



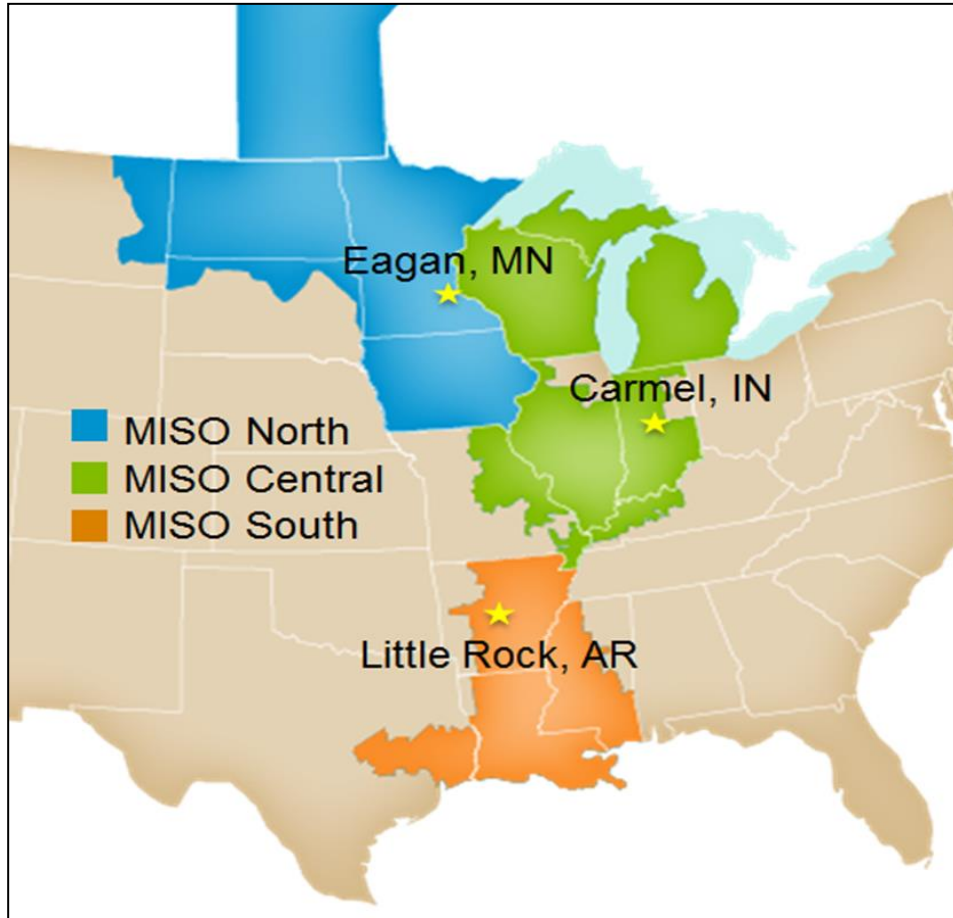
# Managing the Evolving Portfolio in the MISO Region

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Midwestern Governors Association Webinar  
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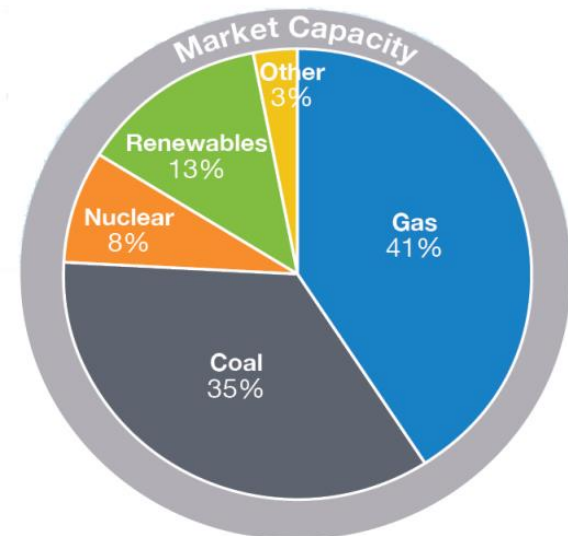
# MISO drives value creation through efficient and reliable markets, operations, planning, and innovation

