

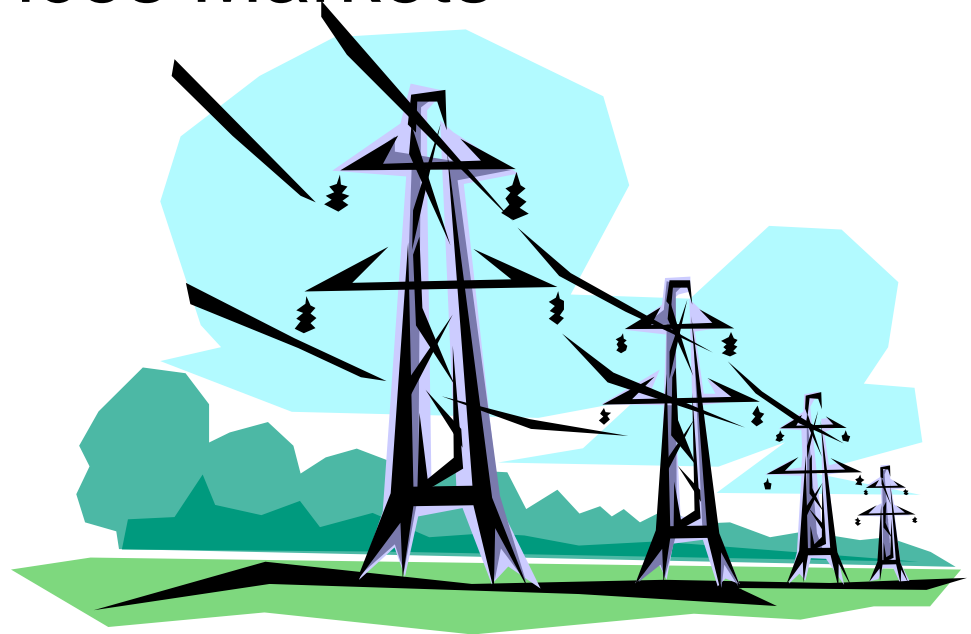
# Midwest Market Initiative

## Midwest ISO Market Design: Wind in Energy, Capacity and Ancillary Services Markets

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**MISO**

- Introduction
- Midwest ISO – who, what, where?
- Midwest ISO -- roles and responsibilities today
- Midwest ISO Energy Markets
- Midwest ISO Reserve Markets?
- End state
- Questions?

- The Midwest ISO is an independent, non-profit grid manager for the transmission of high voltage electricity across much of the Midwest.
- The Midwest ISO was the first FERC-approved Regional Transmission Organization (RTO).

