

Regional Transmission Organization Overview

Presented to The Energy Regulatory Office of Kosovo and The
Illinois Commerce Commission
June 8, 2009

Agenda

- Regional Transmission Organization (RTO) Background
 - Federal Energy Regulatory Commission (FERC) RTO Characteristics and Functions
- Current RTOs
- Midwest ISO (MISO) Specifics
- Major Challenges

FERC Order 2000

- Characteristics identified in the order:
 - Independence from market participants
 - Appropriate scope and regional configuration
 - Possession of operational authority for all transmission facilities under the RTO's control
 - Exclusive authority to maintain short-term reliability

FERC Order 2000 cont'd

- Minimum functions identified in the order:
 - Administer its own tariff and employ a transmission pricing system that will promote efficient use and expansion of transmission and generation facilities
 - Create market mechanisms to manage transmission congestion
 - Develop and implement procedures to address parallel flow issues

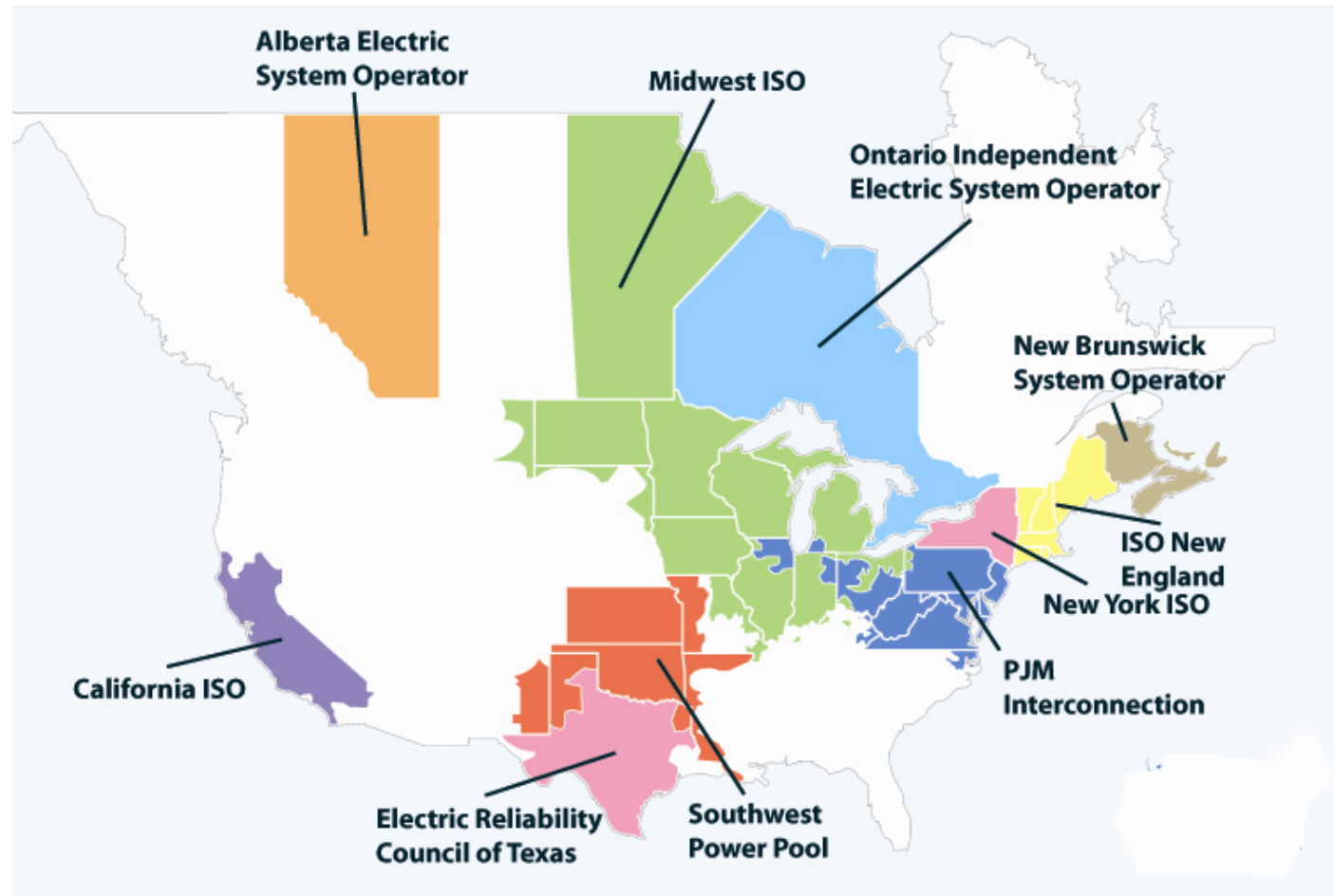
Order 200 Functions cont'd

- Serve as a supplier of last resort for all ancillary services required in Order No. 888 and subsequent orders
- Operate a single Open-Access Same-Time Information System (OASIS) site for all transmission facilities under its control with responsibility for independently calculating Total Transmission Capacity (TTC) and Available Transmission Capacity (ATC)

Order 200 Functions cont'd

- Monitor markets to identify design flaws and market power
- Plan and coordinate necessary transmission additions and upgrades
- Interregional coordination

ISOs and RTOs



Comparison of RTO/ISO Services

Services Provided	MISO	ISO-NE	NYISO	PJM	SPP	ERCOT	CAISO
