

# **An Overview of MISO's Clean Power Plan Analysis**

**Nov. 16, 2015**  
**Iowa 111(d) Stakeholder Meeting**

# MISO is one of nine ISOs and RTOs in North America

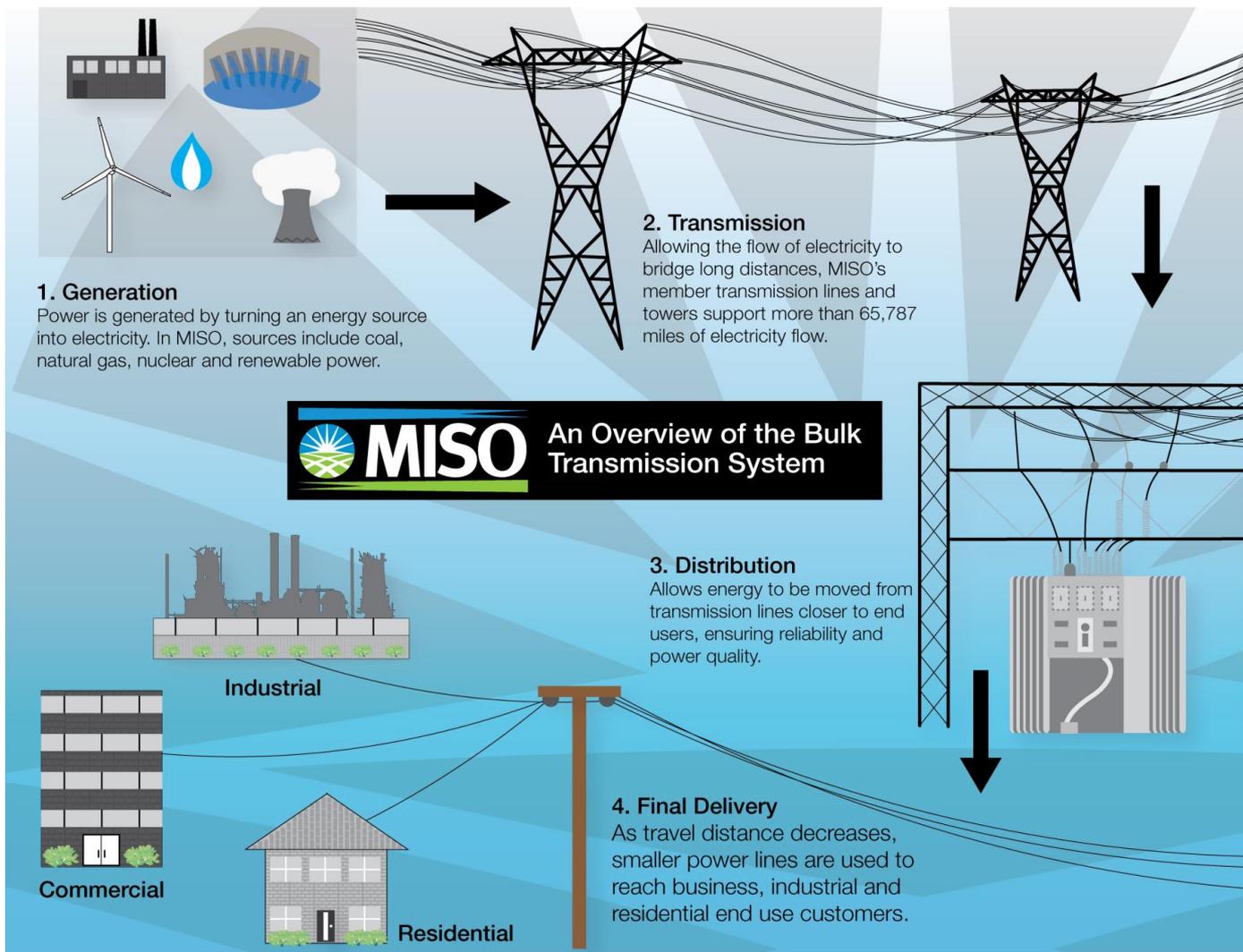
## MISO's Current Scope of Operations

- **Generation Capacity**
  - 178,396 MW (market)
  - 192,802 MW (reliability)
- **Historic Peak Load**
  - 127,125 MW (market)
  - 131,181 MW (reliability)
- **65,800 miles of transmission**
- **Footprint**
  - 15 States
  - 1 Canadian Province
  - City of New Orleans

