



Midwest ISO Overview

OMS Black Sea Partners Meeting
October 18, 2010

MidwestISO
Energizing the Heartland

Landmark Federal Energy Regulatory Commission (FERC) orders shaped the formation of Regional Transmission Organizations (RTOs)

Order 888/889 (1996)

- ▶ Provides for open access to transmission
- ▶ Enables broad wholesale power competition
- ▶ Authorizes recovery of stranded costs
- ▶ Establishes Open Access Same Time Information System (OASIS) and standards of conduct
- ▶ Delineates state vs. federal jurisdictions

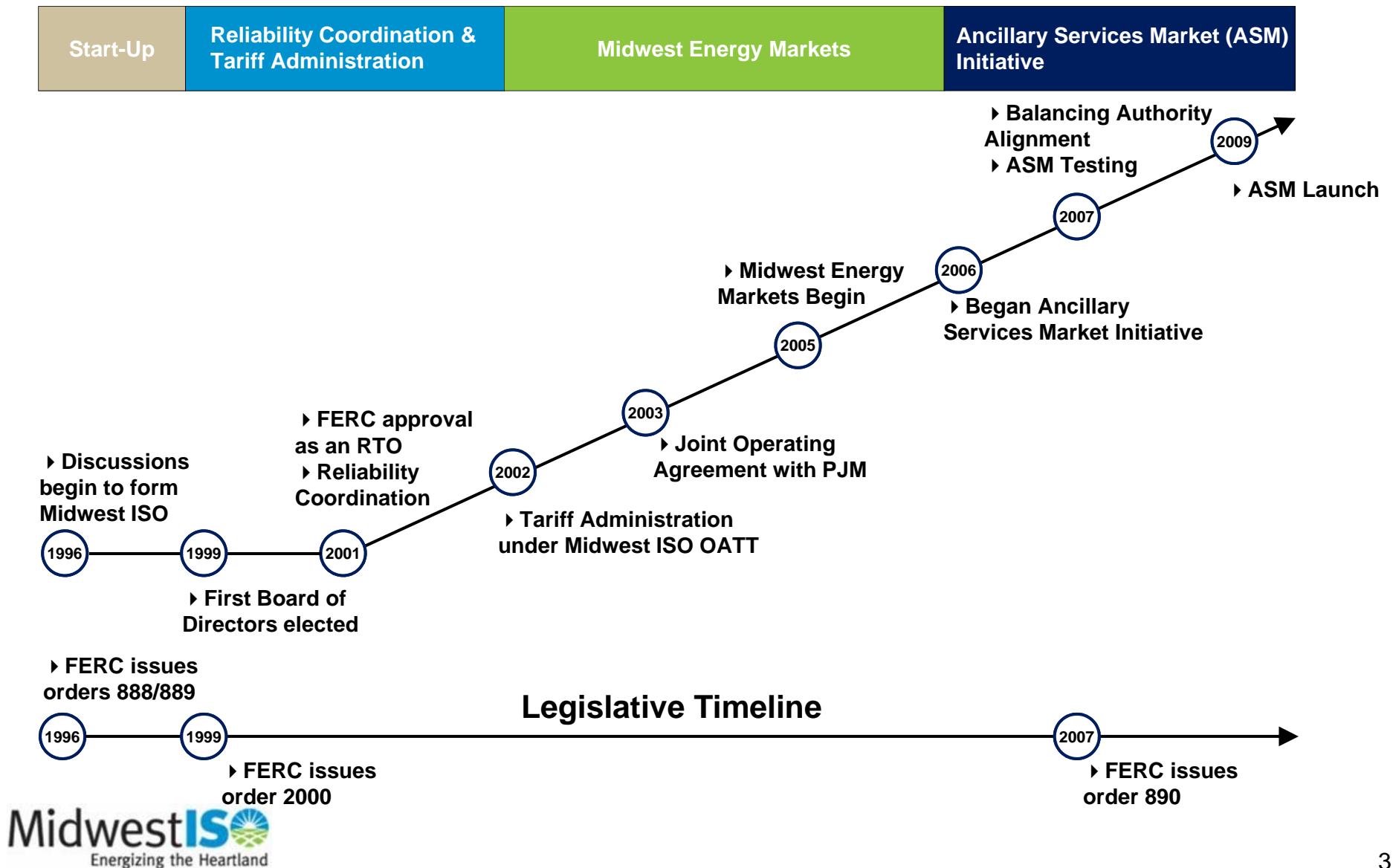
Order 2000 (1999)

- ▶ Establishes the four characteristics for RTOs
 - Independence
 - Scope and regional configuration
 - Operational authority
 - Short-term reliability
- ▶ Sets forth the eight functions of RTOs
 - Tariff design and administration
 - Congestion management
 - Parallel path flow
 - Ancillary services
 - OASIS, TTC, ATC
 - Market monitor
 - Planning and expansion
 - Interregional coordination
- ▶ Establishes principal of voluntary membership

Order 890 (2007)

- ▶ Establishes RTO roles and obligations in regional planning:
 - Coordination
 - Openness
 - Transparency
 - Information exchange
 - Comparability
 - Dispute resolution
 - Regional participation
 - Congestion studies
 - Cost allocation
- ▶ Promotes consistency and transparency of Available Transmission Capacity calculation
- ▶ Adoption of “conditional firm” component to long-term point-to-point service

The Midwest ISO's development began as a means to comply with FERC Orders 888/889, but growth was driven by the value created