Grid Operations	2002	1997	1998	1997	1997	1996	1998
Transmission Scheduling	4	4	4	4	4	4	4
Regional Economic Dispatch	4	4	4	4	4	4	4
Transmission Planning	2002	1997	1999	1997	1998	1997	2002
Regional Transmission Planning	4	4	4	4	4	4	4
Regional Interconnection	4	4	4	4	4	4	4
Transmission Cost Allocation Method	4	4	4	4	4	4	4
Wholesale Market Operations	2005	1999	1999	1998	2006	2001	1998
Real-time Energy Market	4	4	4	4	0	4	4
Locational Energy Price	4	4	4	4	0	2009	4
Hourly Energy Price	4	4	4	4	0	4	4
Congestion Price	4	4	4	4	0	4	4
Losses Price	4	4	4	4	4	4	4
Day-ahead Energy Market	4	4	4	4	0	2009	2008
Virtual Bidding	4	4	4	4	4	4	2009
Ancillary Services Market	2009	4	4	4	2	4	4
Regulation	2009	4	4	4	2	4	4
Operating Reserves	2009	4	4	4	2	4	4
Financial Transmission Rights	4	4	4	4	4	0	4
Capacity Market	0	0	0	0	0	0	0
Settlements and Billing	4	4	4	4	4	4	4
Market Oversight	2005	1997	1999	1998	2006	2004	1998

○ No Market Capability

● Full Market Capability

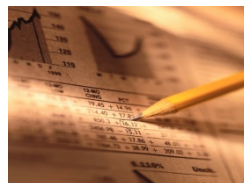
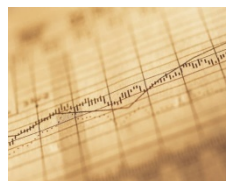
Dates represent estimated start

Sources: ISO/RTO Council: "The Value of Independent Regional Grid Operators"; FERC; Booz Allen research

The Midwest ISO's Role

What We Do

- Provide Independent Transmission System Access
- Deliver Improved Reliability Coordination
- Perform Efficient Market Operations
- Coordinate Regional Planning
- Foster Platform for Wholesale Market Development



Implications

- All parties have equal and non-discriminatory access
- Substantial regional reliability improvements
- Lower cost unit commitment, dispatch and congestion management
- Integrated system planning
- Encourage infrastructure investment and facilitate regulatory initiatives

