

***Presentation to
Representatives
of the Public Utilities Regulatory***

Commission of Ghana

Regional Transmission Organizations

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April, 2005

The Midwest Independent Transmission System Operator: America's First Regional Transmission Organization



What Is a Regional Transmission Organization?

A Regional Transmission Organization (RTO) provides wholesale electric transmission service under one tariff for a large geographic area

RTOs are regulated by the Federal government (Federal Energy Regulatory Commission)



RTO Activities

Include:

- ✓ **Tariff administration**
- ✓ **Congestion management**
- ✓ **Parallel path flow**
- ✓ **Calculate available transmission capacity**
- ✓ **Market monitoring**
- ✓ **Planning and expansion**
- ✓ **Inter-regional coordination**

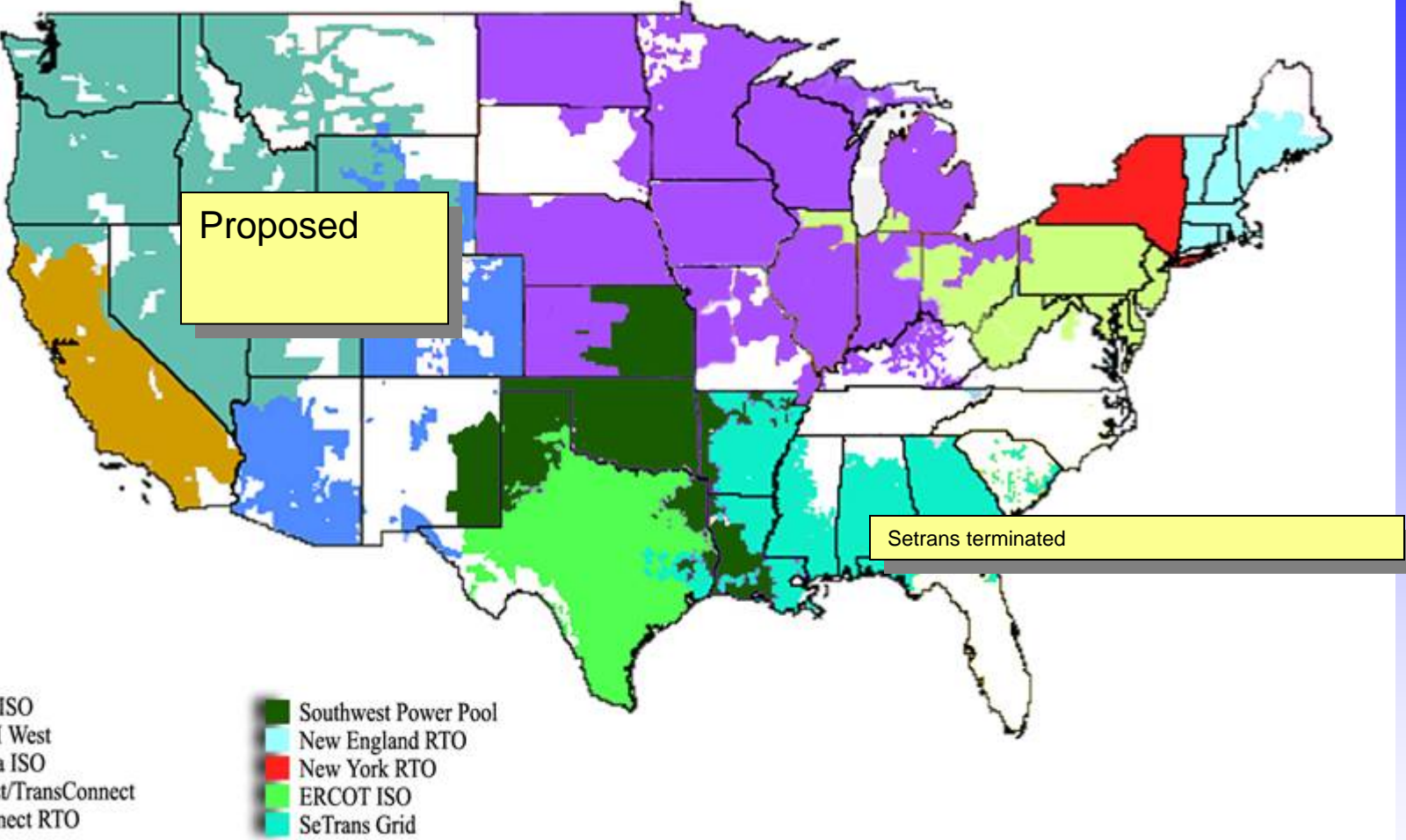


Benefits of a Regional Transmission Organization

- **Independence**
 - **Non-discriminatory open access to a large consolidated transmission system**
 - **Independent calculation of Available Transfer Capability/Available Flowgate Capability**
 - **Independent market monitoring and mitigation**
- **Enhanced Reliability**
 - **Better planning process over a larger region**
 - **Better congestion management**
 - **Improved maintenance and outage coordination**

