RTO/ISO Overview

Greg Troxell,
Assistant General Counsel

May 22, 2012

MISO

Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Value Proposition
- Transmission Service
- MISO Markets
- Compliance

ISOs and RTOs

- **Independent Transmission System Operator (ISO)**
  - Non-profit organization that controls transmission, but does not own transmission assets
  - Provides non-discriminatory access to the grid, managing congestion, maintaining the reliability and security of the grid, and providing billing and settlement services

- **Regional Transmission Organization (RTO)**
  - Voluntary organization of Transmission Owners, Users, and other entities who coordinate transmission planning, expansion, operation, and use
  - *Coordinates wholesale energy and operating reserve markets*

MISO

Difference between ISOs & RTOs

- **The Regional Transmission Organization (RTO) must meet the Order No. 2000 characteristics to be approved by FERC:**
  - Independence
  - Scope and Regional Configuration
  - Operational Authority
  - Short-Term Reliability
- Not all ISOs are RTOs. An ISO must meet the eligibility requirements and receive FERC approval before having RTO status.
- 2005 Energy Act defines “Transmission Organization” to include both, plus “independent transmission providers” or other “transmission organization” approved by FERC to operate Trans.
  - ISO, RTO, Transco

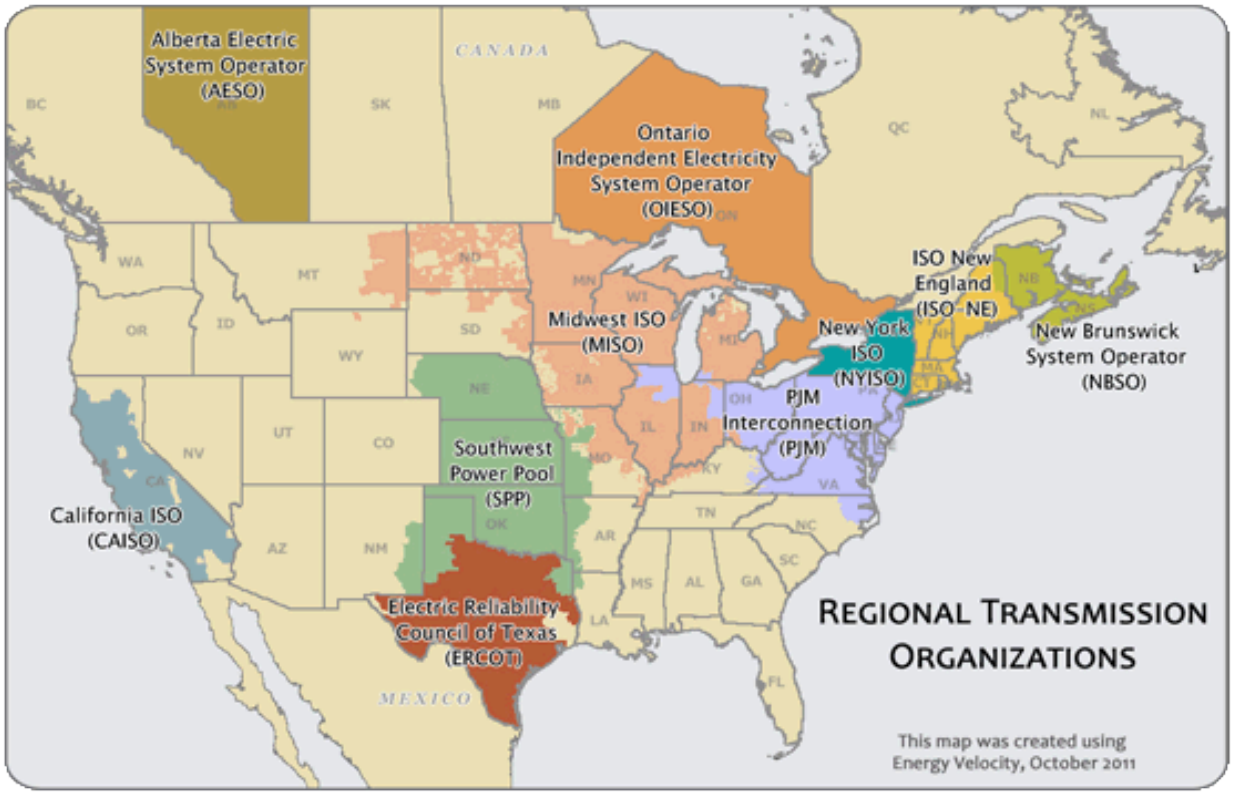
MISO

Why Do We Need ISOs or RTOs?

- **1965 Blackout led to formation of NERC, Regional Councils—Reliability Function for Transmission**
- **Order 888—Transmission Open Access**
- **Order 2000—Regional Open Access/Markets**
- **The goal of ISOs and RTOs is to deliver reliable wholesale electricity at the most economical cost**
  - De-pancaking of transmission rates across the region
  - Manage congestion (RTO, with market mechanisms)
  - Non-Discriminatory Tariff Administration/Scheduling
  - Regional Transmission Planning
  - Social Policies – Renewables, Demand Response

MISO

ISOs and RTOs



Note: ERCOT, AESO, and IESO are ***NOT*** Order No. 2000 RTOs

Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Cornerstones and Value Proposition
- Transmission Service
- MISO Markets
- Compliance

What is MISO?

