



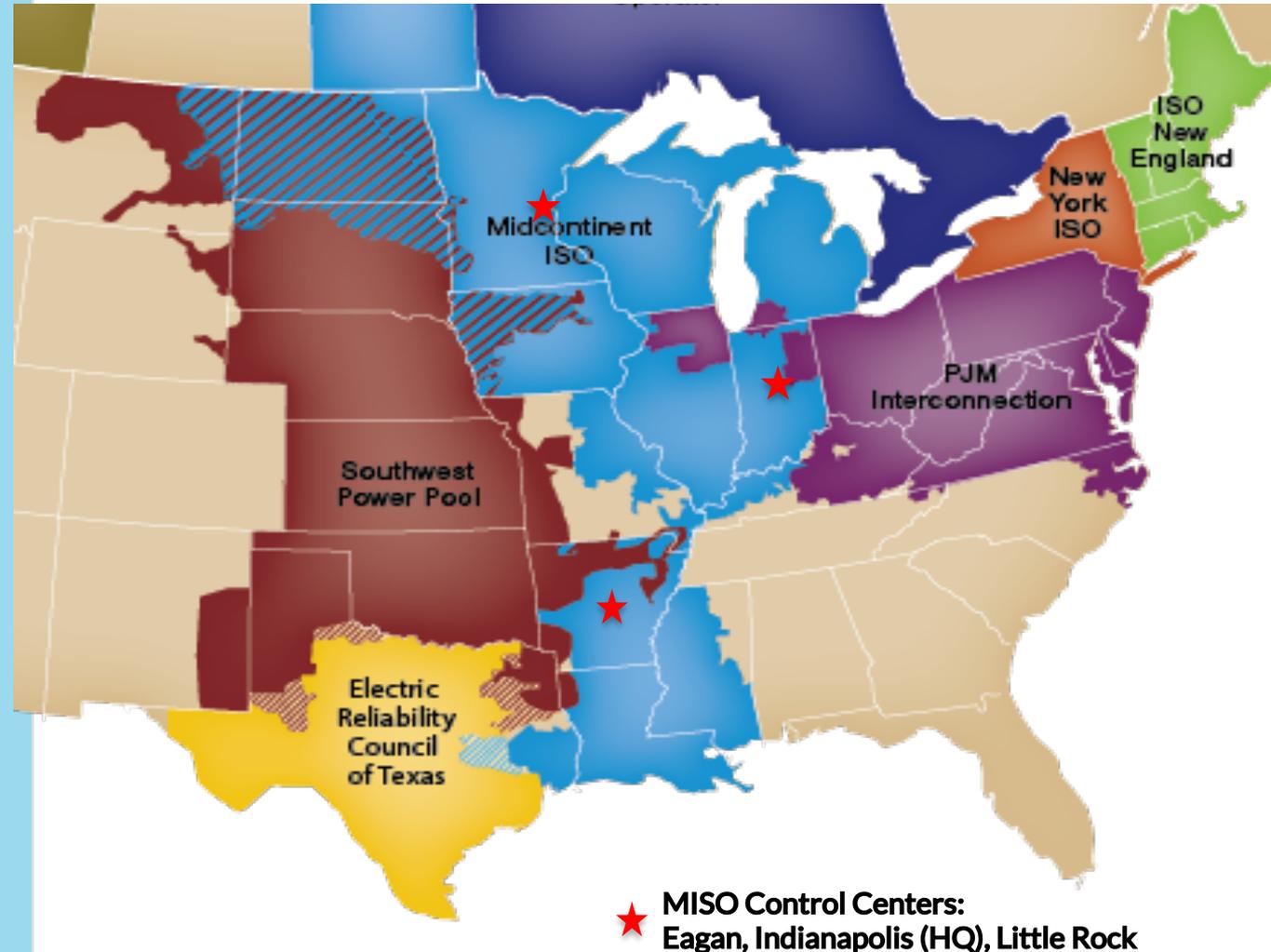
Midcontinent Independent System Operator

