



NCSL – Electricity Markets and State Challenges

June 27, 2018

MISO Overview

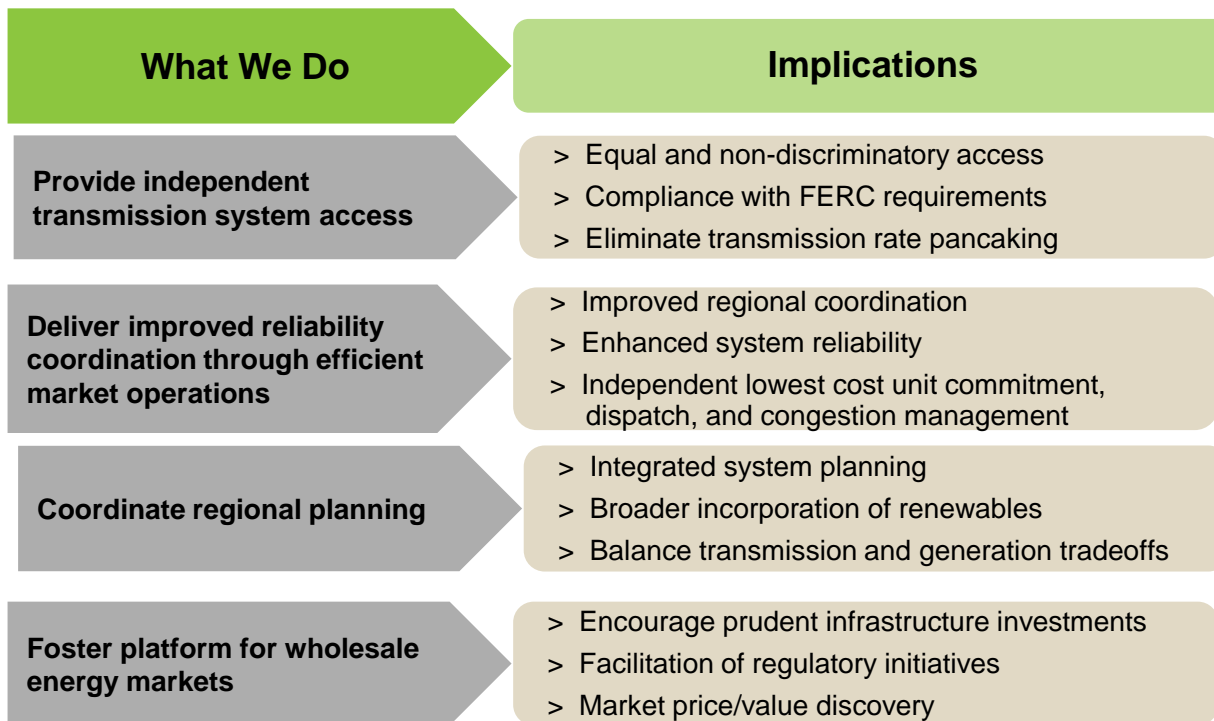


MISO by-the-numbers

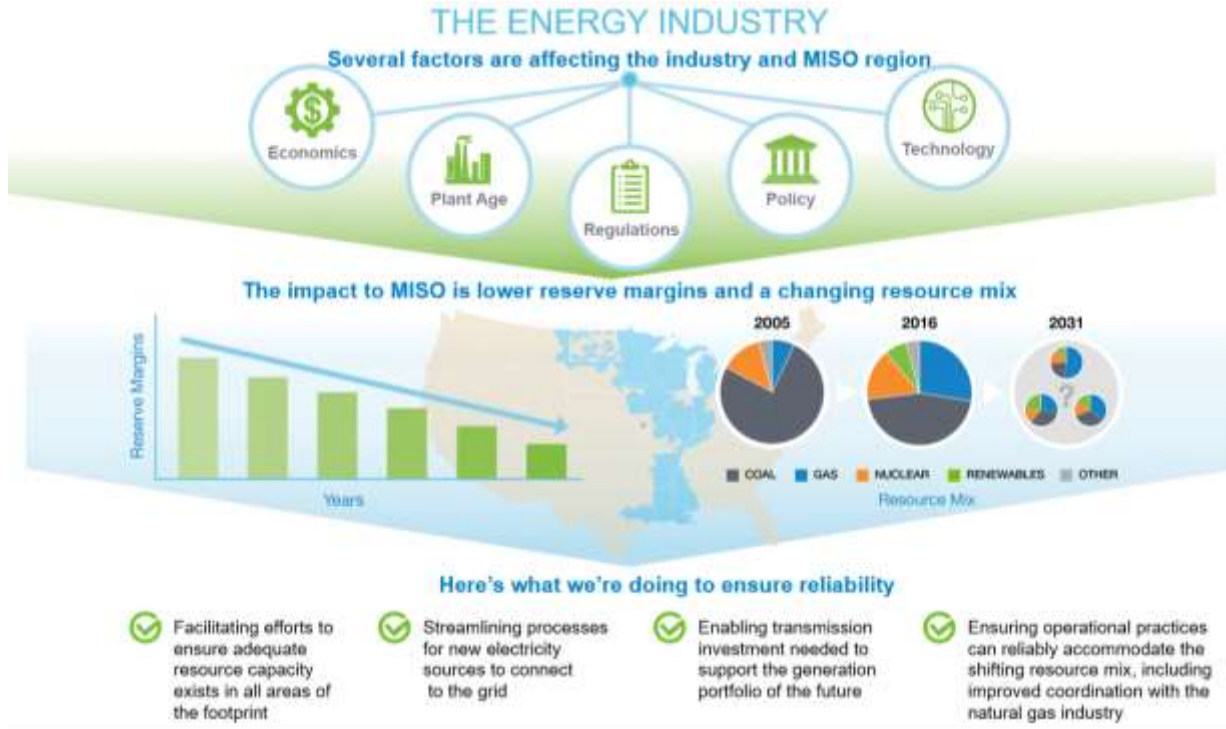
High Voltage Transmission	65,853 miles
Installed Generation	177,388 MW
Installed Generation	1,594 Units
Peak System Demand	127,125 MW

- MISO is an independent, non-profit organization in 15 U.S. States and one Canadian province, including:
 - Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Manitoba, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, Texas, South Dakota, and Wisconsin

MISO's Role Focuses in Key Areas

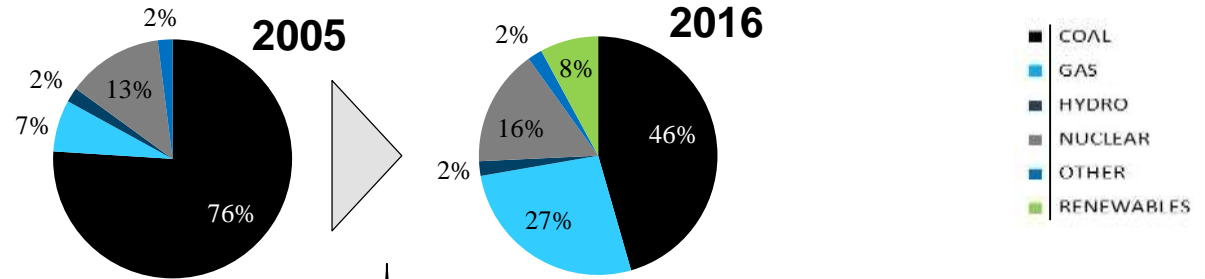


Response to the Changing Energy Landscape

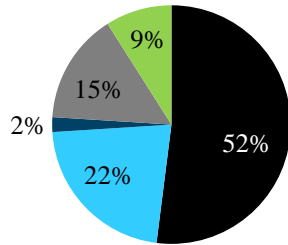


Significant Growth in Renewable and Gas-Fired Generation

MISO Generation Portfolio Evolution



2031 Future Scenarios



Existing Fleet

No carbon regulations modeled but some reductions expected due to RPS and economics.

