Midwest ISO Overview



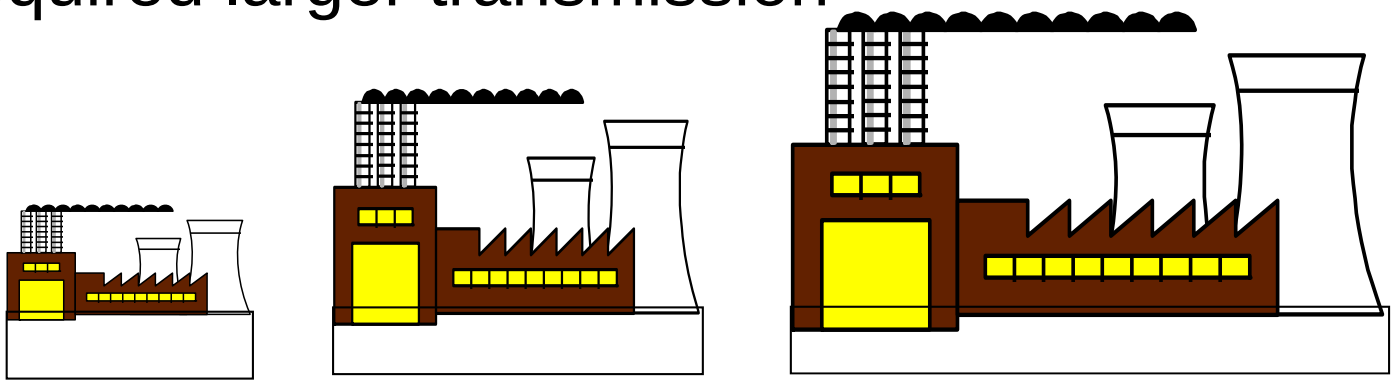
Mr. Clair J. Moeller

February 25, 2008

MidwestISO
Energizing the Heartland

System Development

- **First electrification was small scale and local**
  - Transmission was in its infancy
  - Moved Hydro to load centers
- **Economies of scale in Generation Technology (1935-1970)**
  - Required larger transmission

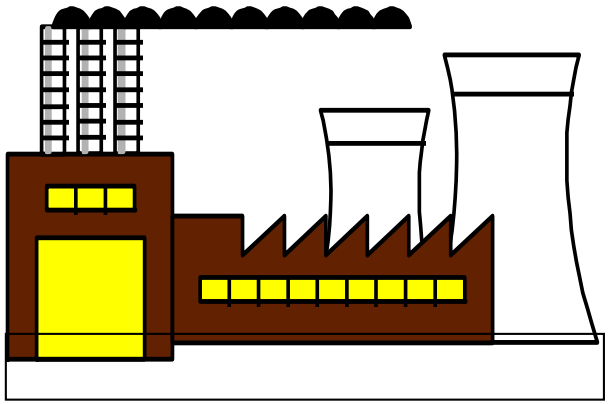


MidwestISO
Energizing the Heartland

System Development

- **Large Generation Installations**
  - Required transmission solutions to distribute to loads and interconnections
- **Increased need to coordinate reliability between companies**
  - Blackouts (1965, 2003 Northeast Blackouts)
  - NERC is born

(National Electric Reliability Council)



MidwestISO
Energizing the Heartland

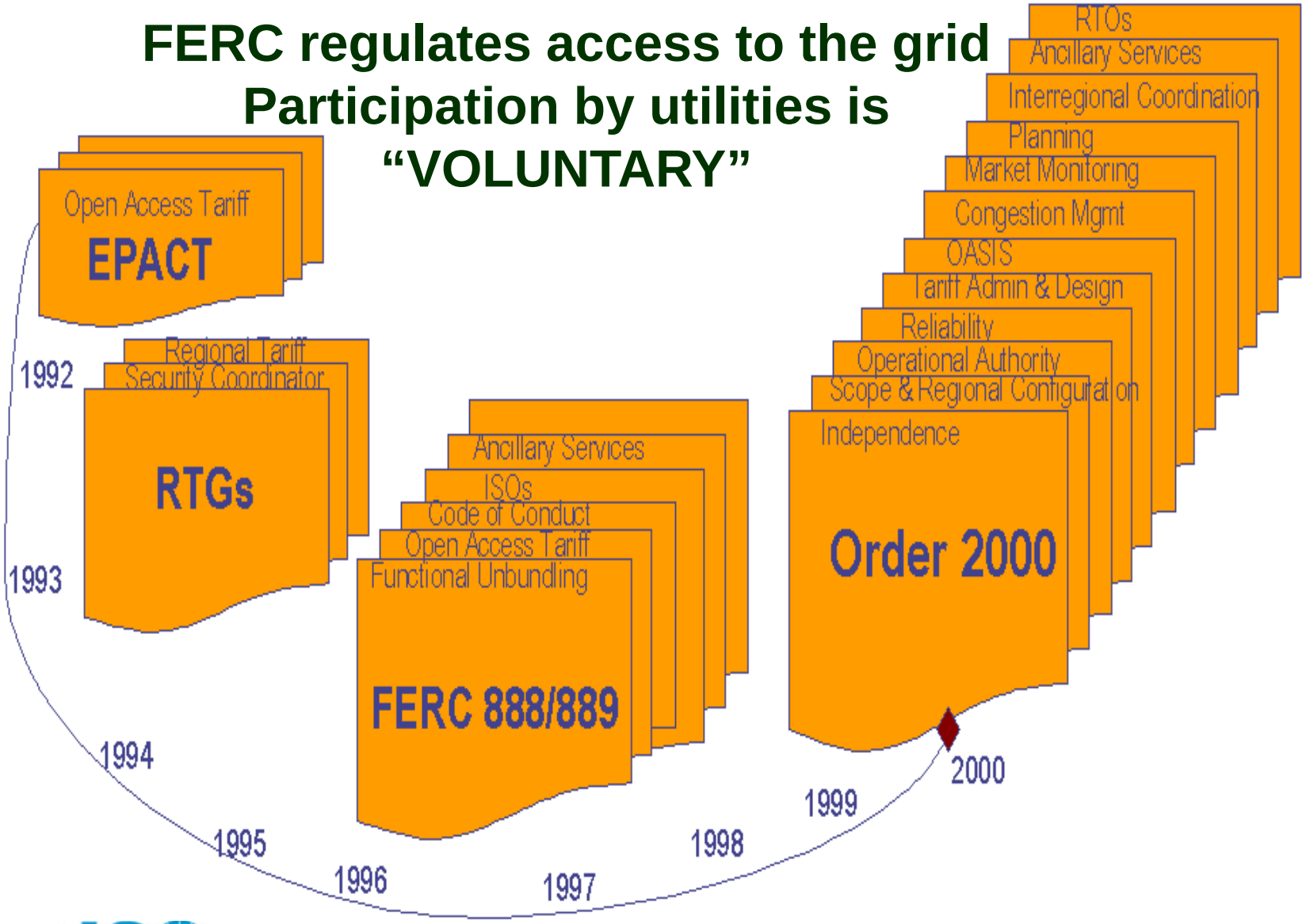
System Development

- **Generation economies of scale peaked in the early 1980's**
  - Many generation projects ran into cost trouble
    - Many states mandated "bidding"
  - Transmission construction also became difficult
- **Energy trades increased in volume**
  - Long before RTO regulations, utilities began exchanging power for economic reasons
  - Wholesale competition added to the number of players and the volume of transactions
  - Transmission systems grew in importance
    - Manipulation of the market was possible (and easy)
  - Complaints at FERC of market power manipulation increased

MidwestISO
Energizing the Heartland

Open Access Transmission

FERC regulates access to the grid
Participation by utilities is "VOLUNTARY"



MidwestISO
Energizing the Heartland

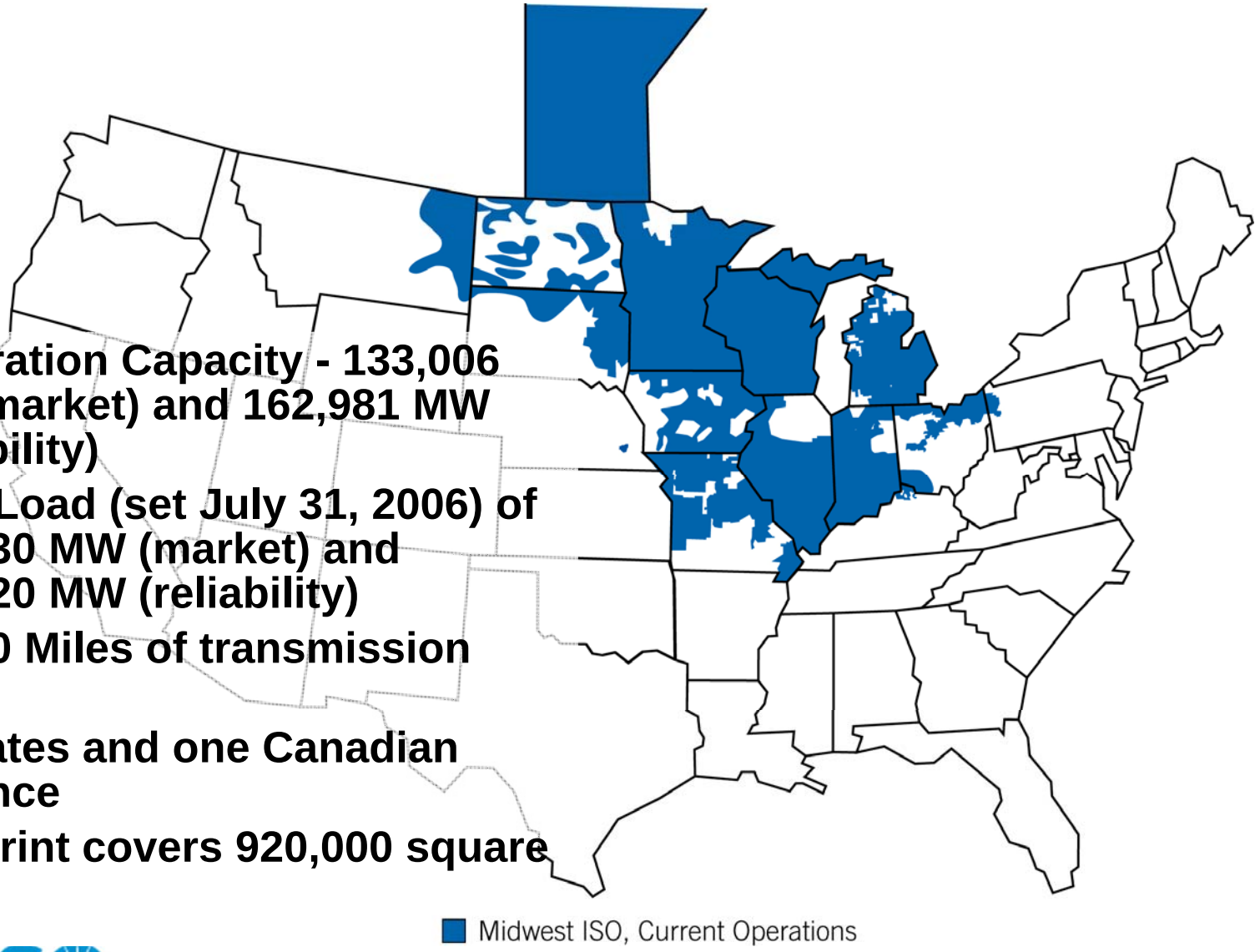
Who We Are

- Independent, non-profit organization responsible for maintaining reliable transmission of power in 15 states and one Canadian province
  - Organized Electric Energy Market
  - Transmission Planning
  - Fair Access