**Todd Hillman, SVP &
Chief Customer Officer
October 3, 2019**

MISO is the largest electric grid operator in North America

MISO

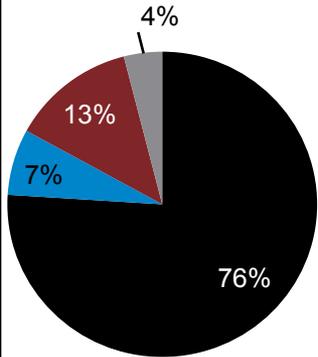
- 15 states + Manitoba
- ~ 45 million end use customers
- \$30 billion market
- 175,000 MW generation capacity
- 68,500 miles of high voltage transmission lines
- Network model consists of 300,000 data points



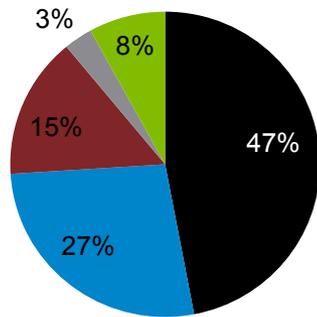
MISO's generation fleet is accelerating toward more renewables

MISO Generation Mix
(% of MWh)

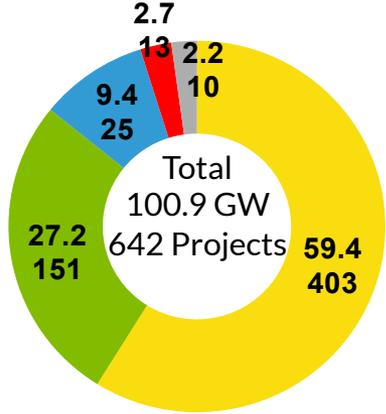
2005



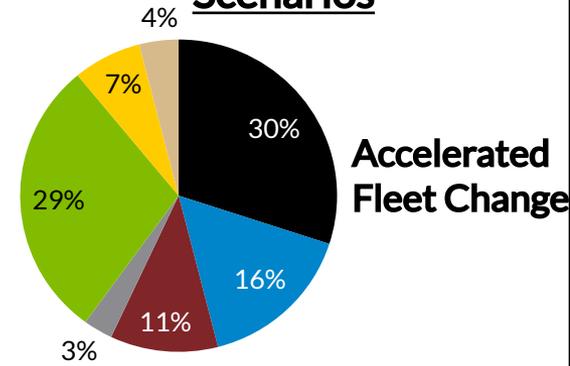
2018



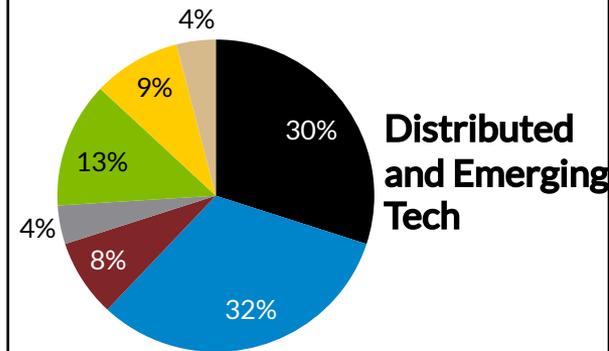
Generator Interconnection Requests



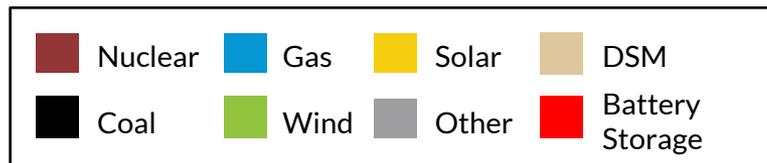
2033 Future Planning Scenarios



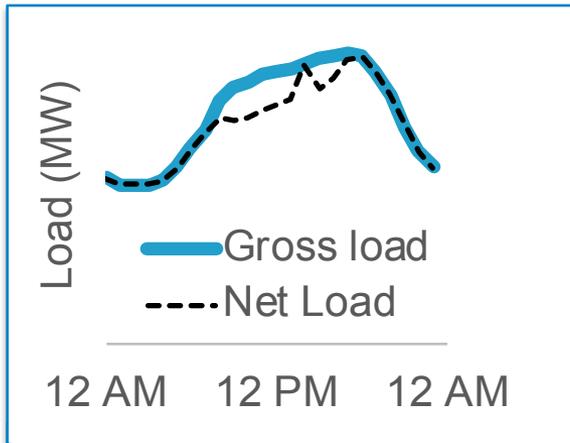
Accelerated Fleet Change



Distributed and Emerging Tech

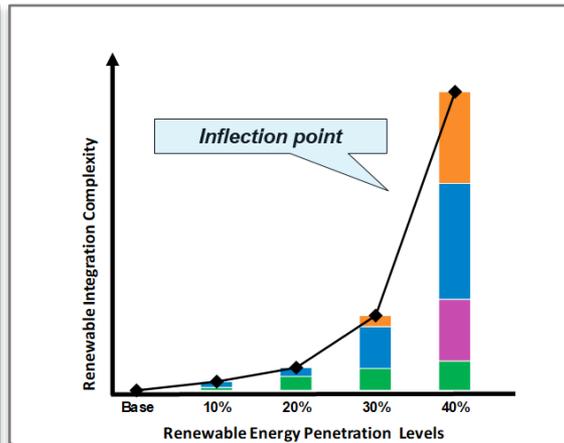


MISO is assessing reliability risk in other major categories and scouting the broader horizon, with an eye towards solution development and enhancing business capabilities



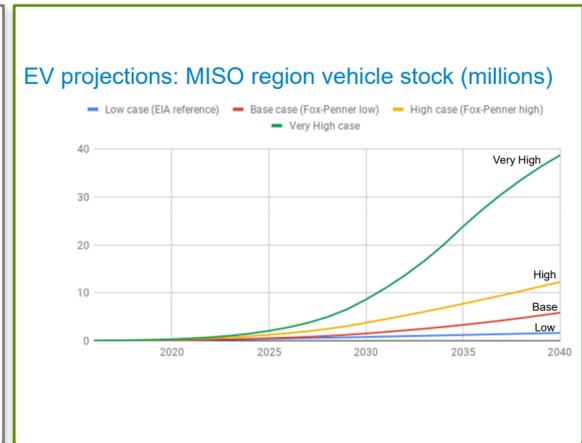
Distributed Energy Resources and Transmission and Distribution Interface

Explore visibility and coordination needs and potential options to address challenges and opportunities



Wind and Solar

Address increased variability and uncertainty in evolving fleet, more fully leveraging planning, markets and footprint diversity



Insights, Studies, Innovation

Identify and explore other issues with potentially large impacts (e.g., electric vehicles, electrification, digitalization, computational improvements)

MISO is focused on three trends that shape a more low-emission grid



De-marginalization

- The modified set of resources that can provide the next increment of energy at zero (e.g. renewables) or very low additional costs.



Decentralization