## The most reliable, value-creating RTO

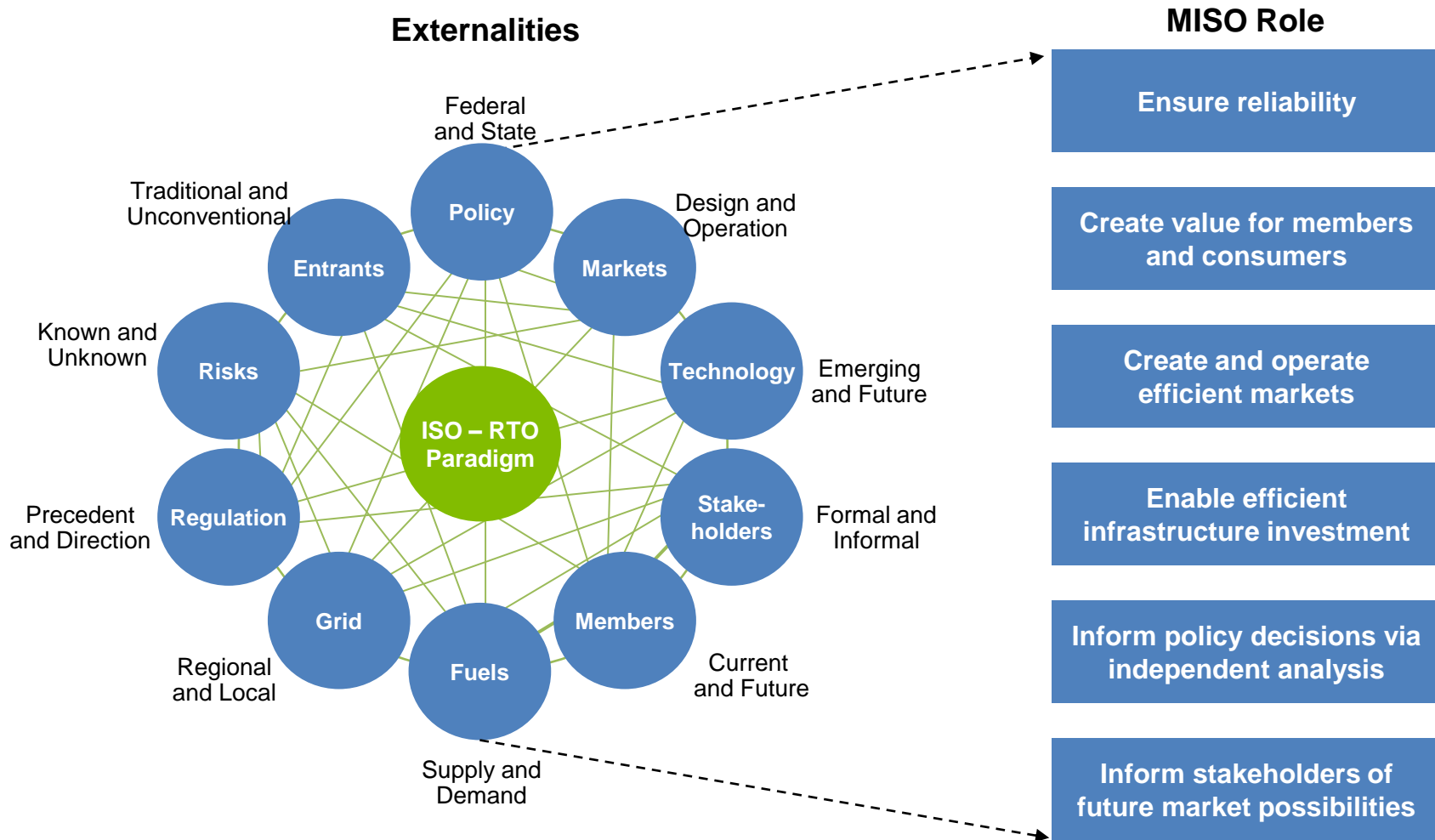


### MISO by-the-numbers

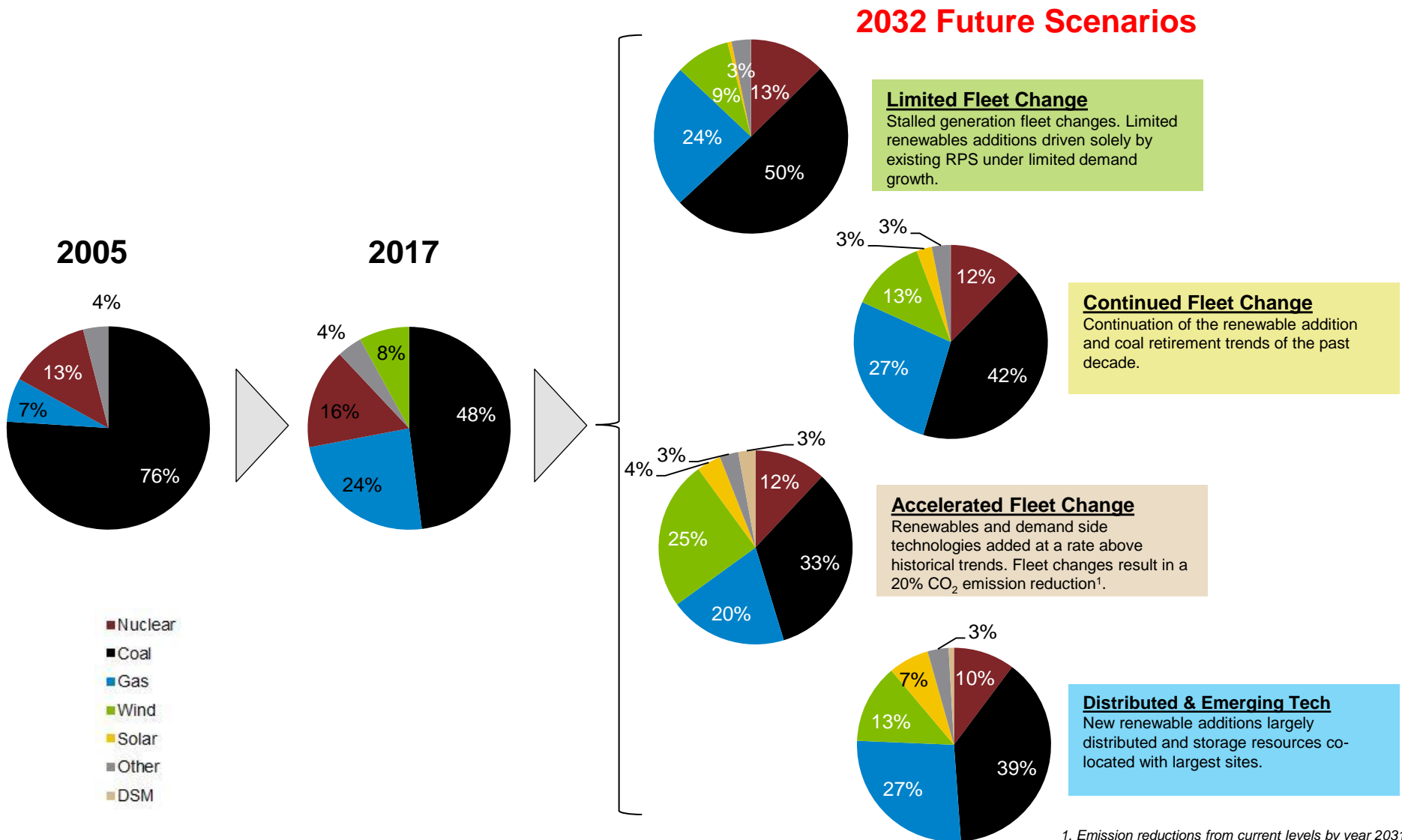
High Voltage Transmission	65,800 miles
Generation Capacity	174,000 MW
Peak Summer System Demand	127,125 MW
Customers Served	42 Million