# Midwest Market Initiative

## Midwest ISO

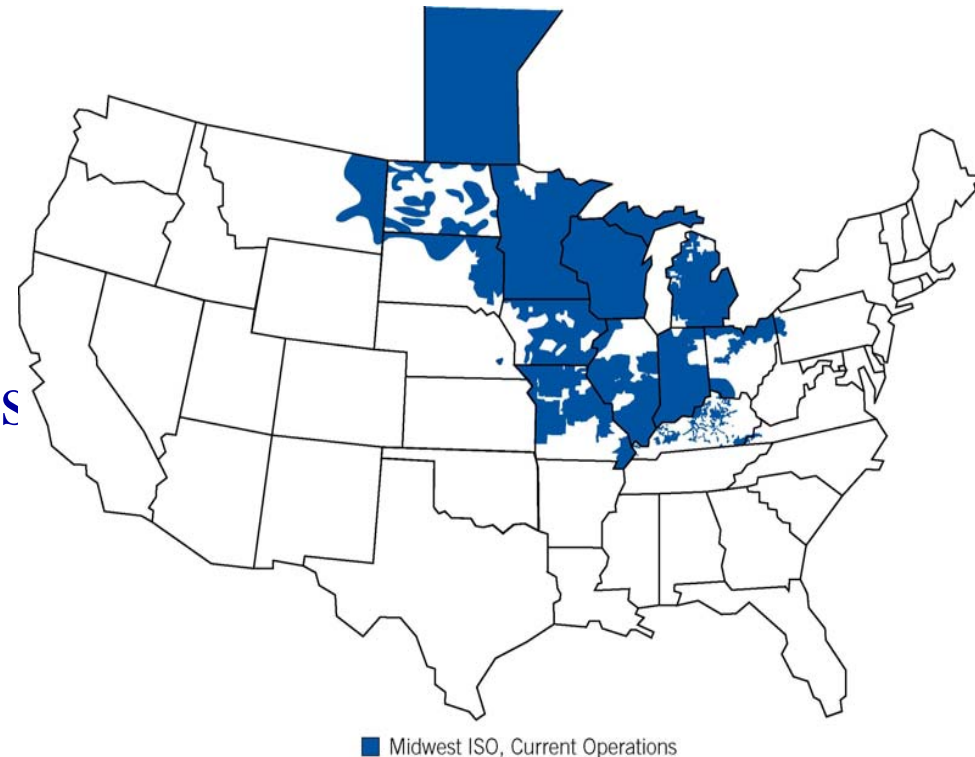
Operational since  
15 December 2001

- 35 Control Areas
- 25 Transmission Owners

Two Control Centers

- Carmel, IN
- St. Paul, MN

One Reliability Region



### Scope of Operations

15 states + Manitoba

35 control areas

Primary NERC Regions – MAIN, MAPP, ECAR

Transmission Miles - 96,000

Generating Capacity - 112,000 MW installed capacity

Peak Load - 105,000 MW

Annual Billing - US \$600 million \* without Ameren/transmission service only

Total Annual Energy, Gwhours - 600,000

FERC jurisdictional

Independent Board of Directors

Markets scheduled to open March 1, 2005

Independent Market Monitor



### Current Operations

- 1 February 2002 – Midwest ISO implements full provision of Day-1 services including
  - Reliability Coordination
  - Maintenance Coordination
  - Long-term Planning
  - Interconnection Studies
  - Tariff Administration

Per FERC Order 888, the Midwest ISO is required to offer six ancillary services

- Schedule 1 – Scheduling, System Control and Dispatch
- Schedule 2 – Reactive Supply and Voltage Control
- Schedule 3 – Regulation and Frequency Response
- Schedule 4 – Energy Imbalance
- Schedule 5 – Operating Reserve – Spinning
- Schedule 6 – Operating Reserve - Supplemental

- Because the Midwest ISO is not a control area operator, it is unable to offer ancillary services directly.
- The Midwest ISO acts as a transmission customer's agent to secure required ancillary services from the Midwest ISO Control Areas.

- Schedules 1 and 2 – required
- Schedule 3, 4, 5, and 6 – available from
  - Midwest ISO
  - Control Area
  - 3<sup>rd</sup> Party
  - Self Supply
- Ancillary services provided by the Midwest ISO are charged at the applicable control area rate. Revenues are passed straight through to the Control Area.

**Bilateral transactions facilitated by “physical” transmission service provided under regional OATT**

**MISO’s primary responsibilities related to the market include:**

- **Acceptance and analysis of requests to reserve transmission capacity for future scheduling of transactions**
- **Acceptance of schedules for approved reservations**
- **Monitoring transmission usage**
- **Providing reliability coordination**
- **Invoicing participants monthly for use of transmission lines as well as other associated services**

# Midwest Market Initiative

## Initial Proposal: Midwest Energy Markets

The critical design elements included in these Market Protocols are:

- **Real-Time Centralized Dispatch**
- **Integrated Energy and Congestion Management Day-Ahead Market**
- **Locational Marginal Pricing (LMP)**
- **Financial Transmission Rights**
- **Reliability Assessment Commitment (RAC)**
- **Self-Schedules and Bilateral Schedules**
- **Use Limited and Demand Response Resources**
- **Load Aggregation and Trading Hubs**
- **Market Timeline**
- **Market Power Mitigation**
- **Market Settlements**

*There are some critical components in the design structure as it exists that need resolution.* These elements either have yet to be addressed or need more attention in these Market Protocols and include the following:

- **Security Constrained Unit Commitment (SCUC)**
- **Resource Adequacy**
- **Pre-OATT Contracts (grandfathered agreements)**
- **Ancillary Service Procurement**
- **Control Area Activities**

### A. Real-Time Centralized Dispatch based on LMP

- MISO uses a Security Constrained Economic Dispatch (SCED) program every 5 minutes of each operating hour
- MISO sends control areas Net Scheduled Interchange (NSI) and basepoints for generators
  - NSI and resource basepoints sent every 5 minutes
  - Dynamic Schedules sent every 5 minutes
  - Ramped Control Area NSI sent every 4 seconds
  - Ramped Dynamic Schedule values sent every 4 seconds
- Control Areas will be responsible for regulation between dispatch interval and for operating reserves
- MISO calculates ex-post Real-Time LMPs based on actual system activity

### **A. Real-Time Centralized Dispatch based on LMP: Wind**

- Intermittent Resources: special treatment
- Designation/election
- Price-taker offers
- Uninstructed Deviation Penalties
  - Rationale
  - Tolerance Bands
- Forecasting Requirements
- Loss Treatment: marginal loss charges
- Market monitoring

### **B. Day-Ahead Market**

Supply Offers and Demand Bids are due at 0900 EST prior to the operating day

MISO uses Security Constrained Unit Commitment (SCUC) to economically commit units to meet bid demand

MISO uses Security Constrained Economic Dispatch (SCED) to efficiently allocate Transmission Capacity

Day-Ahead Market provides the opportunity to lock-in prices prior to the operating day – a forward hedge

### **B. Day-Ahead Market: Wind**

- No special treatment
- Financial market
- Must offer obligation for DNRs (designated network resources)
- Limits on supply offers