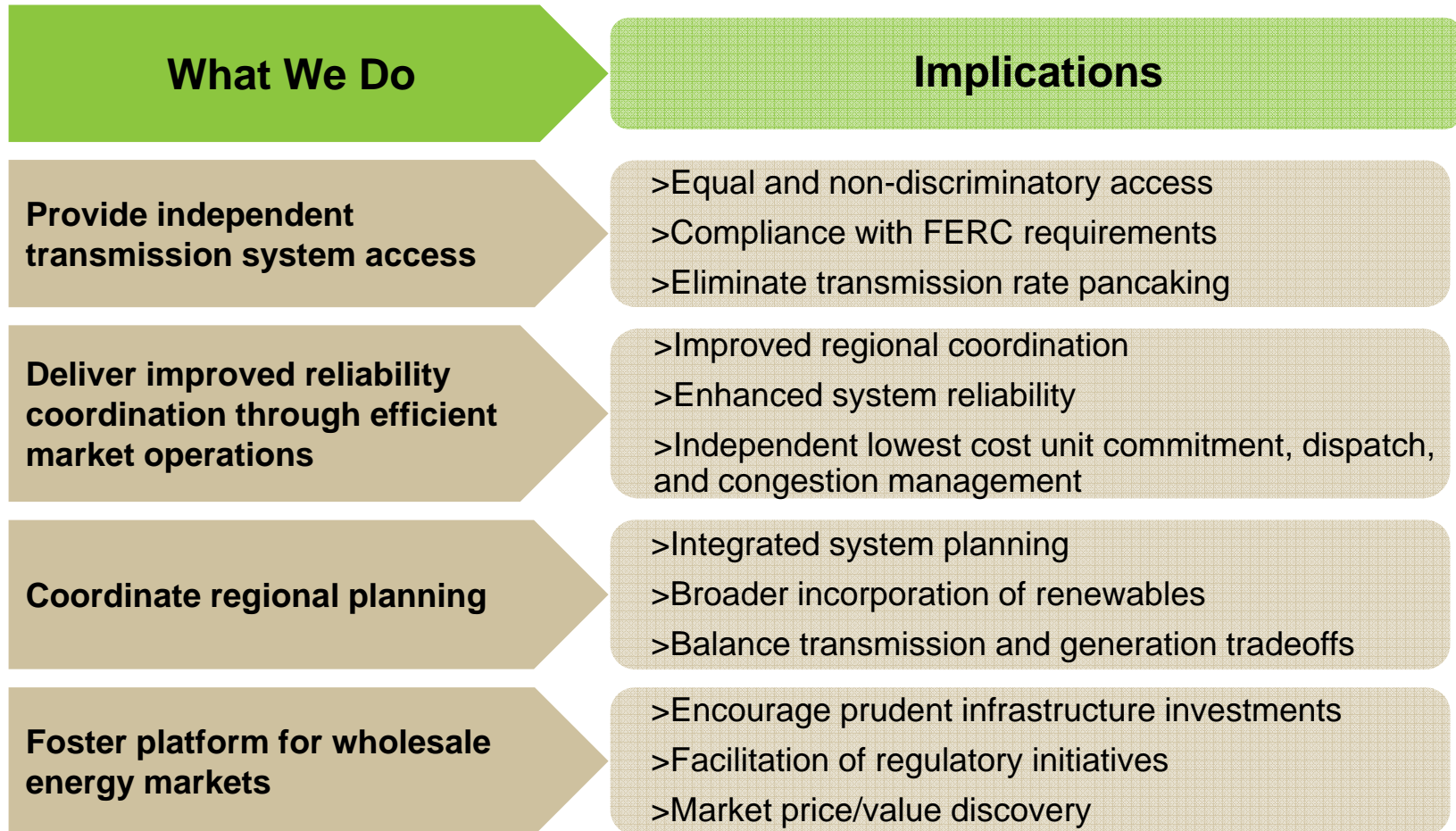


The Midwest ISO's vision / mission is very clear...

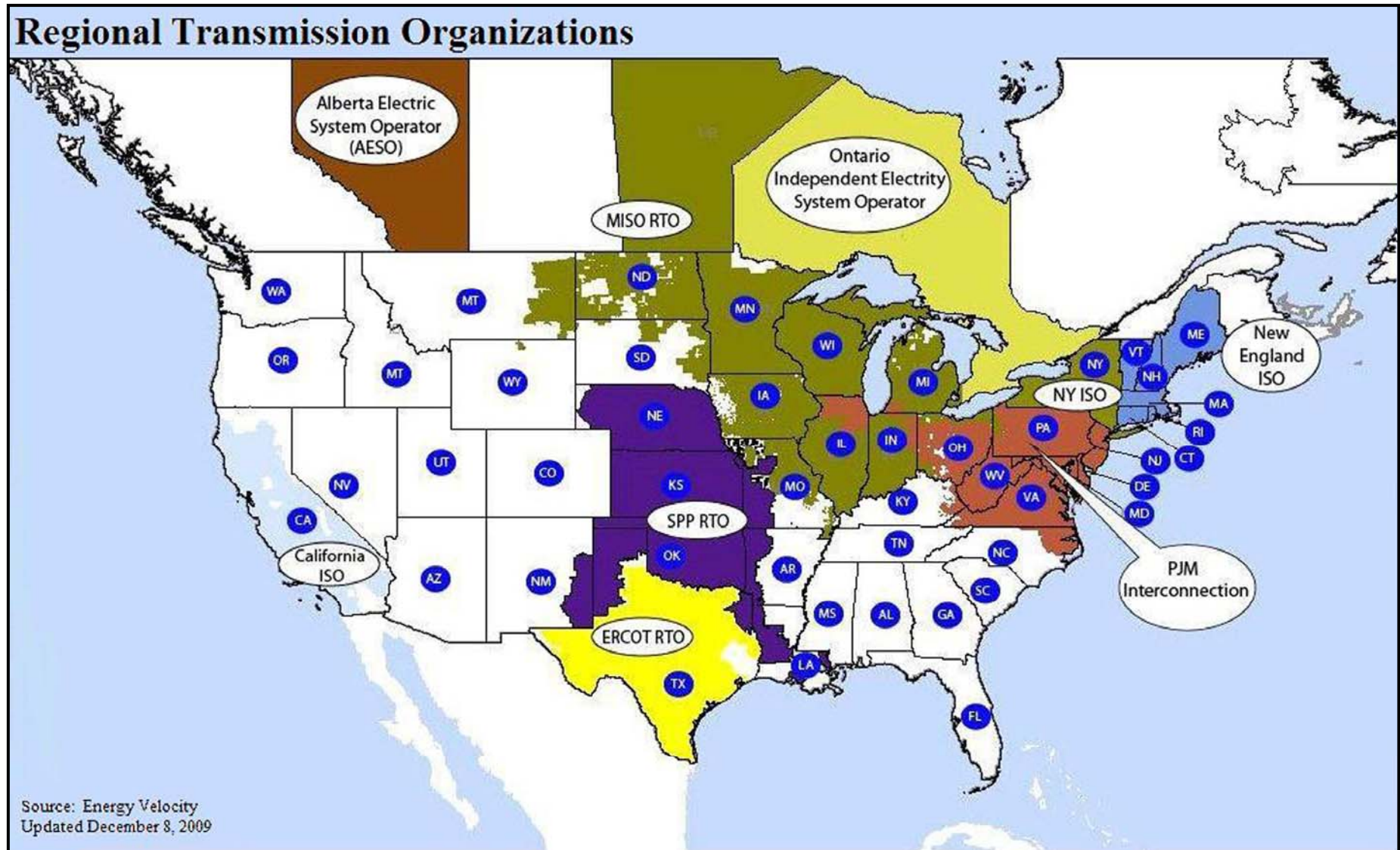
**Drive value creation through efficient
reliability / market operations,
planning and innovation**

- ▶ Value creation is our singular focus on a daily basis
 - Energy markets are just a tool to create value
- ▶ We look at value from a regional, end-use consumer perspective
- ▶ We are focused on the wholesale side of the business
- ▶ Driving value to the end user requires coordination between wholesale and retail

The Midwest ISO's Focus and Role



The Midwest ISO is geographically the largest Regional Transmission Organization / Independent System Operator in North America



Although, the Midwest ISO's footprint is broad, it is largely comprised of traditionally regulated states



Interconnected High Voltage Transmission Lines

- ▶ 56,300 miles

Installed Generation Capacity

- ▶ 144,132 MW (market footprint)
 - 1,304 generating units
- ▶ 160,757 MW (reliability footprint)
 - 1,522 generating units

Peak Demand – 7/13/2006

- ▶ 116,030 MW (market footprint)
- ▶ 136,520 MW (reliability footprint)

Midwest Market Highlights

- ▶ \$24 billion annual gross market charges (2009)
- ▶ 300 Market Participants who serve 40+ million people

