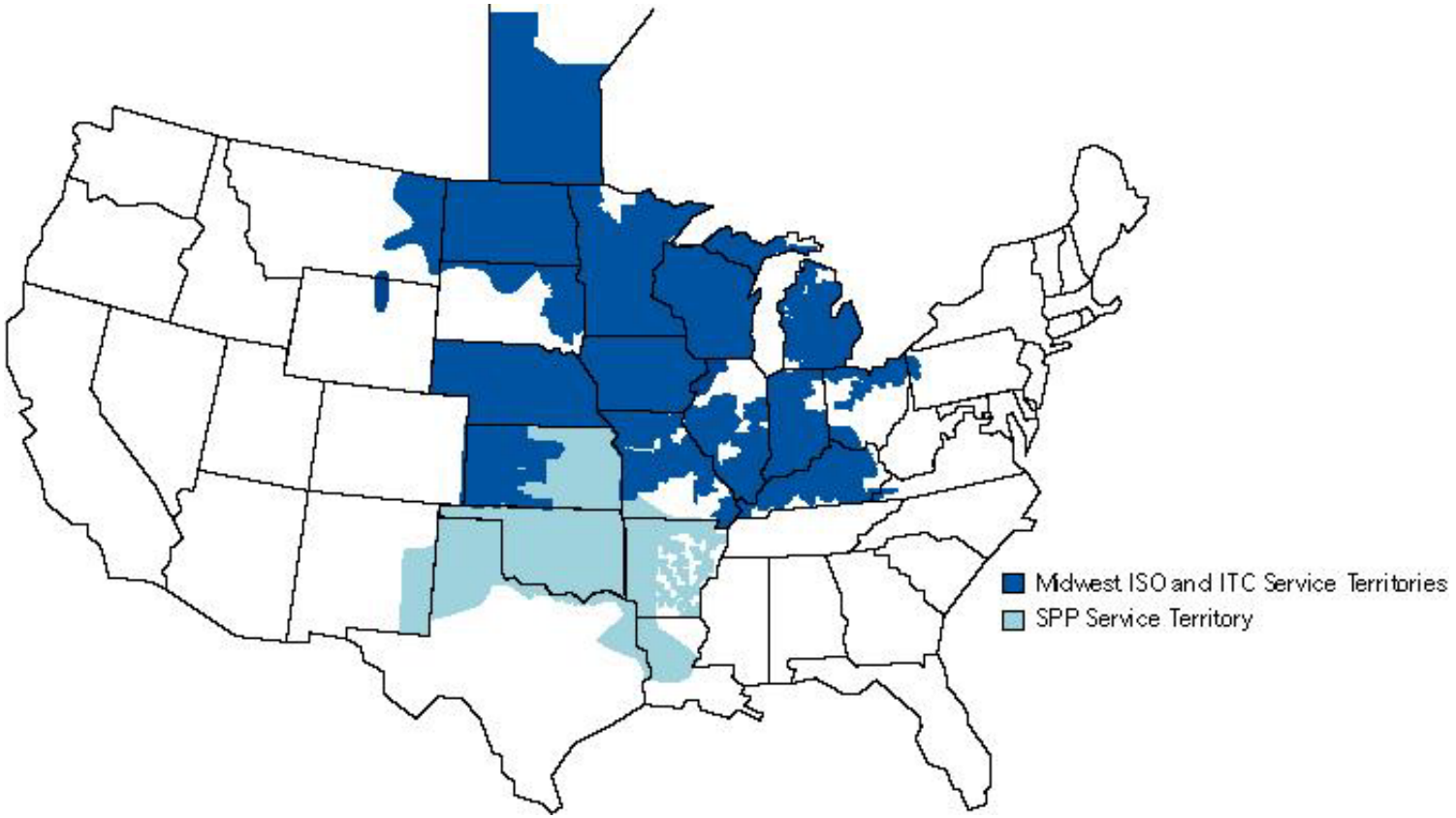
Energy Markets at the Crossroads

Managing Multiple RTOs within State Boundaries
The Midwest RTO's Perspective
December 12, 2002

Crowne Plaza Hotel
Springfield, Illinois

MISO Service Territory With SPP



Scope (with SPP)

150 GW peak load

144,000+ miles of transmission lines

20.9 million customers

Who We Are…

- Midwest ISO is an independent, non-profit grid operator for the transmission of high voltage electricity across much of the Midwest

- Member based
  - TOs* and TDUs** and Coordination Agreements
  - End Users and State Regulatory Authorities
  - Consumers and Environmental Groups
  - Power Marketers and IPPs

- Nation's first FERC approved Regional Transmission Organization (RTO)

***TO - Transmission Owner**
****TDU – Transmission Dependent Utility**

Midwest ISO
Regional Transmission Organization

AGREEMENTS

Transmission Owners Agreement (Delegates Responsibility)

Open Access Transmission Tariff (Establishes Rules)

MISO RTO By-Laws (Defines Corporation)

GOVERNANCE

Independent Board of Directors
(Ensure that the business performs in accordance to the TOA)

Transmission Owners Committee
(Exercise authority granted under the TOA)

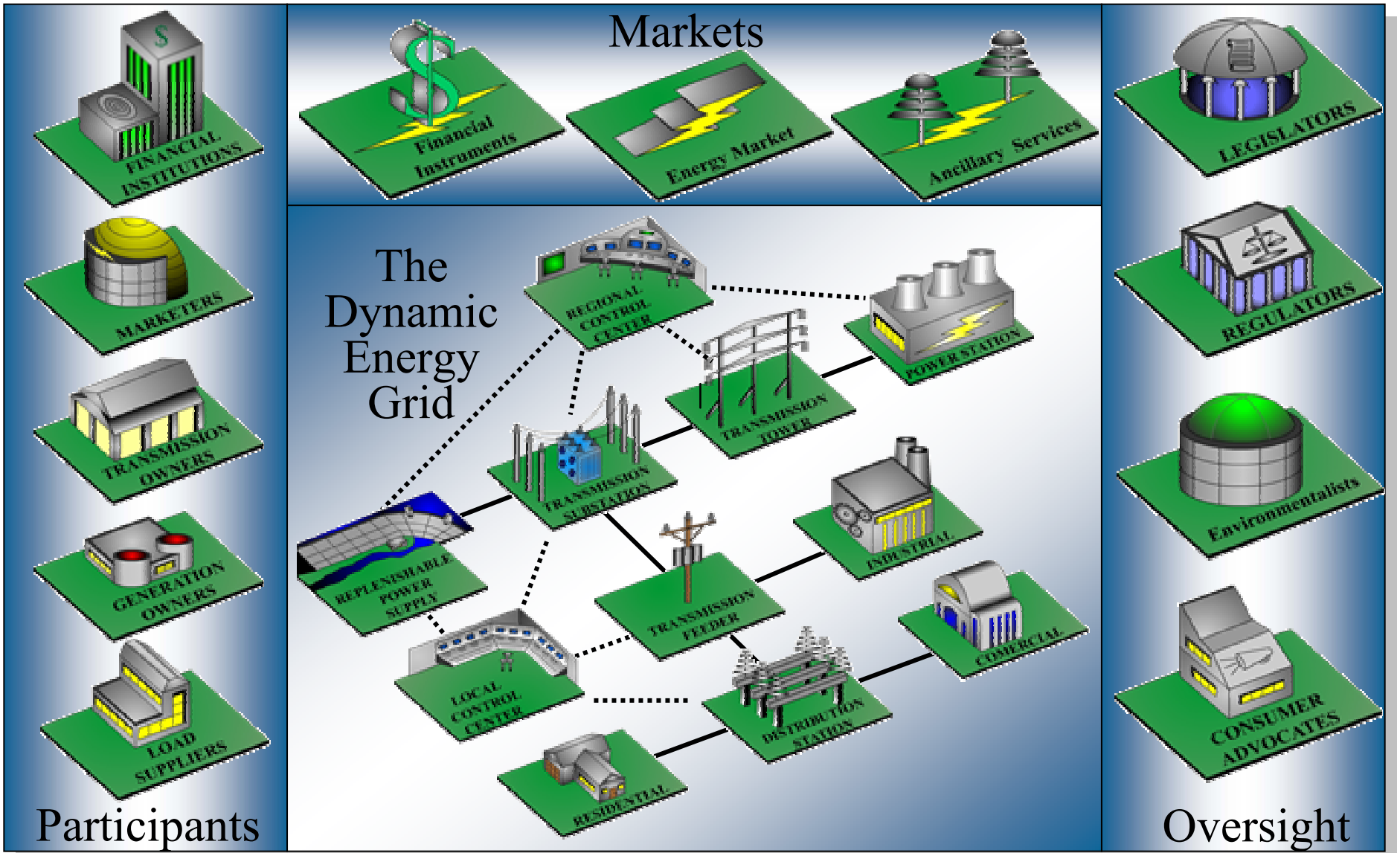
Advisory Committee
(Stakeholder group that is advisor to Board regarding Policy Issues)

MISO Officers
(Administer the TOA and perform functions directed by Board)