Policy Regulation

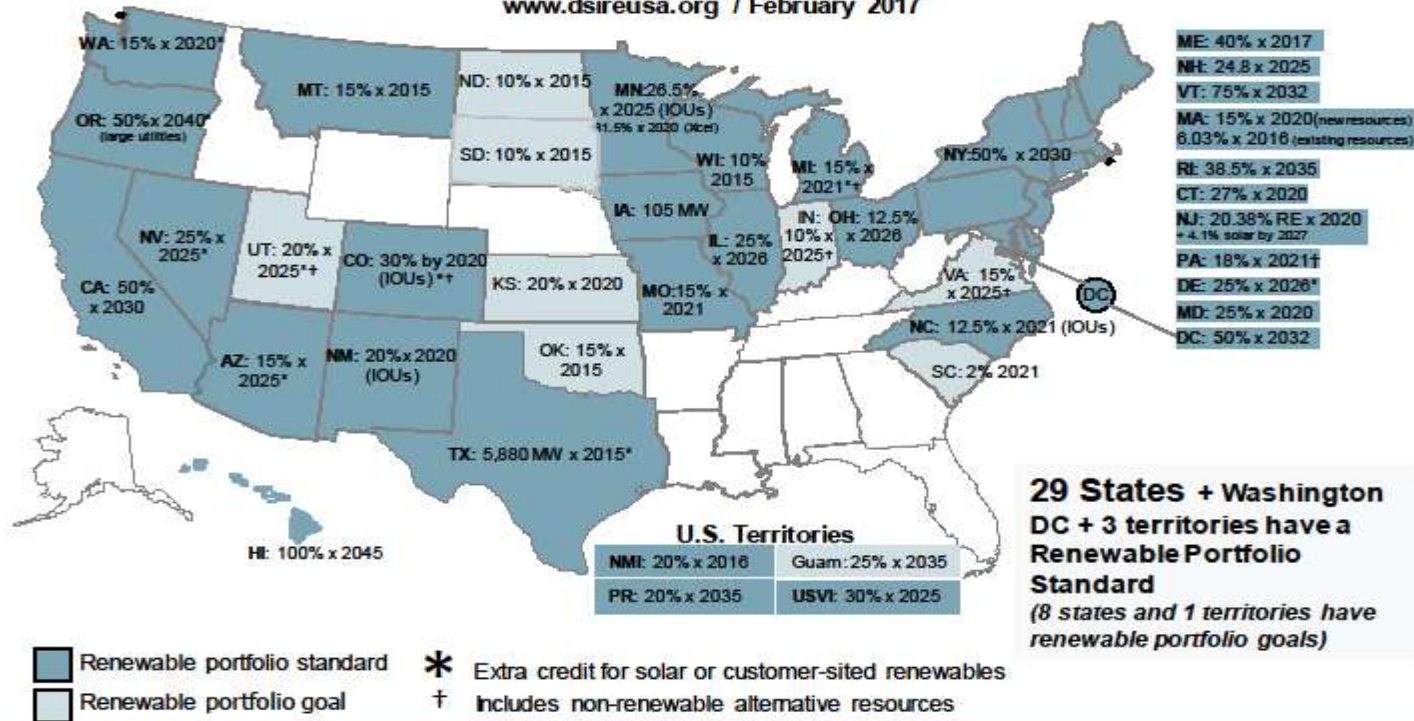
Carbon regulations targeting a 25% reduction across all aggregated unit outputs are enacted.

Accelerated Technology

Increase in carbon emissions results in carbon regulations targeting a 35% reduction across all aggregated unit outputs are enacted.