- **Independent, non-profit, non-stock, Delaware corporation responsible for maintaining reliable transmission of power in 12 states and Canadian Province of Manitoba**
  - MISO approved as an ISO, 84 FERC ¶ 61,231 (1998)

- **First Regional Transmission Organization (RTO) approved by the Federal Energy Regulatory Commission**
  - MISO approved as RTO, 97 FERC ¶ 61,326 (2001)
  - MISO Energy Markets approved, 107 FERC ¶ 61,191(2004)
  - MISO Ancillary Services Market approved, 125 FERC ¶ 61,322 (2008) (last in a series, beginning with 122 FERC ¶ 61,172)

MISO: Regulatory Backdrop

- **MISO was the product of an extensive regulatory backdrop:**
  - *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, Final Rule, 75 FERC ¶ 61,080 (1996)("Order No. 888")
  - *Open Access Same-Time Information System (formerly Real-Time Information Networks) and Standards of Conduct*, Final Rule, 75 FERC ¶ 61,078 (1996)("Order No. 889")
  - *Regional Transmission Organizations*, Final Rule, 89 FERC ¶ 61,285 (1999)("Order No. 2000")
    - Atlantic City Electric Co. et al. v. FERC, 295 F.3d 1 (D.C. Cir. 2002)

Order No. 888 (April 24, 1996)

- **In Order No. 888, the Federal Energy Regulatory Commission ("FERC")**:
  - Required public utilities to file open access non-discriminatory transmission tariffs; and
  - Permitted public utilities to recover stranded costs.

- **Goal of Order No. 888:** "*Remove impediments to competition in the wholesale bulk power marketplace and to bring more efficient, lower cost power to the Nation's electricity consumers*."*

- **Order No. 888** encouraged development of independent system operators ("ISOs")**

*See http://www.ferc.gov/legal/maj-ord-reg/land-docs/order888.asp.
**JAMES H. MCGREW, FERC: FEDERAL ENERGY REGULATORY COMMISSION 156 (ABA Publishing 2009).

Order No. 889 (issued April 24, 1996)

- **In Order No. 889, FERC**:
  - Required each public utility to implement standards of conduct to functionally separate transmission/wholesale power merchant functions; and
  - Required each public utility to create or participate in an Open Access Same-Time Information System ("OASIS").
    - OASIS: Provides information about available transmission capacity, prices, etc.

- **Goal of Order No. 889:** "[Ensure] that transmission customers have access to transmission information enabling them to obtain open access transmission service on a nondiscriminatory basis."*

*Source: McGrew at 154.

Order No. 2000 (issued December 20, 1999)

- **Sought to address certain problems that remained after Order Nos. 888 and 889.**

- **In Order No. 2000, FERC**:
  - Amended its regulations under the Federal Power Act to advance the formation of RTOs
  - Required each public utility to make certain filings with respect to forming and participating in an RTO
  - Codified minimum characteristics and functions for RTOs

- **Goal of Order No. 2000:** "[P]romote efficiency in wholesale electricity markets and ensure that electricity consumers pay the lowest price possible for reliable service."*

*See Order No. 2000. 18 CFR § 35.34

Minimum Characteristics of an RTO under Order No. 2000*

1. Independence
2. Scope and Regional Configuration
3. Operational Authority
4. Short-Term Reliability

*Order No. 2000 at p. 151-323.

Minimum Functions of an RTO under Order No. 2000*

1. Tariff Administration and Design
2. Congestion Management (via market solutions)
3. Parallel Path Flow
4. Ancillary Services
5. OASIS and Total Transmission Capability (TTC) and Available Transmission Capability (ATC)
6. Market Monitoring
7. Planning and Expansion
8. Interregional Coordination