# MISO's role continues to evolve as the industry's requirements change

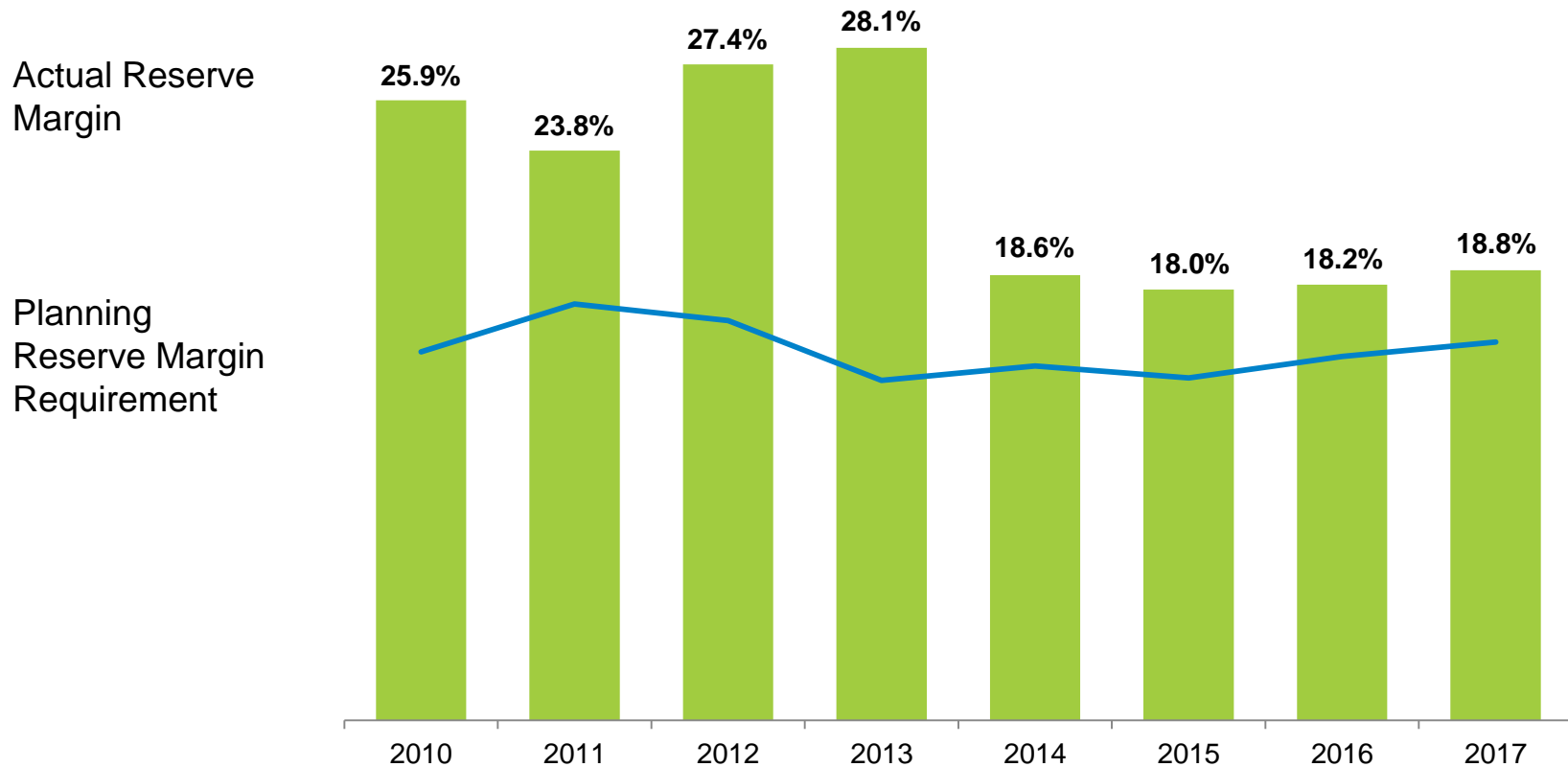


# The generation fleet in the MISO region has been shifting for a decade-plus; continued evolution expected



1. Emission reductions from current levels by year 2031

# Retirements and increasing renewables, which get lower capacity credit, have led to lower reserve margins



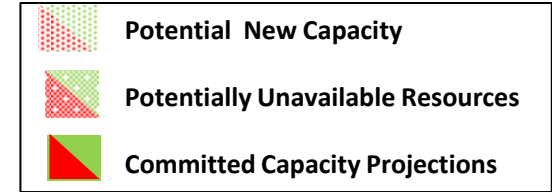
# Forecasted capacity balances for 2019 declined year-over-year largely due to decreased availability of resources

## Regional 2019 Outlook Committed Capacity Projection Variations since 2017 OMS MISO Survey In GW (Installed Capacity)

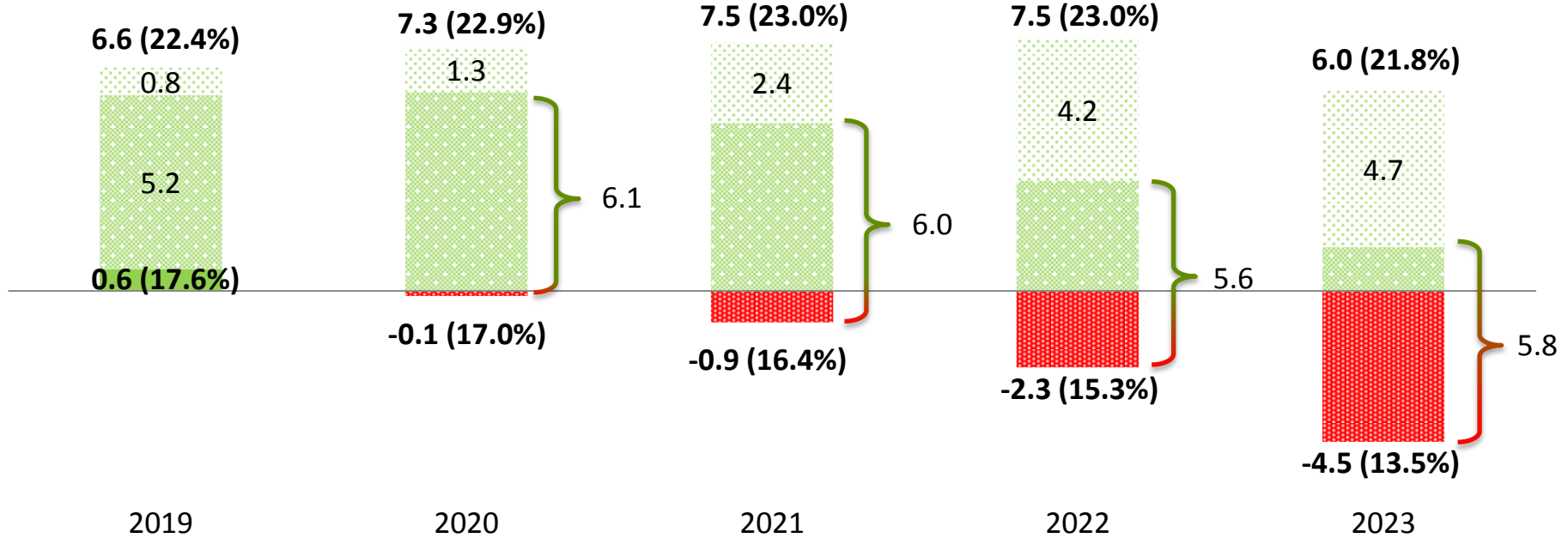


# Existing resources, combined with potential retirements and new capacity, drive potential near-term resource balance ranges