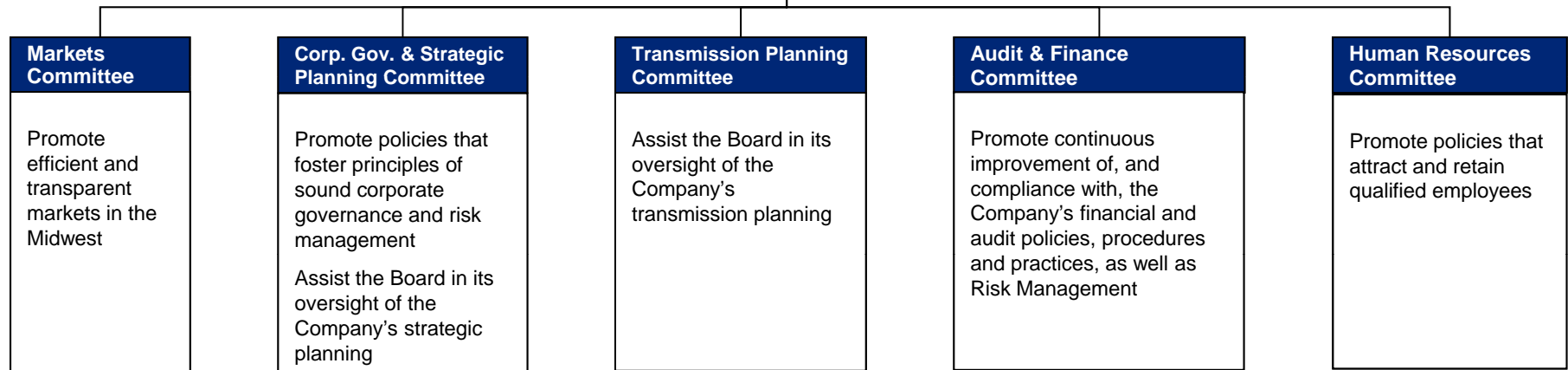
Three Control Centers

- ▶ Carmel, IN (Headquarters)
- ▶ St. Paul, MN
- ▶ Indianapolis, IN (Backup)

Midwest ISO Corporate Governance Structure

Midwest ISO Board of Directors (Seven Independent Members and the CEO)

- | | | | |
|--------------------------------|---------------------|-----------------------|----------------------|
| ▶ Paul J. Feldman, Chair | ▶ John Bear, CEO | ▶ Baljit Dail | ▶ Judy Walsh |
| ▶ J. Michael Evans, Vice Chair | ▶ Michael J. Curran | ▶ Shelley A. Longmuir | ▶ Eugene W. Zeltmann |



- ▶ The Transmission Owners Agreement established an independent Board of seven persons with staggered 3 year terms and the CEO:
 - ▶ Four members with expertise in
 - ▶ Corporate leadership at the senior management or board of directors level, or
 - ▶ Professional disciplines of finance, accounting, engineering, or utility laws and regulation
 - ▶ One member with expertise in the operation of electric transmission systems
 - ▶ One member with expertise in the planning of electric transmission systems, and
 - ▶ One member with expertise in commercial markets, trading and associated risk management
- ▶ The current Board of Directors has extensive experience in the energy industry
- ▶ All Board and Committee meetings are open

Midwest ISO Stakeholder Structure

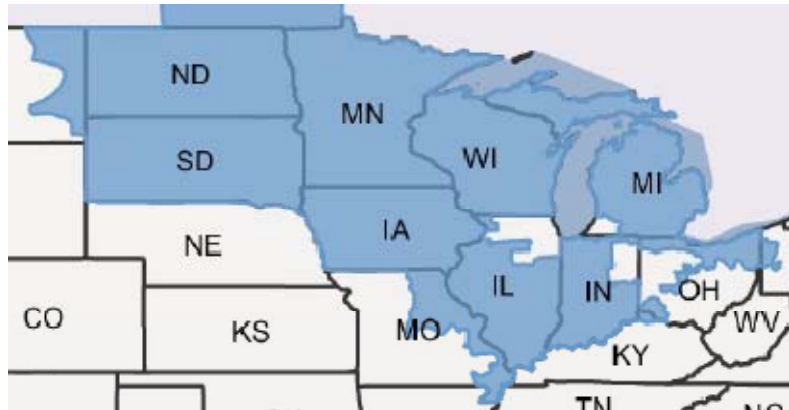
- ▶ Stakeholder Structure consists of 4 primary groups, each with a number of subordinate entities



The Organization of Midwest ISO States is extensively involved in the stakeholder process

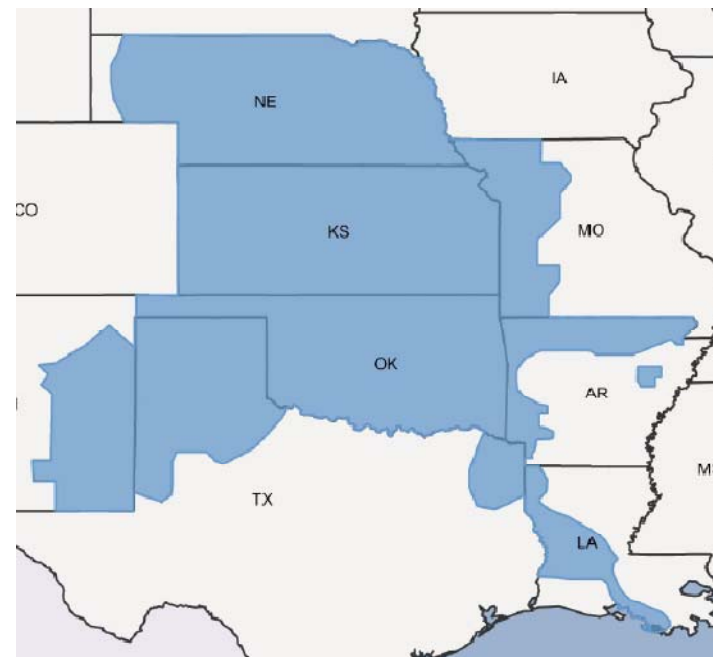
Organization of Midwest ISO States (OMS)

- ▶ Non-profit, self-governing organization of representatives from each state with regulatory jurisdiction over entities participating in the Midwest ISO
- ▶ Coordinates regulatory oversight among the states; making recommendations to the Midwest ISO, its Board of Directors, the FERC, other relevant government entities, and state commissions as appropriate; and intervening in proceedings before the FERC and in related judicial proceedings to express the positions of the OMS.



SPP Regional State Committee (SPP RSC)

- ▶ The SPP RSC is comprised of retail regulatory commissioners from agencies in Arkansas, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Texas
- ▶ The SPP Regional State Committee provides collective state regulatory agency input on matters of regional importance related to the development and operation of bulk electric transmission.