Renewable Portfolio Standard Policies

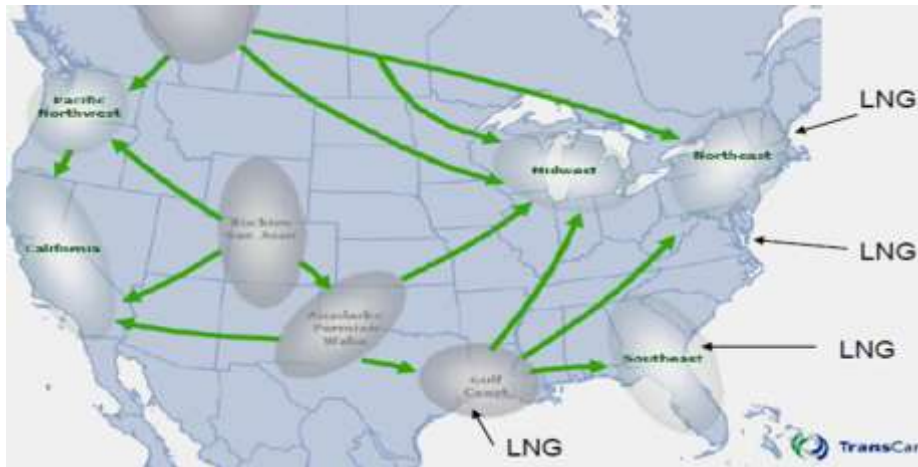
www.dsireusa.org / February 2017



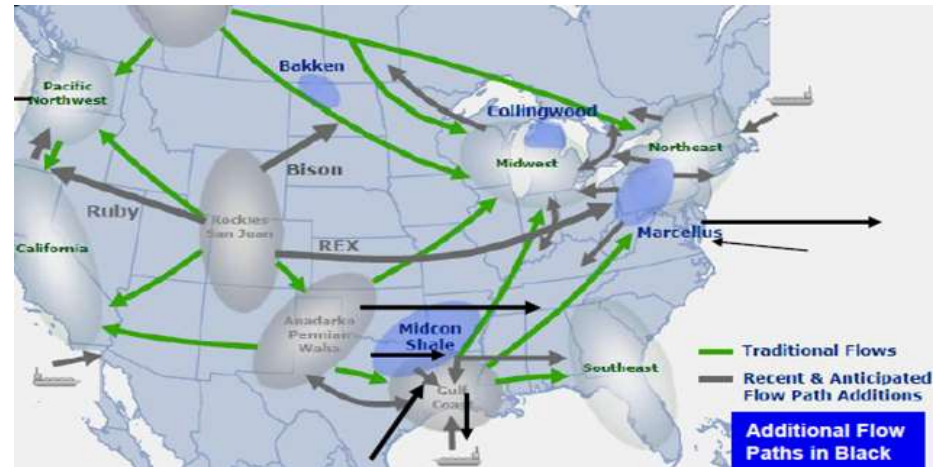
Gas flows are shifting due to shale gas, calling for gas/electric coordination

- Increased flows to MISO from Marcellus/Utica on new-build pipelines and pipeline reversals are improving MISO supply diversity
- U.S. gas production from non-traditional supply regions continues to be favorable, causing flatter prices

Historic Flow Patterns and LNG Imports



Developing "Grid" Flow Patterns & LNG Exports

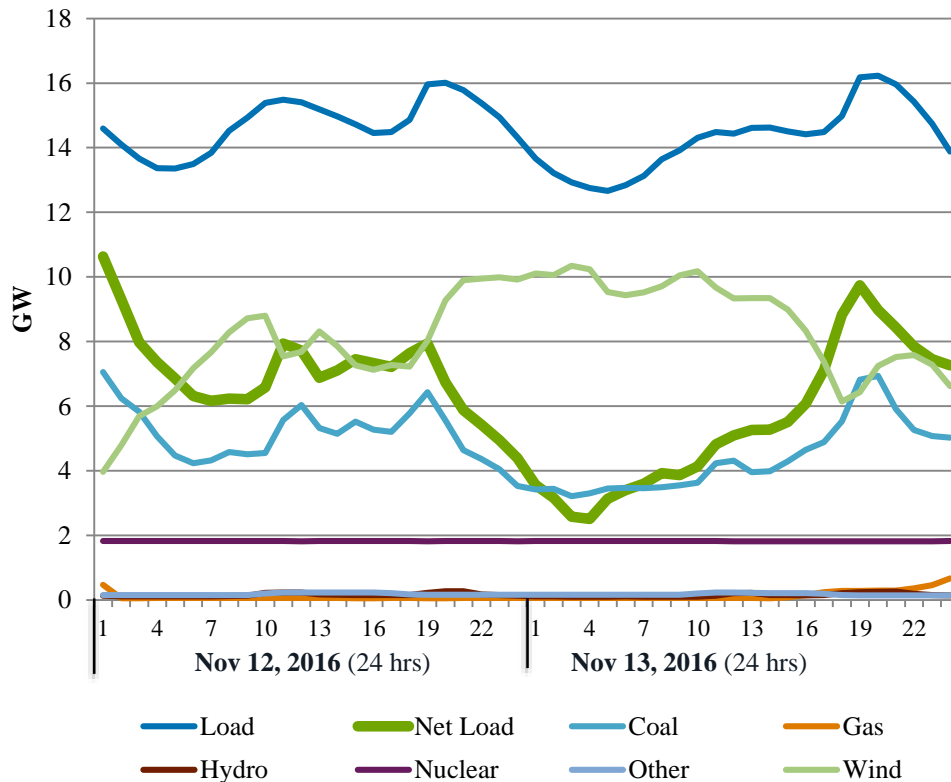


MISO is already experiencing high wind levels

	MISO Total	MISO North*
2016 wind % of annual energy	8%	27%
2016 hourly wind peak (Dec. 7th 11pm)	13.6 GW	11.6 GW
2016 maximum wind as a % of load (Nov. 13th 4 am)	22%	80%