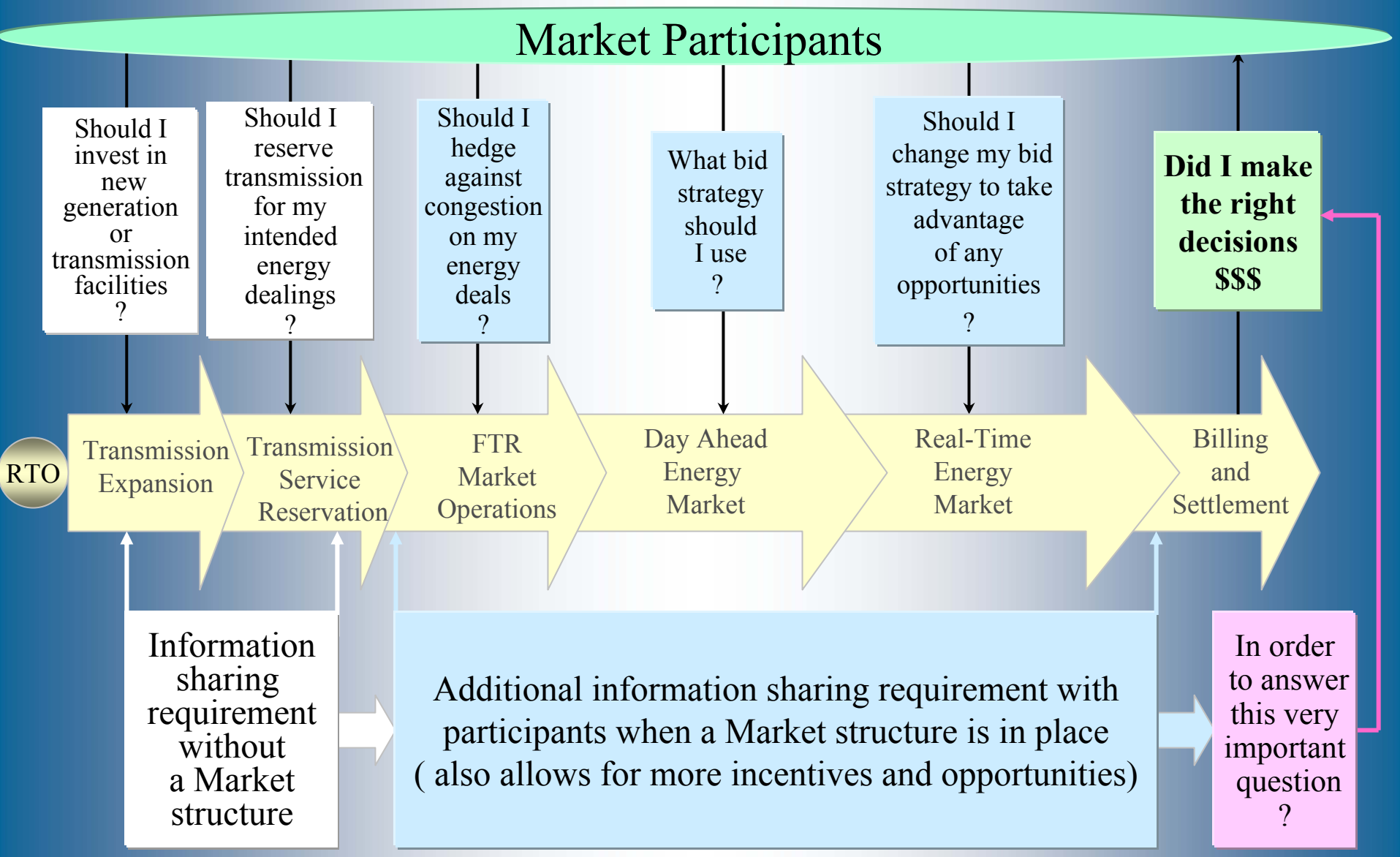
MAJOR FUNCTIONS

- Tariff Administration
- Congestion Management
- Parallel Path Flow
- Ancillary Services
- OASIS and ATC
- Market Monitoring
- Planning and Expansion
- Interregional Coordination

The Energy Marketplace



The Participant View of the Energy Marketplace



What We Do as an RTO

- Coordinate long-term transmission planning
- Administer generation interconnections
- Evaluate transmission service requests through one OASIS* site
- Approve and Provide transmission reservations
- Schedule transmission service over multiple control areas
- Provide billing/settlements for transmission service
- Manage congestion over a wide area in real time (reliability coordination)
- Analyze system conditions in real time

*OASIS – Open Access Same-time Information System

High Level RTO Functions

Interregional Coordination

Transmission

Transmission Expansion Planning

FTR Market

Congestion Management

Tariff Administration

Load

Real Time Operations

Market Settlements

EMS

Market Monitoring

OASIS

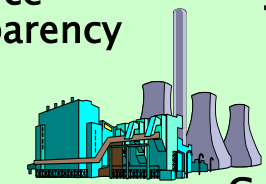
Transmission and Generation Outage Scheduling

Generation Dispatch Transmission Security

Generation

Price Transparency

Ancillary Services Markets



Energy Market

Unit Commitment

Connection of New Generation

Energy Market Objectives

RTO Functions

Transmission Expansion Planning / Generation Interconnection

- Holistic broad view point
- Independence and Neutrality
- Equitable Process
- Optimal use of Resources

When Combined with An Efficient Energy Market

- Financial Incentive to Support Reliability :
  - Congestion Cost Causality
  - Supply/Demand
- Price Transparency

Establishes Regional Reliability at a Low Price

- Adequate Supply
- Competitive Prices
- Efficient Growth

Which Meets the Consumer Retail Energy Needs

- Reliable Supply of Power
- Low Price for Electricity

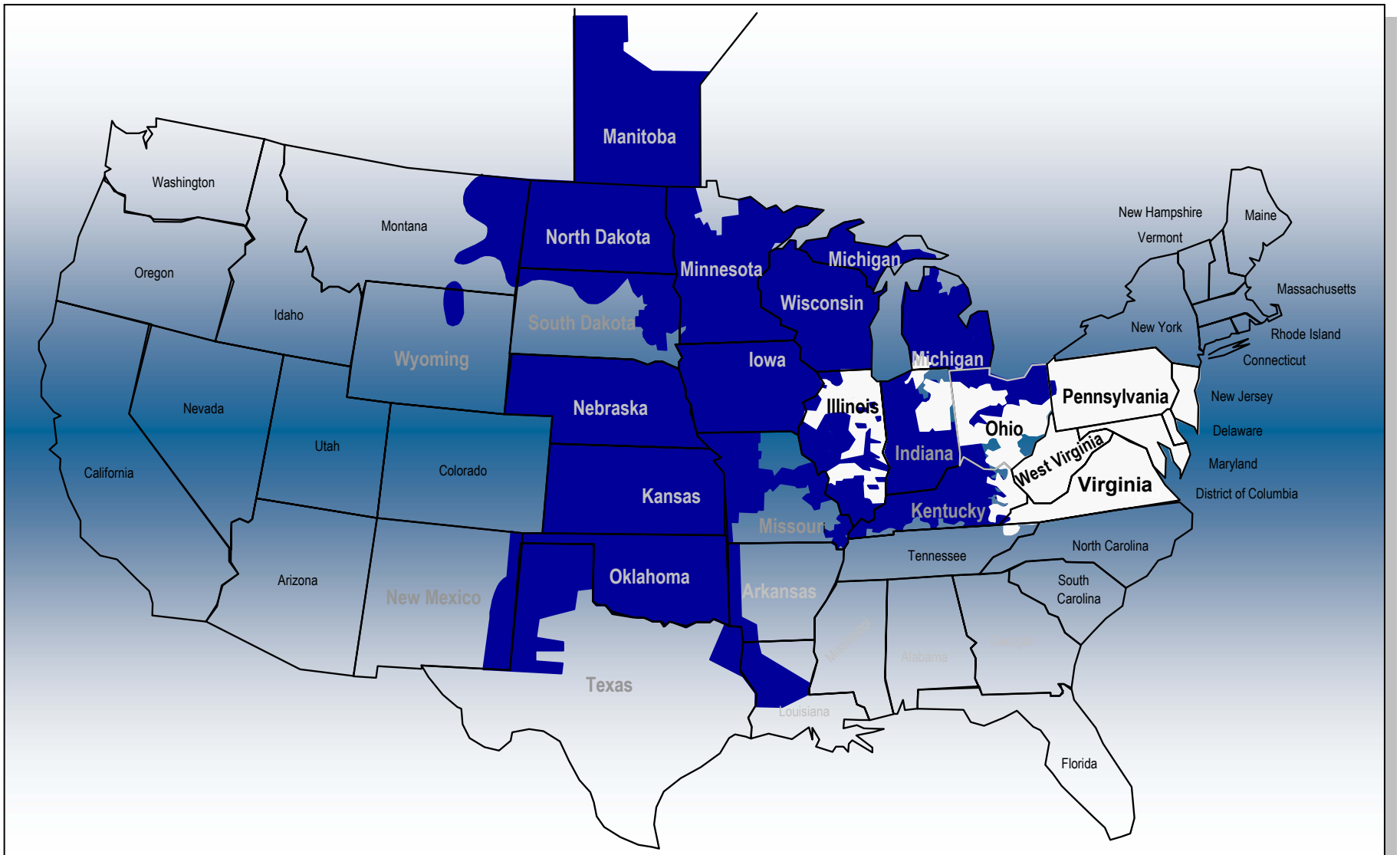
And Provides for a Brighter Energy Future

- More Consumer Choices
- Competitive Price for Electricity
- Continued Reliable Supply of Power
- Incentives for Investment
- Industry Standardization
- Recognized Best Practices

Benefits of the Midwest Market

- Transparency of energy imbalance pricing data
- Market Based Congestion Management including visibility of the financial impact of Congestion Management
- Higher utilization of transmission assets
- Optimal use of energy resources across a wider region
- Deferral of generation construction through utilization of a wider set of assets
- Facilitates the ability of demand response to market incentives
- Visibility of data for use in siting generation
- Visibility of price data for use in Futures contracts
- Higher utilization of transmission assets
- Meeting requirements of FERC Order 2000
  - Congestion Management
  - Energy Imbalance

MISO & PJM Footprints



What's Happened So Far…

July 2002 FERC conditional approval of former Alliance companies' RTO elections

Midwest ISO

- Ameren
- First Energy
- Northern Indiana Public Service

PJM

- American Electric Power
- Commonwealth Edison
- Dayton Power & Light
- Illinois Power