*Order No. 2000 at p. 323-497. 18 CFR § 35.34

MISO

Designation of MISO as an RTO

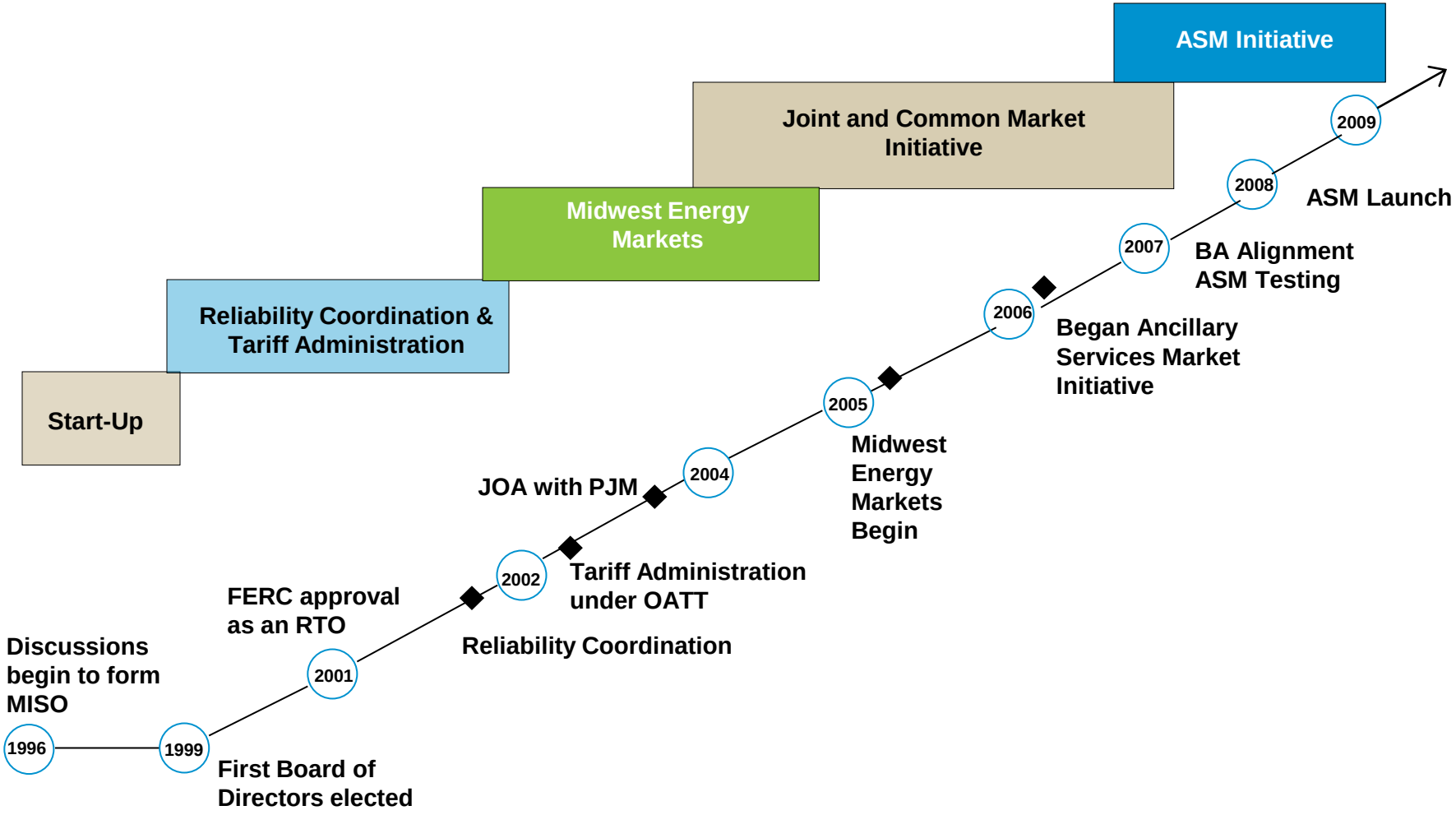
- 01/16/01: MISO submitted Order No. 2000 compliance filing

- 12/20/01: FERC granted MISO RTO status, finding that it had satisfied all of the required characteristics/functions of an RTO under Order 2000.*

"We believe that a properly formed RTO in the Midwest will greatly benefit the public interest by enhancing the reliability of the Midwest electric grid and facilitating and enhancing competition. It will accomplish this primarily through standardization of the rates, terms, and conditions of transmission service over a broad region. With this order . . . we hope to help [MISO] achieve substantial benefits for Midwestern customers."*

**Midwest Independent Transmission System Operator, Inc*., 97 FERC ¶ 61,326 (2001).

MISO Evolution



Critical Deliverables

What We Do	Implications
• Provide independent transmission system access	• Equal and non-discriminatory access
• Deliver improved reliability coordination	• Regional reliability improvements
• Perform efficient market operations	• Lower cost unit commitment, dispatch, congestion management
• Coordinate regional planning	• Integrated system planning
• Foster platform for wholesale energy markets	• Encourage infrastructure investment, facilitate regulatory initiatives

MISO

Who are MISO's Customers?

- ***Transmission Owner*** **–** owns, operates, and maintains transmission lines.
- ***Customer*** **–** Anyone who conducts business within the MISO region. This is a financial relationship.
- ***Market Participant*** **("*MP*") –** Same as a customer. Explicitly refers to participation in the Midwest Market.
- ***Member*** **–** An entity that has voting rights within the MISO committee structure.
- ***Stakeholder*** **–** Any entity (or person) who is interested in activities at MISO. Primarily refers to those who participate in committee meetings.

Scope of MISO Operations (June 2012)