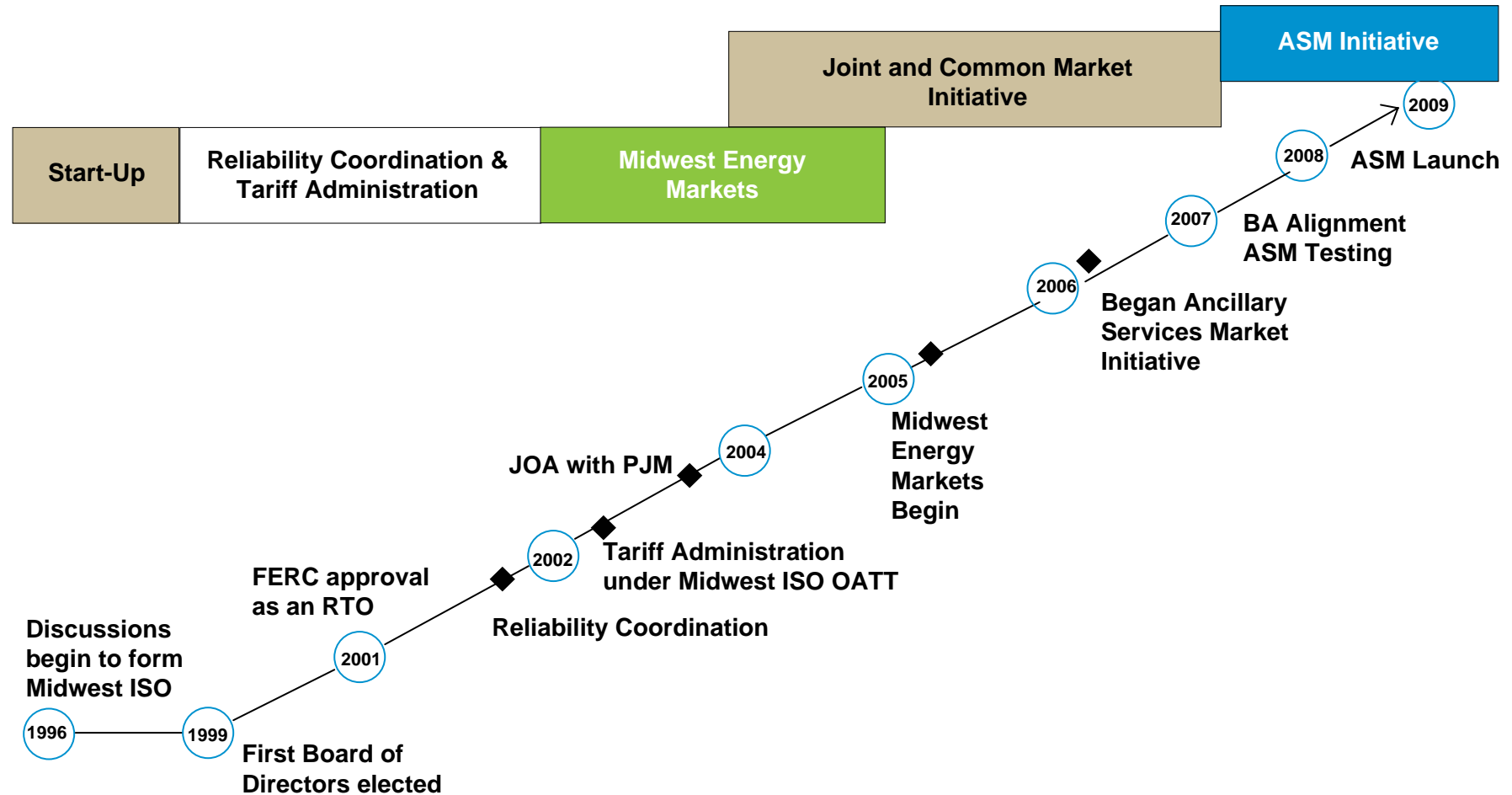
Midwest ISO facts

- **Independent, voluntary, regulated by the FERC**
- **Network model: 5,464 generating units**
- **\$41 Billion energy market**
- **1,896 pricing nodes**
- **Governed by independent eight member board**
- **31 transmission owning members**
- **\$2.4 B in new transmission projects thru 2015**