What's Happened So Far…

FERC APPROVAL CONDITIONAL BASED ON

- Elimination of rate pancaking between PJM & MISO
- Complete sign off by NERC of the Reliability Proposals at each stage of the process
- Requirement to hold Michigan and Wisconsin harmless

Addressing The Seam Issues

Challenges

- RTO choices of utilities leaves “marbled” configuration
- Single common market will resolve many of the issues, but not all
- Transition to single common market will require perfect coordination with PJM

Addressing The Seam Issues

By Establishment of a Joint and Common Market

MISO

SPP Southwest Power Pool

PJM

Common Markets

Common Market Rules

Common Billing & Settlement

Simplified & Enhanced Participant Interaction

Multi-Regional Reliability Improvement

Multi-Regional Resource Optimization

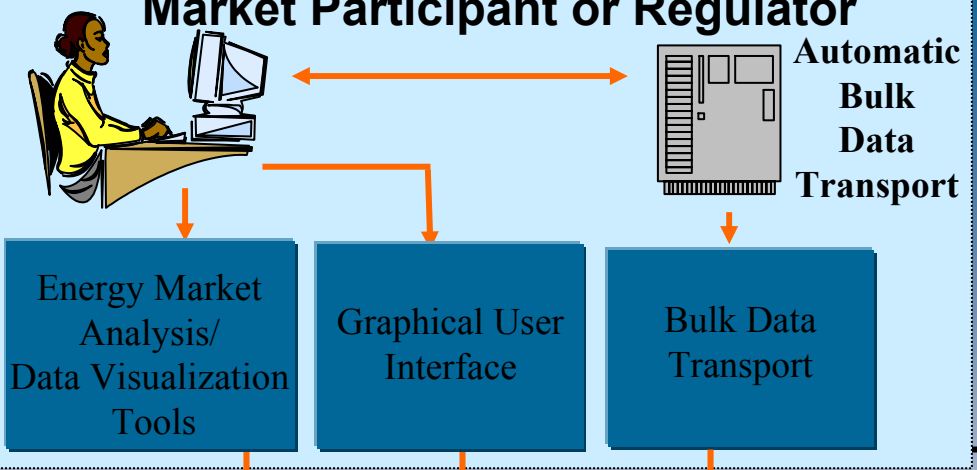
Reduced Implementation Costs

Value Proposition

Addressing The Seam Issues With Technology

Common Market Portal

The CMP functionality will exist, in total, at all the participating RTOs.
It will be developed as a set of encapsulated services that will interface with an RTOs existing application systems through customized APIs.



Required Standards Development

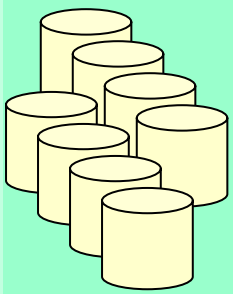
- Security
- Graphical User Interface
- Bulk Data Transport
- Data Model
- Application Program Interfaces

Existing Market Systems

MISO Market Information Systems

API

Portal Services Request Broker



Portal Request Services

CPP CPA PSR PCR

Portal Functions

Portal UI Widgets

Common Process Functions

Portal Data Repository

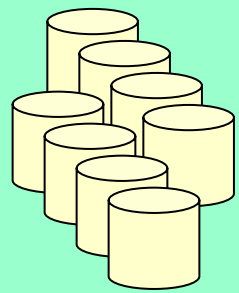
Composite RTO Data

RTO Data Exchange

Portal Services Request Broker

API

Any RTO's Market Information Systems



Existing Market Systems

Addressing The Seam Issues With Technology

Common Market Portal - FTR Request Example

1) Participant Requests FTR from NewCo to New England

Request Encryption

Electronic Signature

Internet Transport of Encrypted Information

Request Decryption

Authenticate User

Common Market Portal

2) Splits the FTR into its individual RTO components.
3) Transmits requests for FTR's to each of the RTO's.
4) Waits for response from the RTOs.

Participant

8) Reviews FTR's cost (accepts or rejects)

7) Combines RTOs FTR responses and notifies the participant of the approval or denial of the desired FTR.

9) If the FTR is accepted, notifies the individual RTO's of the FTR acceptance.

Enterprise Application Integration Message Bus

New England

New York

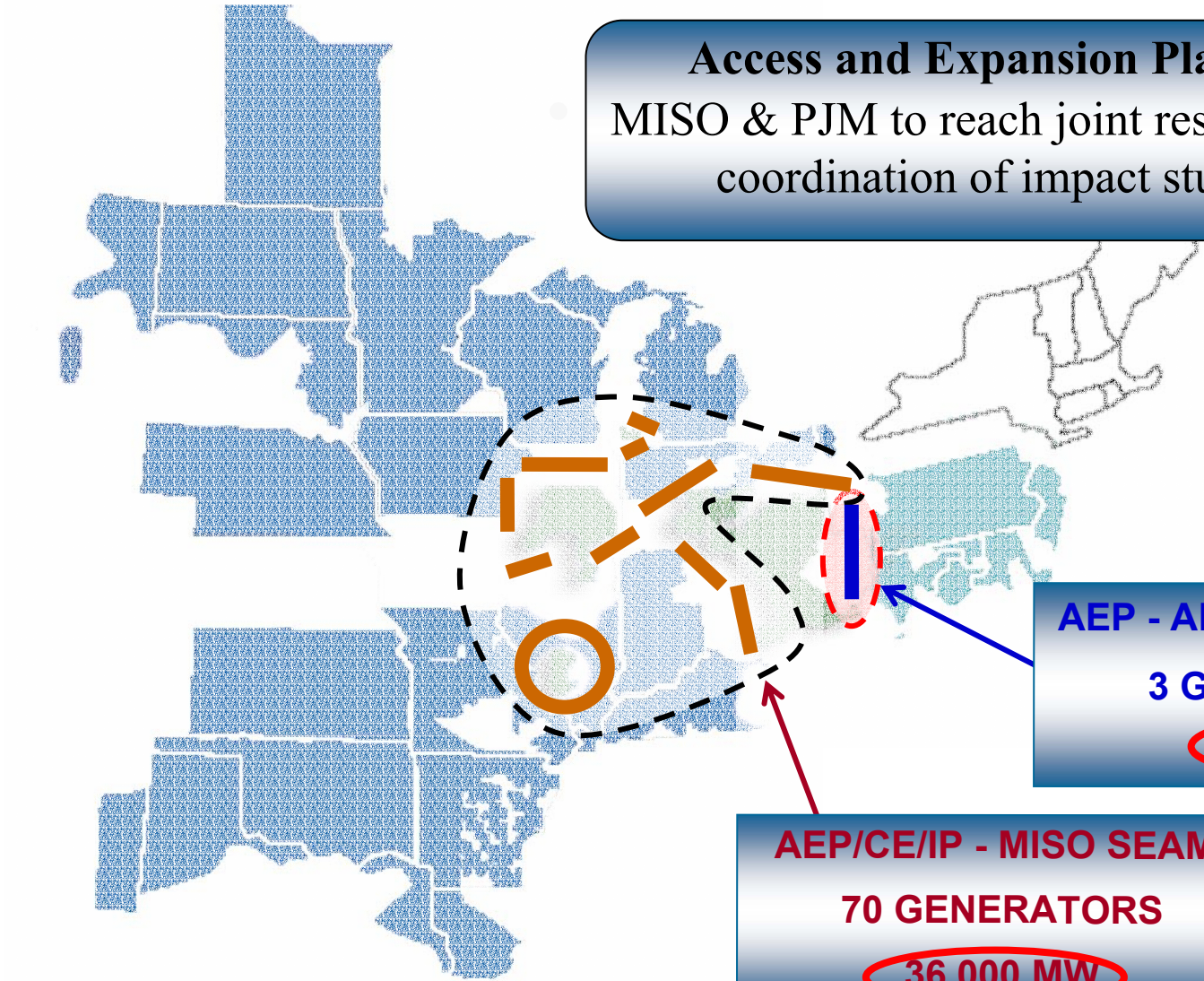
PJM

MISO

5) Each RTO performs its own simultaneous feasibility study for the requested FTR.
6) Each RTO transmits results of study (approval/denial of FTR) back to the CMP.

10) Each RTO commits the requested FTR.

Addressing The Seam Issues Through Coordinated Planning Activities



Access and Expansion Planning

MISO & PJM to reach joint resolution for coordination of impact studies.