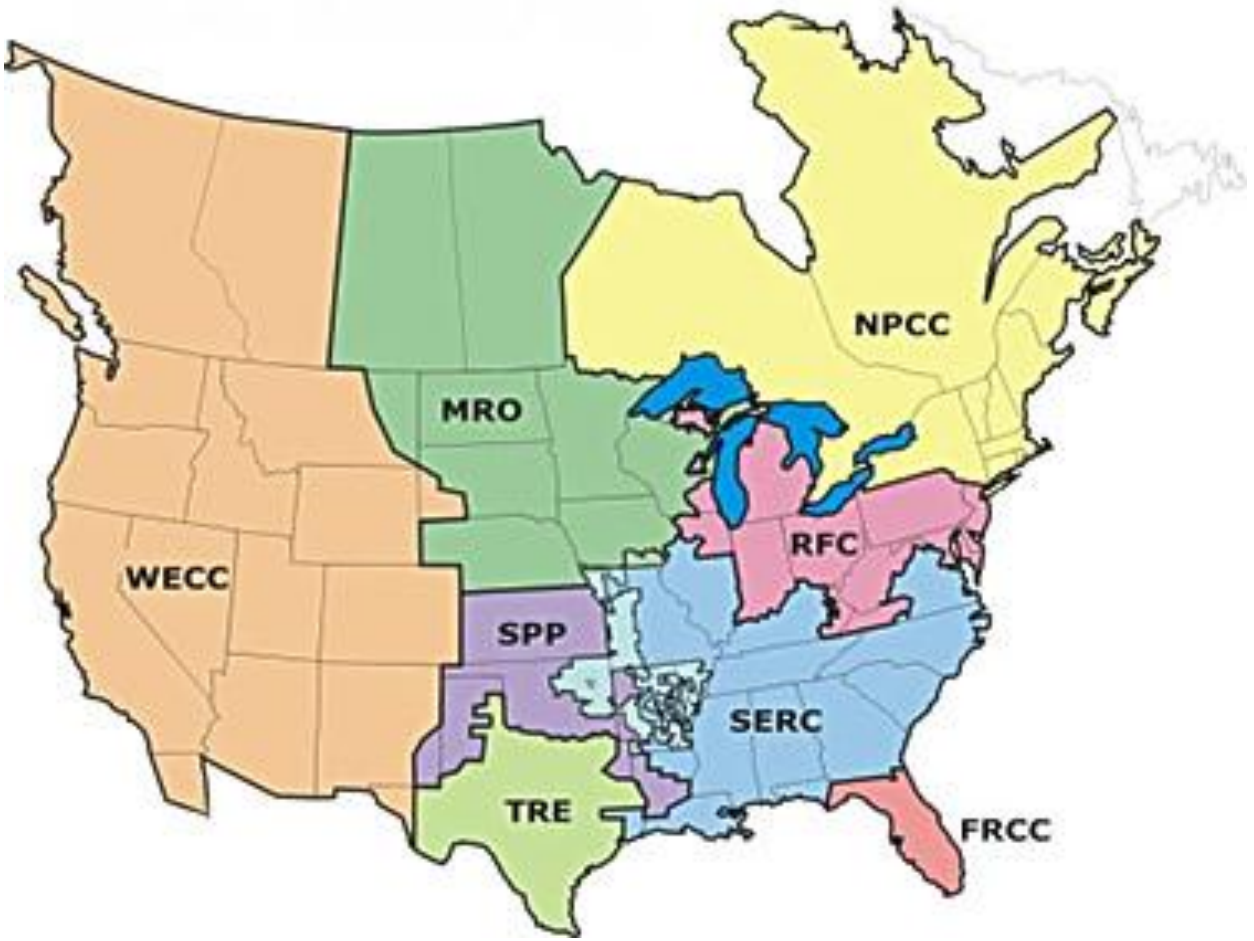
- **Generation Capacity**
  - 131,178 MW (market)
  - 143,347 MW (reliability)
- **Historic Peak Load (set July 20, 2011)**
  - 103,975 MW (market)
  - 110,032 MW (reliability)
- **49,641 miles of transmission lines**
- **11 states, 1 Canadian province (Manitoba)**
- **6,032 generating units in the network model (March 2012)**
- **360+ Market Participants serving 40+ million people**

MISO

Who Oversees MISO?

- **Federal Energy Regulatory Commission (FERC)**
  - Changes or additions to MISO Tariff subject to FERC approval
- **North American Electric Reliability Corporation (NERC)**
  - Develops and enforces reliability standards as part of its responsibility as a FERC certified Electric Reliability Organization (ERO). Designated as an ERO in 2006.
- **Regional Entities**
  - Region-specific reliability rules
  - MRO, RFC and SERC in MISO region
- **North American Energy Standards Board**
  - Develops business practices and commercial rules which FERC then requires utilities to incorporate into tariffs
  - But standards are copyright protected, not published in FedReg
    - But, see Docket No. NARA 12-0002.