The Midwest ISO utilizes an external Independent Market Monitor

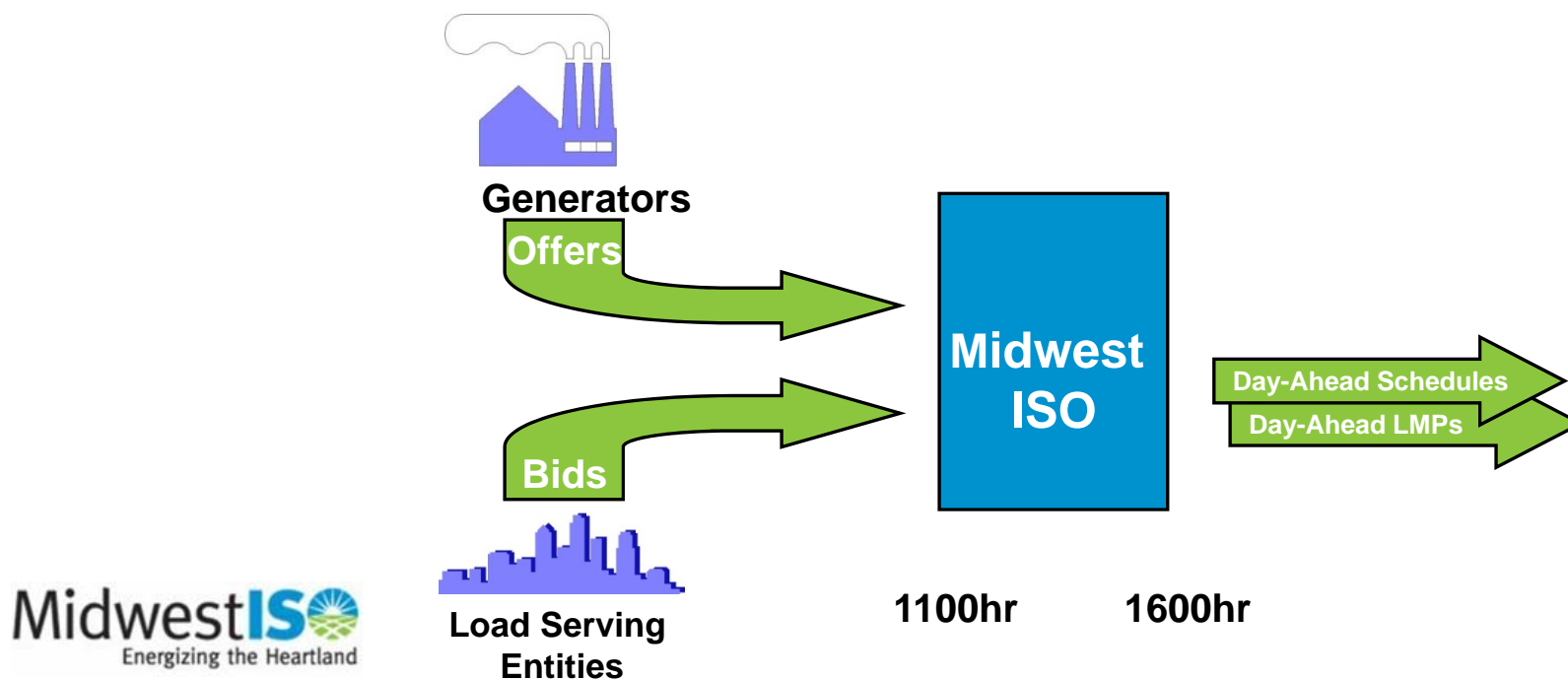
- ▶ Responsible for evaluating the competitive performance, design and operation of the markets
 - ▶ Real-time monitoring to assure competitiveness and compliance with market rules and tariffs
 - ▶ Refer potentially sanctionable market behavior to FERC
 - ▶ Analyze and report on market performance
 - ▶ Identify opportunities to improve market rules
- ▶ Hired by and reports to the Board of Directors

Markets are Midwest ISO's primary tools to efficiently manage generation and transmission assets, keeping energy prices as low as possible

Market	Summary	Implications
Day-Ahead Energy Market	<ul style="list-style-type: none"> ▶ Forward energy and ancillary services <ul style="list-style-type: none"> – Price differentiated by physical location 	<ul style="list-style-type: none"> ▶ Facilitate an efficient commitment of generation
Real-Time Energy Market	<ul style="list-style-type: none"> ▶ Spot energy and ancillary services <ul style="list-style-type: none"> – Price differentiated by physical location – 5-minute energy dispatch 	<ul style="list-style-type: none"> ▶ Dispatch the lowest-cost resources to satisfy system demand without overloading the transmission network
Financial Transmission Rights Market (FTR)	<ul style="list-style-type: none"> ▶ Allows participants to hedge transmission congestion risk associated with serving load or engaging in other market transactions ▶ Preserves the value of existing investments through FTR allocation 	<ul style="list-style-type: none"> ▶ Provide transparent economic signals to guide short-run operational and long-run investment decisions by participants and regulators
Resource Adequacy	<ul style="list-style-type: none"> ▶ Year and month ahead forward “planning reserve” or “capacity” product ▶ Assures ability to produce energy and ancillary products 	

Day-Ahead Energy Market – the vast majority of the transactions occur in this market

- ▶ Day-Ahead Energy Market is the “planning phase” – plan your next day operations and calculate costs
 - Pre-pay for energy, transmission, and ancillary services
 - Costs are based on congestion arising from expected system conditions
- ▶ Reflects participants’ expectations of next day market outcomes
- ▶ Market clearing process results in
 - An optimal set of unit commitment and hourly operating schedules for the next operating day based on bids and offers
 - A set of Day-Ahead Energy and Ancillary Service Market prices at which day-ahead cleared supply and demand schedules are settled

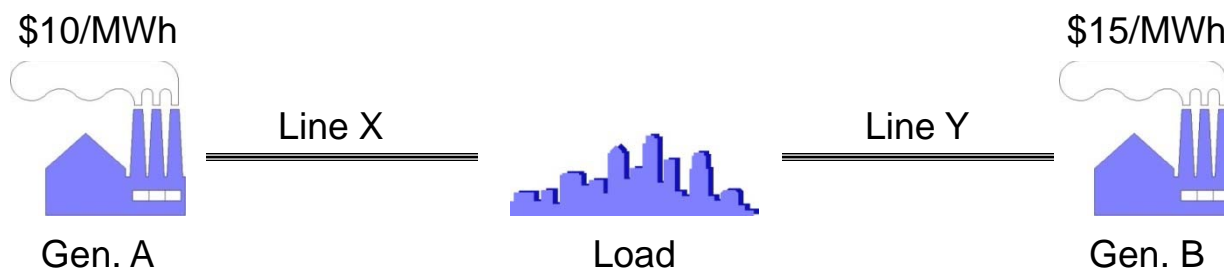


Real-Time Energy Market – serves as a “true-up” market to address actual real-time system conditions versus the day-ahead expected conditions

- ▶ Adjusts for deviations from your day-ahead plan
 - May experience unanticipated and unhedged congestion
- ▶ Reflects continuous balancing of supply and demand within limits of reliable transmission system operations
- ▶ Midwest ISO uses a Security Constrained Economic Dispatch (SCED) program to simultaneously:
 - Balance injections/withdrawals
 - Assure adequate operating reserves
 - Manage congestion
 - Produce prices used to establish resource basepoints

Financial Transmission Rights Market (FTR)

- ▶ Financial instrument that provides a “hedge” against congestion charges in the Day-Ahead Energy Market
 - Between a generation source and a load sink
 - Covers a specific period and capacity
 - Settles only in Day-Ahead Energy Market
- ▶ Reflects participant expectations of future Day-Ahead Energy Market outcomes
- ▶ FTRs are distributed annually and monthly via:
 - Allocation Process based on preexisting transmission “rights”
 - Auction Process