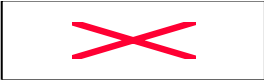


ISO/RTO Map



Legend

- Midwest ISO
- PJM/PJM West
- California ISO
- RTO West/TransConnect
- WestConnect RTO
- Southwest Power Pool
- New England RTO
- New York RTO
- ERCOT ISO
- SeTrans Grid



Benefits of a Regional Transmission Organization

- **One-stop Shopping**
 - **Single OASIS (Open Access Same Time Information System)**
 - **Single scheduling system**
 - **Consolidation of reliability coordinators into one regional entity**
 - **One standardized generator interconnection process**
- **Savings**
 - **Elimination of pancaked rates**
 - **Eliminates seams within the RTO and addresses seams with other RTOs**
 - **Lower reserve requirements on a regional basis**



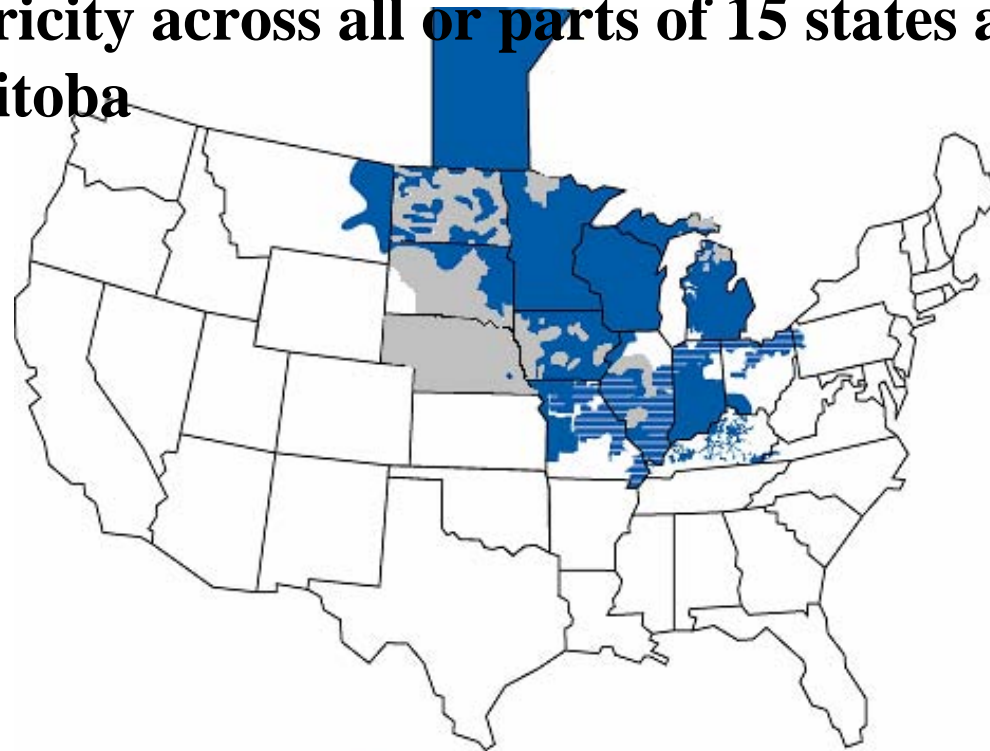
History

- **1996: FERC requires open access, first meetings held to form MISO**
- **1999: FERC order on RTOs**
- **2001: MISO moves into control center**
- **2002: Full operations begin**
- **2004: Energy market tariff filed**



MISO

Midwest ISO is an independent, non-profit grid monitor for the transmission of high voltage electricity across all or parts of 15 states and Manitoba



- Midwest ISO, Current Operations
- ▨ GridAmerica (Ameren, FirstEnergy and NIPSCO)
- Reliability Coordination Area



MISO Fast Facts

- **Control centers both in Indiana and Minnesota**
- **24 transmission-owning utility members**
- **Administrative cost adder capped at 15 cents per megawatt-hour funds current operations. (Market costs will be recovered once market starts)**
- **Voluntary membership**
- **Independent**
- **Non-profit**



