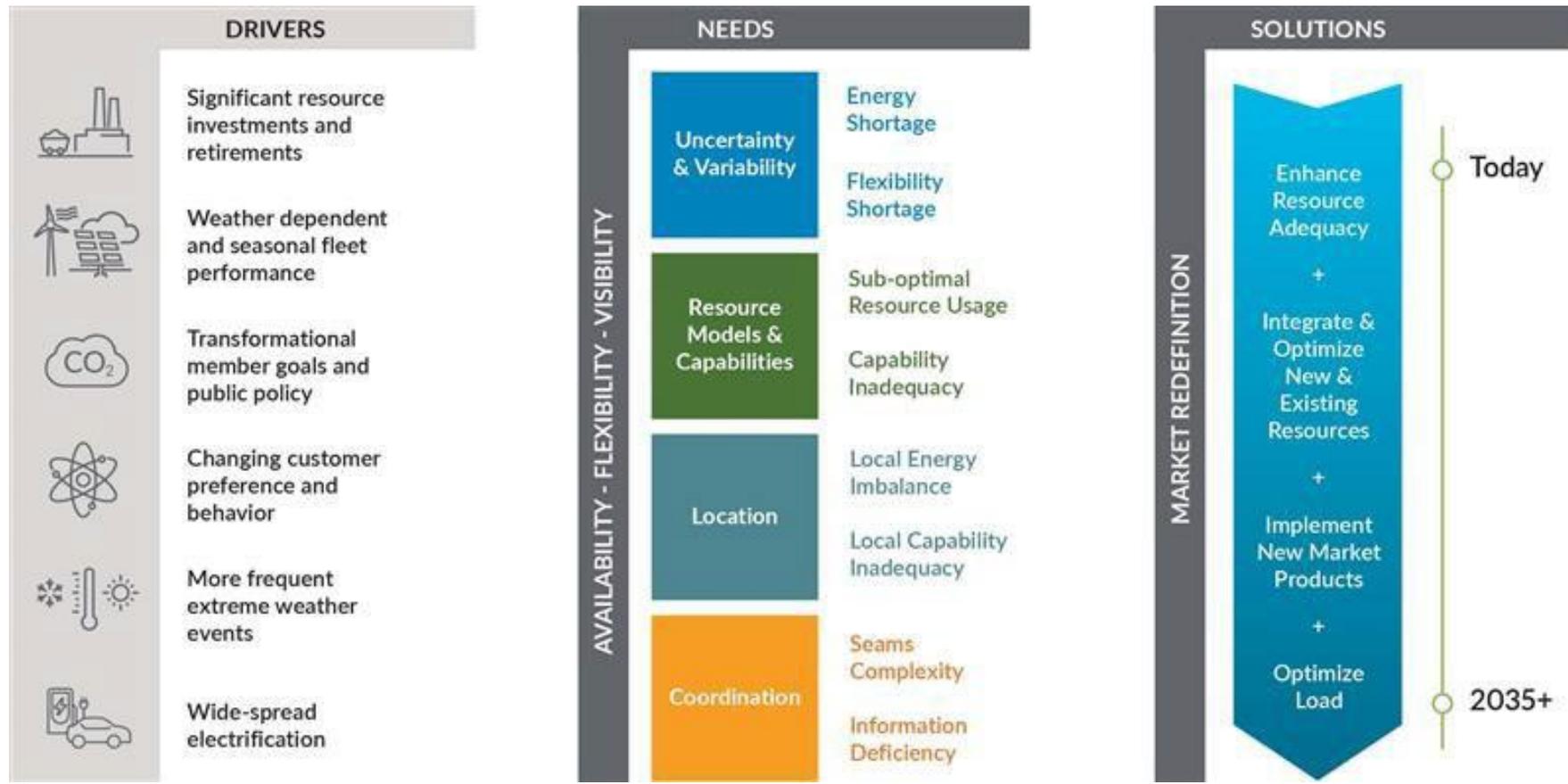
What We Do	Implications
Provide independent transmission system access	<ul style="list-style-type: none">• Equal and non-discriminatory access• Compliance with FERC requirements• Eliminate transmission rate pancaking
Deliver improved reliability coordination through efficient market operations	<ul style="list-style-type: none">• Improved regional coordination• Enhanced system reliability• Independent lowest cost unit commitment, dispatch, and congestion management
Coordinate regional planning	<ul style="list-style-type: none">• Integrated system planning• Broader incorporation of renewables• Balance transmission and generation tradeoffs
Provide platform for wholesale energy markets	<ul style="list-style-type: none">• Encourage prudent infrastructure investments• Facilitation of regulatory initiatives• Market price/value discovery