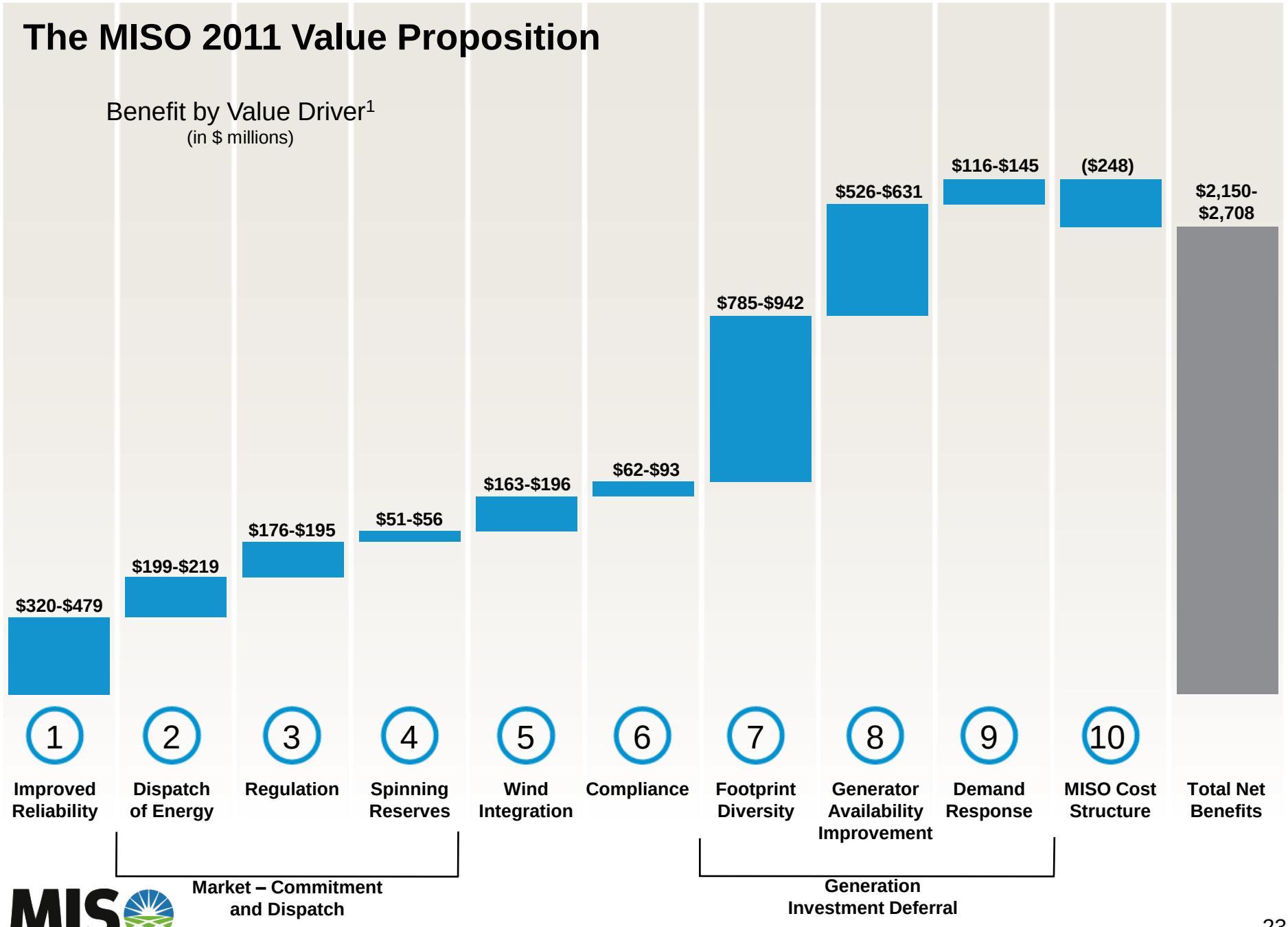
Regional Entities



Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Value Proposition
- Transmission Service
- MISO Markets
- Compliance

The MISO 2011 Value Proposition



[1]Figures shown reflect annual benefits and costs that can be expected in 2011

Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Cornerstones and Value Proposition
- Transmission Service
- MISO Markets
- Compliance

Transmission Service

- **Tariff, Module B**
  - Pro Forma in most respects
- **Point-to-Point (Firm/Non-Firm)**
- **Network**
- **Discounting**

