

# Renewable Portfolio Standards- Impacts on Regional Planning

**The Calm Before the Storm**  
**Institute for Regulatory Policy Studies Conference**  
**December 10, 2009**

# The Transmission Design Challenge

- General Approach for Transmission Study
  - Minimize transmission capital costs, generation capital costs and system energy costs while maintaining system reliability
- Solution may be subject competing constraints or goals:
  - Minimize investment risk (seek shorter payback horizon)
  - Maximize carbon reduction (replace coal production)
  - Maximize local economic development (install wind directly within RPS State)
  - Maximize economic value (seek lowest cost to customer)

# Policy Matters

- The level of uncertainty that exists around future policy decisions creates difficulty for those involved in the planning function and causes hesitancy for those with the resources to undertake transmission expansion projects.
- To minimize the risk involved with planning a system under such conditions, the process must consider projects in the context of all potential outcomes
- Identifying transmission plans that result in the least regrets regardless of policy decisions will help to alleviate the impacts of those future outcomes

# Capacity (bottom up) Transmission Planning

- Traditional approach to planning
- Used to connect new generation to load and meet local reliability needs
- 1-5 year planning horizon
- Single hour, primarily highest demand hour
- Uses power flow, reliability, models
- Results in the least cost solution to the identified reliability need

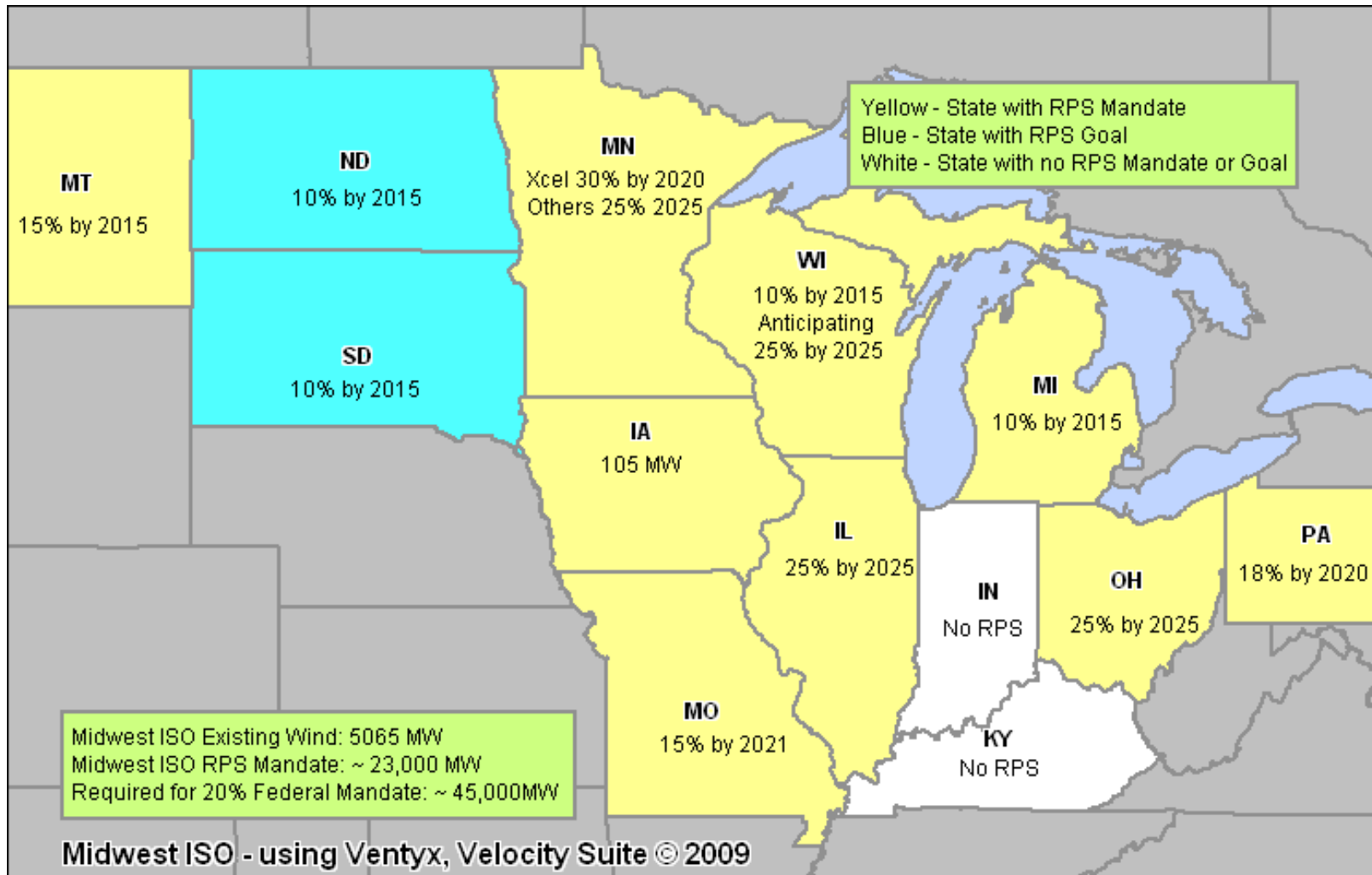
# Value Based (top down) Transmission Planning