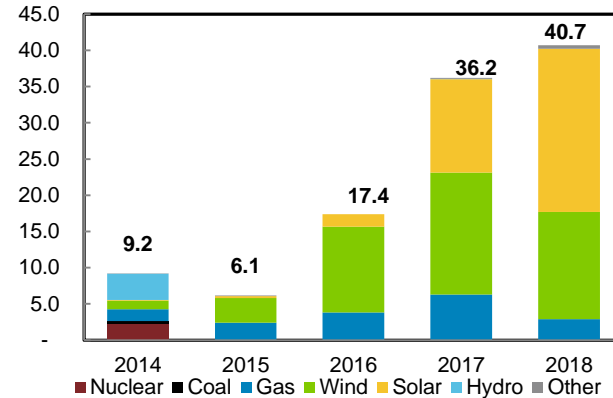
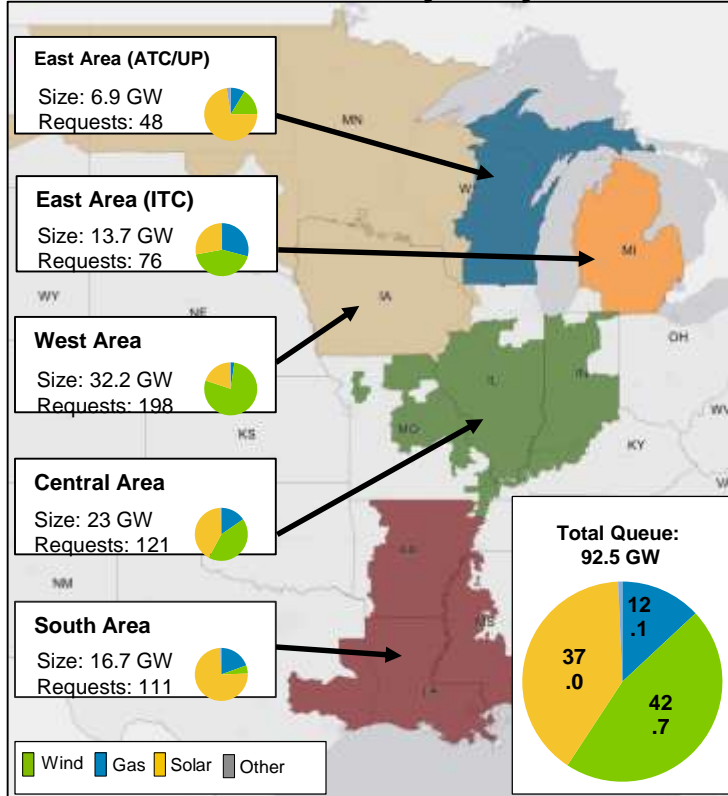
*MISO North has roughly the same annual energy as ISO New England