MidwestISO
Energizing the Heartland

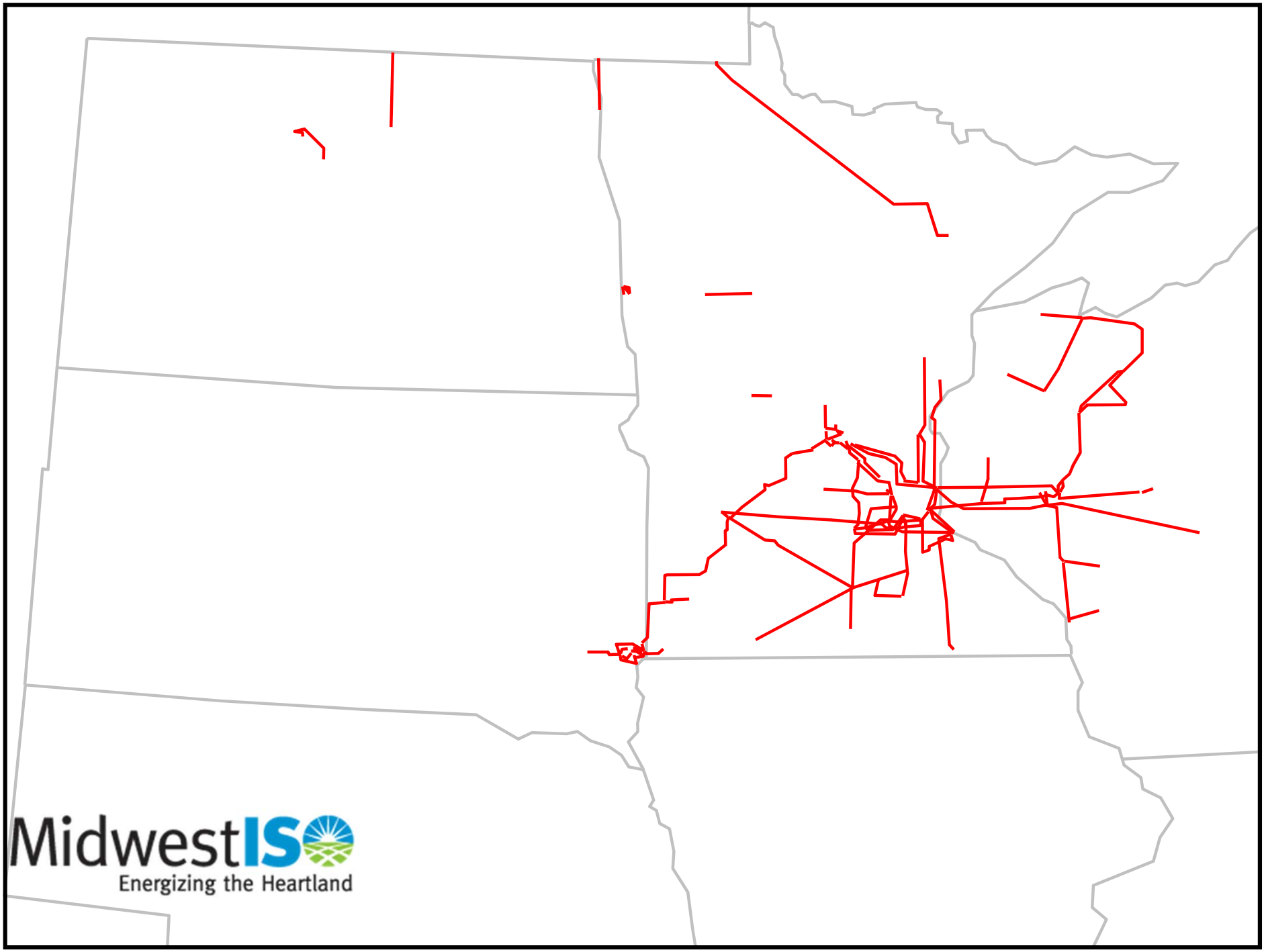
Market Footprint

- **Generation Capacity - 133,006 MW (market) and 162,981 MW (reliability)**
- **Peak Load (set July 31, 2006) of 116,030 MW (market) and 136,520 MW (reliability)**
- **93,600 Miles of transmission lines**
- **15 States and one Canadian province**
- **Footprint covers 920,000 square miles**

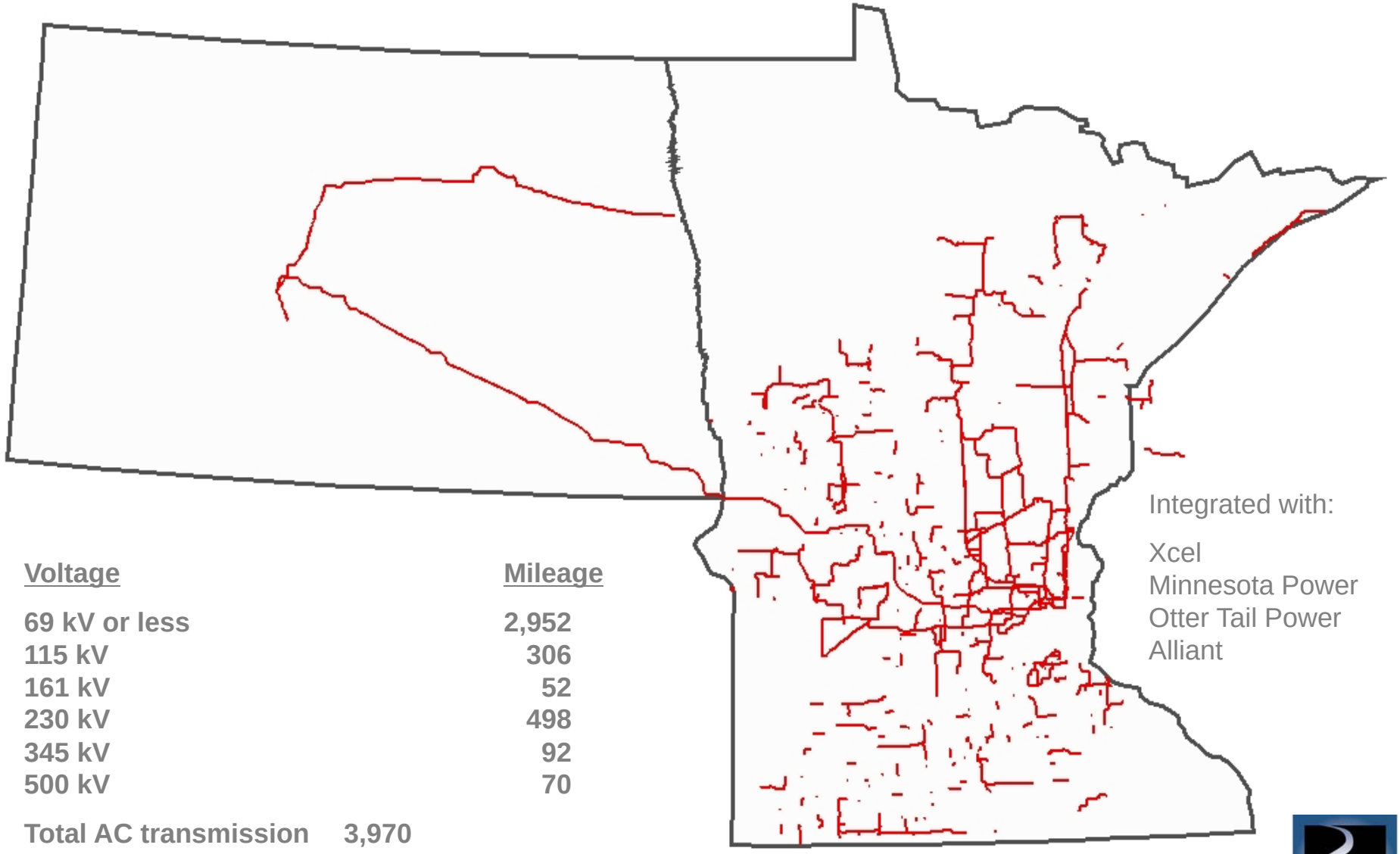


MidwestISO
Energizing the Heartland

Xcel Energy Transmission



GRE Transmission System



Voltage	Mileage
69 kV or less	2,952
115 kV	306
161 kV	52
230 kV	498
345 kV	92
500 kV	70
Total AC transmission	3,970
±400 kV DC	435
Total transmission line	4,405

Integrated with:

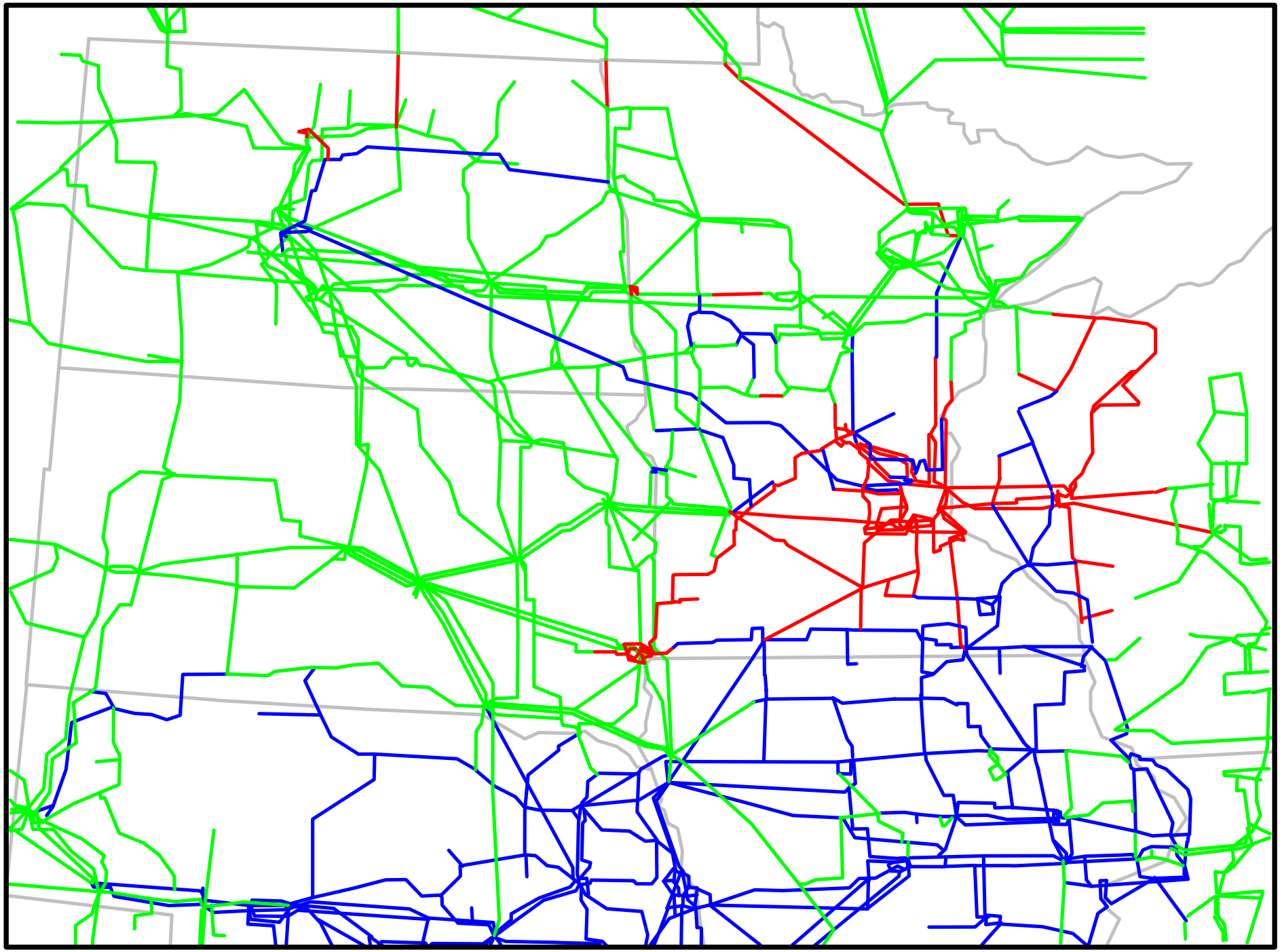
Xcel
Minnesota Power
Otter Tail Power
Alliant