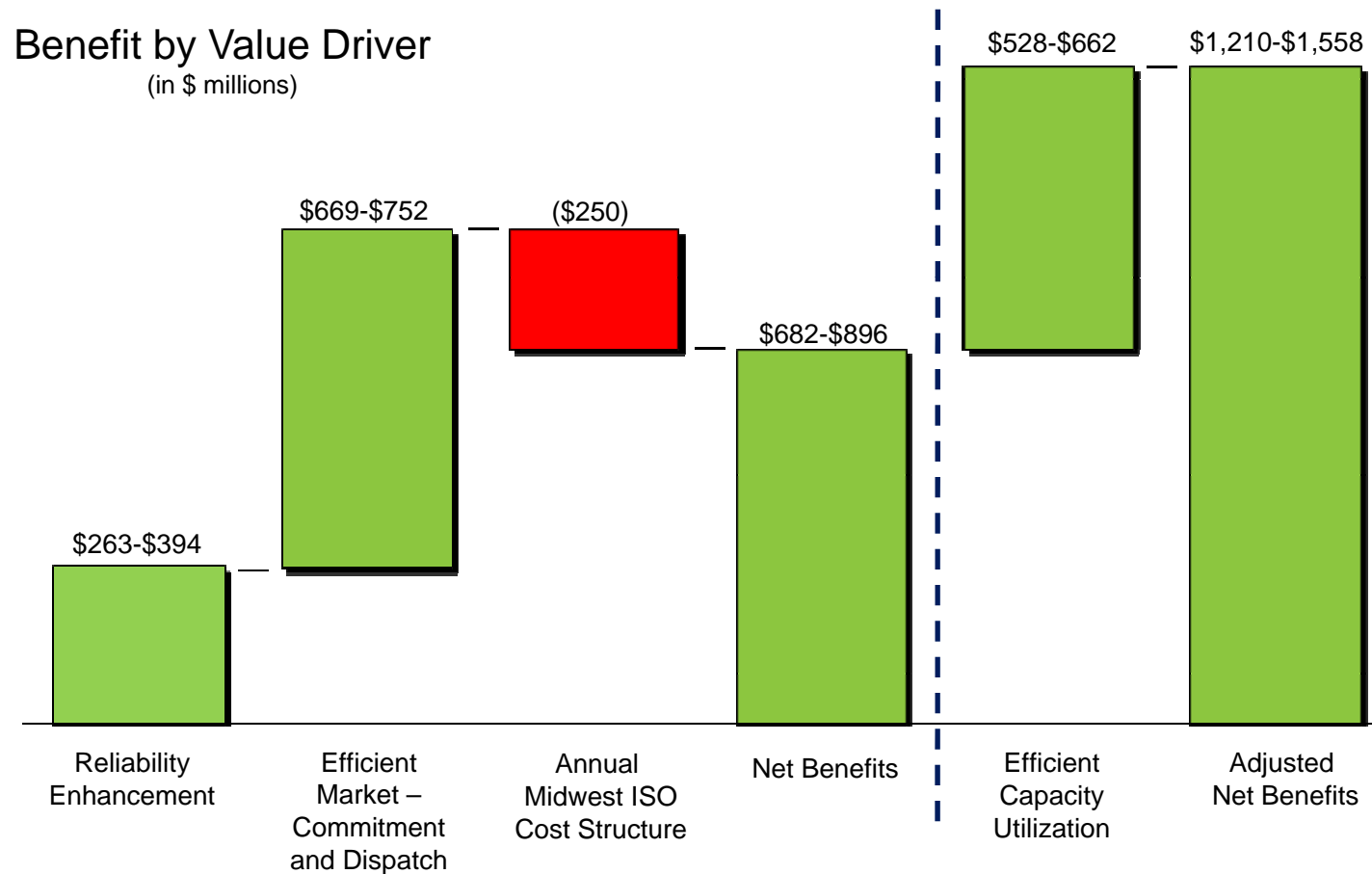
- ▶ If Line X is not congested, Load would buy from Gen. A for \$10/MWh
- ▶ If Line X is congested, Load would be forced to buy from Gen. B for \$15/MWh
- ▶ The congestion cost is \$5/MWh
- ▶ A FTR would allow Load to recover that congestion cost

Ancillary Services Market – financial settlement markets for the efficient acquisition and pricing of ancillary services

- ▶ Regulation - allows the system operator to physically balance supply and demand on a real-time, moment-to-moment basis
- ▶ Contingency reserves- used to provide energy to meet demand on the system in the event of a sudden and unexpected loss of a generation or transmission resource
 - Spinning reserves - Capability of generation resources or other qualified resources already synchronized to the grid to reach their targeted output within 10 minutes
 - Supplemental reserve - Provided by generation resources, or other qualified resources, already synchronized or not currently synchronized to the grid, but which can be ramped up to supply energy within 10 minutes

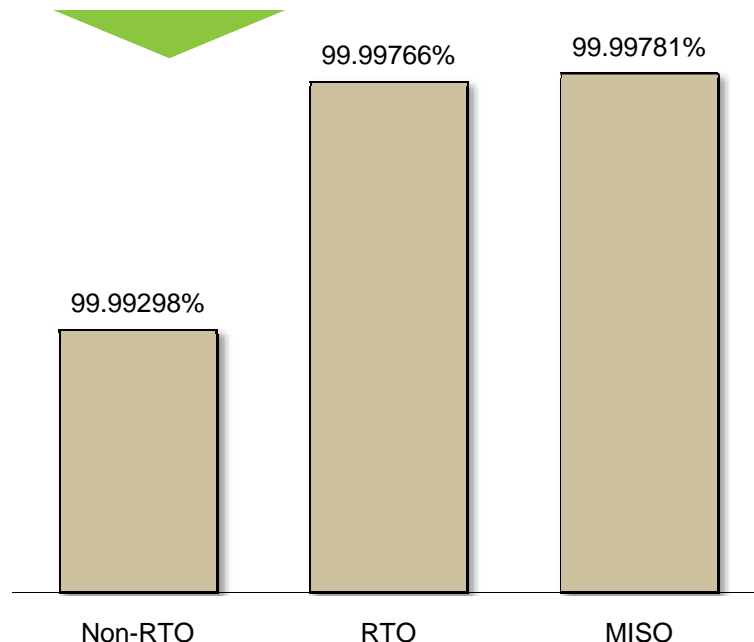
The Midwest ISO is focused on measurable value creation and the value is measured regularly

2009 Summary of Midwest ISO Value Proposition



The Midwest ISO has improved grid reliability and markets enable it to be done cost efficiently

Transmission System Availability Index (TSAI)^{1,2,3}



¹Disturbances with outages exceeding 1,000,000 customers and/or outage durations longer than one week were excluded from the analysis as it was assumed those characteristics fit the profile of a distribution-level event

²Data collected from: (a) NERC, 2000-2007 Disturbance Data (transmission based outages only), (b) Energy Information Administration, 2000-2007 Disturbance Data (transmission based outages only), and (c) Energy Information Administration, EIA-826 Database

³Midwest ISO's reliability footprint prior to 1/1/2009 was used for these calculations