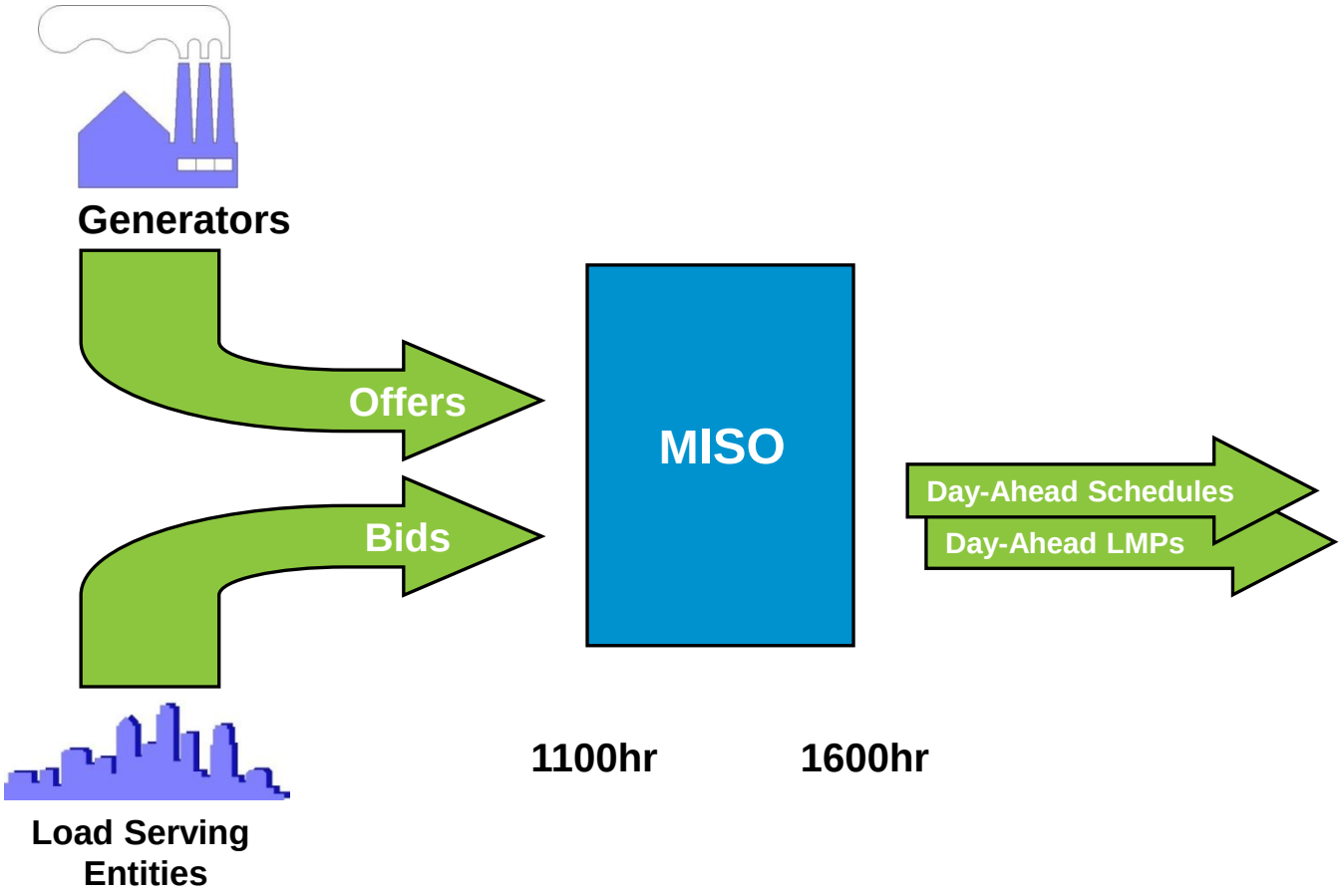
Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Cornerstones and Value Proposition
- Transmission Service
- MISO Markets
- Compliance

MISO Markets

- **Day-Ahead**
- **Real-Time**
- **Financial Transmission Rights (FTR)**
- **Ancillary Services**
  - Operating Reserves/Regulation

Day-Ahead Market



Real-Time Market

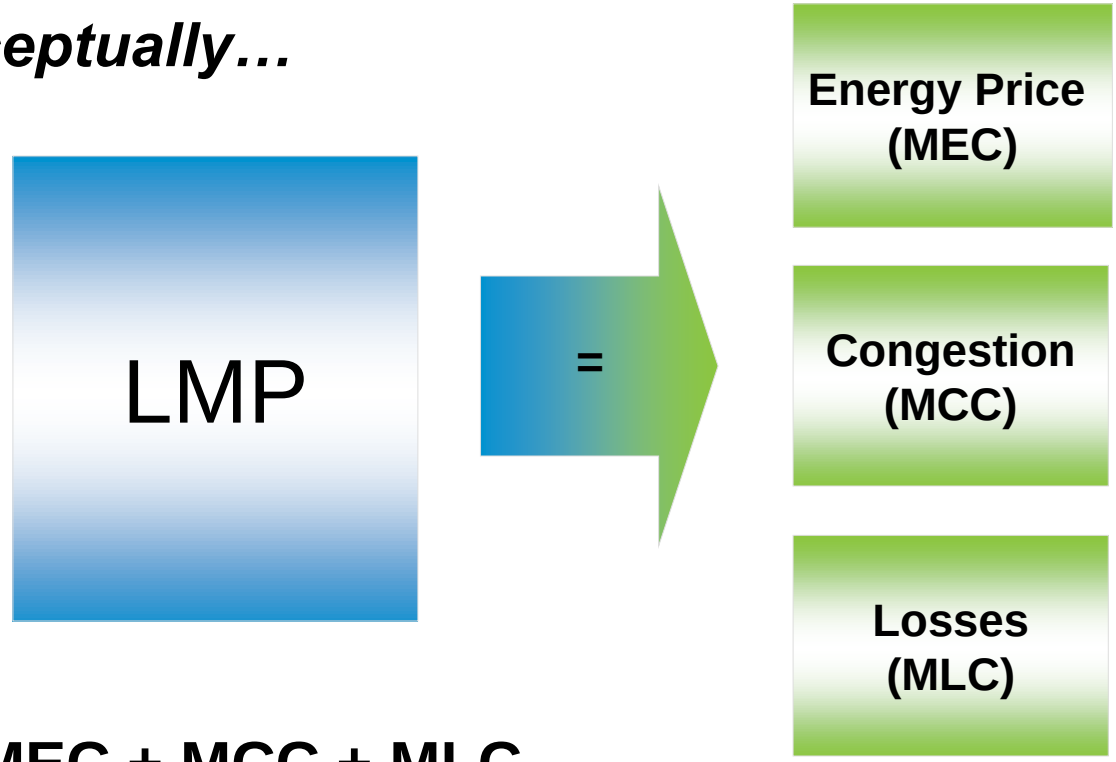
- **A continuous process of balancing generation and demand at least cost while recognizing current operating conditions**