Original investment	$617,138,038
Net book value	$336,103,516

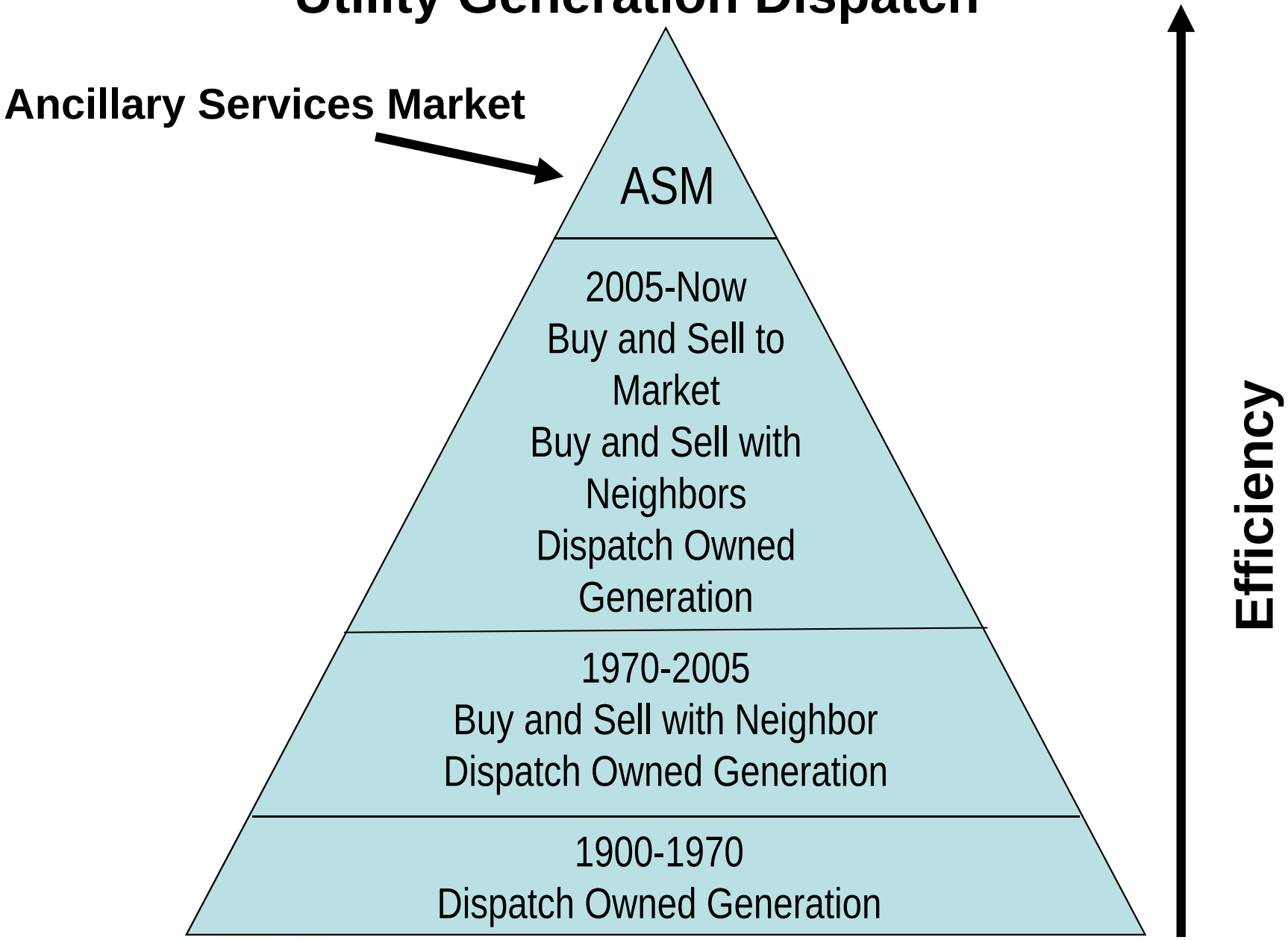
as of 12/31/01

GREAT RIVER ENERGY®
A Touchstone Energy® Cooperative

Regional Transmission

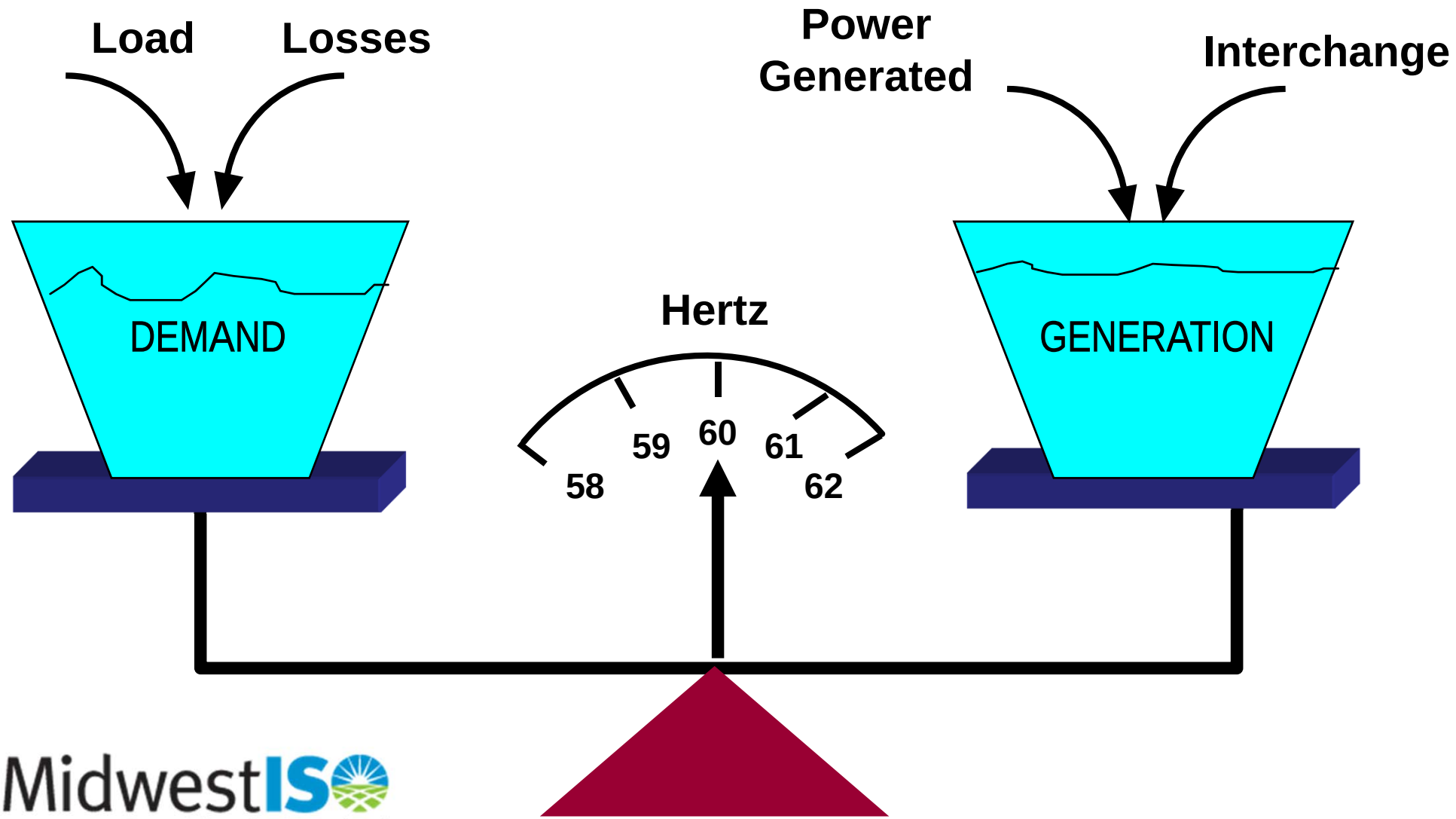


Utility Generation Dispatch



MidwestISO
Energizing the Heartland

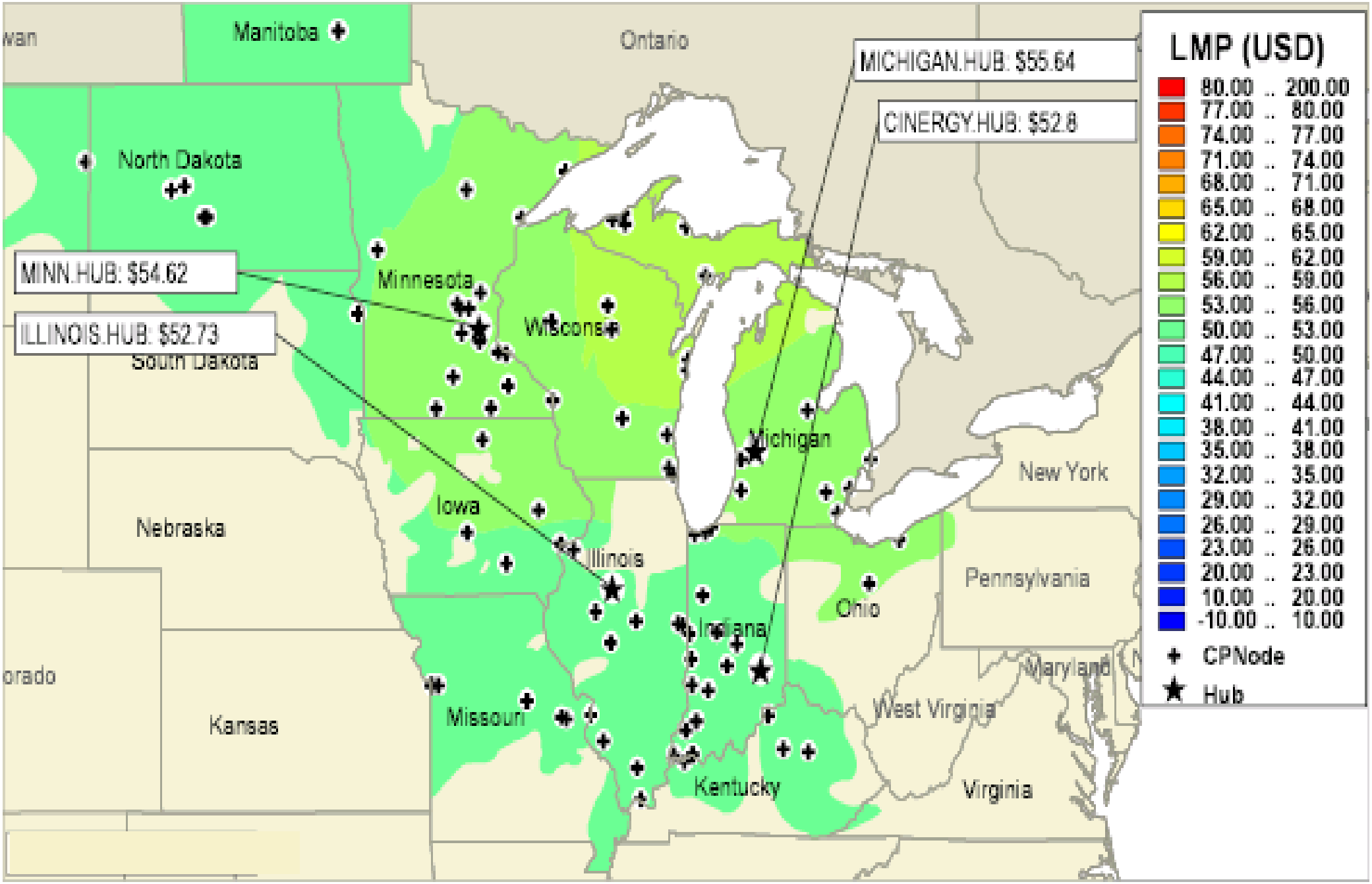
Real Time, Balanced Energy Market



MidwestISO
Energizing the Heartland

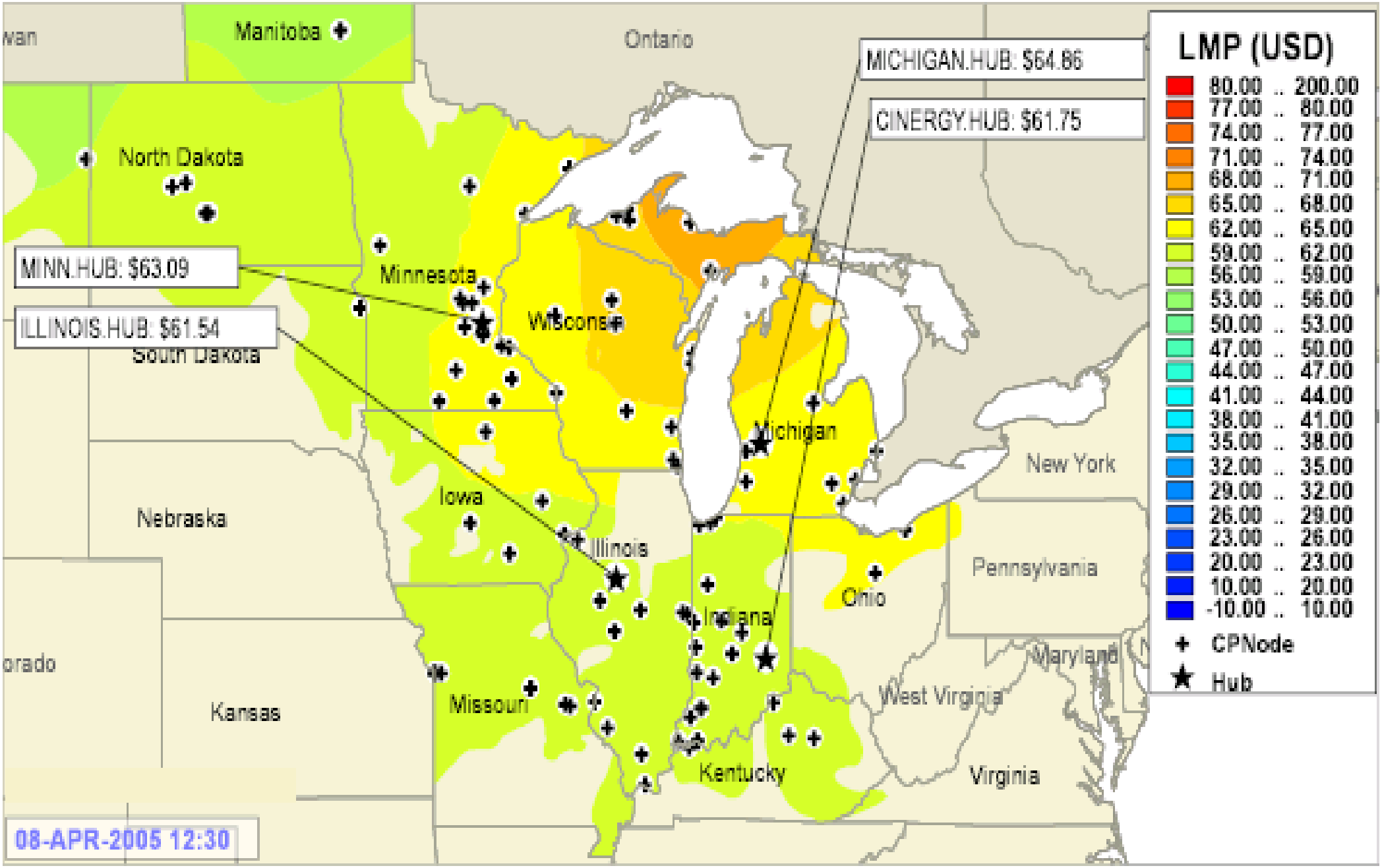
Intermediate Clearing Price

(loss driven small gradient prices, no congestion)