AEP - ALLEGHENY SEAM:

3 GENERATORS

2,000 MW

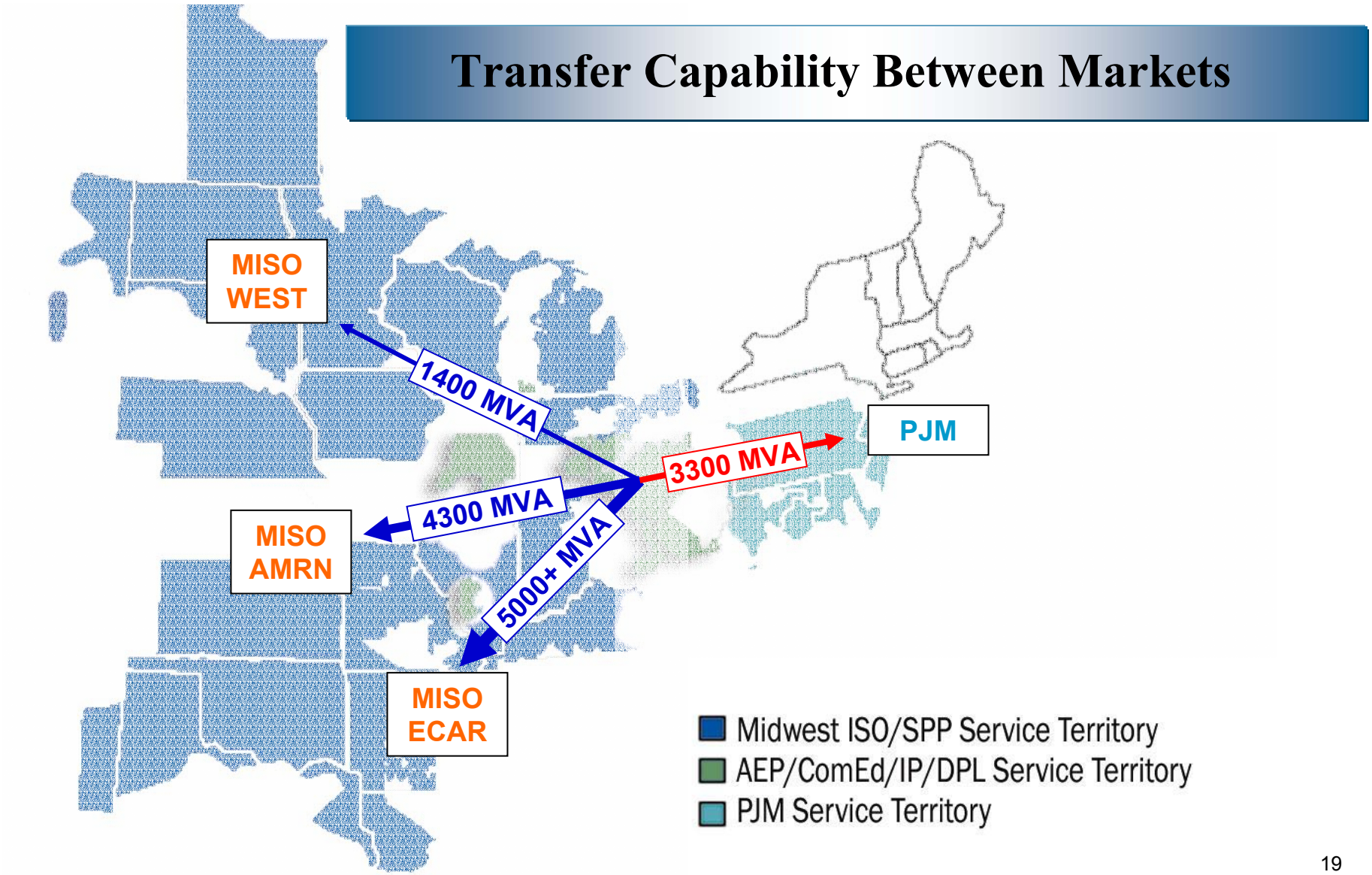
AEP/CE/IP - MISO SEAM:

70 GENERATORS

36,000 MW

* **Active requests within one county of seam**

Addressing The Seam Issues With Coordinated Activities



Addressing The Seam Issues With Coordinated Activities

Outage Maintenance Coordination

MISO & PJM will define list of key facilities in each RTO that impact operations in the other RTO when outaged.

MISO and PJM will cooperate in coordinating transmission maintenance outages on those facilities included in key facilities list through data-sharing, NERC System Data Exchange (SDX) data, and verbal communication.

Addressing The Seam Issues Through Collaborative Actions

NERC Regional Criteria & Reserve Sharing

Members of MISO and PJM may continue to participate in common reserve sharing programs during and following the transition period.

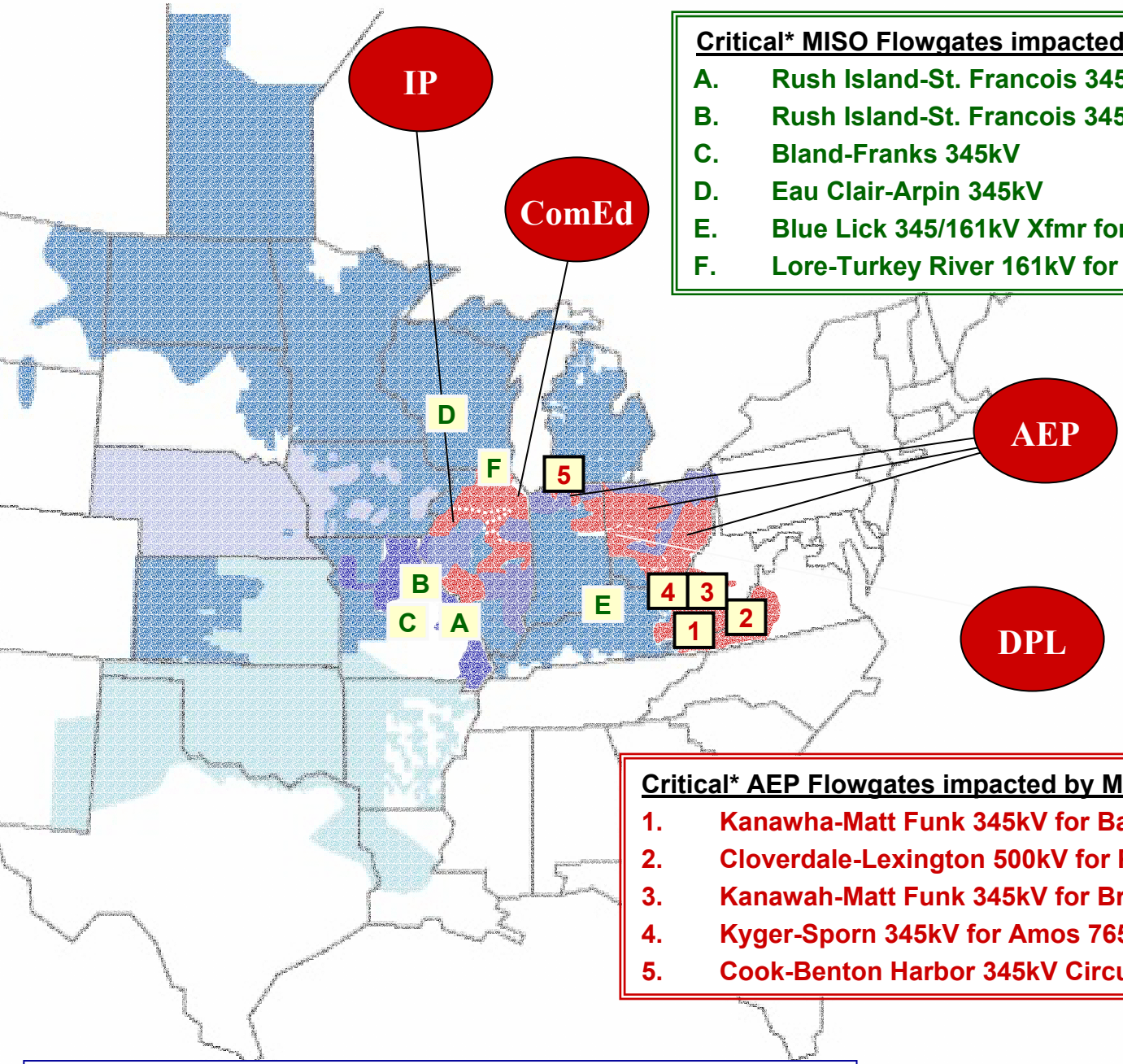
This will require generators in one RTO to respond to reserve sharing events in the other RTO.

MISO & PJM will agree to either assign a transmission margin to their flowgates to allow capacity in both RTOs to respond to reserve sharing events in either RTO,
or
will redispatch generators to provide the transmission capacity when needed.

Addressing The Seam Issues With Joint Agreements

Contract Tie Capacity – Peninsulas / Islands

- Being addressed as part of response to FERC order holding Wisconsin & Michigan harmless.
- MISO and PJM will agree on how full network capabilities can be used to serve transmission customers.
- In those instances where contract path limits are reached before flow-based limits by either RTO, the other RTO will make its contract path capacity available.
- Resolution of “Thru” & “Out” rates could eliminate this problem.



Critical* MISO Flowgates impacted by Illinois and AEP operation(s)

A. Rush Island-St. Francois 345kV
B. Rush Island-St. Francois 345kV for Bland-Franks 345kV
C. Bland-Franks 345kV
D. Eau Clair-Arpin 345kV
E. Blue Lick 345/161kV Xfmr for Baker-Broadford 765kV
F. Lore-Turkey River 161kV for Wempletown-Paddock 345kV

Critical* AEP Flowgates impacted by MISO operation(s)

1. Kanawha-Matt Funk 345kV for Baker-Broadford 765kV
2. Cloverdale-Lexington 500kV for Pruntytown-Mt. Storm 500kV
3. Kanawah-Matt Funk 345kV for Broadford-Jacksons Ferry 765kV
4. Kyger-Sporn 345kV for Amos 765/345kV Transformer
5. Cook-Benton Harbor 345kV Circuit

* 10 or more days in TLR Level 3 or above since January 1, 2001

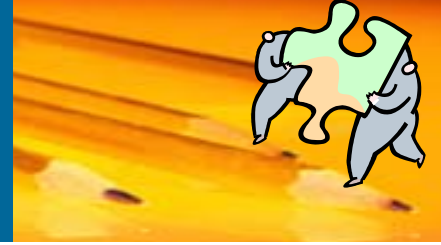
Addressing The Seam Issues With Joint Agreements

Parallel Flows (Congestion Management)

- PJM utilizes Locational Marginal Pricing (LMP) to manage congestion.
  - Transactions internal to PJM are not tagged.
  - Economic Dispatch of generation resources within PJM is utilized to manage. congestion and the cost is passed on to the marketer.