MISO North Maximum Wind as % of Load



Generator Interconnection

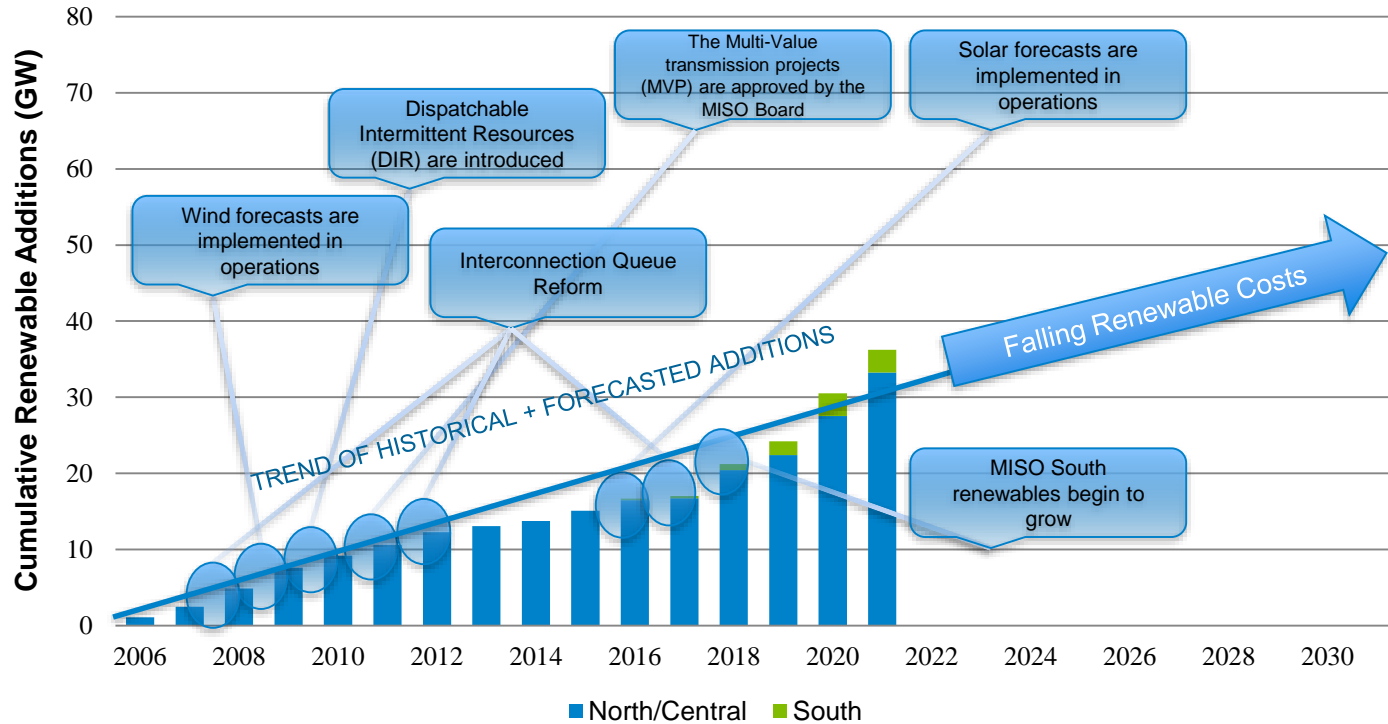
MISO Active Queue by Study Area



Notes:

- The current generator interconnection queue consists of 554 projects totaling 92.5 GW
- The queue size grew by 239 projects and 40.7 GW of projects in 2018
- Detailed queue cycle information can be found on [MISO's website](#)

Renewable Energy Is Growing; When Could It Impact The Grid?

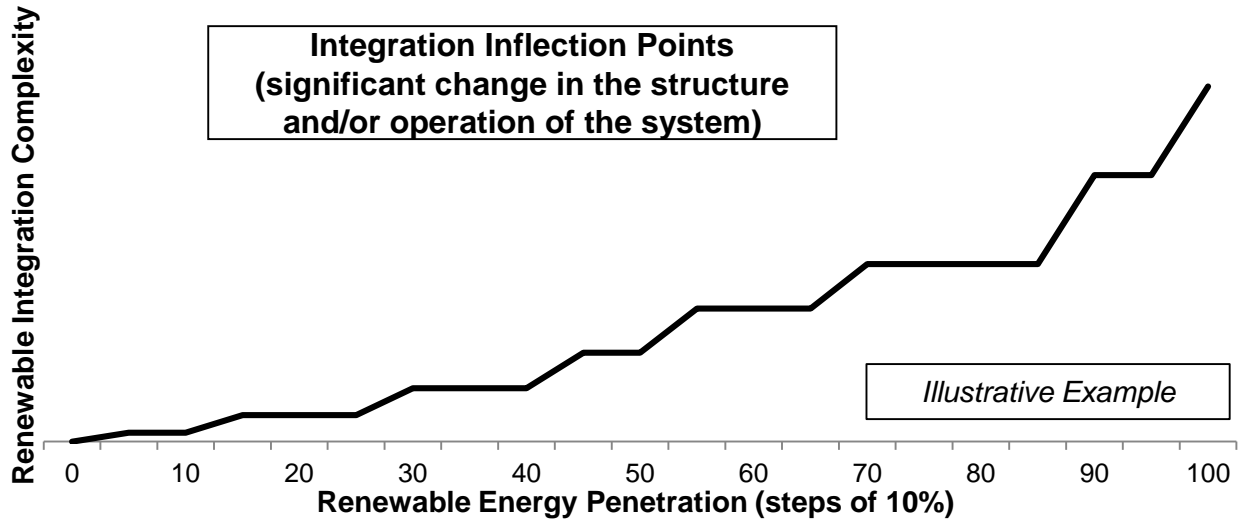


Renewable Integration Impact Assessment

- Goal = To better understand the impacts of renewable energy growth in MISO over the long term
- Provide technically rigorous, concrete examples of integration issues and examine potential solutions to mitigate them
- Inform areas of focus and the sequencing of actions required as penetration increases
- Facilitate a broader conversation about renewable energy-driven impacts of fleet change on the reliability of the electric system