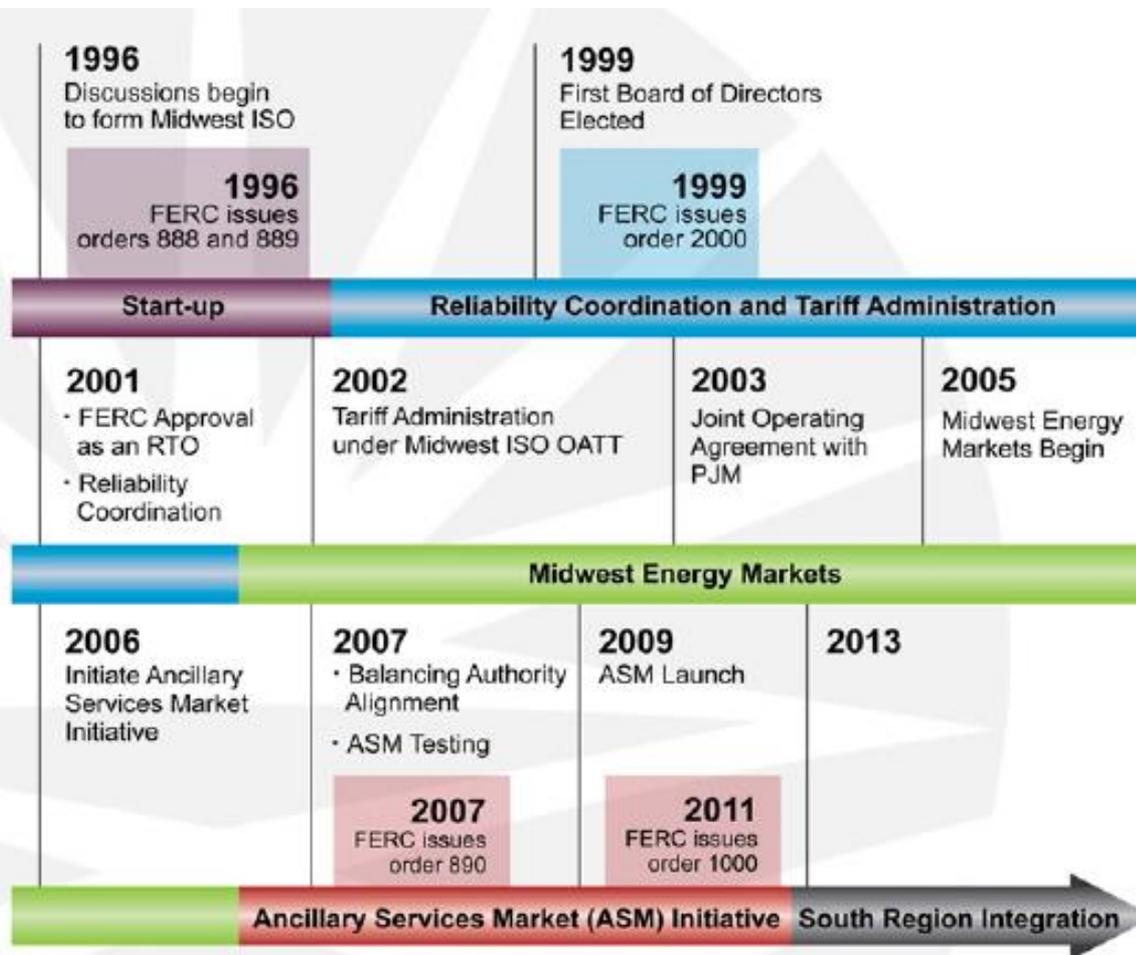


ISO = Independent System Operator  
RTO = Regional Transmission Operator

# ISOs and RTOs direct electric system operations for the mutual benefit of their members



# MISO was formed to address federal requirements...



*...but our growth has been based on value creation.*