Members

Coordination Agreement Members

- **Manitoba Hydro**

Stand-Alone Transmission Companies

- **ATC (American Transmission Co.) (includes Alliant-WP&L, MG&E, WPS, UPPCO and WE transmission facilities)**
- **GridAmerica (includes ATSI (First Energy), Ameren, & NIPSCO)**
- **International Transmission Co. (formerly Detroit Edison)**
- **Michigan Electric Transmission System (formerly Consumers Energy)**

Pending Transmission Owning Members

- **Great River Energy (MN), Illinois Power, and Columbia (MO)**

Non-Transmission Owning Members

- **Marketers**
- **Industrial Customers**
- **IPPs**
- **Munis/Coops/TDUs/Other**



Major Transmission Owning Members

- **Alliant Energy**
- **Aquila, Inc.**
- **Ameren**
- **CILCO**
- **Cinergy**
- **Hoosier Energy**
- **IMPA**
- **IP&L**
- **LG&E**
- **Michigan Public Power Agency**
- **Minnesota Power**
- **Montana-Dakota Utilities**
- **Otter Tail Power Company**
- **Southern Illinois Power Coop.**
- **City of Springfield, Illinois**
- **Vectren**
- **Wabash Valley Power**
- **Xcel**



MISO Services Today

- Schedule transmission service over multiple control areas at non-pancaked rates via one OASIS site
- Analyze system conditions and provide reliability coordination services
- Standardized generation interconnection agreement process for all new generation plants
- Long-term transmission planning



MISO Reliability Actions

- **Enhanced visualization**
- **Improved monitoring tools**
- **Increased staff**
- **Operator training**
- **Grid monitoring computer applications**
- **New telephone system**



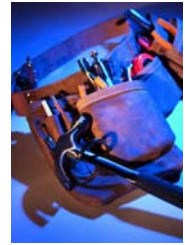
Control Center



- ✓ Since August 2003, MISO has developed and implemented a large number of tools, applications, procedures, and processes that have dramatically increased the level of service to our customers
- ✓ MISO has worked closely with its member companies, as well as with neighboring regional grid operators in this effort
- ✓ Many of these processes and tools have moved MISO beyond the current requirements as set forth in NERC and other industry standards



MISO Visualization Tools

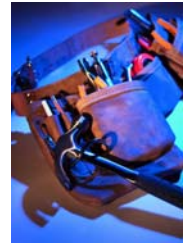


Real-time overview displays show:

- ✓ MISO transmission system and surrounding areas
- ✓ All 230kV and above – and critical underlying facilities 100kV and above
- ✓ Real-time megawatt & reactive values
- ✓ Voltage/Outage indications
- ✓ Provides “Big Picture” of transmission system



MISO System Monitoring Tools and Applications

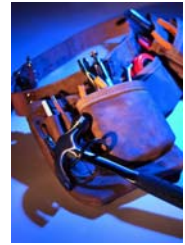


State Estimator

- ✓ State Estimator is a computer model of the Eastern U.S. grid
- ✓ Model contains 100,000 real-time data points
- ✓ Model contains 30,500 busses



MISO System Monitoring Tools and Applications



Contingency Analysis: Uses the State Estimator model which performs 5,500 contingencies (“what ifs”) every 5 minutes and identifies potential problems on the system

- ✓ Personnel on duty at the control center 24 hours a day for support of the State Estimator and Contingency Analysis applications