## Projected Regional Capacity Position in Installed Capacity (ICAP) GW (% Reserves)



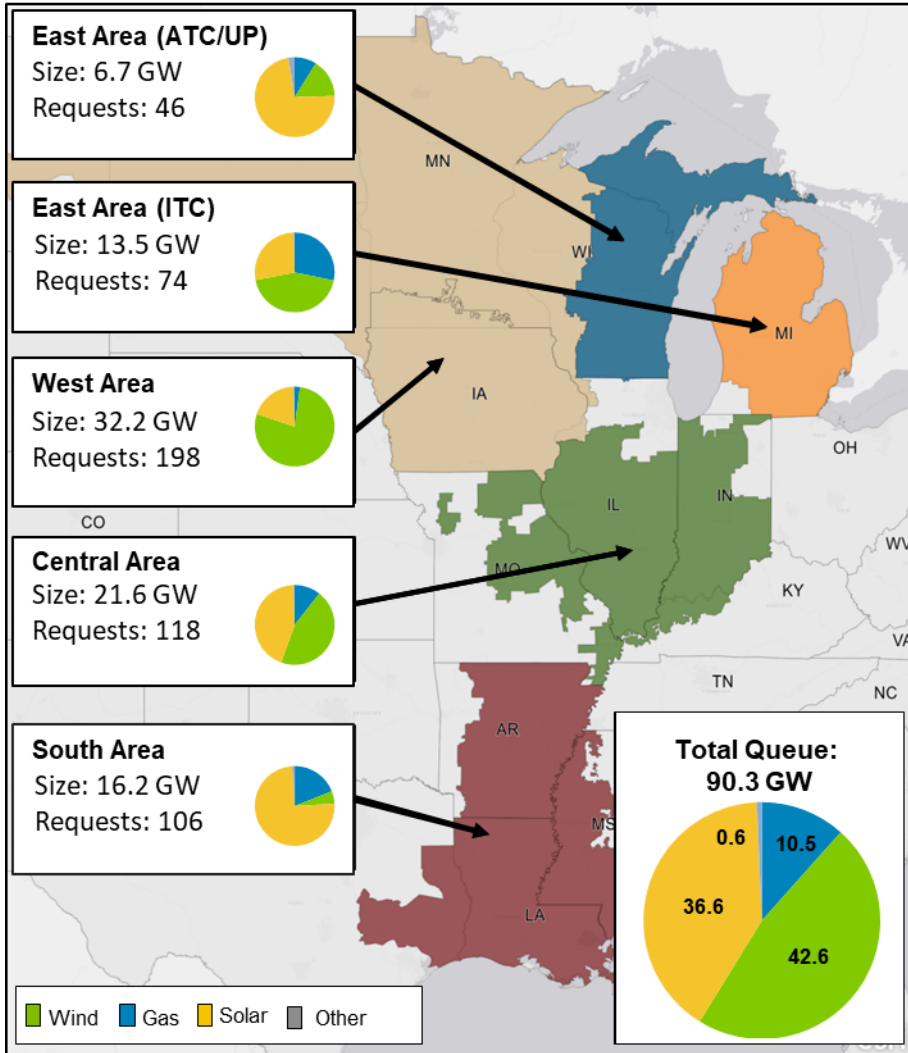
1 day in 10 Planning Reserve Margin PRM (17.1%)



# The current generator interconnection queue consists of 542 projects totaling 90.3 GW...

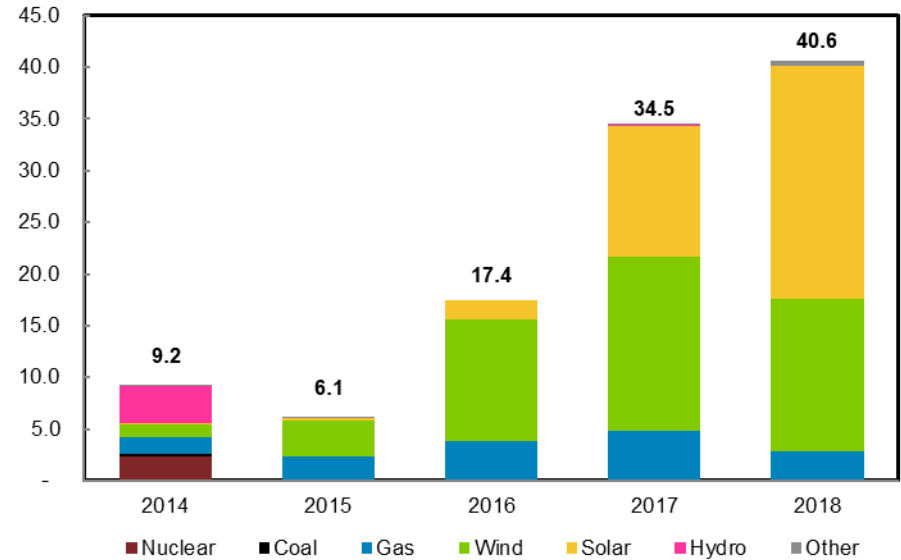
Updated: 6/1/2018

## MISO Active Queue by Study Area



## Interconnection Queue Trends

Active and Completed Projects by Year (GW)