# MISO fulfills several roles, providing a range of services, and generating value for our members

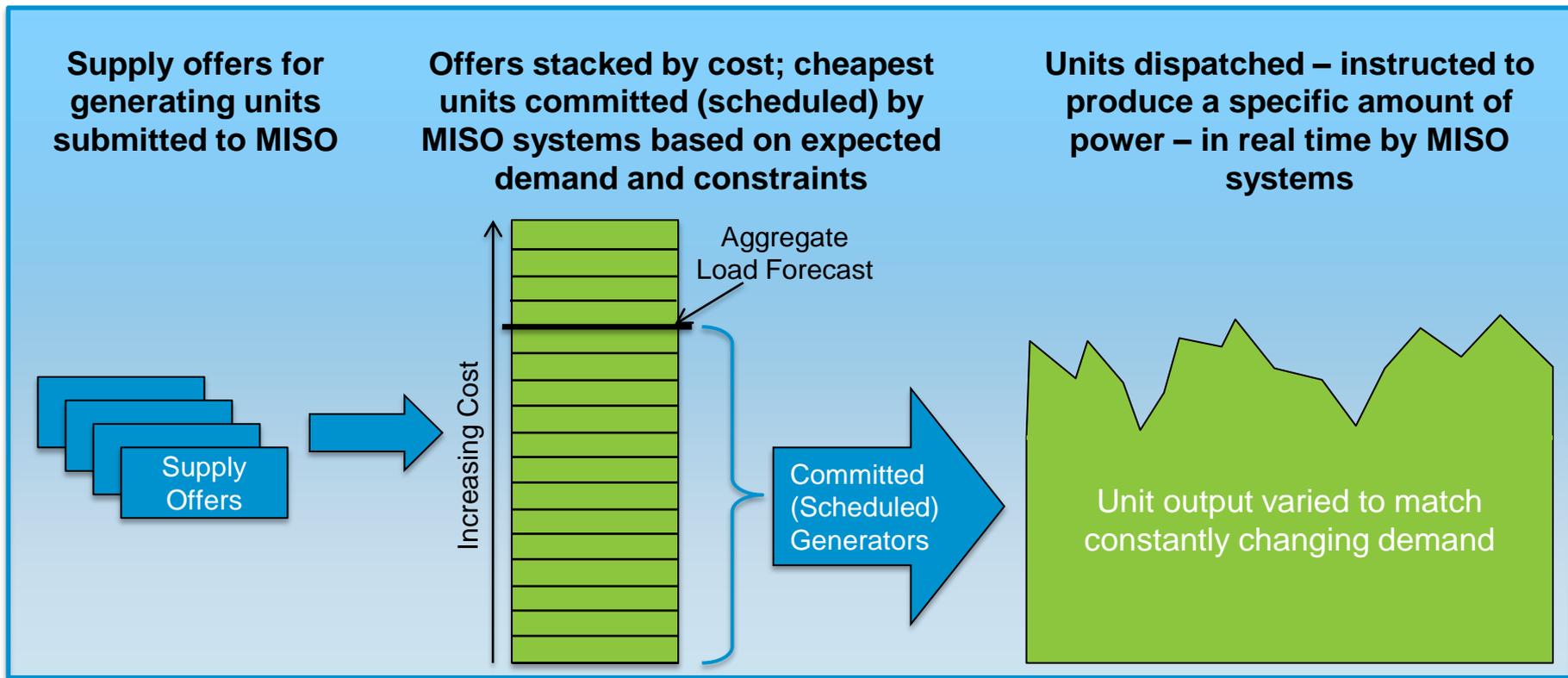
## Our roles

- Coordinate regional planning
- Provide independent transmission system access
- Deliver improved reliability coordination
- Perform efficient market operations
- Foster platform for wholesale energy markets