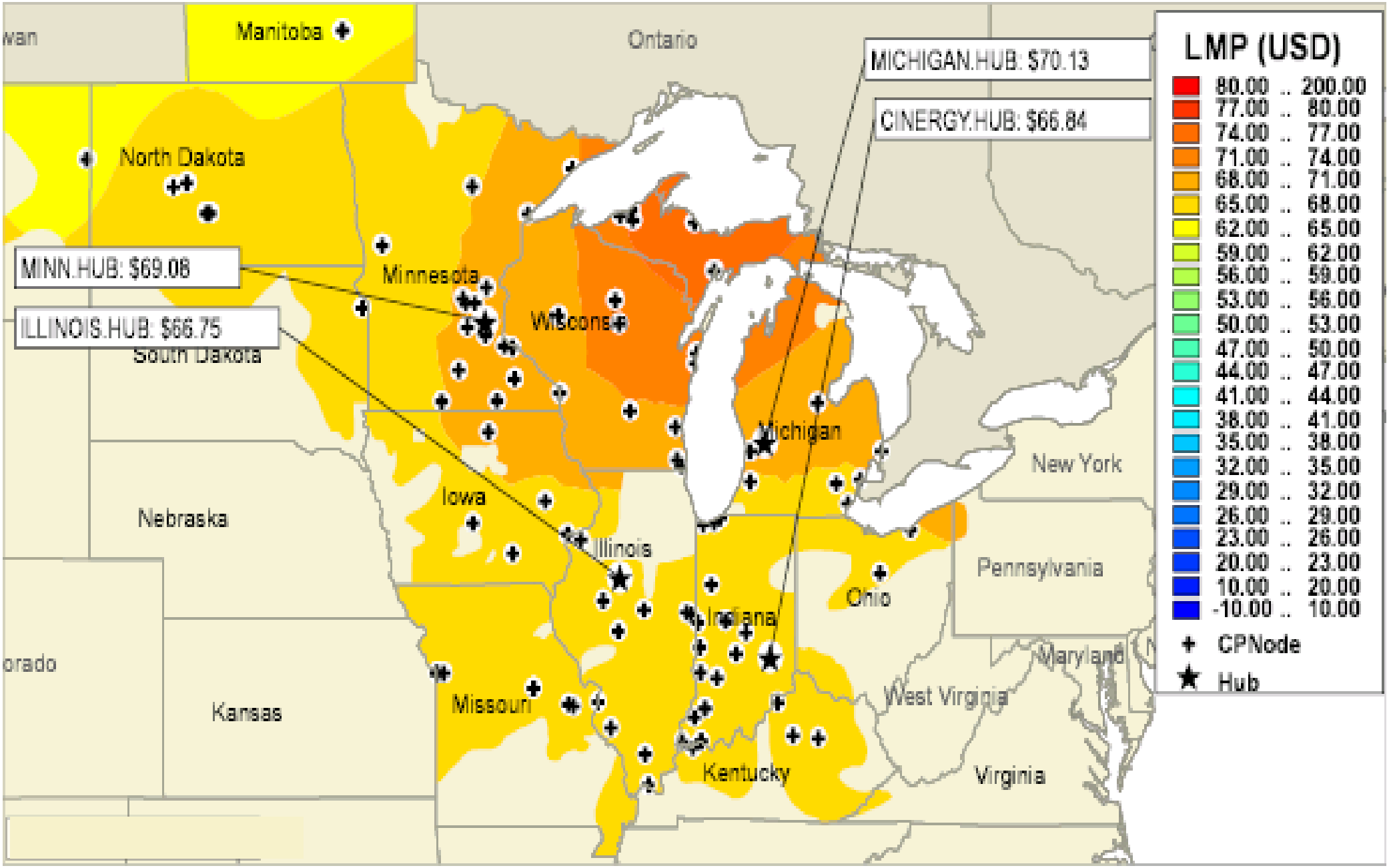
Higher Intermediate Clearing Price

(loss driven small gradient prices, no congestion)



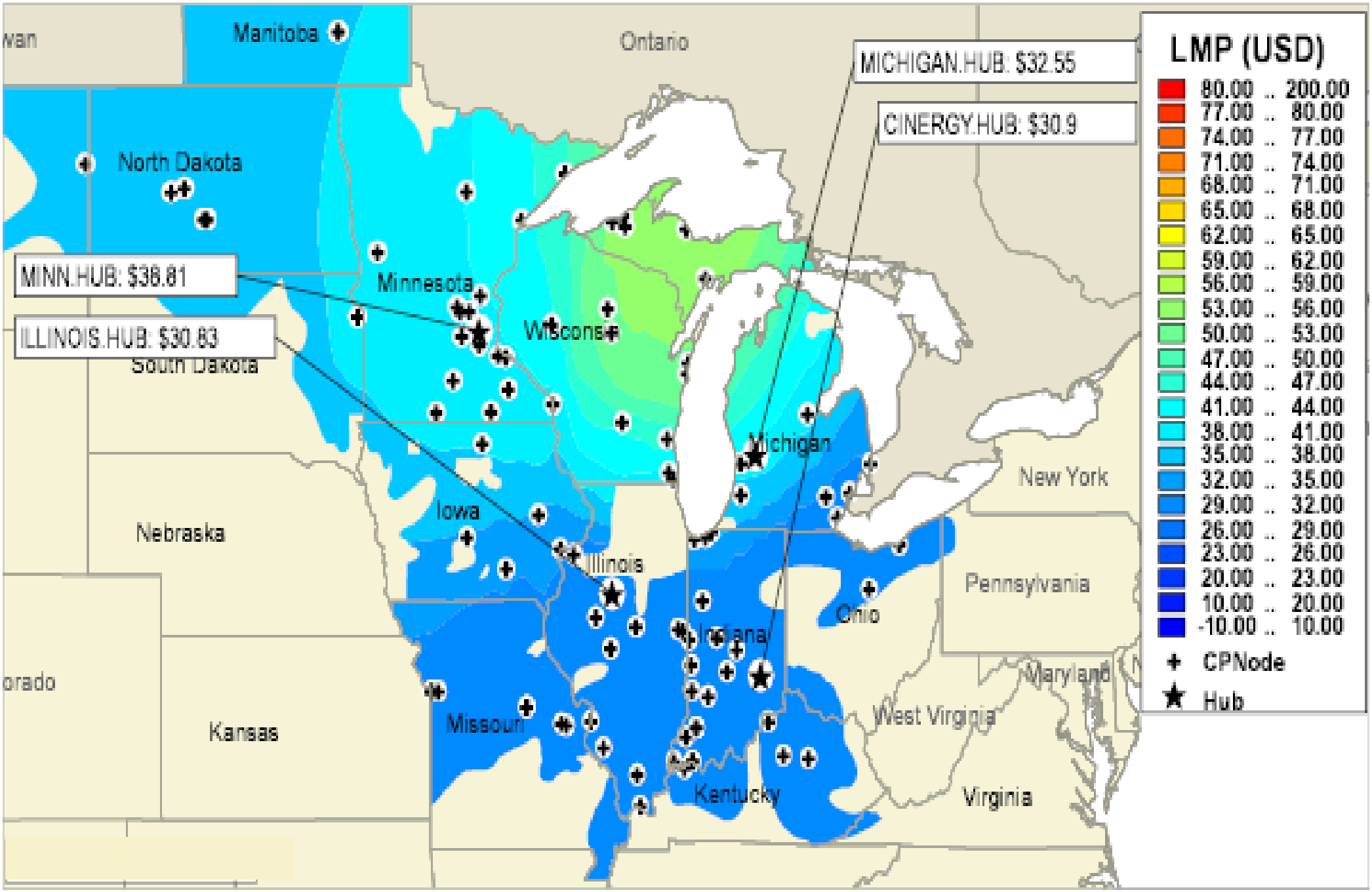
Peaking Clearing Price

(loss driven small gradient prices , no congestion)



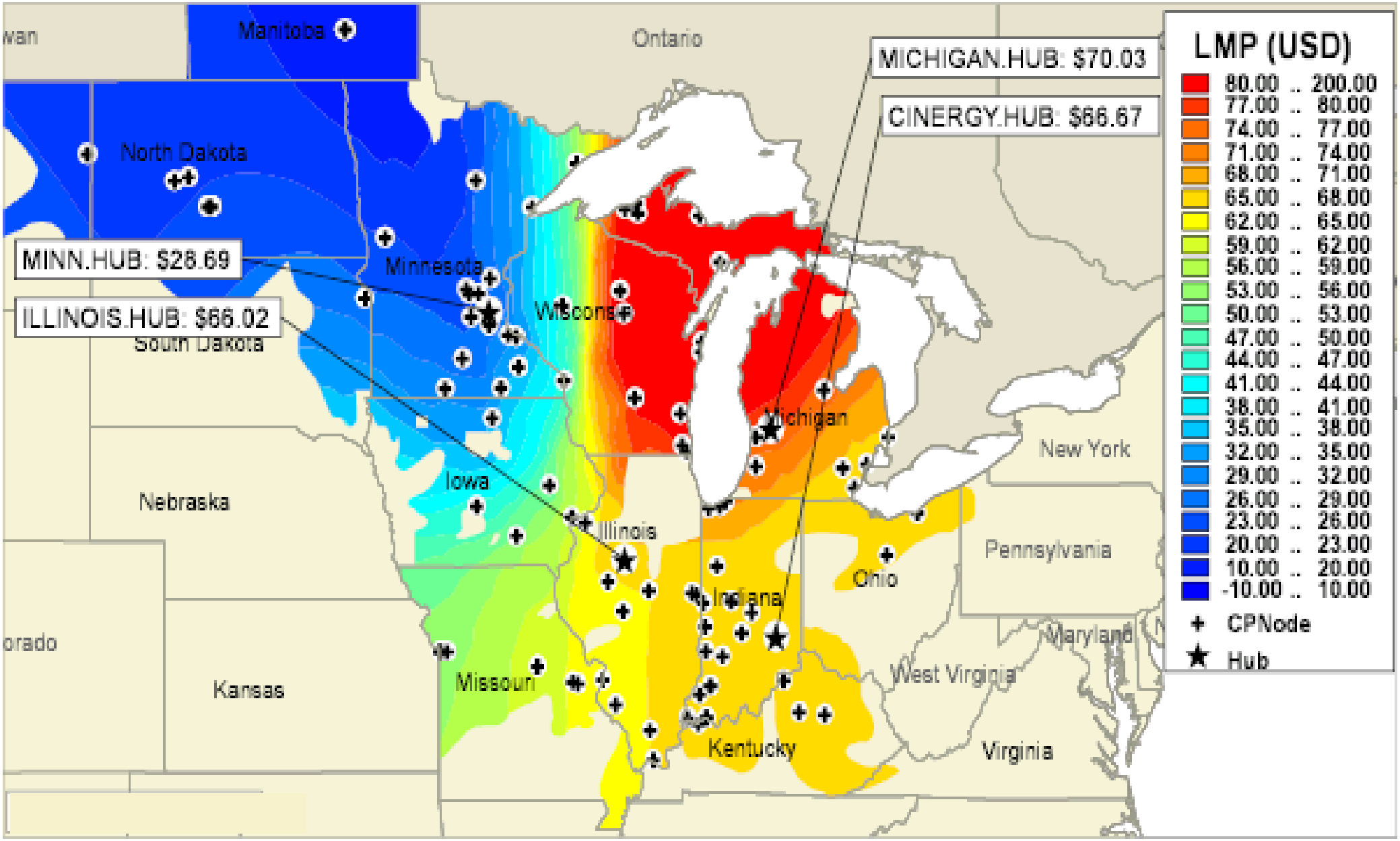
Near-Base Clearing Price

(loss driven and mild congestion prices)



Congestion is Predominant

(steep gradient in prices and wide price range)



Midwest ISO Board of Directors Transmission Planning Principles

- Make the benefits of a competitive energy market available to customers by providing access to the lowest possible electric energy costs
- Provide a transmission infrastructure that safeguards local and regional reliability
- Support state and federal renewable energy objectives by planning for access to all such resources (e.g. wind, biomass, demand-side management)
- Create a mechanism to ensure investment implementation occurs in a timely manner
- Develop a transmission system scenario model and make it available to state and federal energy policy makers to provide context and inform the choices they face