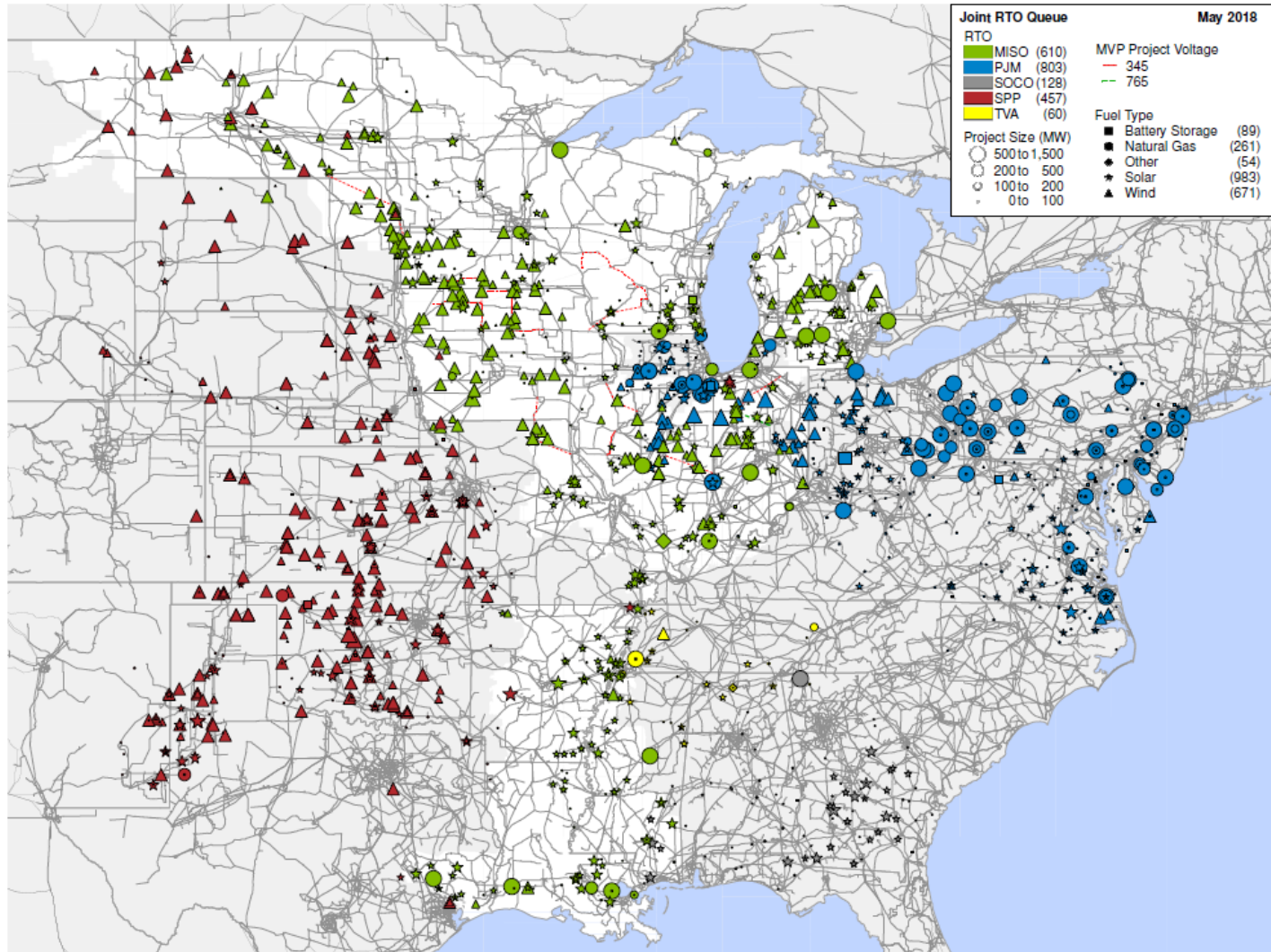


Notes:

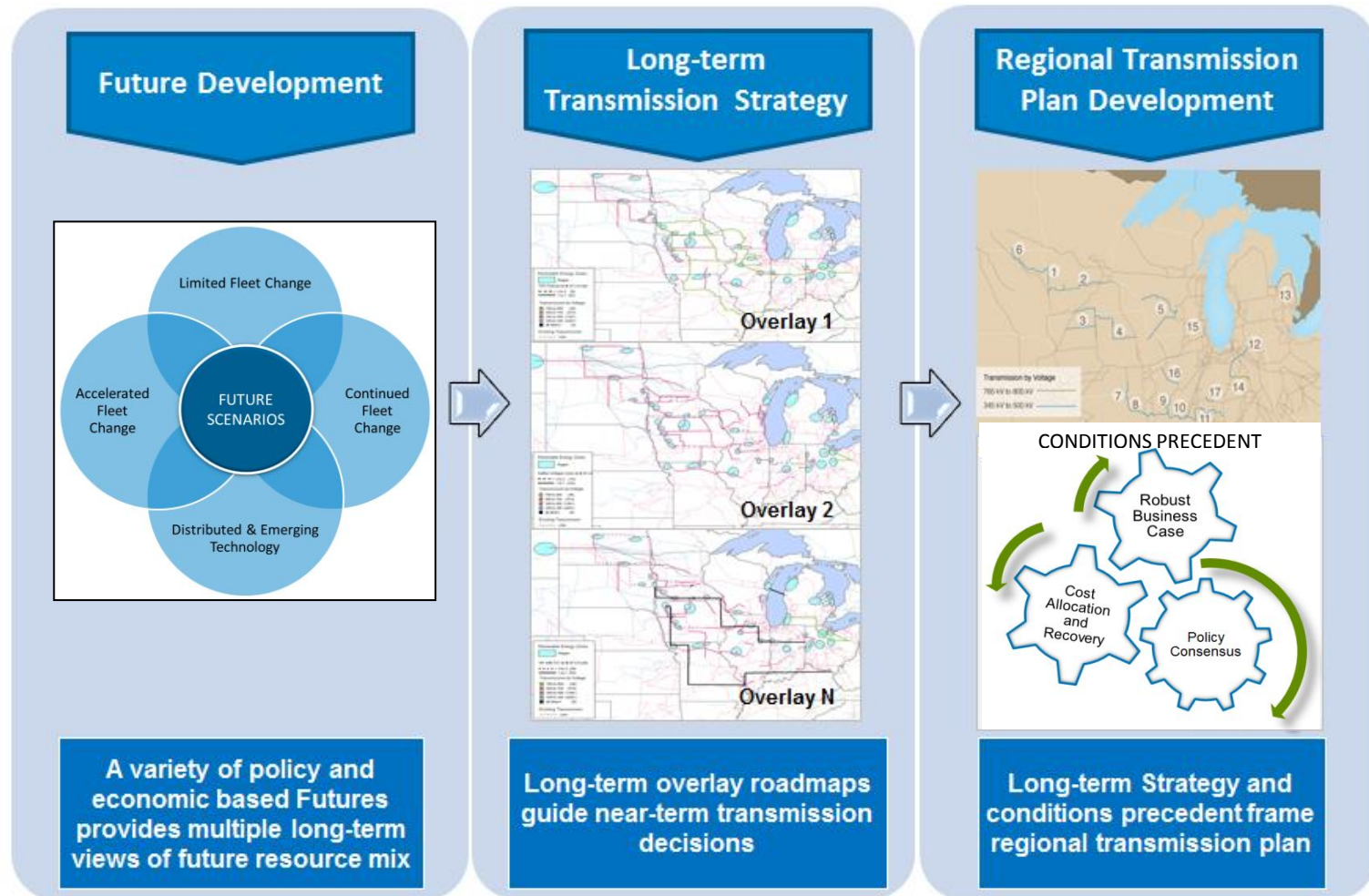
- The total queue size is 542 projects and 90.3 GW with the withdrawal of 11 projects in May.
- Storage in queue = 580 MW