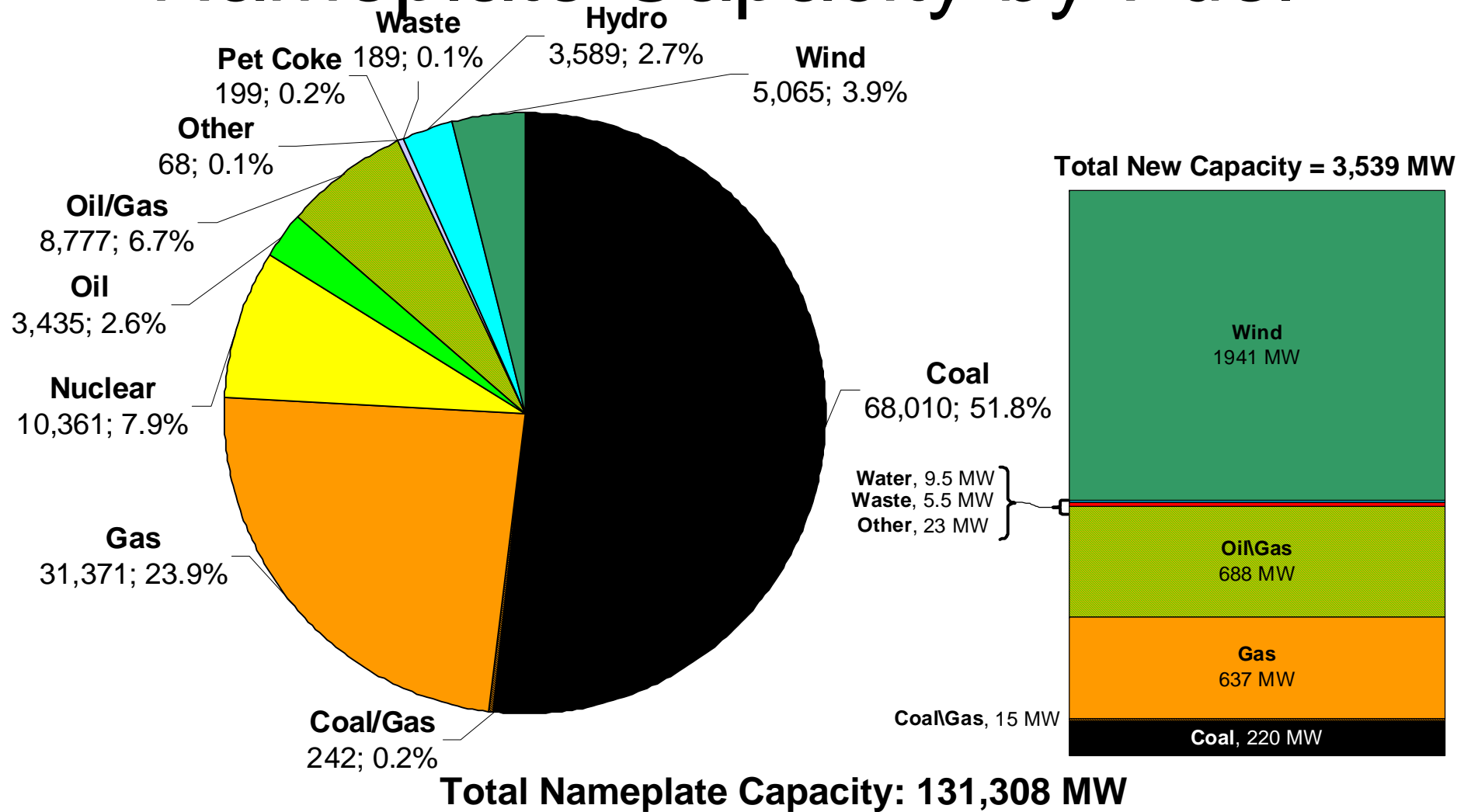
MISO Market Area



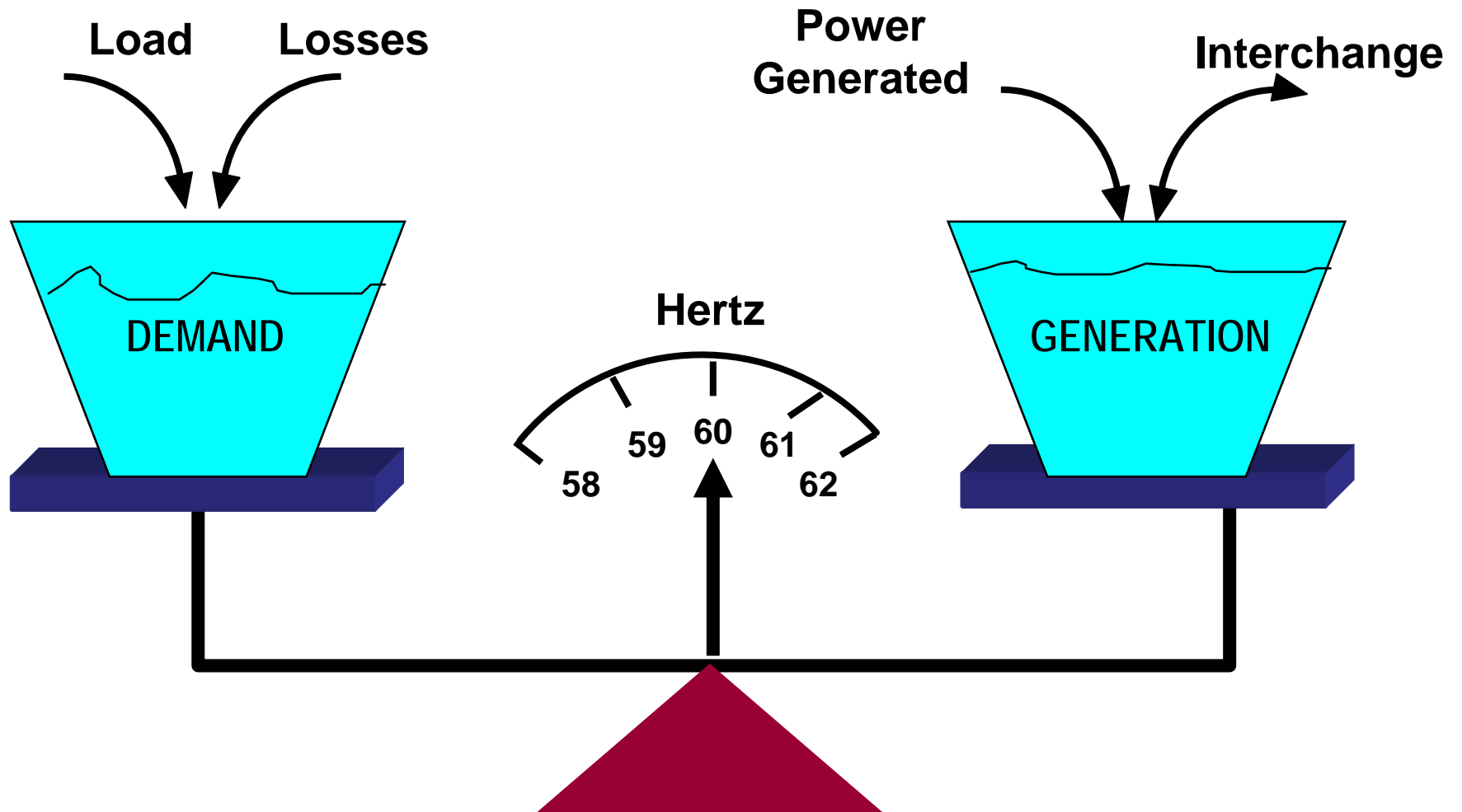
Midwest ISO Evolution



Nameplate Capacity by Fuel



The Energy Balance