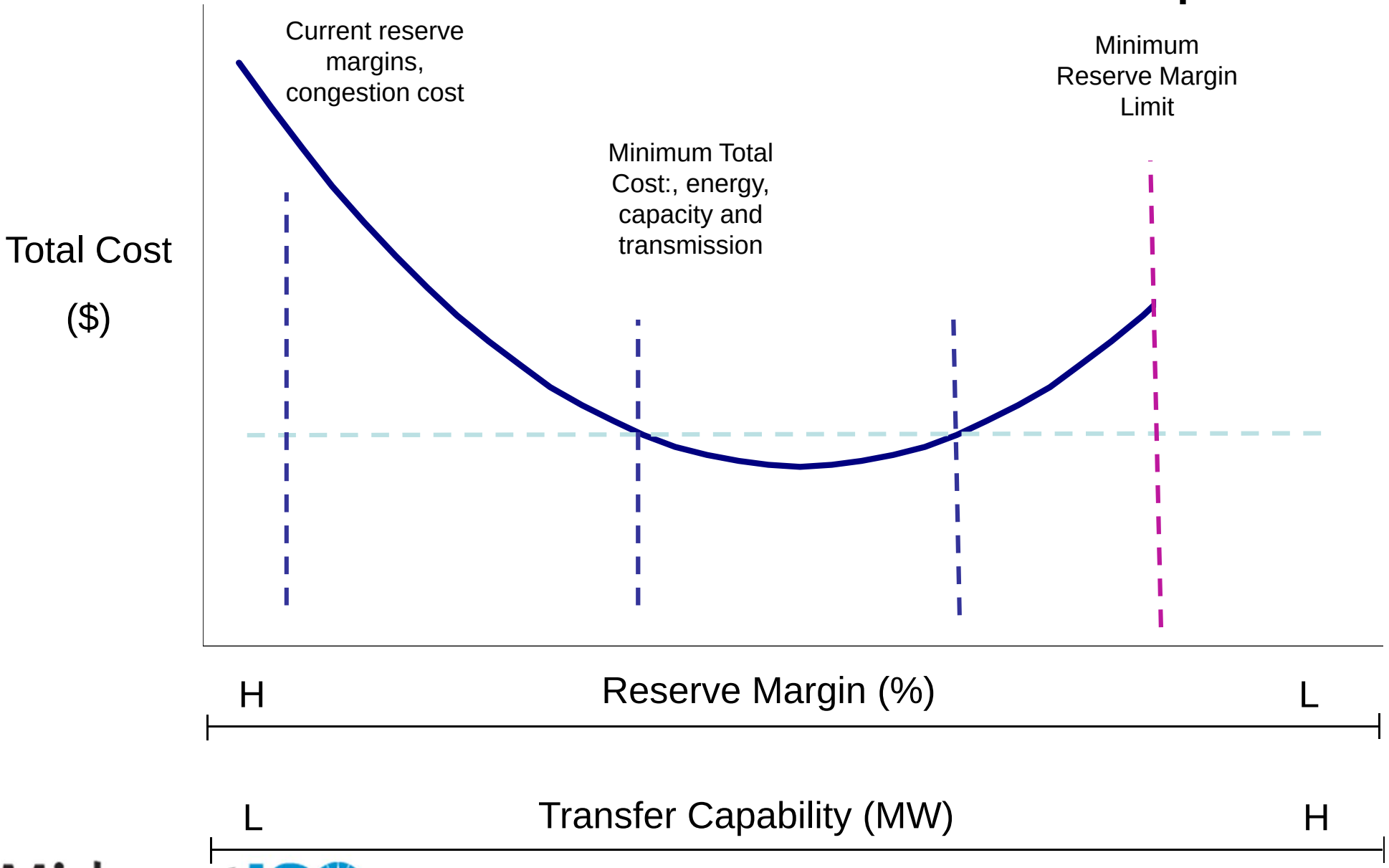
MidwestISO
Energizing the Heartland

Where Are We Going?

- Midwest ISO is pursuing a strategy to:
  - Change the objective of transmission planning from minimum peak capacity planning to delivered wholesale energy price (cost?)
  - Develop a better understanding of transmission investment's value proposition by
    - Reflecting all identifiable value drives
      - recognizing the public good attributes of delivery infrastructure
      - Recognizing the individual beneficiaries attributes
      - Trying to balance a cost allocation accordingly
    - Extending planning horizons to reflect project timescales
      - Scenario modeling
  - Articulate that value, adjust the sharing to correspond
- Develop political consensus
  - Engage State regulators and interested observers

MidwestISO
Energizing the Heartland

All We Need to Do is Find the Sweet Spot!



MidwestISO
Energizing the Heartland

Big Transmission?

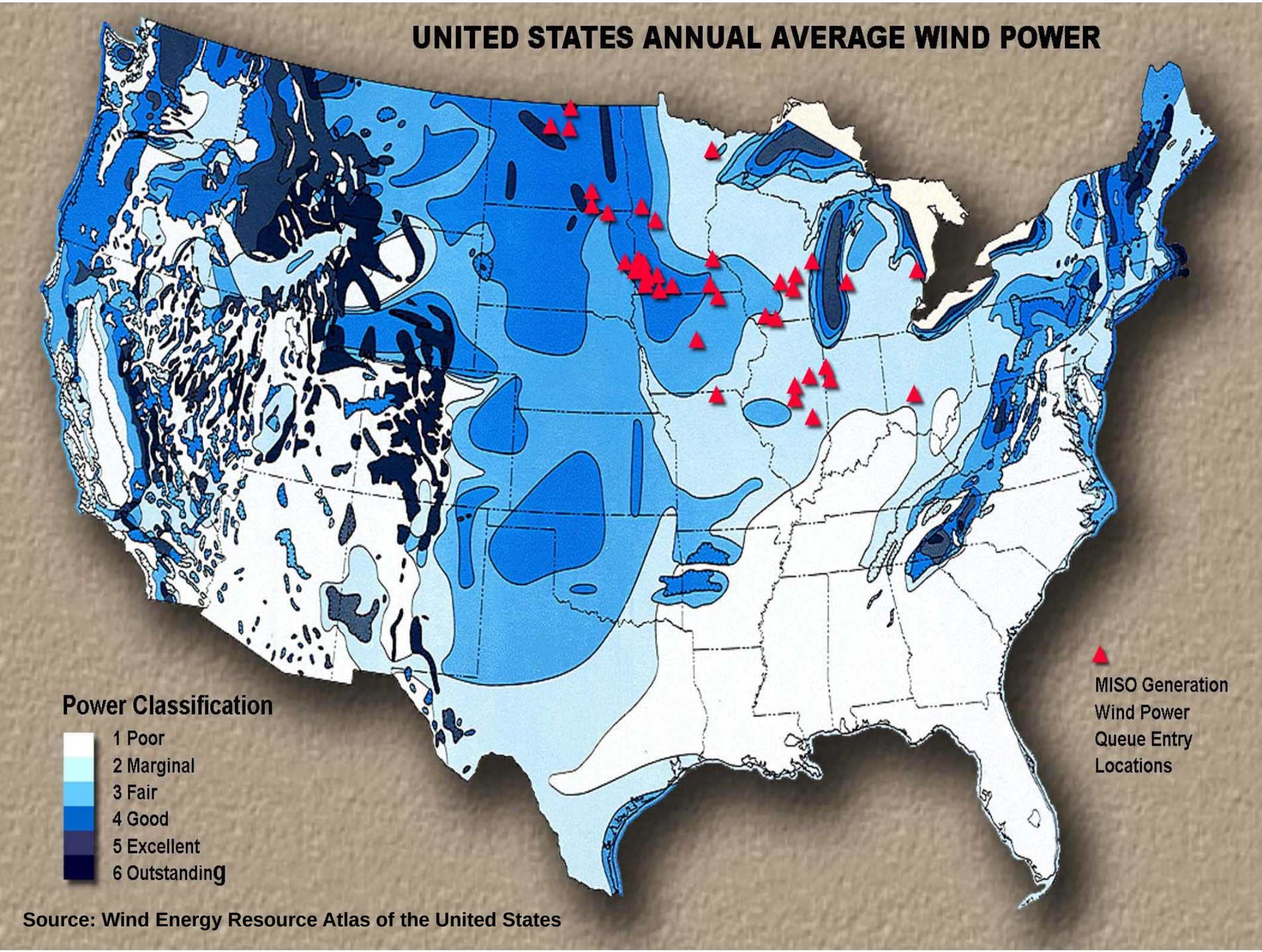
- Regulators are asking (implicitly or explicitly) if there is a case for building more transmission
- Midwest ISO hypothesizes that the current transmission planning paradigm, based primarily on reliability assessment which minimizes transmission build, leaves value for consumers on the table
  - Current paradigm relies on adding generation to support reserve margin requirements when confronted with increasing demand
  - Transmission may be a less expensive alternative
- To answer the question, need to evaluate total value – economic, reliability, public policy and other benefits - of transmission projects which meet longer term needs (i.e. 20 years)

MidwestISO
Energizing the Heartland

Conditions Precedent

- A robust business case for the plan
  - Need to demonstrate that the hypothesized benefits exist, including evaluation of alternatives
  - Regulators are the judge of the business case
- Increased consensus around regional energy policy
  - Does not exist today around wind, for example, across the Midwest ISO footprint
- A regional tariff that matches who benefits with who pays over time
  - For example, beneficiaries of wind may be due to public policy, rather than load flow or economic benefit analyses which are the current basis for cost allocation
- Cost recovery mechanisms that reduce financial risk
  - Investors in these projects need to be assured of cost recovery