- MISO utilizes Transmission Loading Relief (TLR) Procedures to manage congestion (MISO is migrating to LMP congestion Management)
  - Any transaction between two or more Control Areas is tagged.
  - Tagged transactions which impact a constrained facility by 5% or more are curtailed in a pro rata manner to manage energy flow.
  - **Un-tagged transactions are <u>not</u> identified by the TLR Process.**

Addressing The Seam Issues With Joint Agreements



Parallel Flows (ATC* / AFC** Calculation)

- MISO and PJM will execute an ATC/AFC coordination agreement prior to Nov. 1, 2002.

- Agreement will be based upon the ATC/AFC Coordination Agreement reached between MISO, Southwest Power Pool (SPP), and the former Alliance companies.

***ATC – Available Transfer Capability**
****AFC – Available Flowgate Capability**

Addressing The Seam Issues Through the Establishment of Joint Procedures

Different Definitions / Procedures Between RTOs

During actual power system restoration, MISO & PJM will coordinate their actions with each other – as well as with other RTOs.

In the event of an emergency in an area that is in close electrical proximity to both MISO and PJM areas, BOTH RTOs will issue TLR Level 6 or take other actions in kind to address the situation.

Both RTOs agree that either RTO has the authority to direct operating entites in both RTOs during an emergency – this will always be done with both RTOs conferenced in.

Addressing The Seam Issues Through the Collaborative Stakeholder Process

The Midwest Independent Transmission System Operator, Inc. (MISO), PJM Interconnection and Southwest Power Pool, Inc. (SPP) announce a workshop to discuss proposed solutions that will ensure the safe and reliable operation of the transmission grid across their 27-state service territories, the District of Columbia and Canadian province of Manitoba.

The workshop will be held Dec. 18, 2002, from 10 a.m. to 3 p.m. (EST) at the Radisson Airport Hotel & Conference Center in Columbus, Ohio. MISO, PJM and SPP staff will facilitate discussion on proposals to mitigate parallel path flow issues between their service territories. Discussion of the proposals will center on the coordination of information related to the safe and reliable operation of the grid, including coordination of available transfer capability (ATC) and available flowgate capability (AFC) in the two regions.

All interested parties are invited to attend by registering at the MISO, PJM, SPP joint and common website,

www.miso-pjm-spp.com

Appendix A

The Midwest Energy Market Initiative

Energy Market Functionality

FUNCTIONAL AREAS

FTRs

(A financial contract that entitles holder to a stream of revenues – or charges - based on the hourly energy price differences across the path)

- Request processing
- Simultaneous deliverability feasibility testing
- Approval processing

Day Ahead Market

(Based on scheduled hourly quantities and day-ahead hourly prices)

- Security Constrained Unit Commitment
- LMP calculation using generation offers, demand bids, and bilateral transaction schedules.

Real-Time Energy Market

(Based on actual hourly quantity deviations from day-ahead schedule hourly quantities and real-time prices)

- LMP calculation using real-time SE values

SUPPORTING PROCESSES

- Stakeholder Process
- Publish Market Data
- Settlements & Billing

Participant Readiness

- Communications Plan
- Define Membership Requirements
- Manage Customer Registration
- Manage Customer Relations
- Manage Training
- Perform Market Trials

Fixed Transmission Rights Example

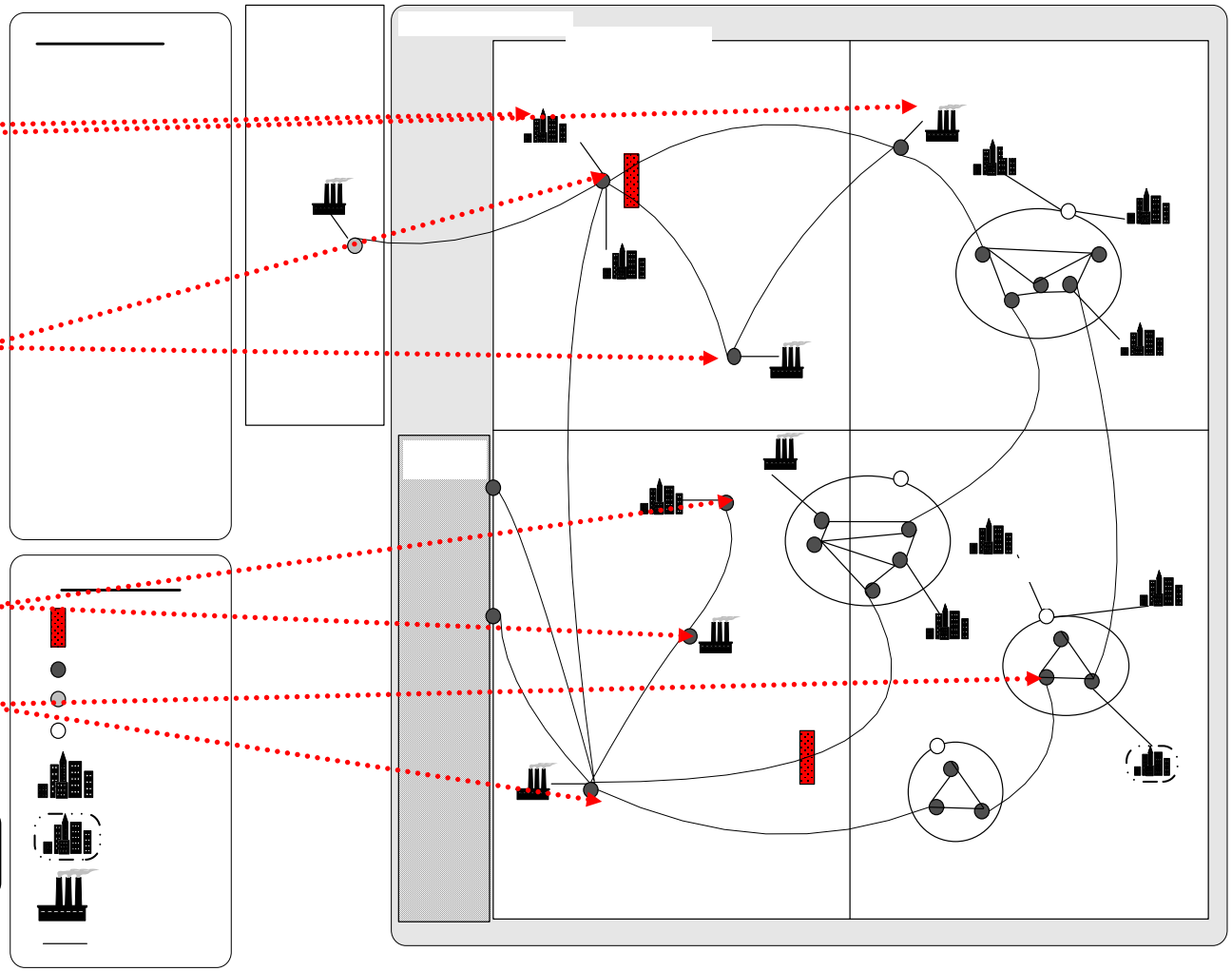
Market Timeline

Annually (Seasonally On/Off Peak):
-MISO processes and distributes Initial / Re-Allocated FTR/ARRs
-Updated ownership information is tracked internally by MISO

Monthly:
-MRE submits bid to Buy FTR
-MISO processes Auction and publishes Auction Results
-Updated ownership information is tracked internally by MISO
-Auction Results are sent for Invoicing

At Least Daily:
-MRE submits FTR Request
-MISO determines result and publishes information for MRE
-MRE accepts/rejects FTR Request and ownership is updated internally
-MRE submits an FTR Trade Request on behalf of a participant
-Trade is processed and ownership is tracked internally by MISO (for trade processed through the RTO)