MISO, like the industry, is facing a massive shift in its resource fleet

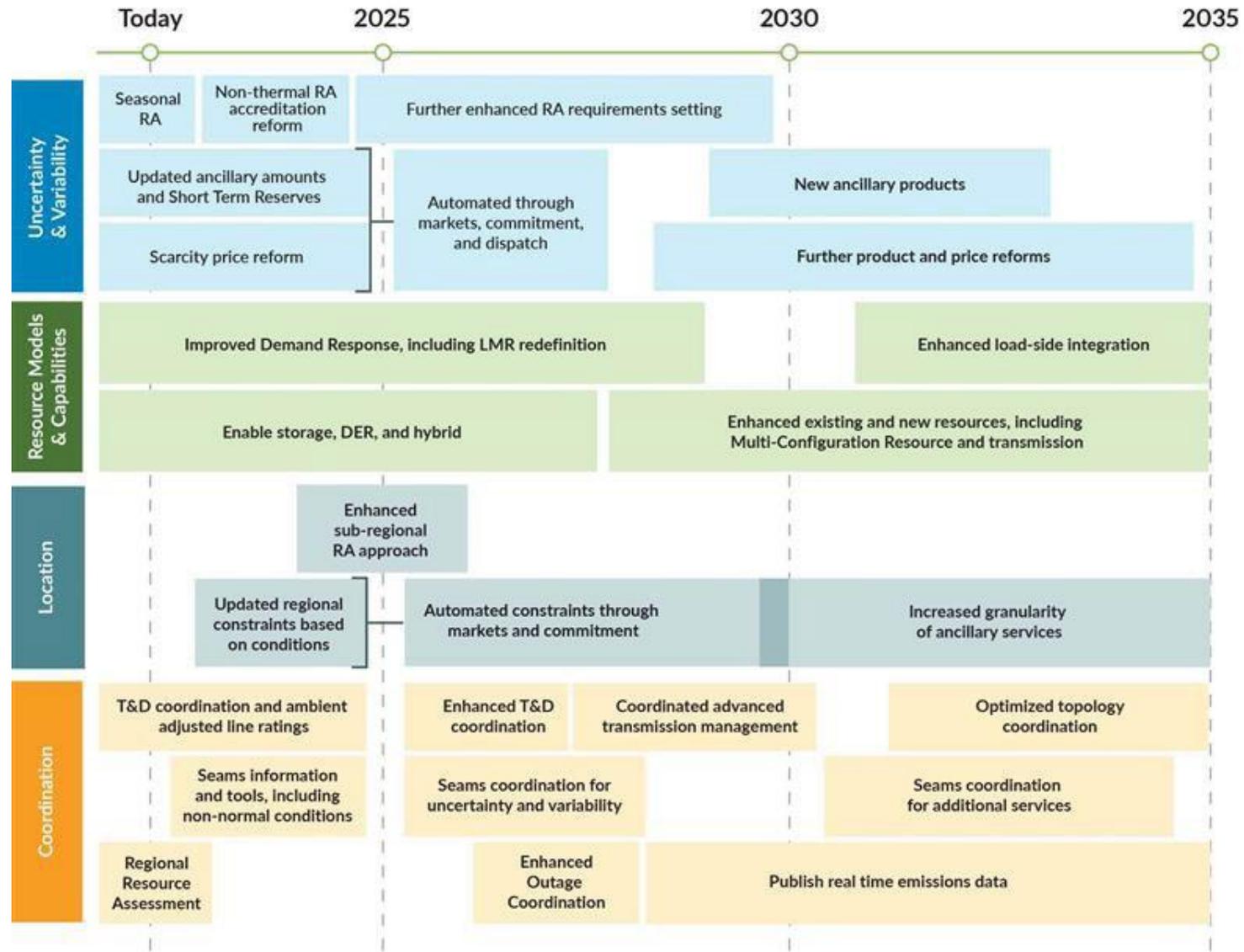


Sources: [Historical Generation Fuel Mix \(xls\)](#); [Historical Generation Fuel Mix \(xlsx\)](#)

The MISO Region's needs are evolving due to fleet change, more frequent and severe extreme weather events, and other drivers



To meet these evolving needs, MISO has developed a comprehensive market redefinition plan