- **Manage congestion via Locational Marginal Pricing and Generation Redispatch**

Locational Marginal Pricing

LMP Components

- ***Conceptually…***



LMP = MEC + MCC + MLC

Financial Transmission Rights

- **Provides a mechanism for Market Participants to manage the risk of congestion**
- **FTRs apply to the Day-Ahead Market only**
- **Financial Mechanism ONLY (not tied to physical delivery)**
- **FTRs hedge against congestion only – not losses**
- **Auction Revenue Rights – The right to share of $$ generated in the annual FTR auction**
- **First Energy v PJM, FERC Docket No. EL12-50**
  - Modeling outages have economic impacts

Ancillary Service Markets

- **Financial settlement markets for the efficient acquisition and pricing of Ancillary Services**
  - Ancillary Services: Services necessary to support Capacity and the transmission of Energy from Resources to Loads while maintaining reliable operation of the Transmission System in accordance with Good Utility Practice. Commonly known in the industry as a collection of secondary services offered to help insure the reliability and availability of energy to consumers (e.g., regulation, *spinning reserve, supplemental reserve*, voltage regulation)
- **Clear identification of Ancillary Services products allows Market Participants to compete to provide services**

Agenda

- Defining ISOs & RTOs
- Role of MISO
- MISO Cornerstones and Value Proposition
- Transmission Service
- MISO Markets
- Compliance

Compliance

- **FERC (Tariff: governance, transmission T&C, markets)**
- **NERC**
  - MISO Registered Functions:
    - Balancing Authority (BA)
    - Interchange Authority (IA)
    - Planning Authority (PA)
    - Reliability Coordinator (RC)
    - Transmission Service Provider (TSP)
- **Regional Entities**
  - 3 Regional Entities located within MISO Region:
    - Reliability*First* Corporation (RFC)
    - Midwest Reliability Organization (MRO)
    - SERC Reliability Corporation (SERC)
- **NAESB (Bus. Practices are adopted by FERC)**

Questions

- **www.misoenergy.org**
- **FAQ High Level Tutorial**
  - https://www.misoenergy.org/AboutUs/Pages/MISOFAQ.aspx
- **Any questions can be addressed by Client Relations at:**
  - 1-866-296-6476 (option 1)
  - Via email at clientrelations@misoenergy.org

Corporate Information / 1

Overview

The Midwest Independent Transmission System Operator, Inc. (MISO) is a non-profit, member-based organization committed to being the leader in electricity markets by providing our customers with valued service, reliable, cost-effective systems and operations, dependable and transparent prices, open access to markets, and planning for long-term efficiency.

Scope of Operations

- Generation Capacity
  - 131,178 MW (market)
  - 143,347 MW (reliability)
- Historic Peak Load (set July 20, 2011)
  - 103,975 MW (market)
  - 110,032 MW (reliability)
- 49,641 miles of transmission
  - 500kV, 345kV, 230kV, 161kV, 138kV, 120kV, 115kV, 69kV
- 11 states
- One Canadian province
- Control Centers
  - Carmel, IN
  - St. Paul, MN
- 629 TWhours annual billing (2010 transmission service)

Reliability

MISO built and continuously refines its extensive network computer model of the MISO interconnected reliability region and surrounding systems.

- Network Model (March 2012)
  - 40,976 network buses
  - 254,430 SCADA data points*
  - 6,032 generating units
  - 32,761 loads

Reliability Analysis

- State Estimator and Real Time Contingency Analysis
  - 249,000 real-time measurements, solving <90 seconds
  - 8,300 "what-if" contingencies, solving <5 minutes on average
- 13,600 one-line station diagrams
- Balancing Authorities - 4 - including MISO Balancing Authority (reliability)
  - 28 Local Balancing Authorities
- Alarming Tools
  - Voltage v. limits
  - Flows v. limits
  - Status
  - Topology processor
- Automatic Generation Control Tool
- Delta Flow and Voltage Tools
- Flowgate Monitoring Tool
- Generation Monitoring Tool
- Interface and Frequency Tools
- ICCP Data Quality Tool
- Power Supply Monitoring Tool

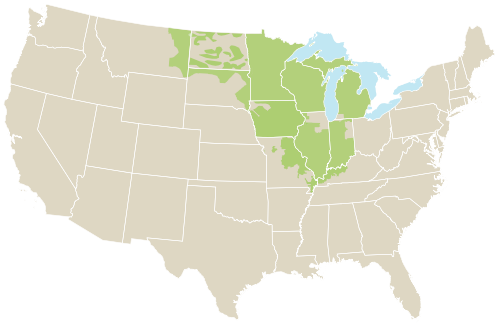
Markets Overview

MISO manages one of the world's largest energy and operating reserves markets using security-constrained economic dispatch of generation. The Energy and Operating Reserves Market includes a Day-Ahead Market, a Real-Time Market, and a Financial Transmission Rights (FTR) Market. These markets are operated and settled separately.