Daily:
-MISO sends ownership information to Market Settlements



Day-Ahead
Energy Market Example

Market Timeline

7 Days Prior - 1000 DA:
- MISO generates load forecast
- GenCo submits outages

1000 DA:
- MISO performs preliminary transmission assessment

1100 DA:
- Begin creating DA Market Case

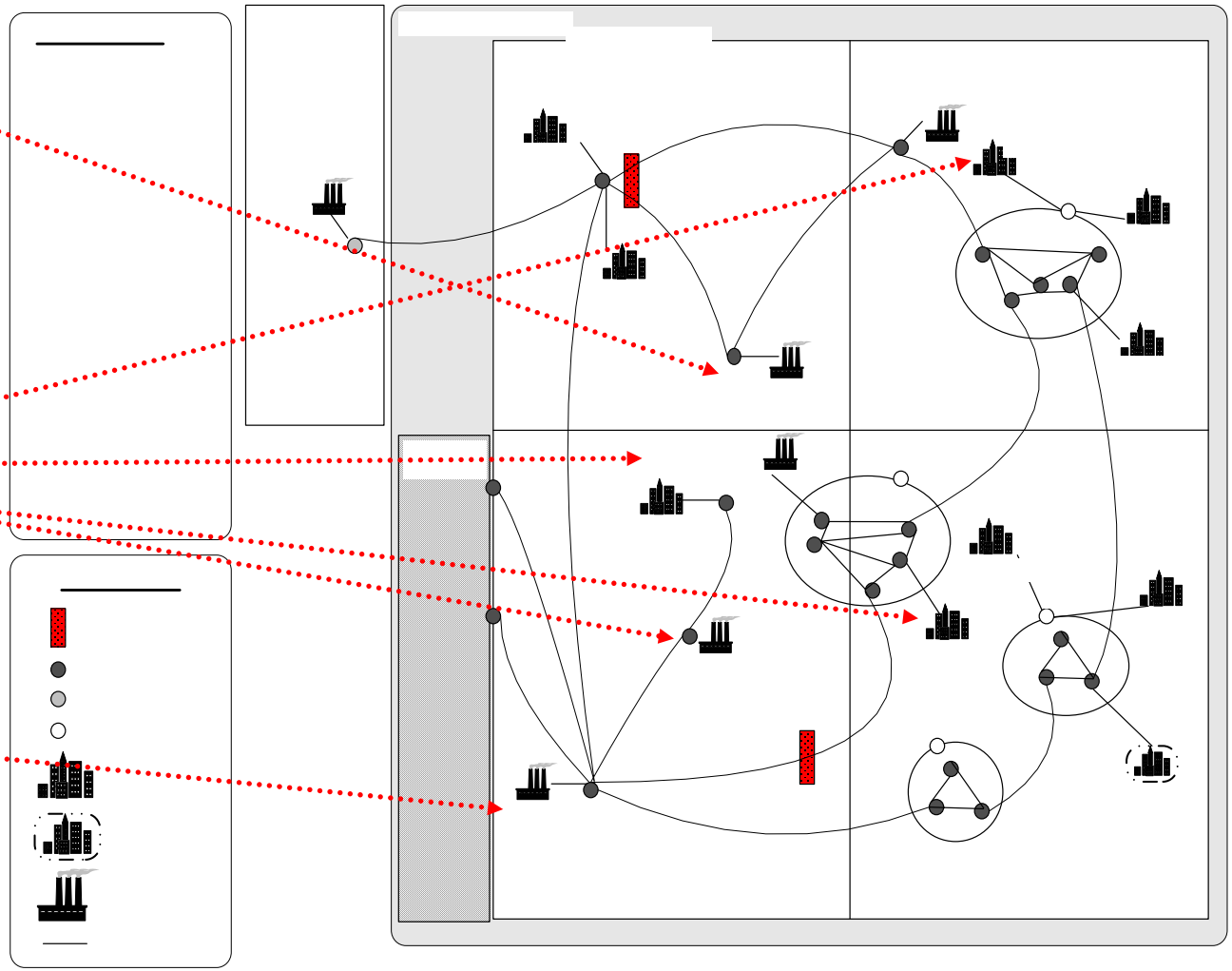
Ending 1200 DA:
- MRE submits demand bids on behalf of Load.
- MRE submits generation offers on behalf of Gen. Res.
- MRE submits DA bilateral schedules with another MRE

1200 DA - 1600 DA:
- MISO clears the DA Market

1600 DA:
- MISO publishes the public and private DA results

1600 – 1800 DA:
- MRE submits three-part bids on behalf of Gen. Res.

1800 – 2000 DA:
- MISO performs DA Resource Adequacy Assessment and Feasibility Study and commits resources, if necessary
- MISO informs MRE of any revisions to Schedule of Operation.



Real-Time Energy Market Example

Market Timeline

DA Market Close to OH - 90 minutes
- MRE Submits Self-Schedule on behalf of Gen. Res
- MRE Submits changes to Offer Curves
- MRE Submits Demand Response Offer on behalf of Dem. Resp. Res

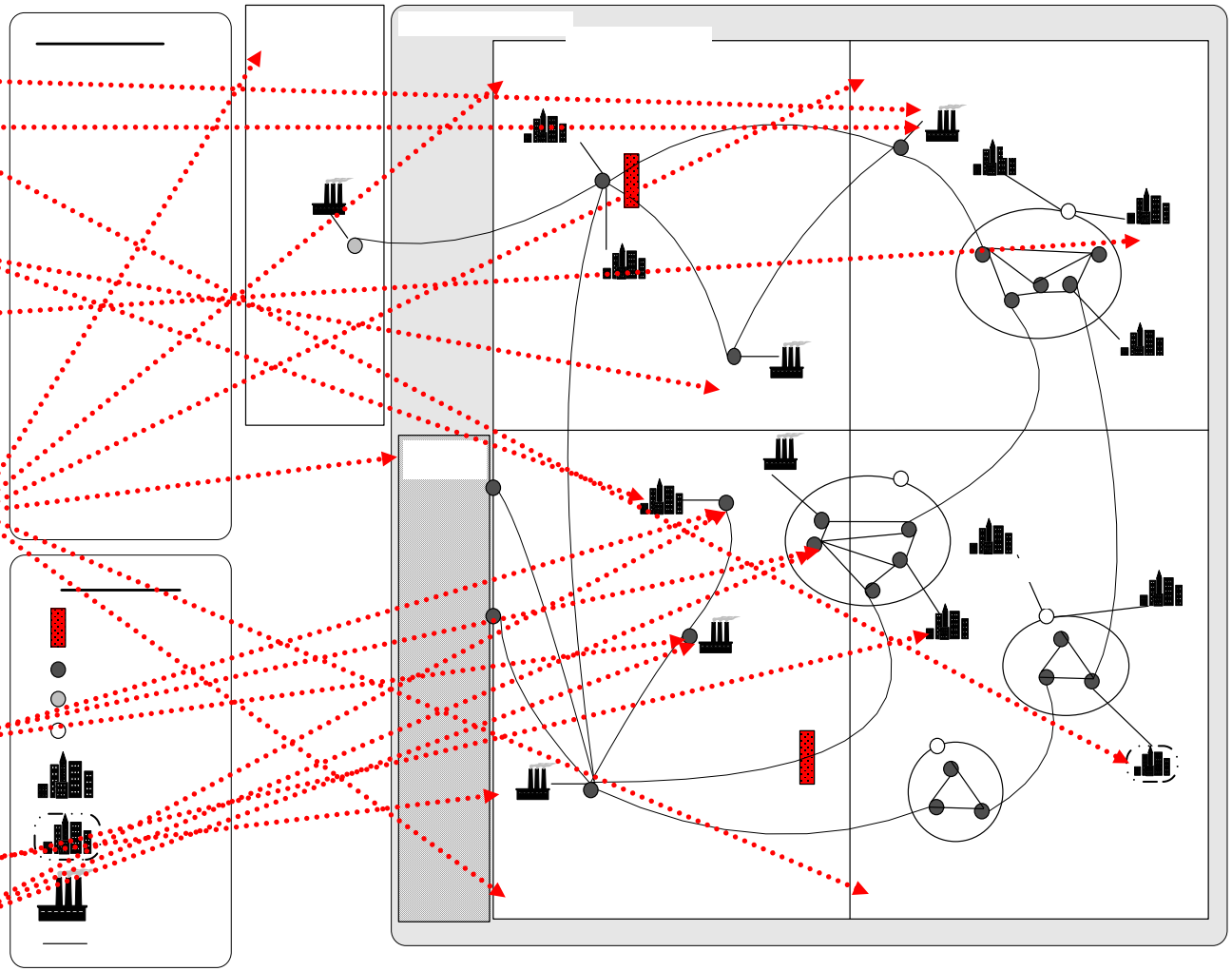
DA Market Close to OH - 20 minutes
- MRE Submits a new Bilateral Schedule with another MRE
- MRE updates existing Bilateral Schedule from the DA Market

T - 5 minutes to T - 0 minutes:
- MISO determines 5 Min. Load Forecast
- MISO performs SCED
- MISO sends NSI to Control Areas
- MISO sends Dispatch Instructions (in both price and MW form)

T – 0 minutes to T + 5 minutes:
- Market Operates

T + 5 minutes:
- MISO calculates and determines Ex-Post LMP

T - 0 minutes to 1200 of OD + 1 Day:
- MRE updates financial bilateral schedules, after-the-fact, for Imbalance Exchange
- MISO calculates and determines Settlement LMP