# ...which the existing transmission system cannot accommodate



# Using a value based planning approach, MISO determines the necessary transmission to address regional needs

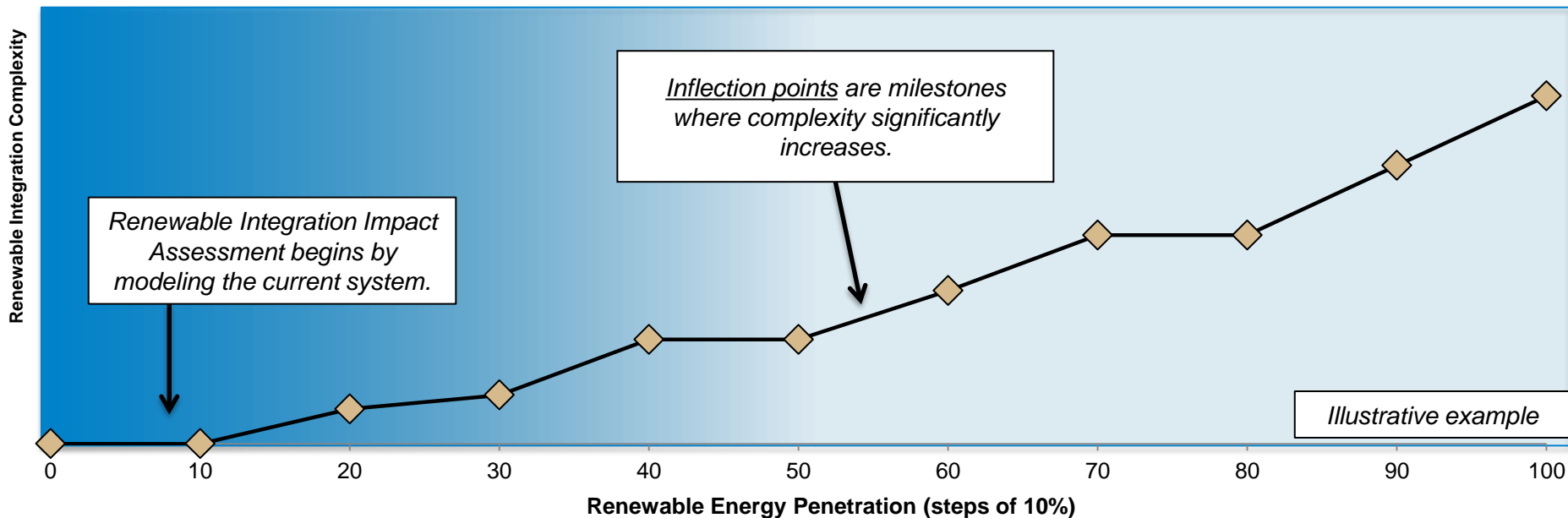


# Studies like the Renewable Integration Impact Assessment are important to understand the effects of increased renewable penetration