### **C. Reliability Assessment Commitment (RAC) process: replacement reserves**

The following principles have guided development of this RAC process:

- The RAC process should allow the Midwest ISO to commit the capacity it deems necessary to reliably operate the grid at the least commitment cost;
- The RAC process should have a transparent and equitable implementation process;
- The RAC process is not intended to create any 'new' markets outside of the existing proposed energy markets; and
- The RAC process should be incentive compatible with the Midwest ISO's proposed Day-Ahead and Real-Time Energy Markets;

### **C. Reliability Assessment Commitment (RAC) process: replacement reserves -- Wind**

- RAC determination:
  - Participation
  - Selection process
  - Procurement target
  - Regulation and operating reserve requirements
- RAC compensation:
- RAC scheduling and dispatch:
- RAC cost allocation:

### **D. Resource Adequacy: planning & operating reserves**

The following principles have guided development of the Midwest ISO's resource adequacy proposal:

- The resource adequacy proposal should enhance system reliability and security;
- The resource adequacy proposal should not impose any additional costs for the Midwest ISO's market participants without a commensurate increase in system reliability;
- The resource adequacy proposal should not promote the abuse of market power.

### **D. Resource Adequacy: planning & operating reserves -- wind**

- Calculating capacity value
- Interim Approach:
  - Comply with existing RRO or state reliability requirements
  - Standard setting responsibility
  - Midwest ISO Designated Network Resources (DNRs)
  - Must Offer requirements
  - Midwest ISO role in RRO process
- Midwest ISO supply adequacy working group (SAWG)
- Organization of Midwest ISO States (OMS) resource adequacy working group
- OMS/SAWG principles & work plan

### **E. Ancillary Services at Energy Market Implementation**

The following ancillary services will continue to be provided by the Midwest ISO Control Areas and charged to transmission customers, much as they are today

- Schedule 1 – System Control and Dispatch
- Schedule 2 – Reactive Supply
- Schedule 3 – Regulation

Schedule 4 – Imbalance will be provided through the Real-Time imbalance energy market

### **E. Ancillary Services at Energy Market Implementation**

#### Schedules 5 & 6 – Operating Reserves

- Non-market
- Interim process until implementation of reserve markets (2006?)

### **E. Ancillary Services at Energy Market Implementation**

Operating reserve obligations met primarily through existing RRO reserve sharing groups

- Transmission customers continue to have option to purchase Schedules 5 & 6 from the Midwest ISO or may self-supply
- Reserve deployment treated as bilateral transactions outside of LMP settlement for predefined period following generation contingency
- Real-time LMPs reflect impact of lost resource following reserve deployment period

### E. Ancillary Services at Energy Market Implementation

- NERC/RRO Reliability Standard compliance remains responsibility of Control Areas, not the Midwest ISO. Need to define role of the Midwest ISO as agent in operating reserve deployment
- Existing Reserve Sharing Groups include non-Midwest ISO participants. Need to accommodate reserve sharing spanning RTO boundaries
- Release of operating reserves during energy emergencies (LMP impacts)

### **F. Midwest ISO & Control Area roles and responsibilities: The Reliability Charter**

#### **NERC Functional Model**

- Reliability authority
- Balancing authority
- Interchange authority
- Real-Time security constrained economic dispatch

### **F. Midwest ISO & Control Area roles and responsibilities: Real-Time Energy Market**

- Multi-Control Area Implementation
- The Midwest ISO will not directly control generation
- 5-minute LMP Base-points produced by the Midwest ISO and sent to Market Participants using 5-minute Load Forecast at Control Area granularity
- Net Scheduled Interchange calculated by the Midwest ISO and sent to each Control Area continuously
- Control Area performs regulation between 5 minute LMP base-points
- Generation limits sent by market participants has generation set aside for regulation and operating reserves “blocked off” from LMP dispatch

# Midwest Market Initiative

## End State: Midwest Energy Markets

The critical design elements included in these Market Protocols are:

- **Real-Time Centralized Dispatch**
- **Integrated Energy and Congestion Management Day-Ahead Market**
- **Locational Marginal Pricing (LMP)**
- **Financial Transmission Rights**
- **Reliability Assessment Commitment (RAC)**
- **Self-Schedules and Bilateral Schedules**
- **Use Limited and Demand Response Resources**
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- **Market Timeline**
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*These critical components in the design structure will reach resolution in the end state.*

- **Security Constrained Unit)t Commitment (SCUC)**
- **Resource Adequacy**
- **Pre-OATT Contracts (grandfathered agreements)**
- **Ancillary Service Procurement** (through simultaneous optimization in Day-Ahead Market)
- **Control Area Activities** (Reliability Charter established)
- **Full Functionality of the Midwest ISO-PJM Market Portal**
- **The Midwest ISO-PJM Common Market**