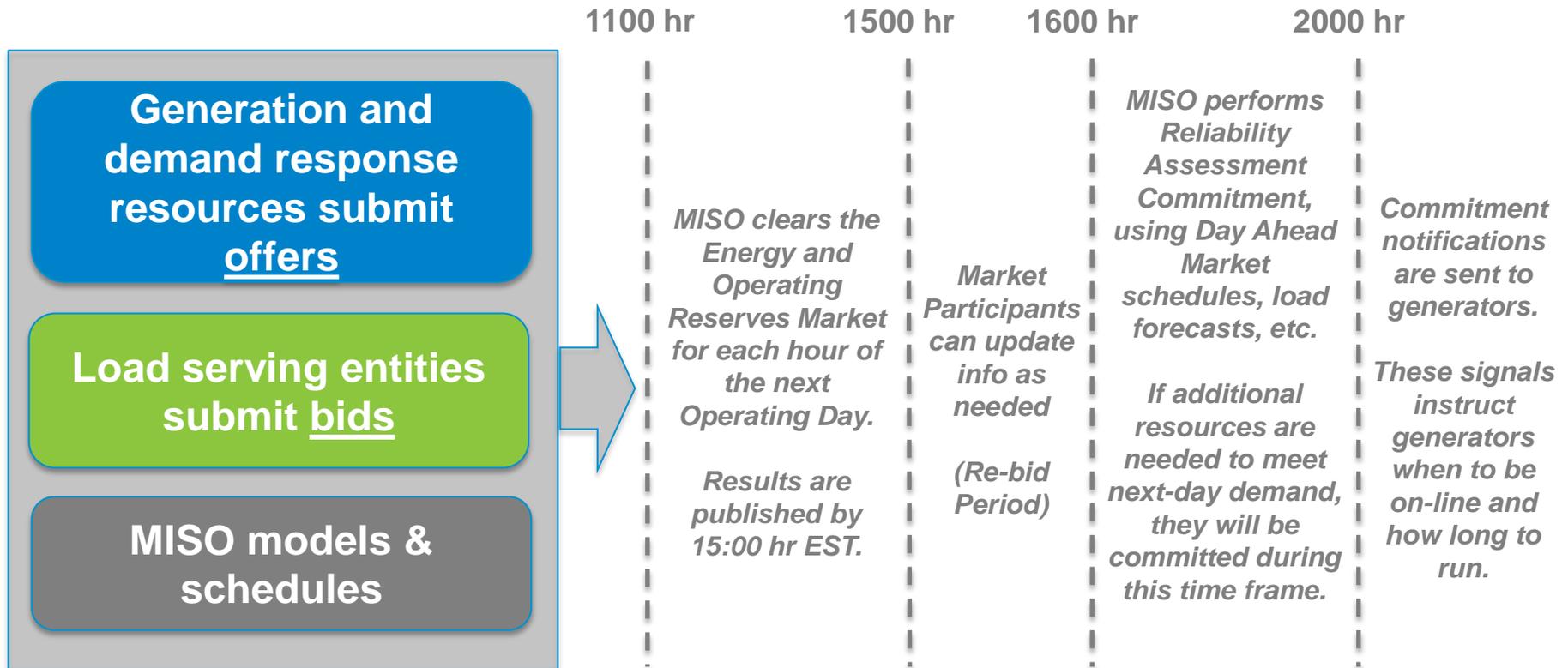
## Our Value

- Integrated system planning
- Equal and non-discriminatory access
- Regional reliability improvements
- Lower cost unit commitment, dispatch, congestion management
- Encourage infrastructure investment, facilitate regulatory initiatives