Identify “Inflection Points” and Complexity

Study Focus Areas:



Inflection Point Focus Areas:

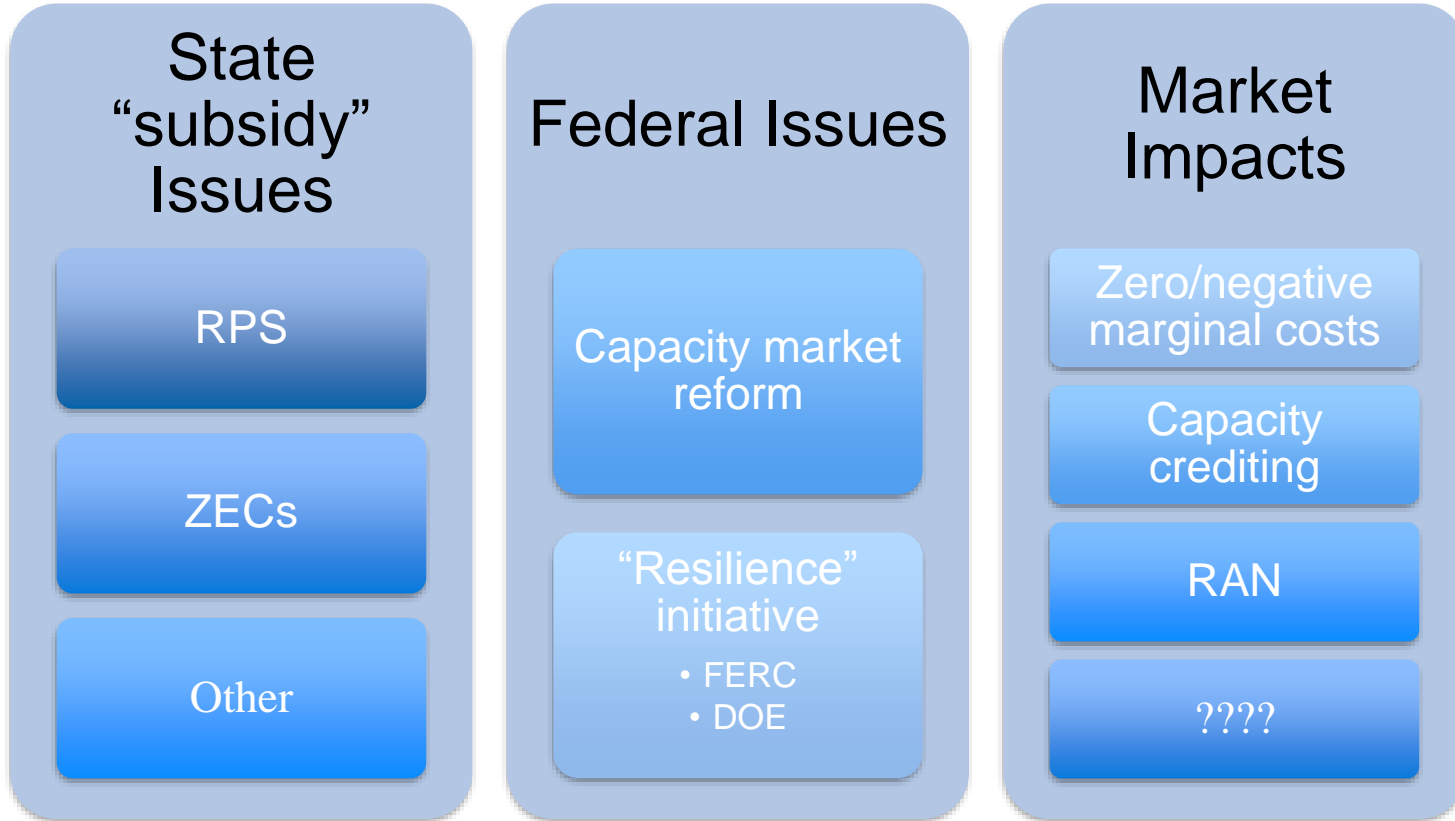
Operational

Steady State

System Stability

Resource Adequacy

State/Federal Developments Affecting Markets





Questions?

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