Energy Market Settlements Example

Market Timeline

5 Days After the Operating Day:
- MISO performs initial settlements for OD1

6 Days After the Operating Day:
- MRE downloads statement from portal

13 Days After the Operating Day:
-MISO produces Invoices for the last seven operating days, including OD1

14 Days After the Operating Day:
- MRE downloads invoice from portal

18 Days After the Operating Day:
- MISO collects money from MREs

20 Days After the Operating Day:
- MISO pays out MREs

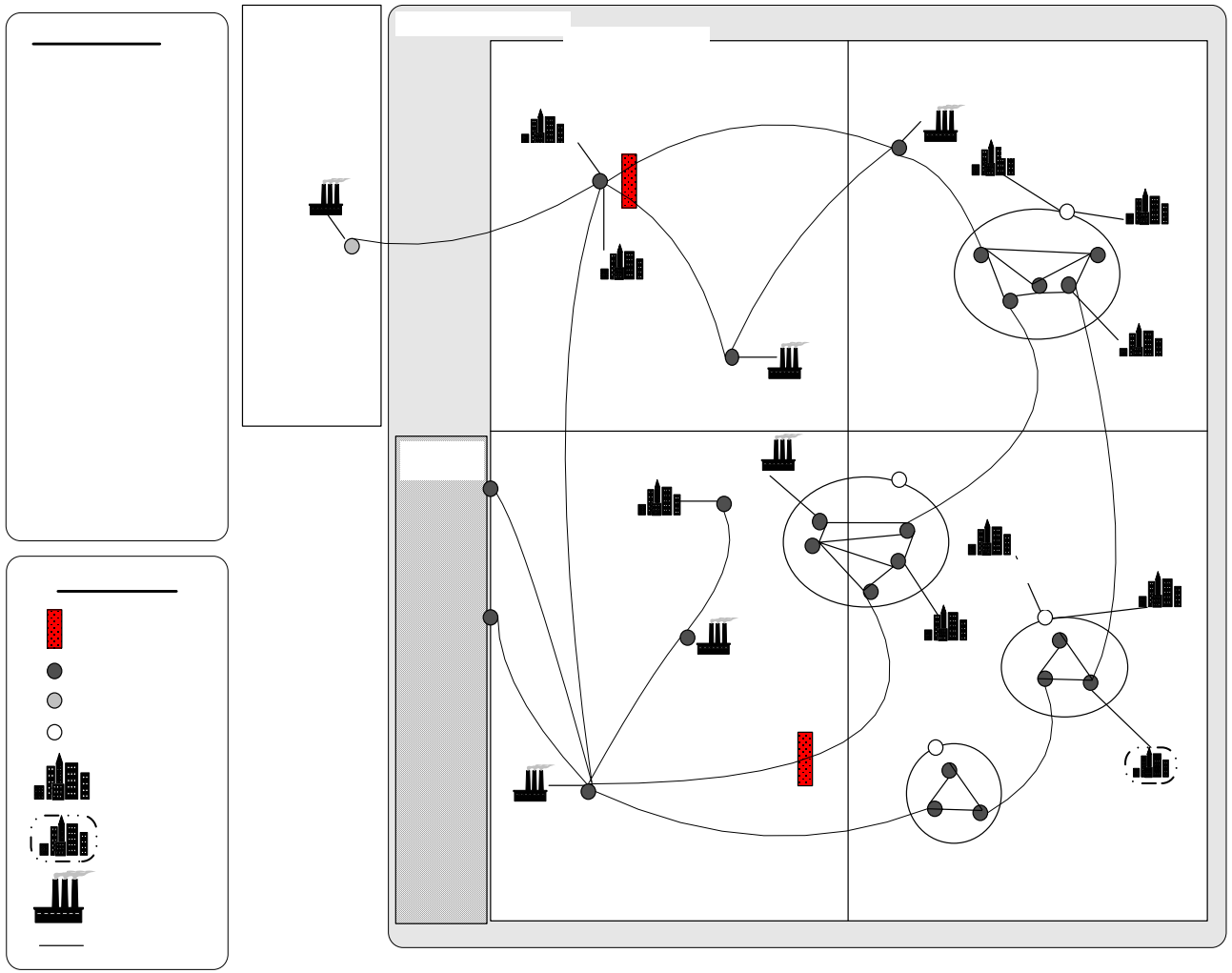
45 Days After the Operating Day:
- Metering Agent submits meter data

45 Days After the Operating Day:
- MISO performs final settlements for OD1

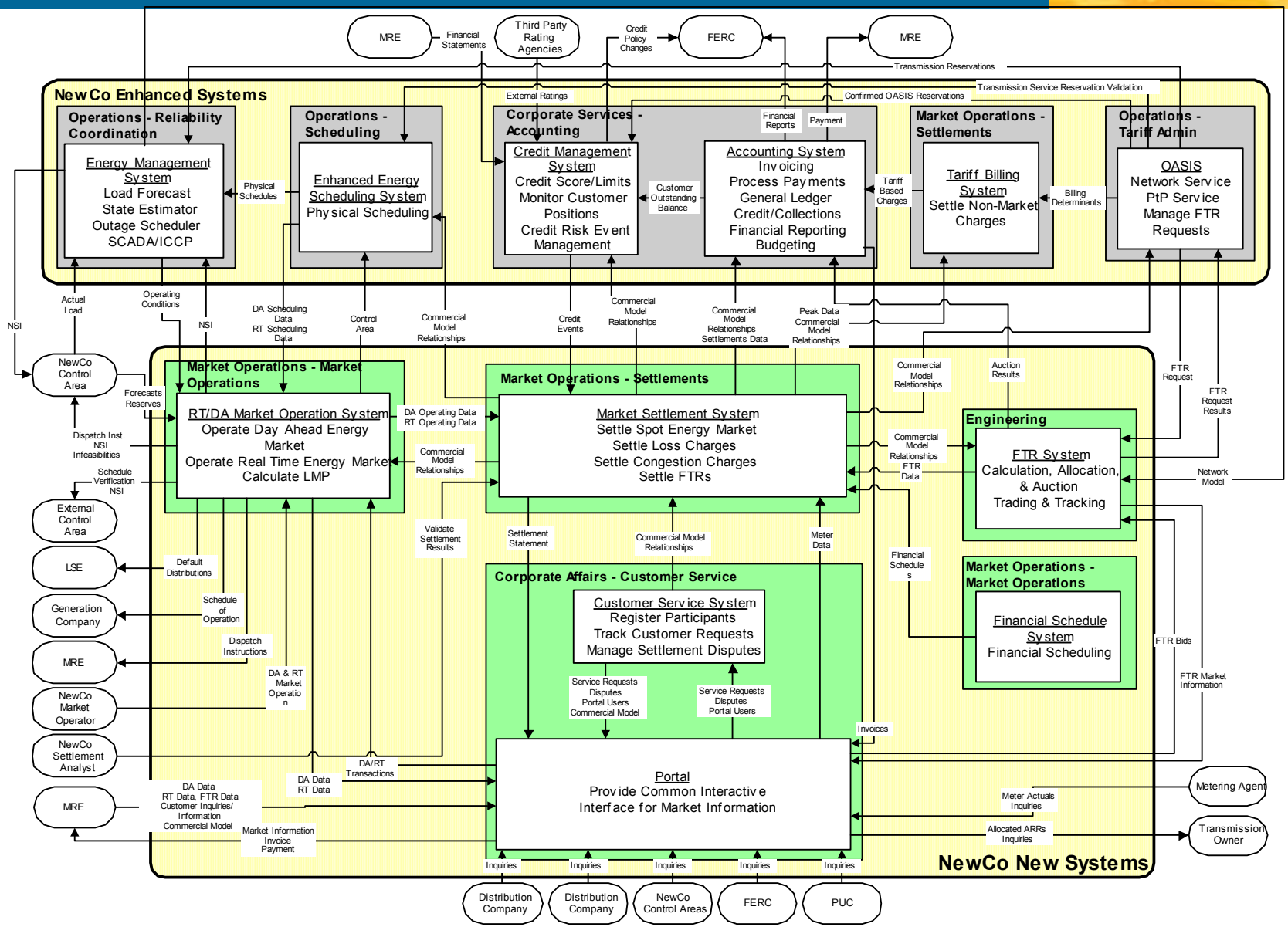
46 Days After the Operating Day:
- MRE downloads statement from portal