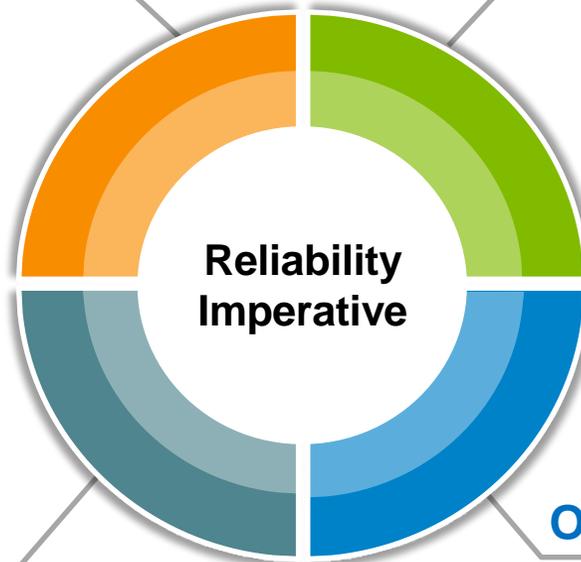
Market Redefinition is just one part of MISO's comprehensive response to the regional Reliability Imperative

Market Redefinition

Aims to ensure that resources with needed capabilities and attributes will be available in the highest risk periods across the year

Long Range Transmission Planning (LRTP)

Assesses future transmission needs holistically, reflecting utility and state plans for new generation; will also consider potential cost-allocation changes



Market System Enhancements (MSE)

Transforms MISO's legacy system platform into a flexible, upgradeable, and secure system that can evolve for years to come; will also integrate advanced technologies to process increasingly complex information

Operations of the Future

Focuses on the skills, processes, and technologies needed to ensure MISO Operations can effectively manage the grid into the future under increased complexity

In the first half of 2022 MISO will be moving forward on a variety of issues supporting the Reliability Imperative

Accreditation for renewables, hybrids, and storage

Seasonal construct and conventional accreditation

First tranche of Long-Range Transmission Planning projects

Energy storage resource participation and Distributed Energy Resources filings

Ambient adjusted line ratings

Energy Management System and Market Clearing Engine upgrades



California ISO



WESTERN EIM

CAISO/Western EIM 2022 Market Initiatives

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2022 TEA Energy Symposium

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California ISO

Within its balancing authority area, the California ISO:

- Maintains reliability on the grid
- Manages the flow of energy
- Oversees the transmission planning process
- Operates the wholesale electric market

For much of the western U.S., the ISO:

- Operates the Western Energy Imbalance Market (WEIM)
- Serves as Reliability Coordinator (RC West)



California ISO balancing authority

The ISO manages the flow of electricity across high-voltage transmission lines for 80 percent of California, and a part of Nevada.

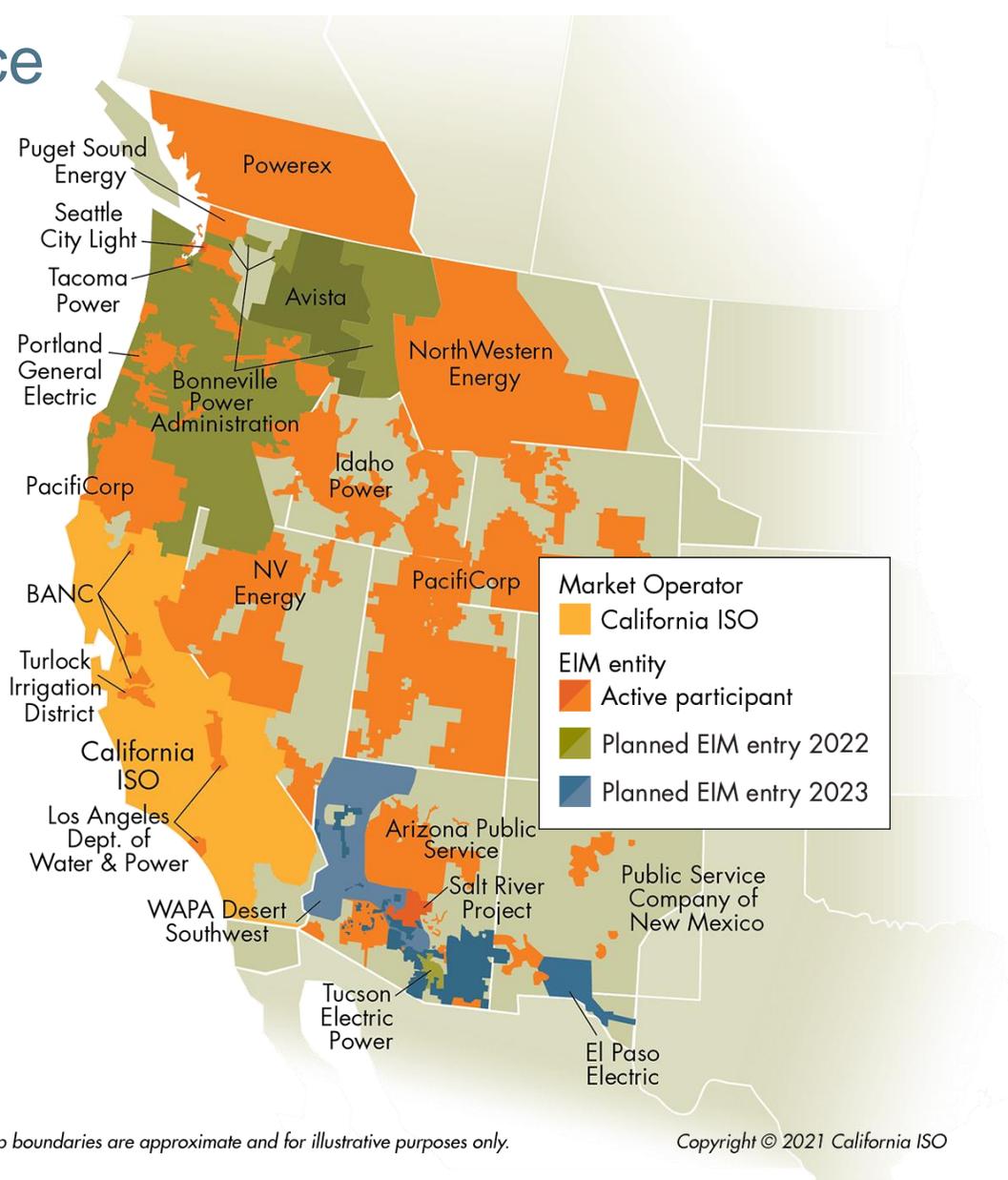
The lines deliver energy to investor-owned and public utilities, and community choice aggregators.