Midwest ISO System Tools

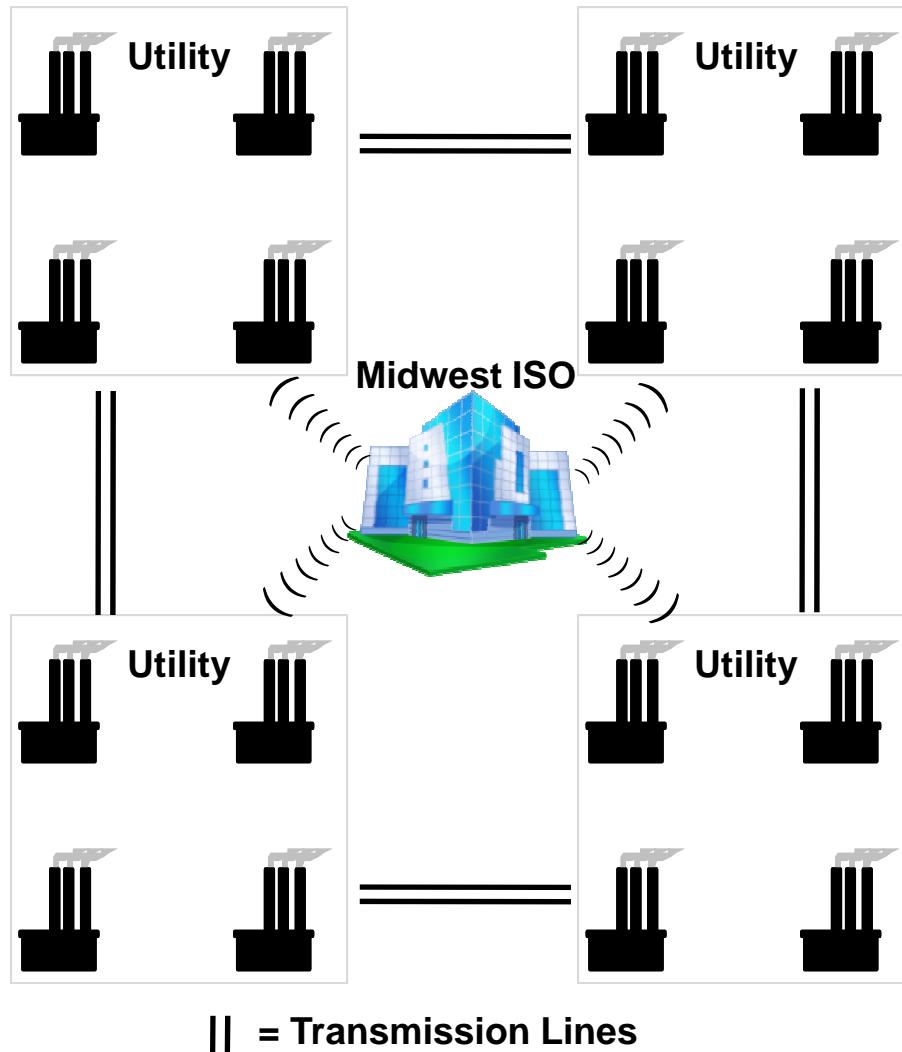
- ▶ **State Estimator – Power Systems Model**
 - 200,000+ data points collected every 15 seconds
 - Solves every 90 seconds
- ▶ **Contingency Analyzer**
 - 8,500 contingencies evaluated every 150 seconds
- ▶ **System Visualization Tools and Alarming**
 - Draws operator attention to important data
- ▶ **Extensive Operator Training**
 - Including a full dispatch training simulator
- ▶ **On-Line Backup Facility**
 - Fully redundant power system and market applications

Managing Transmission Congestion

- ▶ **Transmission Load Relief – Traditional Method**
 - Non-market method of managing congestion
 - 30 to 60 minutes to obtain relief
 - Pro-rate share reduction of transmission usage
 - Disregards economic impacts
- ▶ **Market Dispatch**
 - Market's Unit Dispatch System (UDS) performs a security-constrained unit dispatch every 5 minutes
 - Rapid congestion relief in the most economically efficient manner possible given the assets available

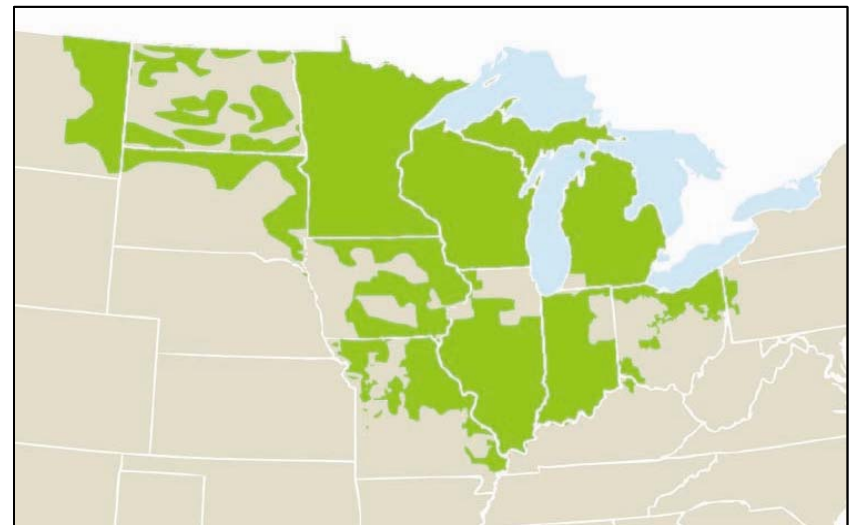
The Midwest ISO allowed for pooling of resources for more efficient optimization of the balance between supply and demand

Commitment &
Dispatch - Energy



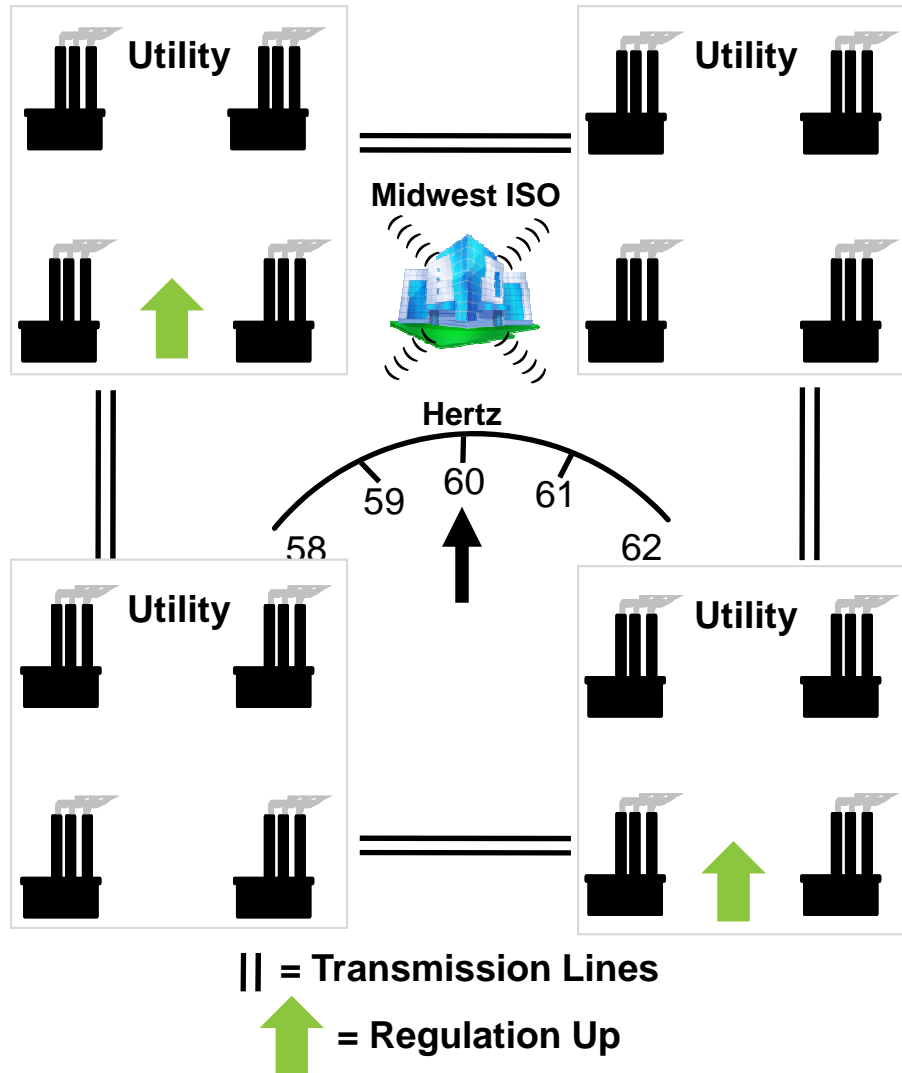
Implications

- ▶ Optimized transmission utilization (market flow)
- ▶ Reduced transaction costs
- ▶ High market transparency
- ▶ Elimination of pancaked transmission rates
- ▶ Centralized unit commitment and dispatch
- ▶ Lower energy costs