# MISO's markets help ensure reliable and efficient dispatch and system operations



# The Day Ahead Market is the financially binding “planning phase” for the operating day

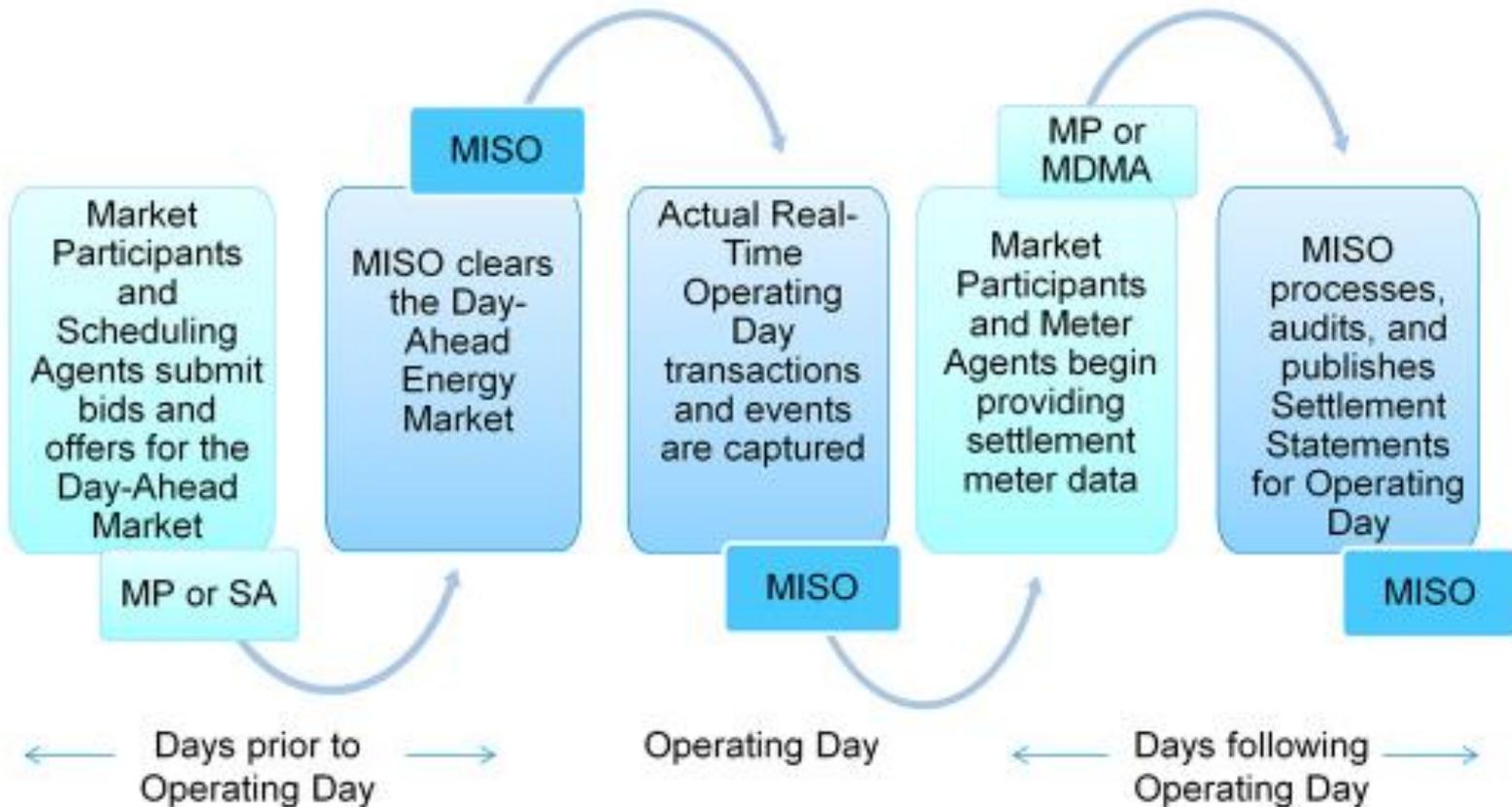


High-level look at MISO’s market timeline for the day before the Operating Day (OD-1)

# The Real Time Market is a spot market for balancing current system conditions

- Balancing supply and demand at least cost while recognizing current operating conditions
  - Including deviations from the Day Ahead schedule
- Dispatching the lowest-cost resources to satisfy demand without overloading the transmission network
  - 5-minute dispatch targets
- Clearing Energy and Operating Reserves in Real-Time
- Providing pricing by physical location
- Providing transparent economic signals to guide short-run operational and long-run investment decisions