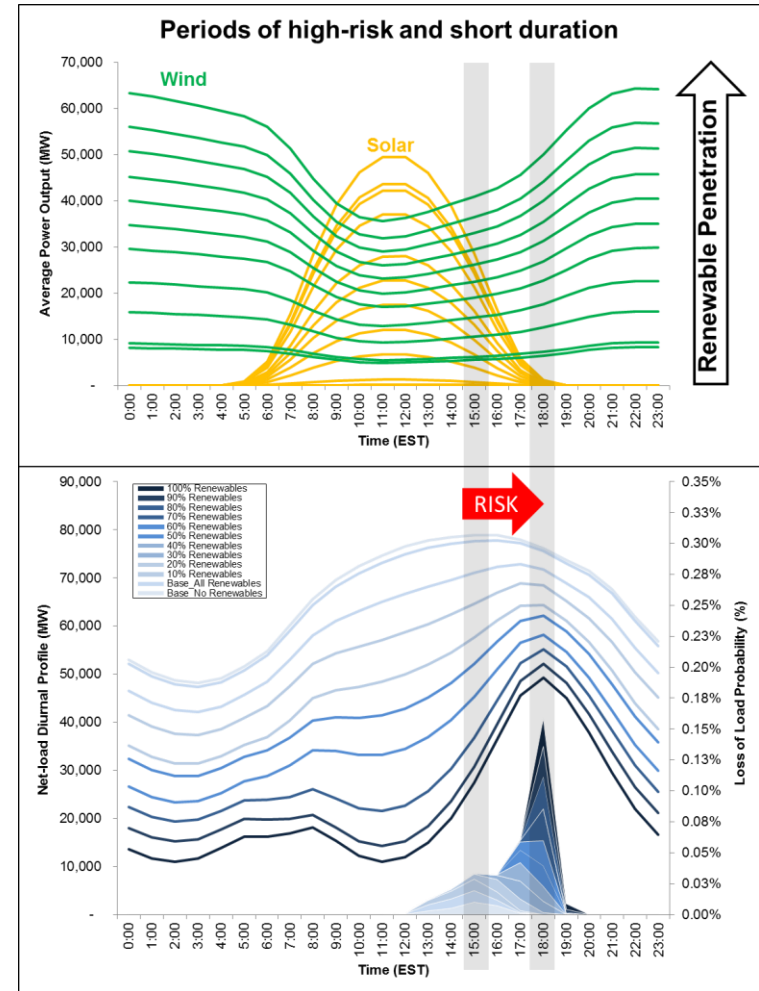
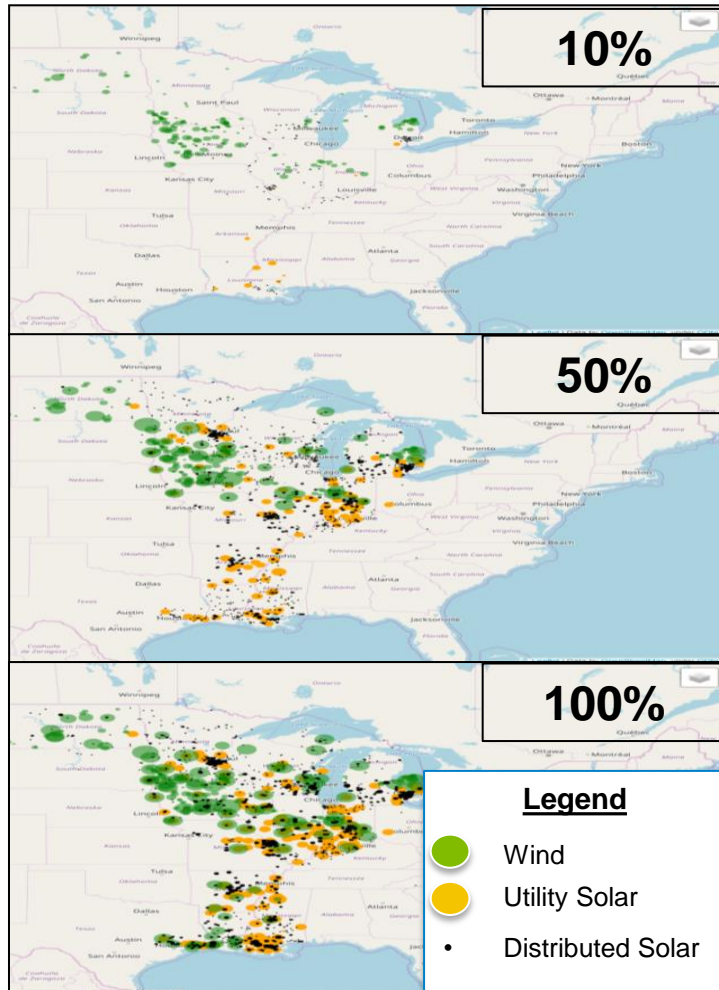


*Focus Areas:*

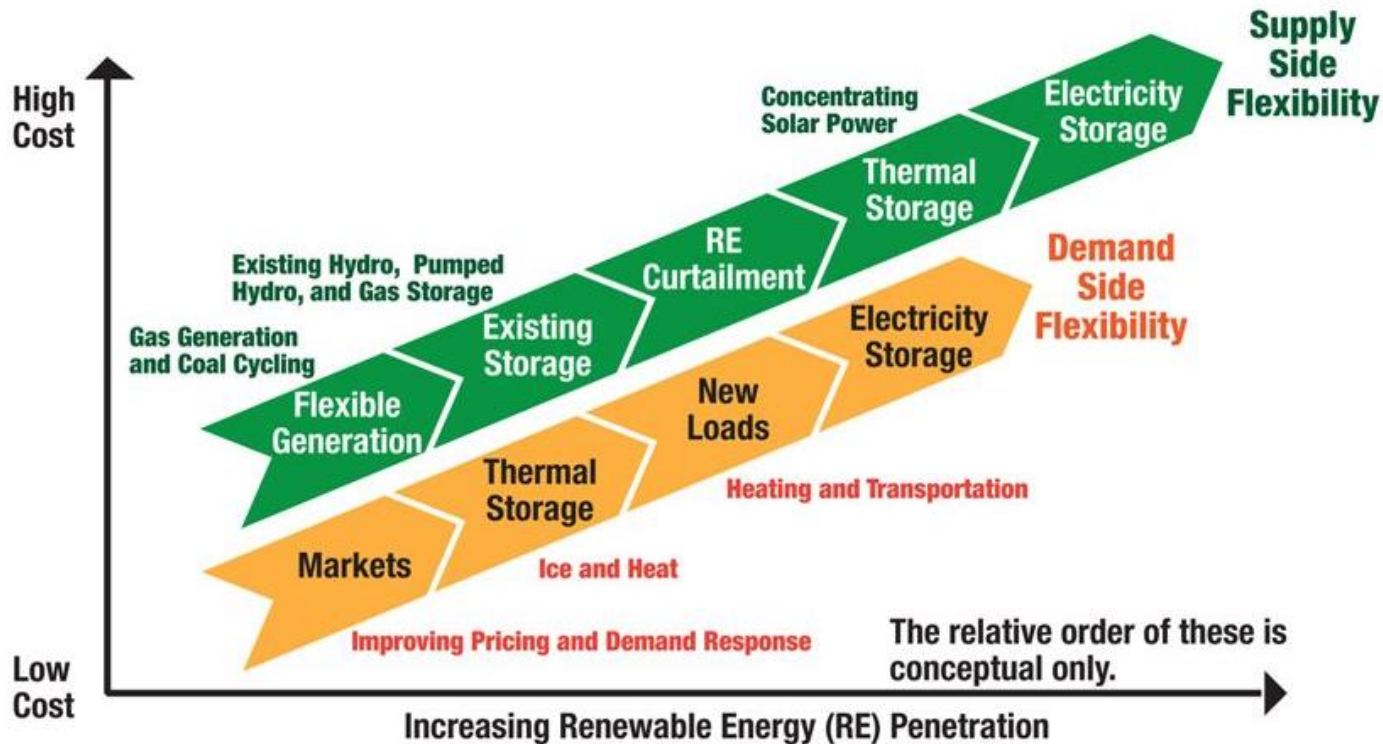
- Resource Adequacy
- Energy Adequacy
- Operating Reliability