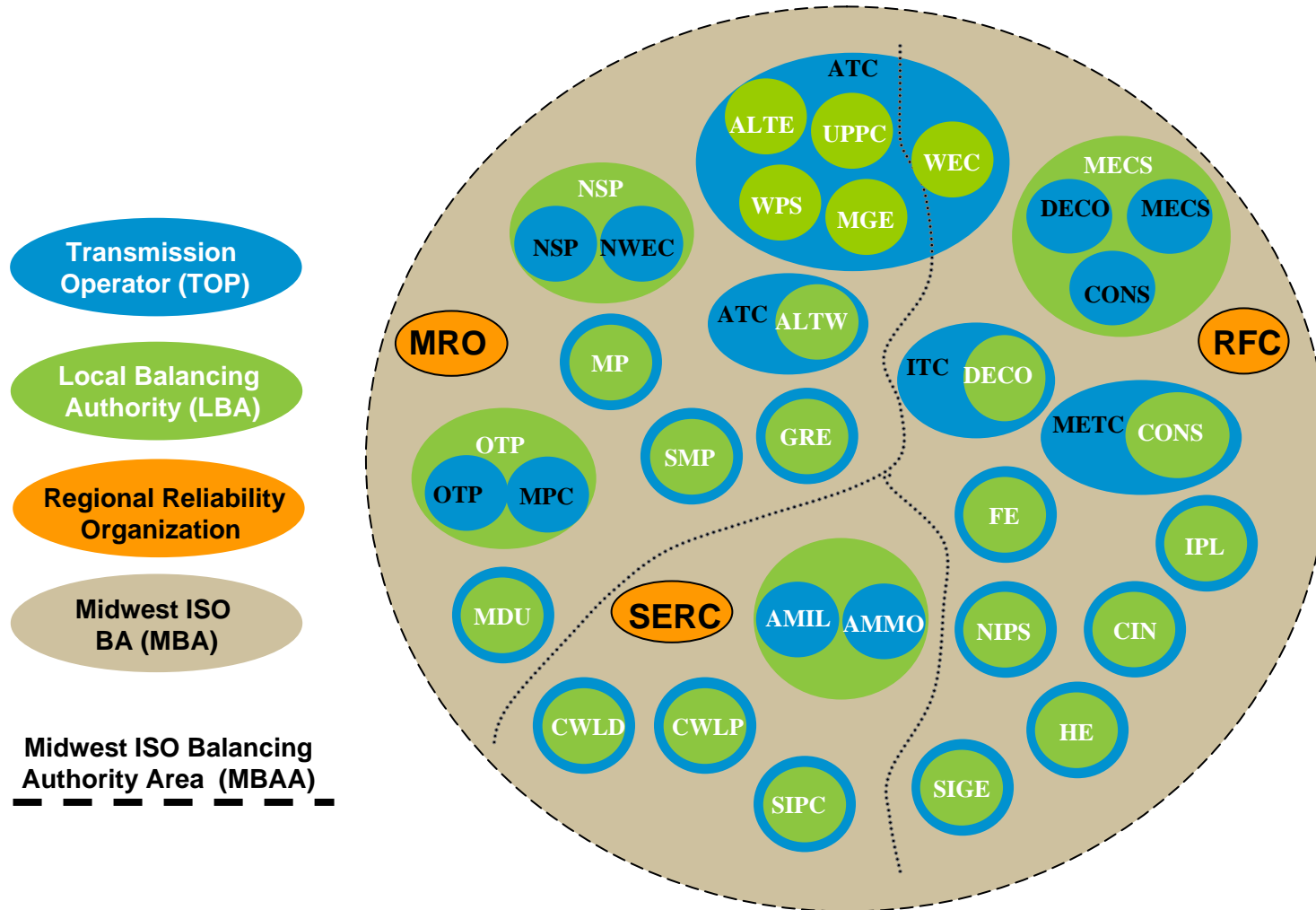


What is a Balancing Authority?

- An electric power system or combination of electric power systems bounded by interconnection metering and telemetering
- Balancing Authority duties
 - Balance Supply and Demand within their area
 - Maintain interchange of power with other Balancing Authorities
 - Maintain frequency of the electric power system within reasonable limits