- The shift away from large, central-station power plants to smaller, often variable resources that are located behind the transmission meter at homes and businesses.



Digitalization

- The revolution in information and communication technologies and platforms that will continue to disrupt nearly everything in our economy, including energy services.

Guiding principles to help ensure reliability for a transforming grid

Guiding Principles

- 1) Reliability Needs and Requirements:** Reliability criteria must reflect required attributes in all horizons – “all hours matter”
- 2) Reliability Contribution:** Members are responsible for meeting reliability criteria with resources that will be accredited based upon the resource’s ability to deliver those attributes
- 3) Alignment with Markets and Infrastructure:** Market prices must be reflective of underlying system conditions and resources must be appropriately incentivized for the attributes they provide; infrastructure should enable efficient utilization of resources

Strategic initiatives cover a broad range of topics

System Planning

- Queue improvements
- Improved forecasting and planning

Operations

- Process improvement / tailoring
- Enhanced operational tools
- Better seams coordination and processes

Markets

- Pricing reflecting system conditions; resources appropriately incentivized for the reliability attributes they provide
- New products and enhancements

Enablers

- Technology (e.g, Business Digital Transformation, Market System Enhancement program, other)
- People, Processes

MISO Corporate Strategy

SERVE AND GROW MEMBERSHIP

Deliver value to
support membership
needs and objectives

ENVISION THE GRID OF THE FUTURE

Facilitate the planning
and development of
the grid to optimize
the changing
resource portfolio

OPERATE RELIABLY AND EFFICIENTLY

Evolve the markets
and services to
enable the grid today
and the future's
changing resource
portfolio

PEOPLE

PROCESS

TECHNOLOGY

INTEGRITY

COMMITMENT

COLLABORATION

CREATIVITY

ADAPTABILITY

CORE VALUES