# MISO's market settlements are the processes used to settle the competitive activities of Market Participants

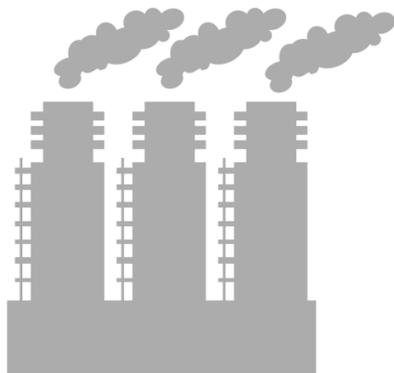


MDMA = Meter Data Management Agent  
SA = Scheduling Agent

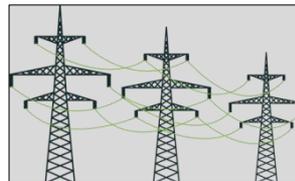
# EPA's Clean Power Plan will have multiple impacts on the MISO region and the electric utility industry as a whole

## Generation Impacts

- Less coal generation
- More gas generation
- Siting questions: Near existing transmission, or gas pipelines?
- More renewables & energy efficiency



## Infrastructure Impacts



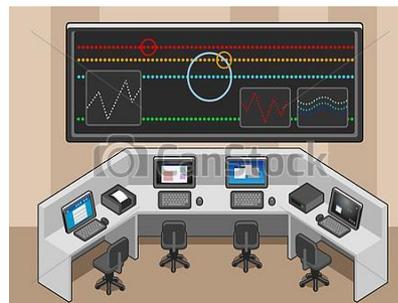
- More transmission and gas pipeline capacity likely needed
- Siting of infrastructure driven by location of new generation & other factors
- Cost-allocation issues

## Reliability Impacts

- Will the rule jeopardize resource adequacy at a local/regional level?
- Will states and utilities have enough time to build & permit new resources?
- Will ancillary services continue to be sufficient?