MidwestISO
Energizing the Heartland

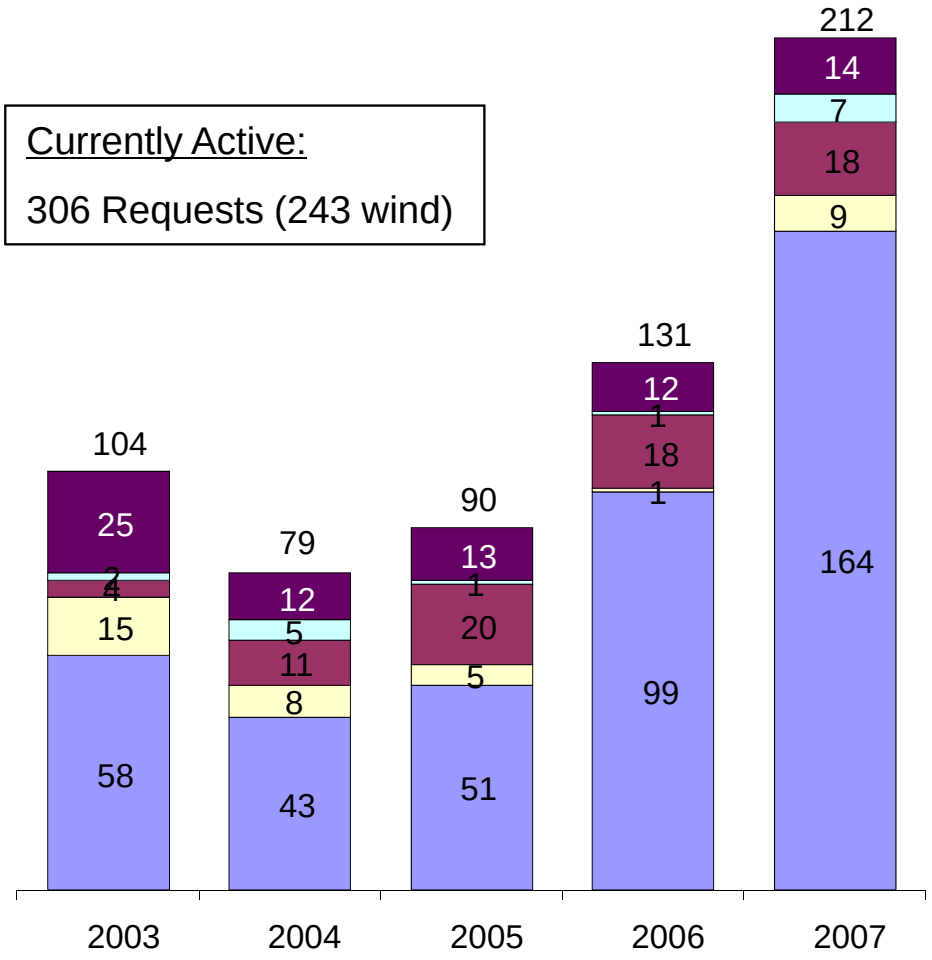

UNITED STATES ANNUAL AVERAGE WIND POWER
Power Classification
1 Poor
2 Marginal
3 Fair
4 Good
5 Excellent
6 Outstanding
MISO Generation
Wind Power
Queue Entry
Locations
Source: Wind Energy Resource Atlas of the United States

Queue Evolution*

Number of Requests

Currently Active:

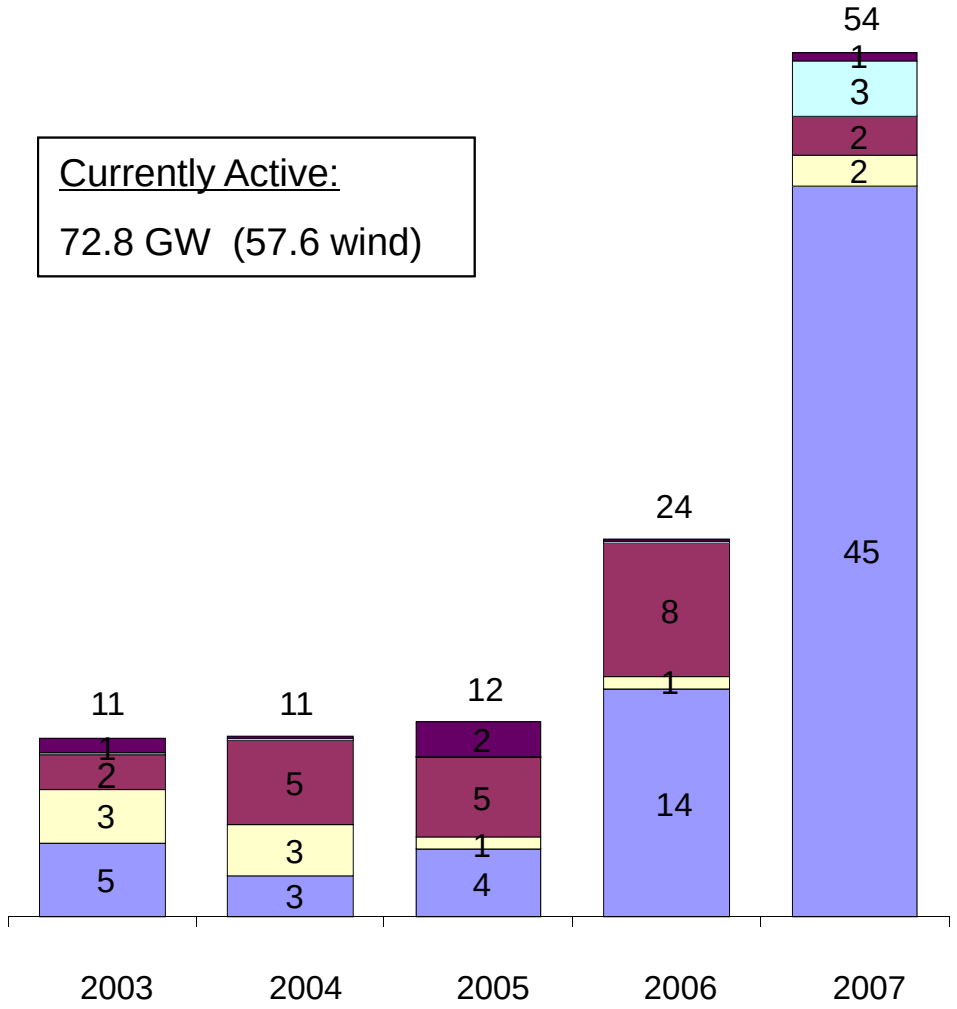
306 Requests (243 wind)



GW of Requests

Currently Active:

72.8 GW (57.6 wind)



Wind
Natural Gas
Coal
Nuclear
Other

MidwestISO
Energizing the Heartland

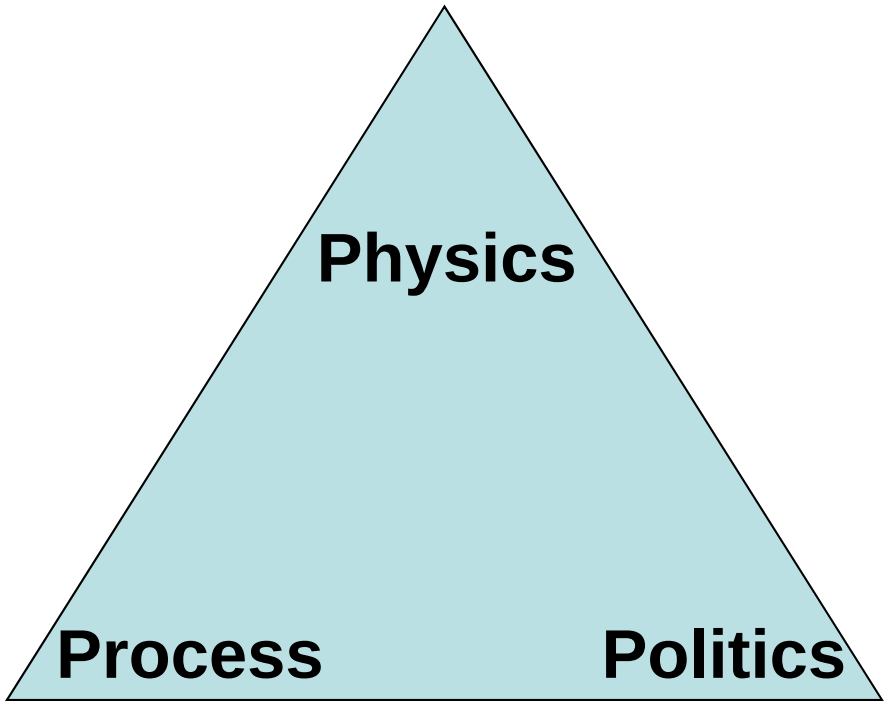
*All requests received as of December 31, 2007

Current Tariff Requirements

- First in-first out (FIFO) approach as mandated by FERC
- Results of first queued study must be known before second queued study can start
- Dependencies on early queued projects hard-wired as contingencies in Interconnection Agreements of subsequent projects—uncertainty range too wide for commercial decision making
- Literal interpretation of the Tariff rules would allow us to complete processing of all requests currently in the queue on August 26, 2362
- Steps MISO has taken so far only reduce that date to 2050

MidwestISO
Energizing the Heartland

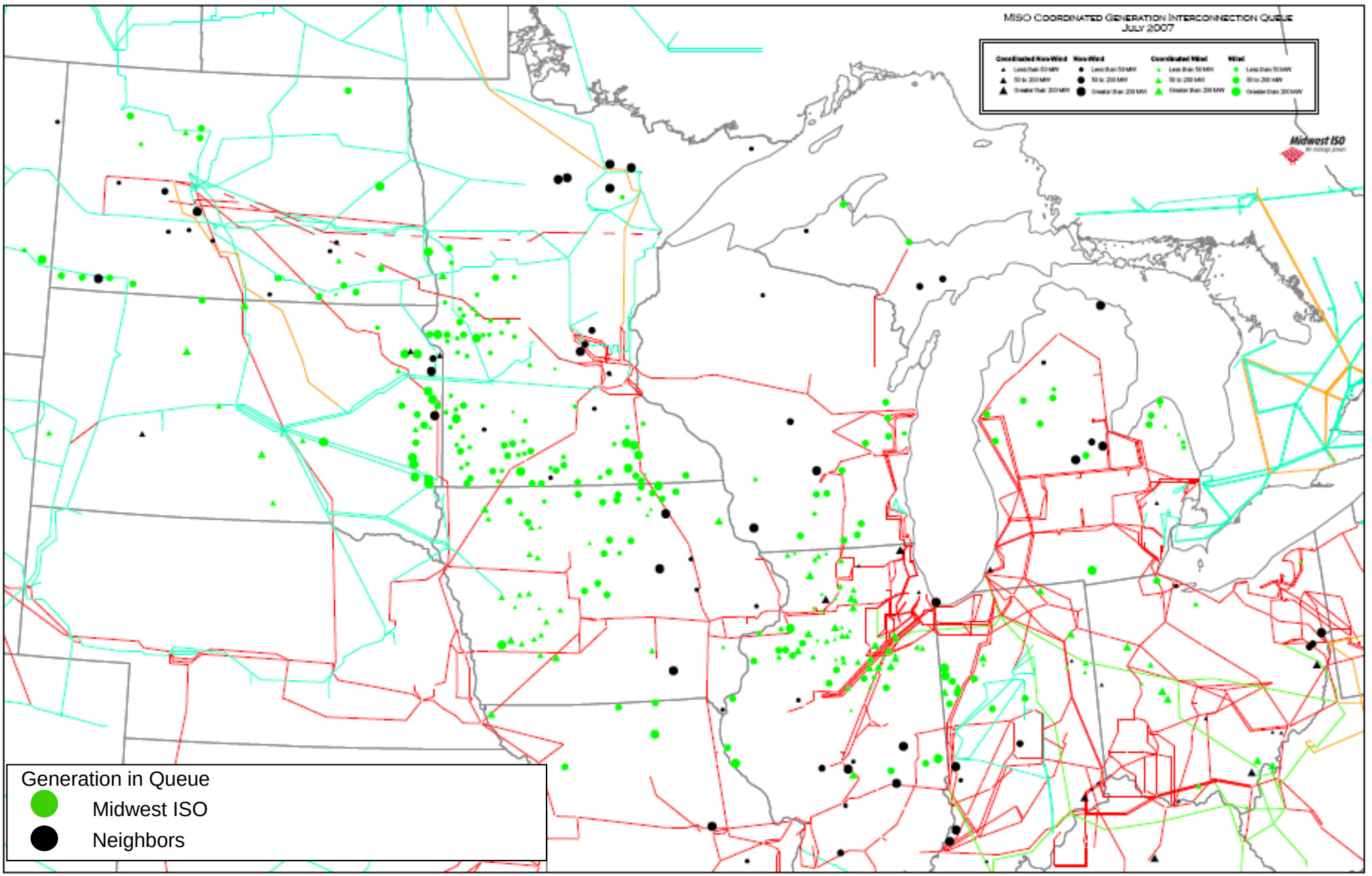
3 P's of Queue Reform



- Success in queue reform rests on addressing each of the 3 P's
- Midwest ISO is currently working with stakeholders on solutions targeted at interconnecting generation more efficiently through improvements to Physics and Process
  - Focus study efforts on those generation projects most ready to achieve interconnection (Process)
  - Use alternative network upgrade identification methods to support interconnection of large quantities of generation in remote areas (Physics)
- Opening dialogue with regulators on items such as cost sharing and recovery