# As renewable penetration increases, planning and operating risk shifts and becomes more acute



# The MISO market, drawing on sufficient transmission capability and diversity of resources, is a low cost alternative to manage renewable intermittency and increasingly unpredictable loads



# The new resource portfolio will require new products and services to ensure efficient incentives

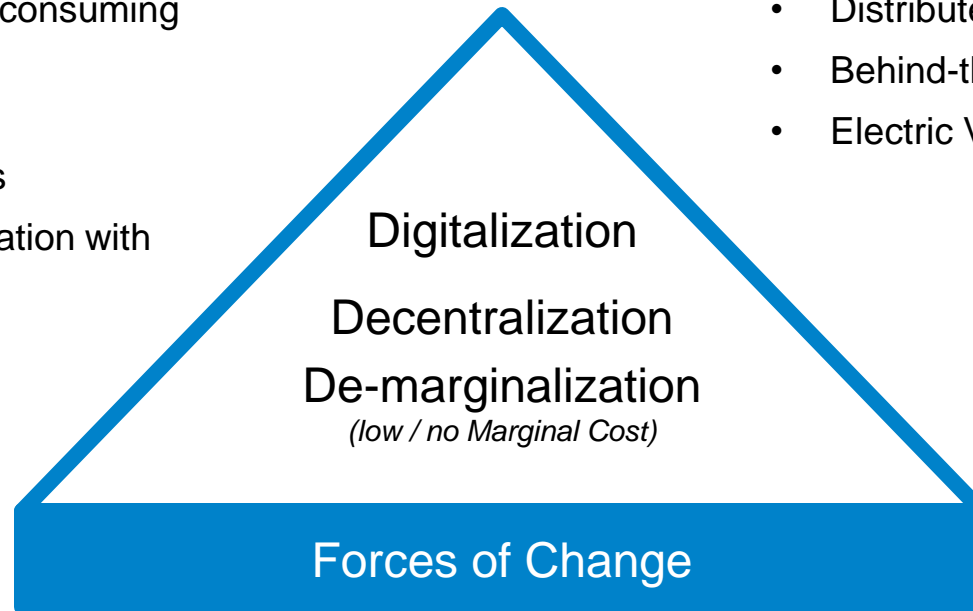
## Digitalization

New classes of electric consuming devices

- Internet of Things
- Flow control devices
- Operational coordination with distribution

## Decentralization

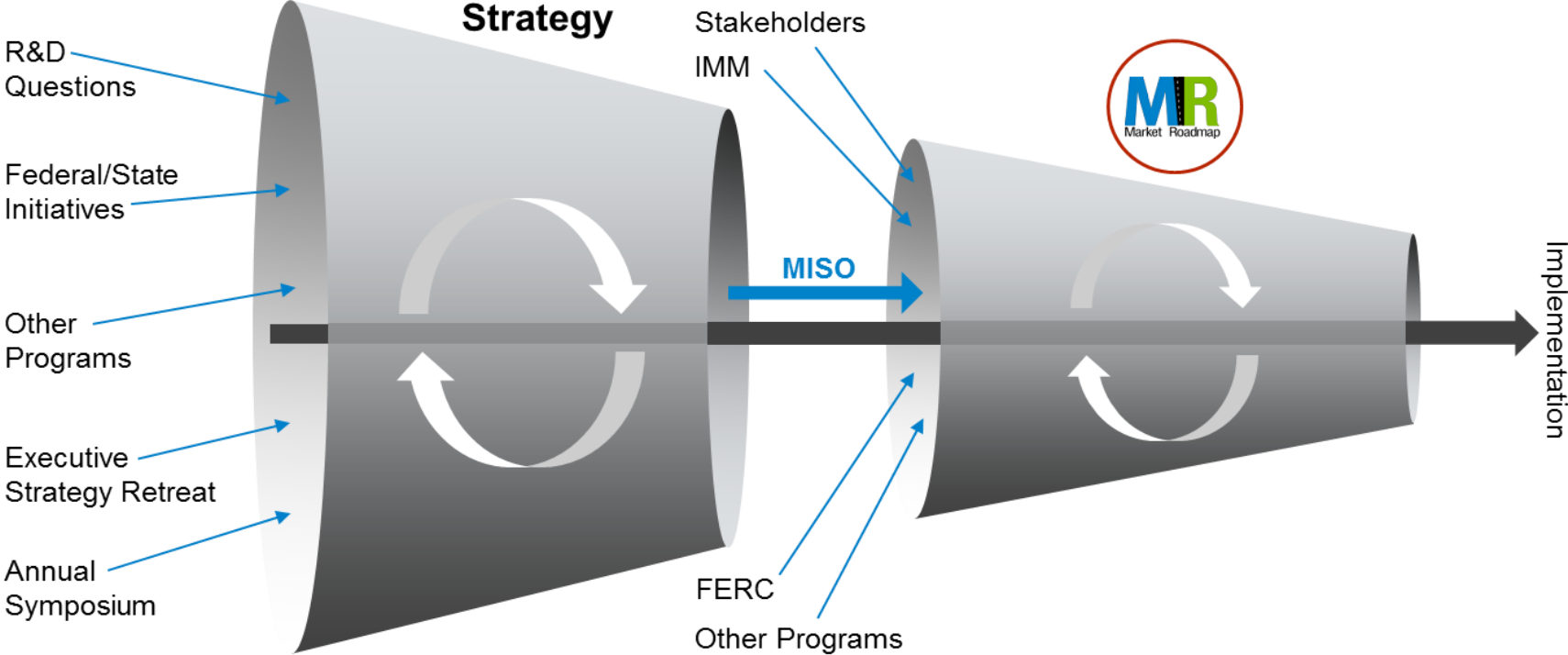
- Distributed Energy Resources
- Behind-the-Meter Energy Storage
- Electric Vehicles



## **De-marginalization (low / no marginal costs)**

- Rapid and substantial changes from portfolio evolution on both the supply and demand side
- Less flexibility achievable from energy dispatch prices alone

# MISO's market roadmap provides a mechanism to ensure achieving reliability through markets is maintained



# Recent and future market development initiatives are focused on pricing reforms, system flexibility and response capability