## Economic Dispatch Impacts

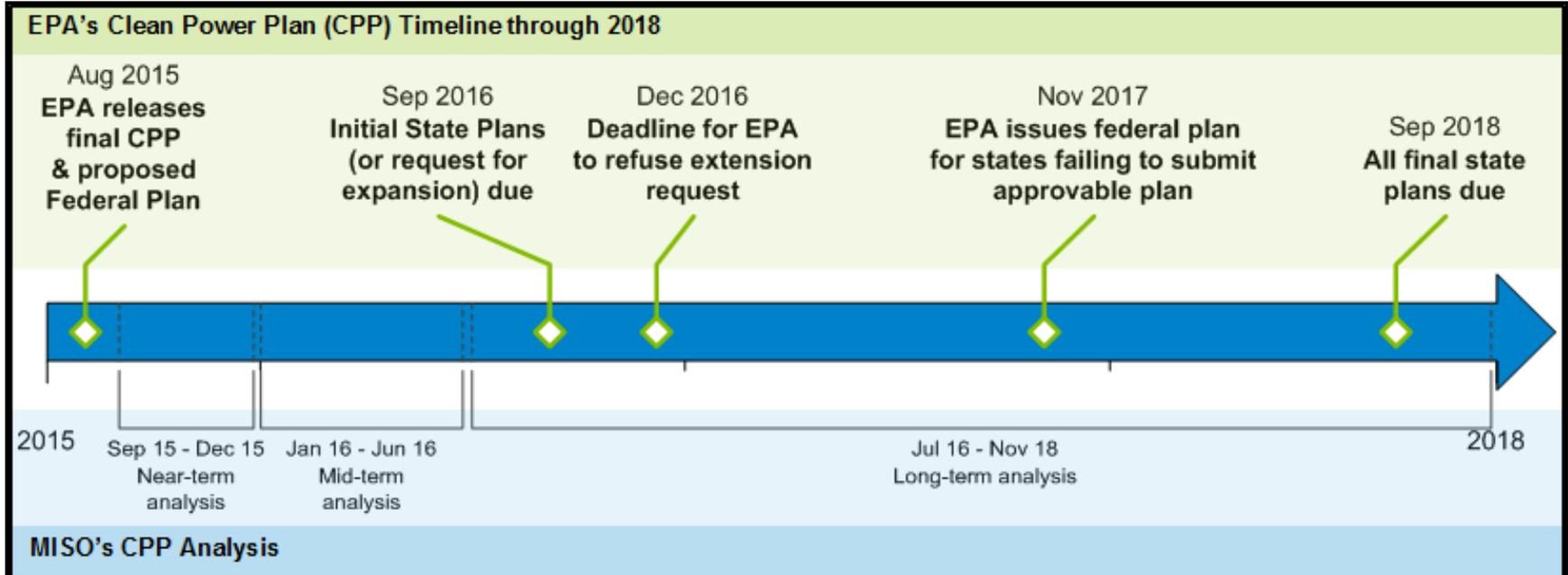


- Which compliance approaches would preserve economic dispatch cost savings?
- How can load growth be accommodated in rate and mass-based compliance plans?
- How can compliance costs best be monetized?

# MISO's CPP study goals, timeline and scope

## Study Goals

- Inform policymakers as they formulate compliance strategies
- Enable the reliable, efficient implementation of CPP-related policy decisions made by member-states and asset-owners



*MISO's CPP study efforts over the next few years will create a bridge between the uncertainty and complexity that exists today and the modeling certainty needed for effective transmission overlay design.*

# MISO's final rule analysis will evaluate compliance pathways and inform the transmission planning process

## Near-Term Modeling (Understanding compliance pathways)

- Rate vs. mass comparison
- Rate and mass interactions
- State vs. regional compliance
- Trading options
- Federal plan
- Range of compliance sensitivities
- Relative compliance costs

Using existing PLEXOS and EGEAS models\*

*\*Existing draft rule models will be updated with final rule parameters*

## Mid-Term Modeling (Preparing for transmission overlay development)

- Potential generation retirements
- Optimal resource expansion
- Wind/solar zones
- Renewables penetration/mix
- Renewables siting
- Thermal siting with new ozone rule

Using new EGEAS models\* and external research

*\*Evaluated using three proposed CPP futures*

## Long-Term Modeling (Developing transmission overlay)

- Will be informed by state compliance plans
- Will use futures formulated through MTEP17 process
- Updates to assumptions as needed over MTEP18 and '19 cycles

Using new EGEAS, PLEXOS and PROMOD models

### **MISO's CPP Final Rule Study**

# Near-term CPP analysis uses existing models to allow for quick delivery of results

## Steps for near-term analysis:

1. Evaluate implementation of EPA's three building blocks
2. Perform sensitivity analysis to show the relative costs and effectiveness of different compliance strategies
3. Assess resource implications of CPP compliance implementations
4. Examine market dispatch and transmission utilization using draft rule scenarios under the following compliance pathways:

<b>Rate compliance</b>	<b>Mass compliance</b>	<b>Mixed rate- and mass-compliance</b>
<b>Leakage mitigated via new source complement</b>		<b>Leakage mitigated through set-asides</b>
<b>Trading platforms</b>		<b>No trading platforms</b>

# Mid-term CPP analysis examines potential resource additions and retirements under three futures

- **Modeling assumptions will be based on the results of near-term analysis**
- **Exact compliance pathways will be determined in consultation with stakeholders**
- **Analysis will incorporate updates to renewable generation mix, profiles, penetration, and siting, based on results of Vibrant Clean Energy (VCE) study\***
- **Analysis will also examine potential resource retirements**
  - Actual retirements driven by the EPA's Mercury and Air Toxics Standard (MATS) rule are now mostly known and are included in the base dataset.
  - A detailed analysis will be conducted for each future to determine the magnitude of potential resource retirements.