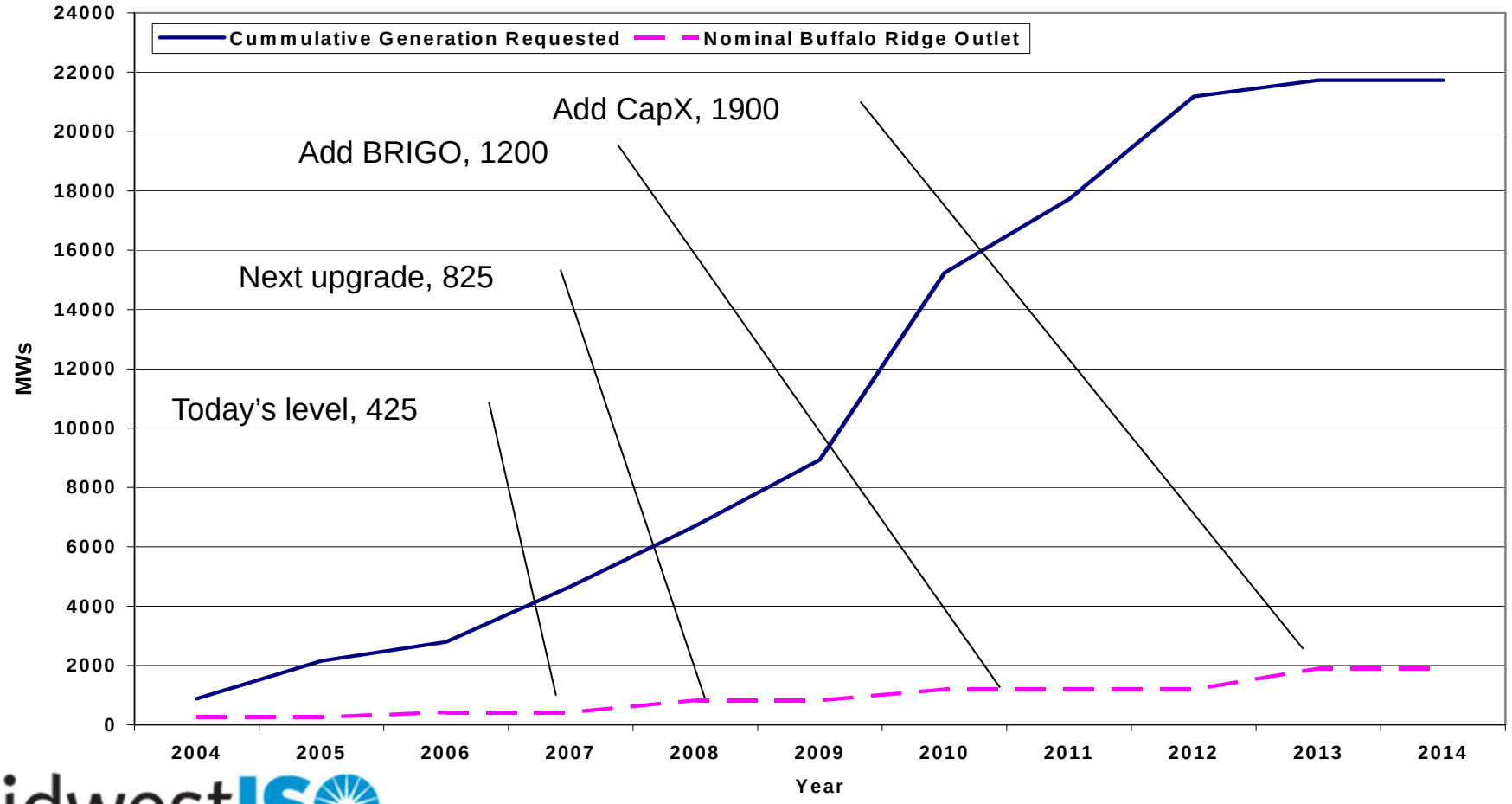
MidwestISO
Energizing the Heartland

Today's Queue



Current Queue Example:
Buffalo Ridge Area

A snapshot of the Buffalo Ridge area indicates that generator requests significantly exceed current transfer capability.

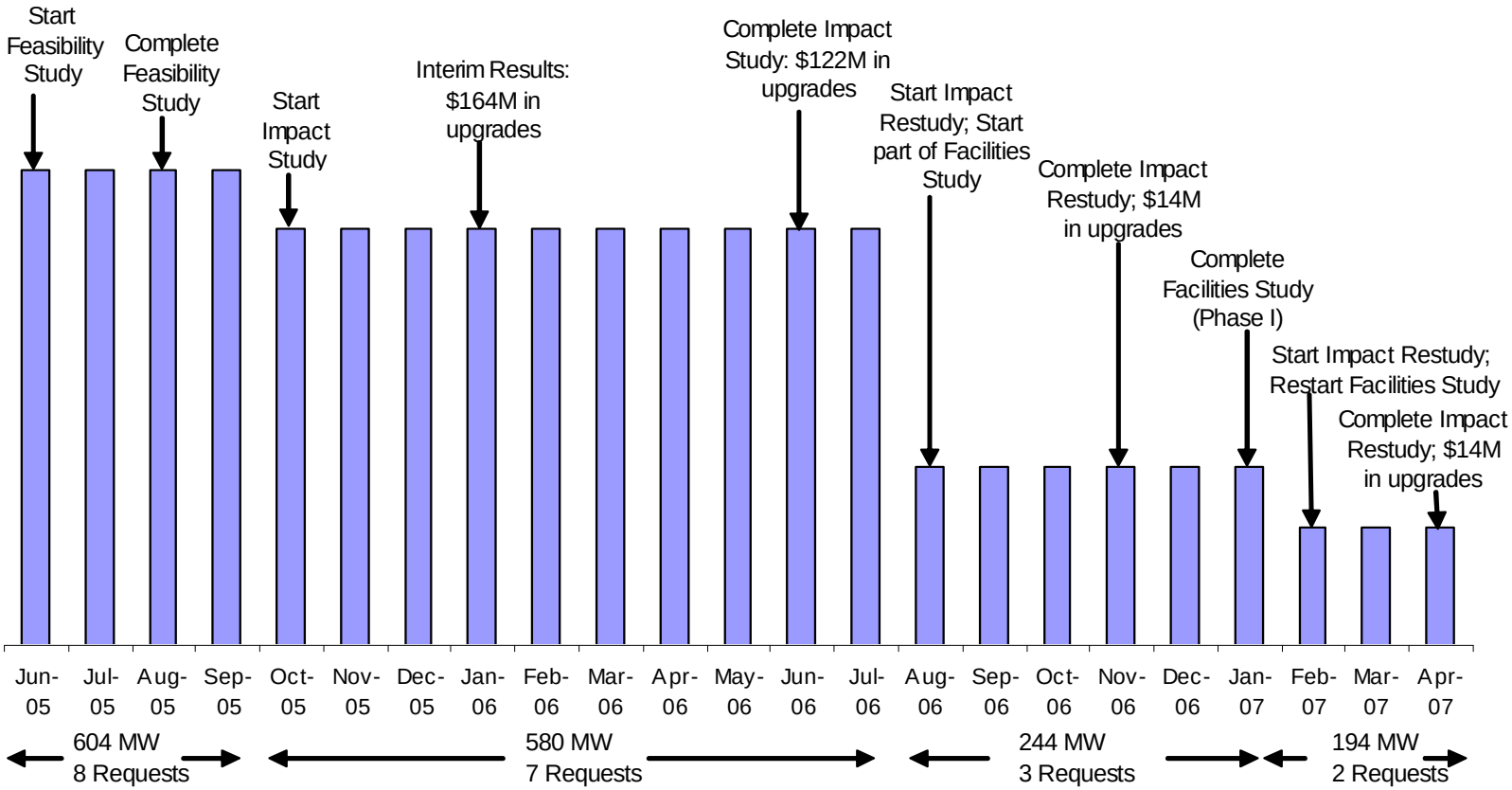


MidwestISO
Energizing the Heartland

Current Queue Example:

Group Study Process

Under the current group study process, all generation requests meeting the location and time-based criteria are considered, independent of demand for power in the region, resulting in restudy



MidwestISO
Energizing the Heartland

Proposed Queue Reform:

Regionally Planned Generator Interconnection Projects

- Overview
  - Goal is to increase integration with long-term planning process to allow more efficient generator interconnection
    - Instead of restudying until supply / demand balance is achieved, use demand assessment up front to size the analysis and identify total supply need; define transmission upgrades accordingly
  - Began developing ideas to integrate projects of this type into current queue and cost sharing protocols through whitepapers and stakeholder discussion in June 2007
- Path Forward
  - Regional Wind Outlet Targeted Study started in February 2008 to identify projects
  - Interconnection Process Task Force to continue evaluation of integration with current queue (e.g. subscription methodology)
  - Outreach to states on cost sharing and allocation issues

MidwestISO
Energizing the Heartland

Questions?

MidwestISO
Energizing the Heartland