Western Energy Imbalance Market (WEIM)

Since its launch in 2014, the Western EIM has enhanced grid reliability, generated millions of dollars in benefits for participants, and improved the integration of renewable energy resources.

- Gross benefits exceeding \$1 billion
- Reduced over half a million metric tons of CO₂



Map boundaries are approximate and for illustrative purposes only.

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Primary drivers of proposed 2022 three-year policy roadmap

- **Increased resource and load variability** - enhance the day-ahead market and extend to WEIM entities to leverage regional diversity and provide west-wide benefits
- **Increasing amounts of storage resources** - enhance CAISO markets to efficiently dispatch storage resources in alignment with operational needs
- **Economic and reliability benefits of greater integration of Western markets** – extend the day-ahead market across a larger footprint and openly and optimally manage access to available transmission

Extended Day-Ahead Market initiative is exploring expanded day-ahead market participation to provide regional benefits

- EDAM will improve market efficiency and more effectively integrate renewable resources by
 - Optimizing day-ahead unit commitment
 - Producing hourly energy transfer schedules
 - Capture resource diversity benefits and improve transmission utilization across a larger footprint
- This year's roadmap reflects the high-priority the CAISO is giving to enabling participating in EDAM by 2024

Day-Ahead Market Enhancements initiative addresses challenges of the transforming grid

- Efficiently schedule supply to address net load uncertainty and real-time ramping needs
 - Improve market efficiency and price signals by co-optimizing imbalance reserves with energy and ancillary services
 - Enhance RUC process to also schedule downward capacity
- Reduce out-of-market actions
- Plays an important role in setting up the foundation for EDAM

Price Formation Enhancements initiative will improve pricing provisions for efficient market pricing during tight supply conditions

- Explore scarcity pricing mechanisms to ensure prices incentivize accurate scheduling and bidding that aligns with operational needs
 - Provide strong incentives for resources including storage to align with operational needs
- Explore fast-start pricing
- Explore advisory market interval pricing issues related to storage dispatch and pricing

Transmission Services and Market Scheduling Priorities initiative is developing a process forward process to release available CAISO transmission for use by non-CAISO entities

- Considers a holistic, long-term, process for wheel-through transactions to obtain high-priority scheduling rights
- Recognizes the need for, and dependence on, wheeling through CAISO's system to serve external load
- Also considering near-term enhancements to scheduling priority processes

Energy Storage Enhancements initiative is developing enhancements to efficiently dispatch storage resources in alignment with operational needs

- Improvements to the existing storage model
- New model for state of charge
- Storage exceptional dispatch provisions to ensure reliable system operations
- Enhancements to the co-located resource model
- Storage dispatch and compensation related topics are also planned to be addressed in the Price Formation initiative

Interconnection Process Enhancements initiative will address a number of issues related to enhancing the Generator Interconnection and Deliverability Allocation Procedures

- Enhancements to incrementally improve the efficacy of the existing processes
- Enhancements to address queue overload
- Broader process reform considerations focusing on aligning the procurement processes