The Midwest ISO's Regulation Market has allowed the region to meet a common footprint regulation target

Commitment &
Dispatch - Regulation



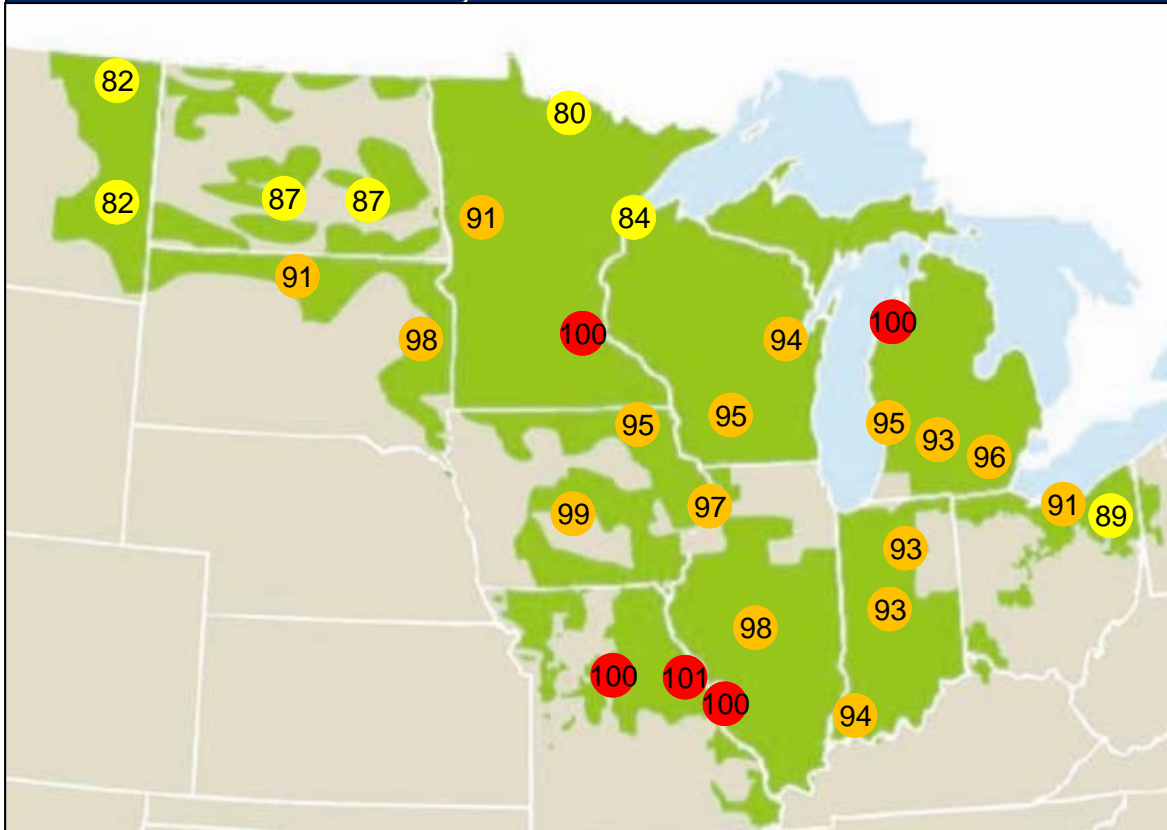
Benefits of Regulation Market

- ▶ Centralized coordination significantly reduced the amount of regulation needed to manage frequency.
- ▶ This reduced requirement made low-cost generation available to serve energy needs.
- ▶ By co-optimizing regulation with energy, regulation was moved “up” in the dispatch stack, freeing low cost units to serve energy needs reducing costs.

Midwest ISO's large footprint increases the load diversity factor allowing for a decrease in regional planning reserve margins from 15.40% to 11.94%

Capacity
Utilization

High Temperatures on July 31, 2006
Midwest ISO Peak of 116,273 MW for 2006



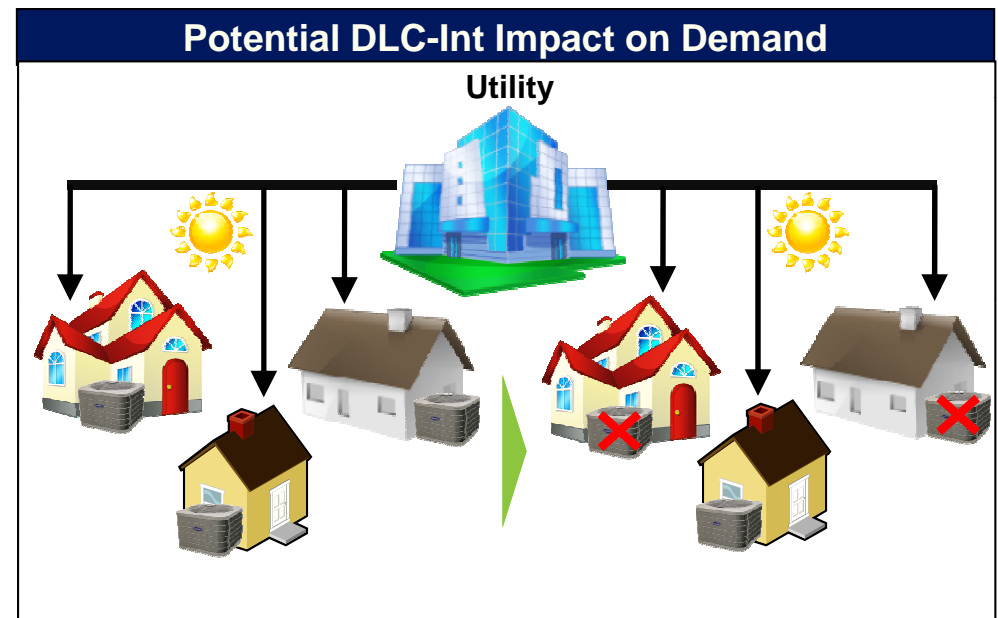
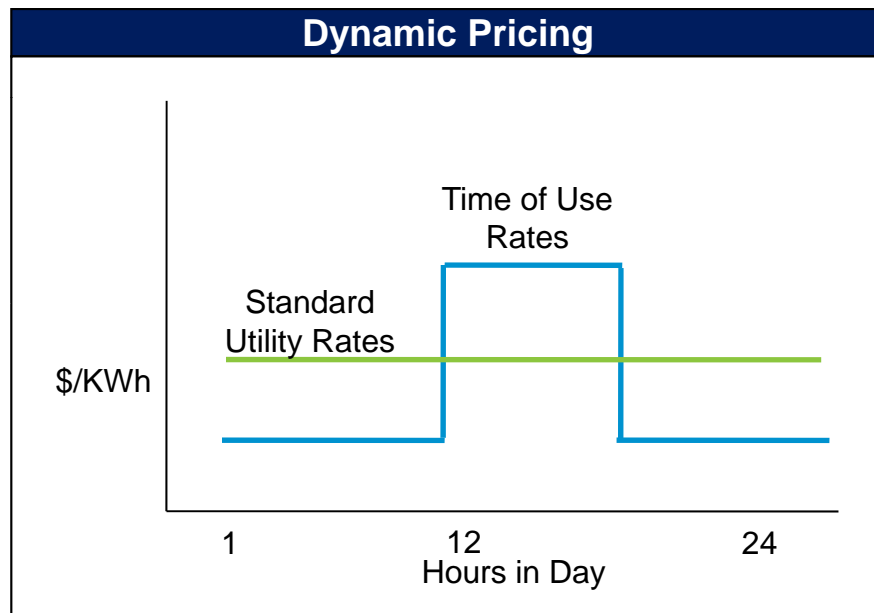
Load Diversity Factor Explained