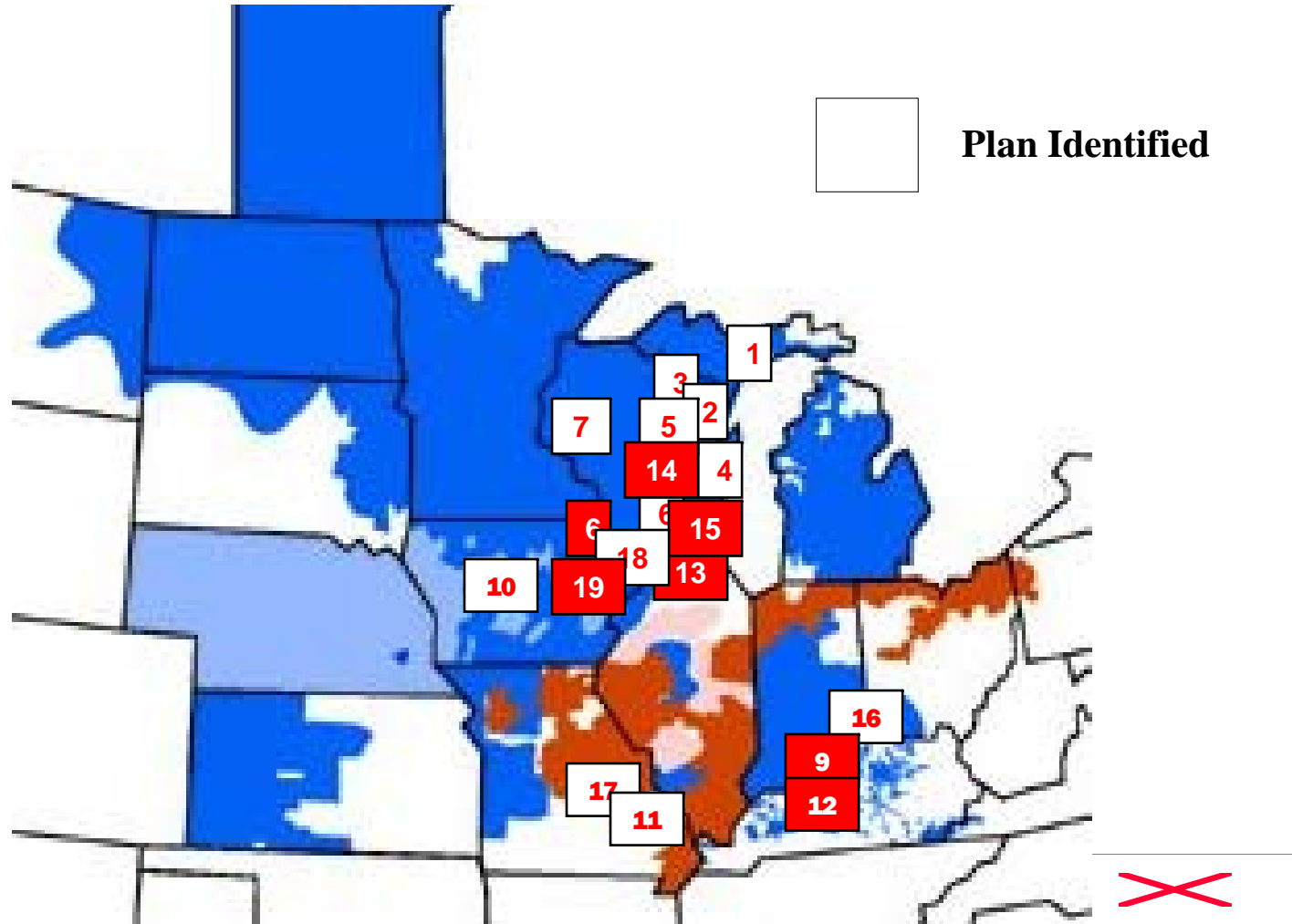
Regional Transmission Plan



5 Yr Investment	
\$1,832 Million	
Northwest:	\$620 M
Central:	\$984 M
East:	\$228 M



CONSTRAINTS ADDRESSED IN TRANSMISSION PLAN



The Midwest Energy Market Yesterday

- **Each utility dispatches their own generation in their own control area**
- **No transparent wholesale market**
- **Trading opportunities not fully exploited**
- **Transmission loading relief (TLRs) -- curtailments – are used to manage congestion instead of re-dispatch**
- **Under-utilization of network**



Starting April 1, 2005: The Midwest Energy Market

- **Centralized security constrained economic dispatch**
- **MISO collects bids at each node and computes the cheapest way to meet demand at every node (locational marginal cost pricing or LMPs)**
- **Bilateral contracts complimented by energy purchases on spot markets**
- **Financial transmission rights (FTRs) used to hedge against congestion risk**



Market Benefits

- **More efficient use of existing transmission network**
- **Better system reliability**
- **\$255 million in annual gross production cost savings**
- **\$713 million in savings to consumers**
- **Lower spot energy prices**
- **Downward pressure on prices in bilateral contracts**



Market Monitor Sees Improvements from LMP

Centralized redispatch...will select the most effective generators to redispatch.

- 1. The current bilateral energy markets do not accurately reflect congestion occurring on the system....**
- 2. Improved accuracy and transparency of the price signals ...will provide significant benefits**
- 3. Increase the utilization of the transmission network and promote reliability.**
- 4. The real-time redispatch (every 5 minutes) will allow interfaces to be operated closer to the rated limits.... The relief available from redispatch is much more predictable and timely than through current processes... -- should contribute to improved reliability.
(Source:Potomac Economics State of Mkt Report, 5/03)**



For more information

- Visit websites: midwestiso.org and Midwestmarket.org
- Other useful websites: ferc.gov, misostates.org, miso-pjm.com, potomaceconomics.com