MISO has commissioned Vibrant Clean Energy (VCE) to perform a study on co-optimizing renewables, natural gas and transmission, to be completed by the end of 2015.

# Mid-term CPP analysis will also update renewable energy zones and DR/EE/DG assumptions

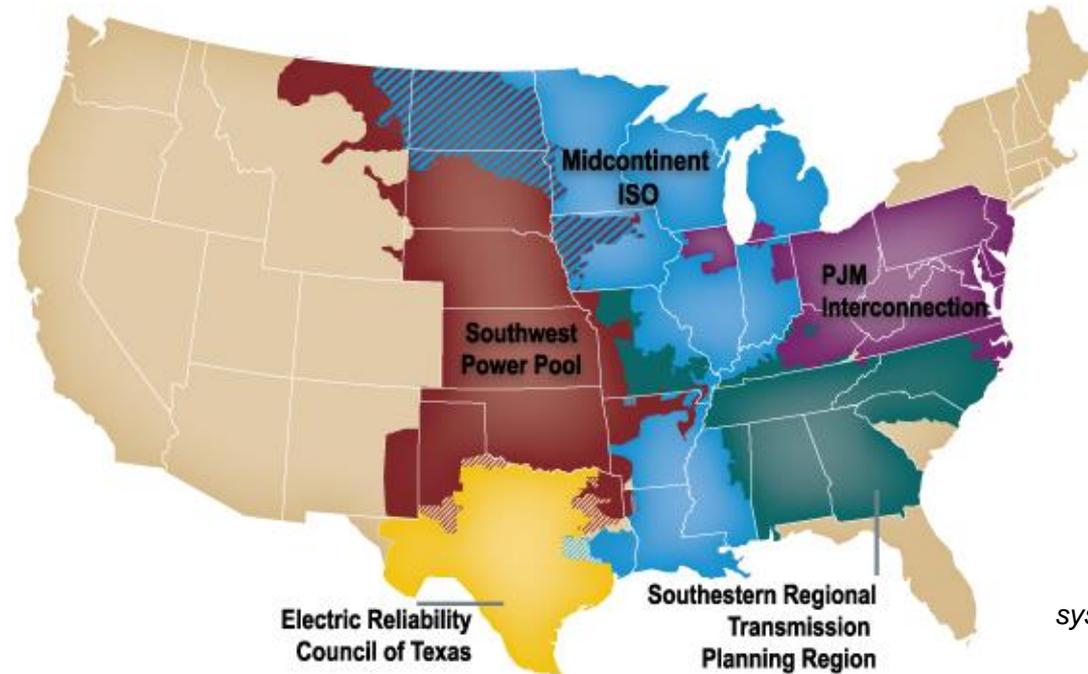
- **Renewable energy zones**

- Based on results of the VCE study, MISO will produce initial renewable energy zones.
- These zones will be further developed in collaboration with stakeholders.

- **Magnitude and distribution of demand response (DR) / energy efficiency (EE) / distributed generation (DG)**

- Input assumptions will be based on the on-going MISO-commissioned Applied Energy Group (AEG) study.
- AEG study results will be included along with other planning alternatives in the economic resource forecast.

# MISO is talking with neighboring system operators about our collective efforts to analyze the Clean Power Plan



*Note: Areas with interspersed system boundaries are illustrated with a crosshatch pattern.*

## These talks reflect the following realities about the grid system and the CPP

- Due to the interconnected nature of the grid system, conditions that affect the MISO-controlled portion of the grid may also impact neighboring system operators.
- The impacts of the CPP will be national in scope, reaching beyond MISO's borders and the borders of any other single system operator.

# Thank you!

- MISO's Planning Advisory Committee is the forum for learning more about MISO's CPP study and for participating in study discussions.
  - <https://www.misoenergy.org/STAKEHOLDERCENTER/COMMITTEESWORKGROUPTASKFORCES/PAC/Pages/home.aspx>
- For more on MISO Markets, please see MISO's markets training materials found at:
  - <https://www.misoenergy.org/Training/Pages/Training.aspx>