- ▶ The high temperature map illustrates that the peak for each Load Serving Entity (LSE) does not occur at the same time
- ▶ Individual LSEs maintain reserves based on their monthly peak load forecasts. These LSE peak forecasts do not sum to the system coincident peak because they could occur at a different time than the system peak.
- ▶ To account for this diversity within the system, a reserve margin was calculated for application to individual LSE peaks utilizing a 3.00% diversity factor

A lower planning reserve margin enabled by the Midwest ISO benefits the region by allowing them to defer the investment of generation

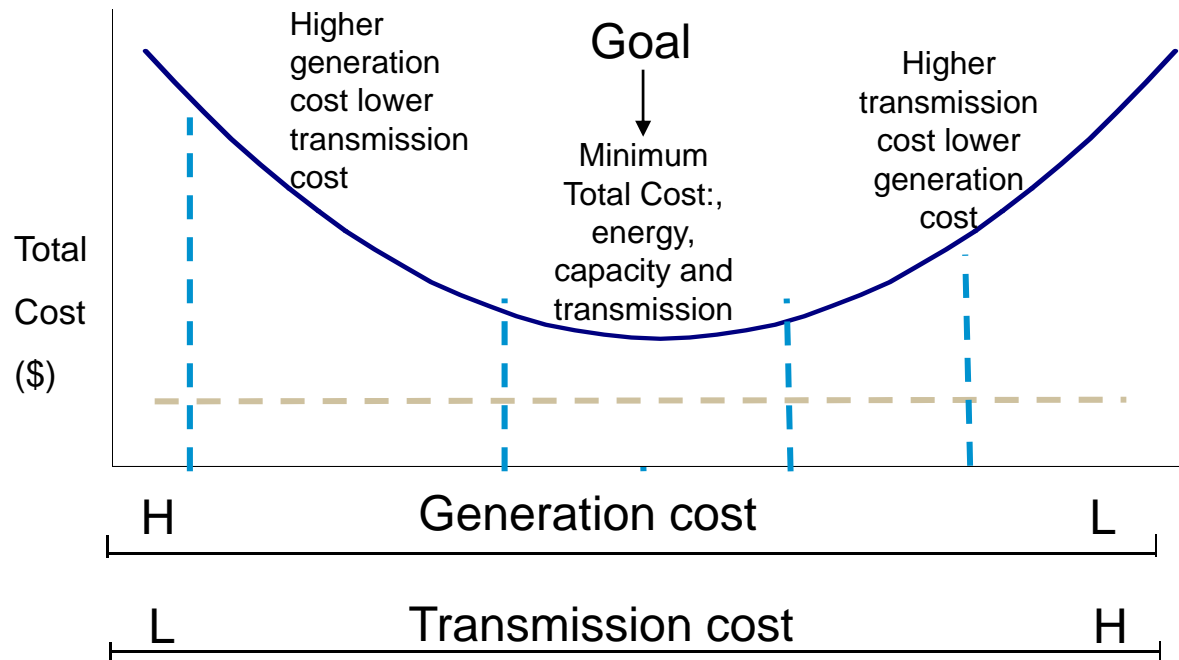
The Midwest ISO is working with our stakeholders to increase the utilization of demand side programs in the market. Market rules are in place to allow demand resources to participate in each of our market offerings.

Capacity
Utilization



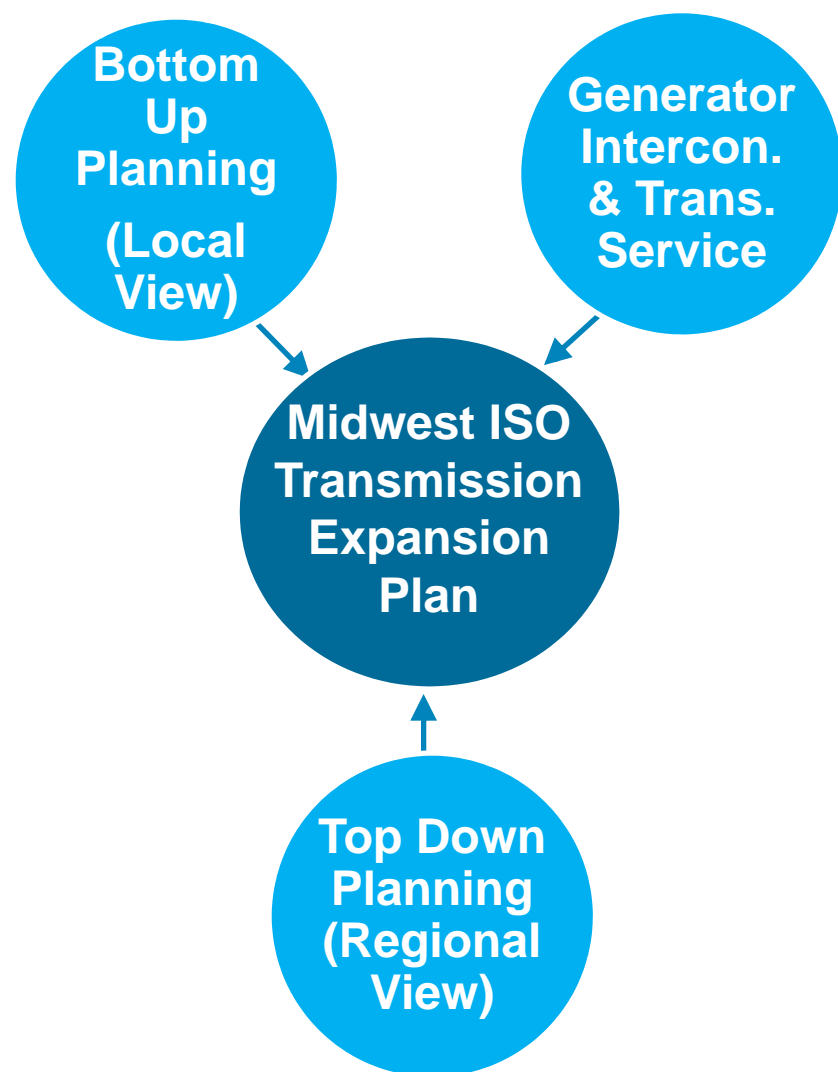
The Midwest ISO's transmission planning process is focused on minimizing the total cost of delivered power to consumers: energy, capacity and transmission

Balancing Generation and Transmission Investment



Increasing energy transfer capability through transmission buildout allows increased access to low cost generating and deferral of new generation investment

Midwest ISO's planning approach comprehensively addresses transmission needs and the results are documented annually in the Midwest ISO Transmission Expansion Plan



Midwest ISO Transmission Expansion Plan (MTEP)

- ▶ Appendix A contains the transmission projects recommended (annually) to the Board of Directors for Construction
 - \$8.4 billion approved (or currently under review for approval in 2010) since first MTEP in 2003; \$2.6 billion of that already in service
 - Current planned projects in Appendix A represent approximately 1,700 miles of new transmission, and another approximately 2,400 miles of upgraded transmission in existing right of way
- ▶ Appendix B contains transmission projects for which a need has been identified but project has not been fully studied and/or approval is not yet timely
- ▶ Appendix C contains conceptual projects, or ideas to address specific problems for which further evaluation is necessary to build business case