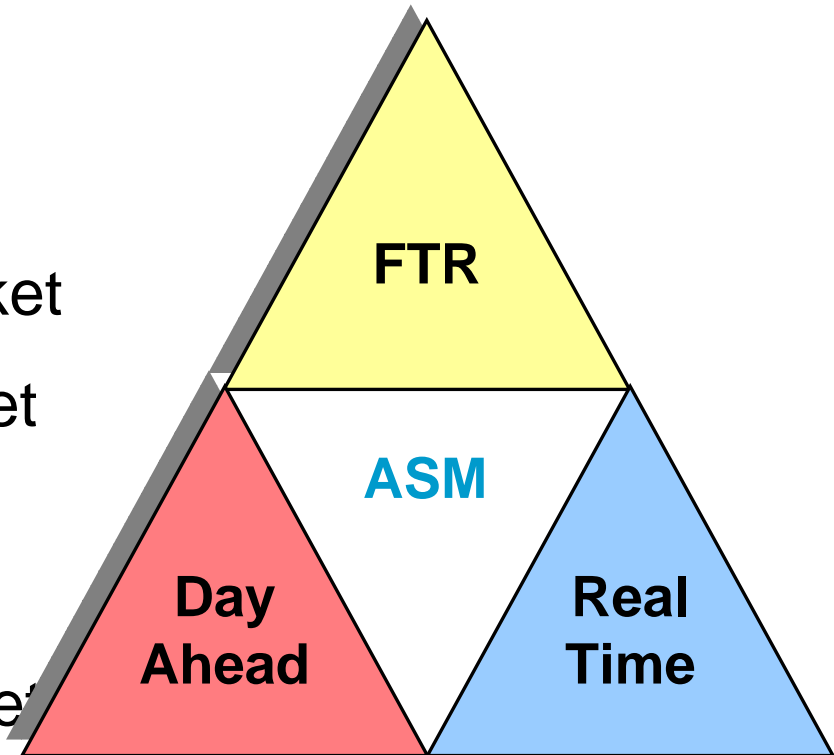
Balancing Authority Alignment

Energy and Operating Reserves Market Operations



Midwest ISO Market Overview

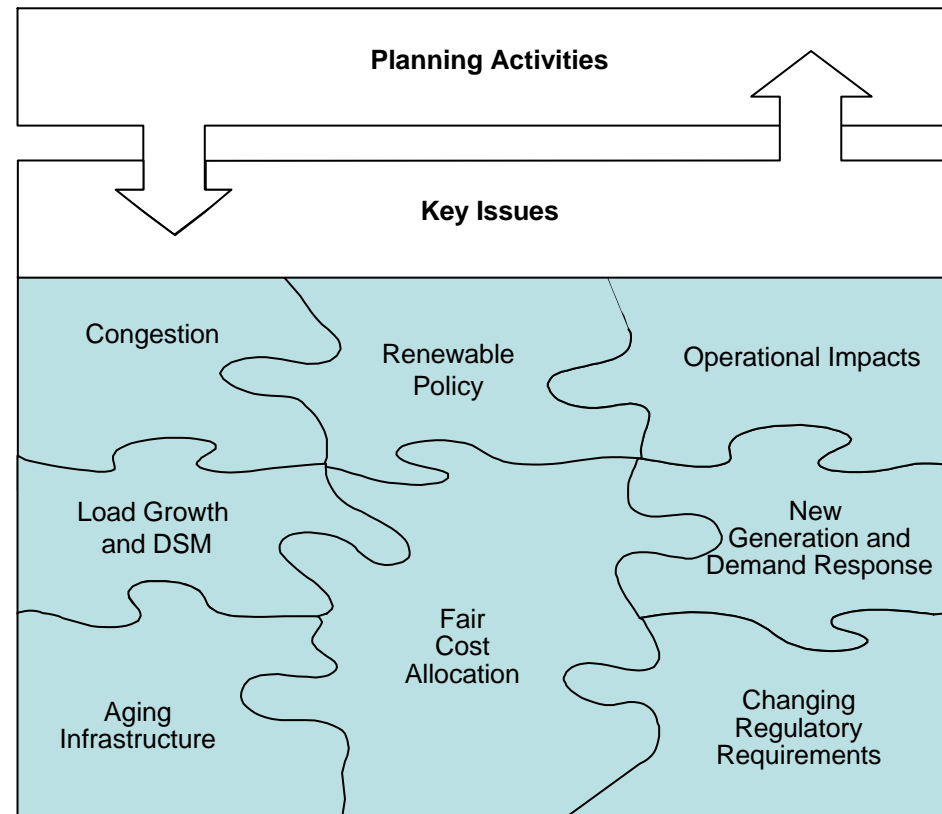
- **The Midwest ISO market consists of four components:**
 - ❶ Day Ahead Energy Market
 - ❷ Real Time Energy Market
 - ❸ Financial Transmission Rights Market (FTR)
 - ❹ Ancillary Services Market