75 Days After the Operating Day:
- MISO resettles OD1 (#1)

405 Days After the Operating Day:
- MISO resettles for OD1 (#12)

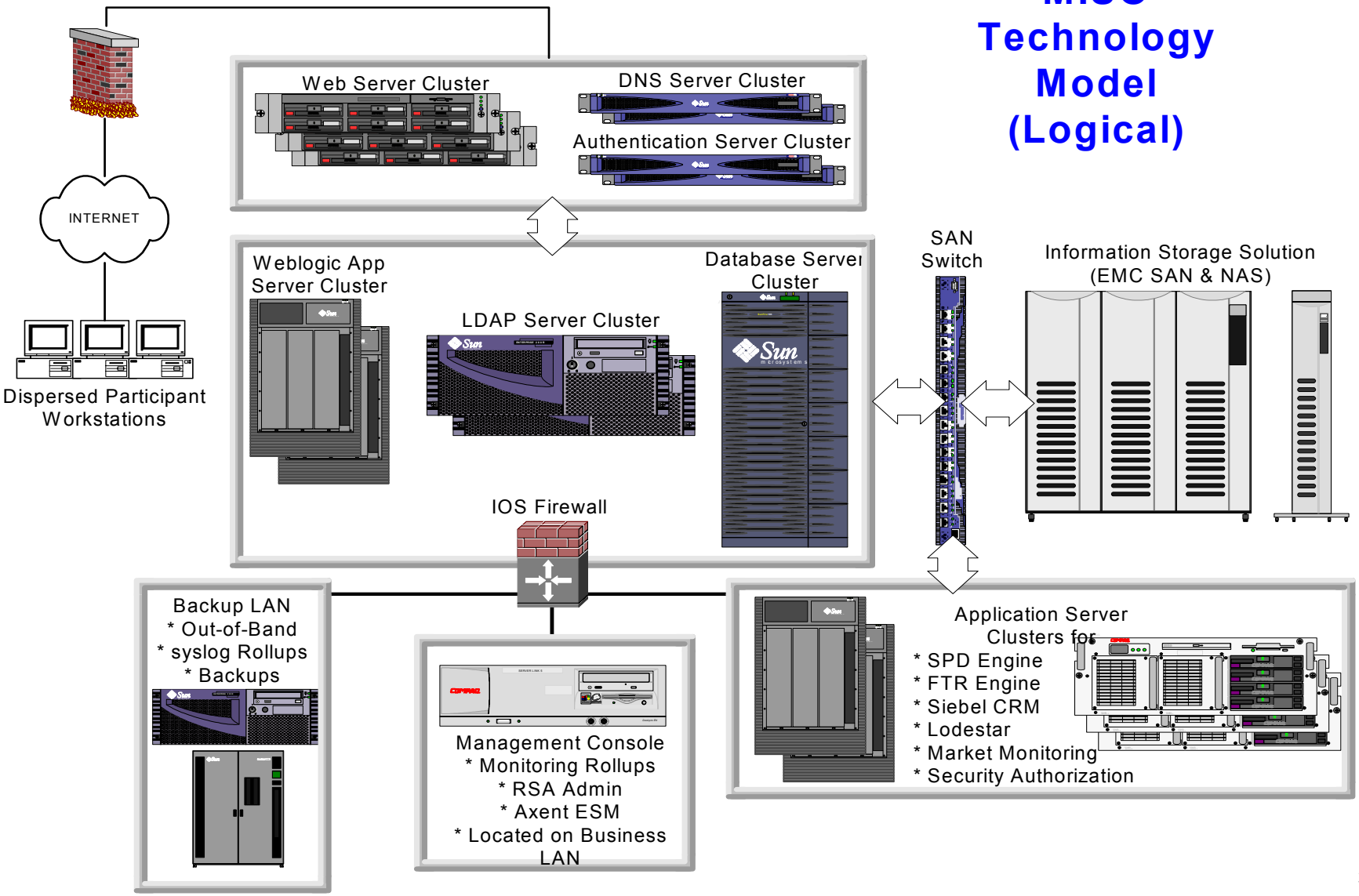


Energy Market Application Architecture

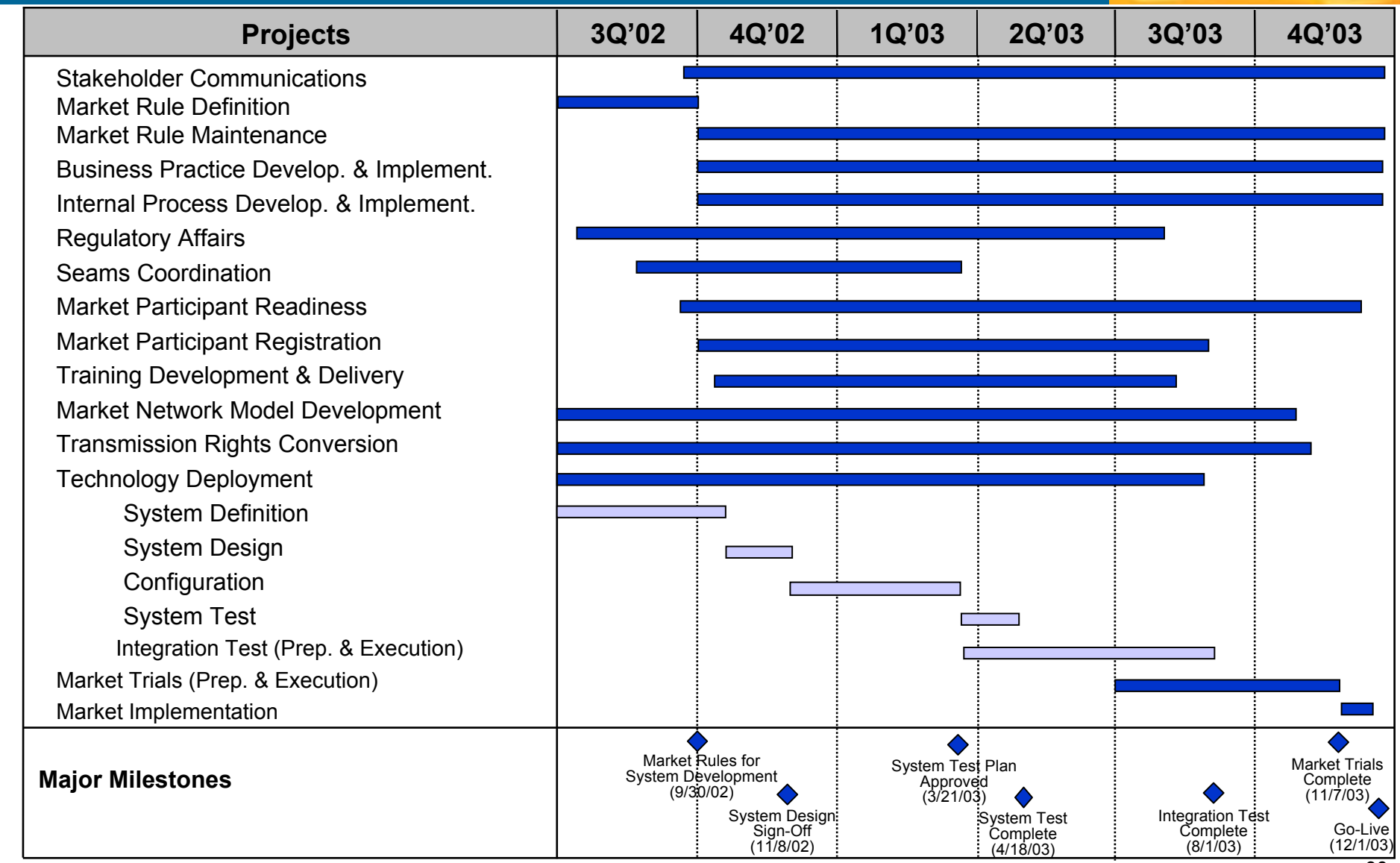


Energy Market Hardware Architecture

MISO Technology Model (Logical)



Midwest Market Initiative Schedule



Energy Market Implementations Cost Comparison

Metric	IMO	CA ISO	PJM	NY ISO	ISO-NE	ERCOT	SPP	MISO
Capital Cost to Implement Mkt ($ Million)	$172.0	$100.0	$140.0	$82.0	$87.0	$137.0	$24.0	$59.2
MARKET CHARACTERISTICS:								
Real Time Energy	Y	Y	Y	Y	Y	Y	Y	Y
Day Ahead Energy	N	Y	Y	Y	Y	N	N	Y
Operating Reserves	Y	Y	Y	Y	Y	Y	Y	N
FTR	Y	Y	Y	Y	N	Y	N	Y
Pricing	MCP	ZONAL	LMP	LMP	MCP	ZONAL	LMP	LMP

Sources:
- IMO, CA ISO, PJM, NY ISO, ERCOT values from RTO West Report
- ISO-NE value provided by ISO-NE CFO
- SPP market was not implemented

MISO / PJM Market Contrast

Item	MISO Proposed	PJM Current	Similarities
Generator Bids	**Hourly** Bidding	**Day Ahead** Bidding	Day Ahead & Real-Time Markets
Price Transparency	Five minute posting of **three** price components: • Energy component • Marginal losses • Marginal congestion	Five minute posting of **one** price component: • Combination of energy and congestion	Settlement debit/credits made on hourly integration of five minute values.
Unit Bids Obligations	Mandatory offering of resources with notification, start-up, and minimum run times **greater than 24 hours.**	Mandatory offering of resources **designated in installed capacity portfolio** of Load Serving Entities.	Three part bids accepted: • Start-up • No-load • Price or monotonically increasing price curve
Handling of Unit Deviation From Requested Output	Uninstructed **deviation penalty** for each hour when difference between actual energy and dispatch is greater than the higher of 3 MW or 3% of the units high emergency limit.	**No implicit penalty**; Units outside of +/-10% current dispatch rate do not set market clearing price, but are paid at clearing price.	

MISO / PJM Market Contrast

Item	MISO Proposed	PJM Current	Similarities
Fixed Transmission Rights	**Seasonal** allocation; Options and obligations to delineate between expected to be funded and non-funded.	**Annual** allocation; If congestion charges collected are less than the target value of FTRs, then the FTR credits are reduced proportionately.	
Resource Adequacy Measures	Resource adequacy monitored days in advance. Day-ahead reliability assessment performed and additional units committed so as to ensure coverage of demand and reserves. LSE's that are short of capacity are charged accordingly.	Reliability Assurance Agreement requires LSEs to contract with resources to cover 119% of their forecasted annual peak load (implemented a number of capacity credit markets to facilitate the trading of energy for the LSE capacity obligation which is not met by bilateral arrangements and/or self-supplied).	

MISO / PJM Market Contrast

Item	MISO Proposed	PJM Current	Similarities
Market Based Ancillary Services	Regulation Market currently under development.	**Current Services:** • Regulation • Day-ahead operating reserve • Balancing operating reserve •Spinning reserve	
Losses Ancillary Service	Cost of losses calculated as the difference between the marginal cost of losses at injection point and marginal cost of losses at delivery point.	Losses flat (2.5% off-peak 3% on-peak) multiplied times hourly energy transactions multiplied by the real-time load weighted average LMP for the entire system; hourly transactions over 200 MWHR may return MW in-kind rather than pay for losses.	

Appendix B

Industry Terminology

Glossary of Terms

Term	Definition
Financial Transmission Right (FTR)	Financial instrument whose value is determined when the transmission grid is congested in the Day-Ahead Market, leading to different LMPs at different locations.
Market Responsible Entity	An entity that is qualified to represent a Market Participant for purposes of market interactions and financial settlements with MISO.
Midwest Independent System Operator (MISO)	Independent Transmission System Operator that serves the electrical transmission needs of much of the Midwest.
Midwest Market Initiative (MMI)	A NewCo initiative to implement market functionality.
NewCo	A combined entity that includes MISO and SPP footprints
Single Market Design Forum (SMDF)	A forum to develop a single market that meets the needs of all customers and stakeholders using the electric power grid in the regions served by MISO, PJM Interconnection, and Southwest Power Pool.
Southwest Power Pool	NERC Reliability Council that provides independent security coordination functions and tariff administration in the Midwest.

Glossary of Acronyms

Term	Definition
ATC	Available Transmission Capacity
ARR	Auction Revenue Right
CAISO	California Independent System Operator
CRM	Customer Relationship Management
DA	Day-Ahead
DAM	Day-Ahead Market
ERCOT	Electric Reliability Council of Texas
FERC	Federal Energy Regulatory Commission
FTR	Financial Transmission Rights
IMO	Independent Market Operator
ISO-NE	Independent System Operator New England
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
LMP	Locational Marginal Pricing
LOI	Letter of Intent
LSE	Load Serving Entity
MISO	Midwest Independent System Operator
MMI	Midwest Market Initiative

Term	Definition
MRE	Market Responsible Entity
NERC	North American Electric Reliability Council
NYISO	New York Independent System Operator
OATT	Open Access Transmission Tariff
OASIS	Open Access Same Time Information System
PJM	PJM Interconnection
PSC	Policy Subcommittee
RT	Real-Time
RTO	Regional Transmission Operator
SCUC	Security Constrained Unit Commitment
SE	State Estimator
SMD NOPR	Standard Market Design Notice of Proposed Ruling
SPD	Scheduling, Pricing, Dispatch
SPP	Southwest Power Pool
TO	Transmission Owner
TOA	Transmission Operator Agreement