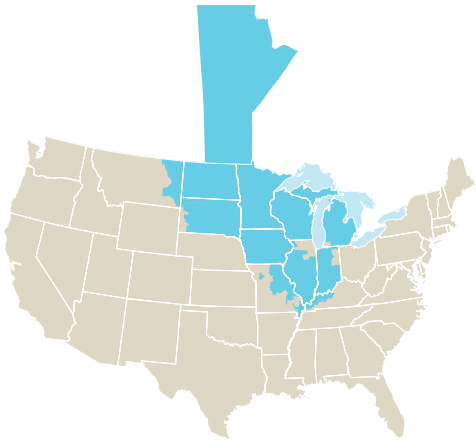
- $23.6 billion annual gross market charges (2011)
- 1,935 pricing nodes
- Five-minute dispatch
- Offers locked in 30 minutes prior to the scheduling hour
- Spot market prices calculated every five minutes
- 363 Market Participants who serve 38.9 million people

Employees

- 815 full-time employees (2012 budget year)



Market Area



Reliability Coordination Area

Governance

MISO is governed by an independent eight-member Board of Directors, with seven independent directors elected by the membership, plus the president of MISO.

No board member may have been a director, officer or employee of a member, user, or affiliate of a member or user for two years before or after election to the Board.

Under MISO's Standards of Conduct, all MISO board members, employees and their immediate family members are required to divest of any holdings in member or user companies.

*includes real-time ICCP measurements, market SCADA points and various SCADA calculations requested for reliability and market operations

Corporate Information / 2

Key Dates

- January 6, 2009
  Ancillary Services Market Begins
- April 16, 2008
  NERC certifies MISO as Balancing Authority
- November 1, 2006
  Chosen Independent Entity for administration of Duke Power transmission services
- April 1, 2005
  Midwest Markets Launch
- February 1, 2002
  Transmission service begins under MISO Open Access Transmission Tariff
- December 2001
  RTO approval from FERC
  Reliability operations begin
- September 16, 1998
  FERC grants conditional approval
- February 12, 1996
  Transmission owners convene to form MISO

Fees for Services

Actual costs to provide services are recovered pursuant to a FERC accepted tariff. Schedule 10 of the tariff recovers the cost of transmission service and reliability coordination. Schedule 16 recovers the cost of the FTR market. Schedule 17 recovers the cost of the day-ahead and real-time energy markets.

Renewable Integration

- Wind in queue as of December 2011, 28,872 MW
- 10,790 MW registered wind capacity (March 2012)

Interconnections

The MISO-administered grid interconnects with the Independent Electricity System Operator of Ontario, the Mid-Continent Area Power Pool, PJM, Southwest Power Pool and the Tennessee Valley Authority. MISO has seams agreements or memorandums of understanding with each of these organizations to facilitate operations.

Diversified Fuel Mix

- Hydroelectric, coal, gas, oil, wind, and nuclear.

Membership

- 40 Transmission Owners with $17.8 billion in transmission assets under MISO's functional control
- 98 Non-transmission owners

Membership Sectors

- Transmission Owners
  Vertically Integrated
  Stand-Alone Transmission Companies
- Coordination Member
- Power Marketers
- Independent Power Producers / Exempt Wholesale Generators
- Municipals / Cooperatives / Transmission-Dependent Utilities
- End-Use Customers
- Environmental Groups
- State Regulatory Authorities
- Public Consumer Groups

Key Committees

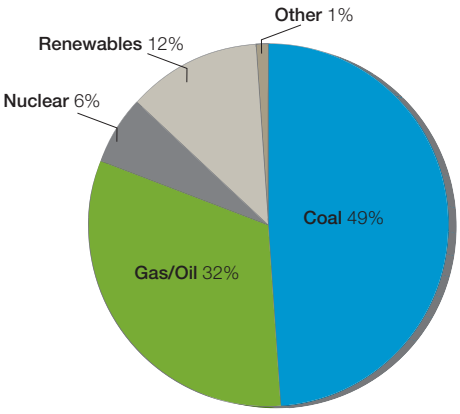
- Board of Directors
- Advisory Committee
  Reliability Subcommittee
  Finance Subcommittee
  Market Subcommittee
- Alternative Dispute Resolution Committee
- Transmission Owners Committees
- Planning Committee

State Regulatory Committee

- Organization of MISO States

Expansion Planning

- 215 approved new projects through 2021
- Approximately $2 billion in annual benefits from all approved projects
- Multi-Value Project Portfolio creating up to $49.2 billion in benefits through first 40 years of operation
- Benefits 1.8 to 3.0 times cost from the Multi-Value Project Portfolio



Awards and Recognition

- OSEG 2011 Governance, Risk Management and Compliance Achievement Award
- 2011 Franz Edelman Award Winner
  for extraordinary achievement in applying operations research in market operations
- North American Electric Reliability Corp
  Examples of Excellence (2007)
  Training
  Tools (3 honors)
  System Restoration
  Operational Scorecard
  Examples of Excellence (2005)
  Voltage stability analysis
  Best Practices (2005)
  Manual redispatch
- Computer World
  Laureate, *Data Storage Best in Class; Best Practices (07)*

How to Contact Us

Carmel
P.O. Box 4202
Carmel, IN 46082
866-296-6476
317-249-5400

Overnight Deliveries

720 City Center Drive
Carmel, IN 46032

St. Paul
1125 Energy Park Drive
St. Paul, MN 55108
651-632-8400

www.misoenergy.org