Ancillary Services

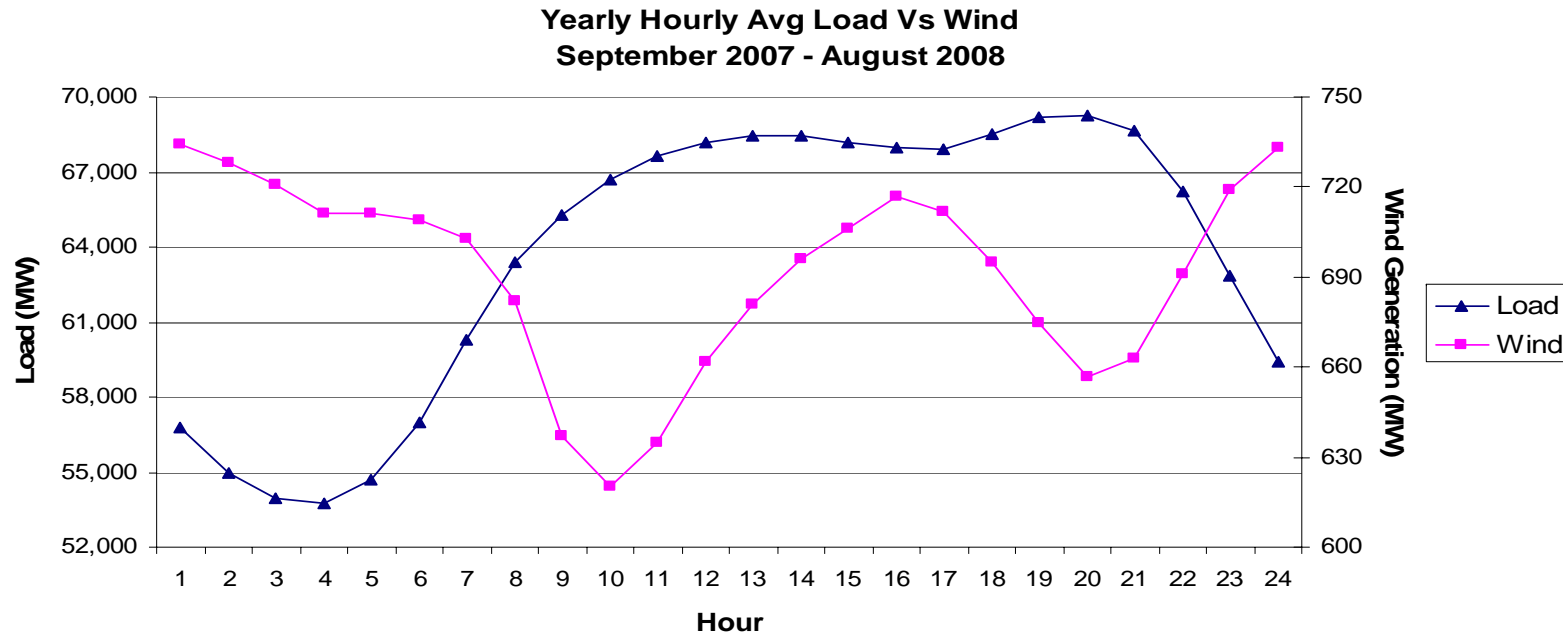
- Integrated into market operations Jan. 6, 2009
- Flexible capacity needed to maintain secure operation of power system
 - Loss or increase of Load
 - Loss or increase of Resources
- Regulation Reserves
- Contingency Reserves
(sometimes called Operating Reserves)
 - Spinning
 - Supplemental (non-spinning)

Key Issues Currently Impacting Transmission Planning



Wind Integration

Operational Impacts in the Midwest ISO



- In addition to infrastructure costs, operational issues are expected to drive additional Contingency Reserve and market wide charge costs when large quantities of an intermittent resources are online.
 - Ramp Requirements: wind has a negative correlation to daily ramps resulting in need for additional reserves to support ramp
 - Load Following: wind changes in same time horizon as load, resulting in need for additional capacity to meet load
 - Wind Forecasting: accuracy decreases with extended time horizon, introducing inefficiency into the commitment process