- Renewable mandates are driving a need for a new approach to transmission planning
- Used to connect large amounts of new generation and deliver energy to the region
- 20+ year planning horizon
- All hours of the year (8760)
- Uses production cost, economic, models
- Results in the regional plan that provides the most value

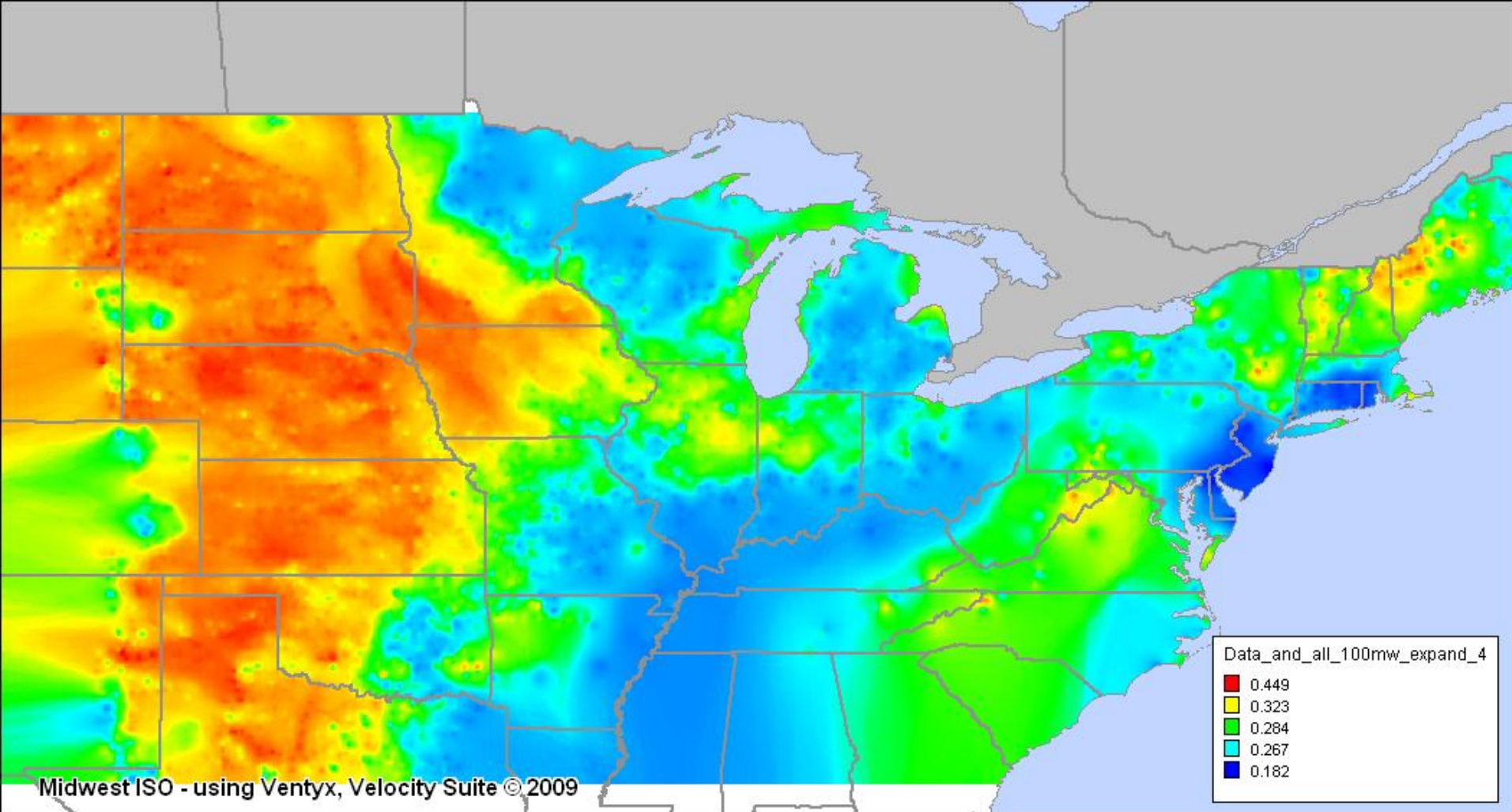
# Current RPS in the Midwest ISO

- 11 of 13 states in the Midwest ISO have an RPS
- An estimated 91GWh of energy will need to be produced from renewable resources by 2027 to meet this requirement
- It will require 30-40GW of installed wind capacity to achieve this requirement
- It will require a significant transmission investment to deliver this energy to load

# Current Renewable Portfolio Standards in the Midwest ISO



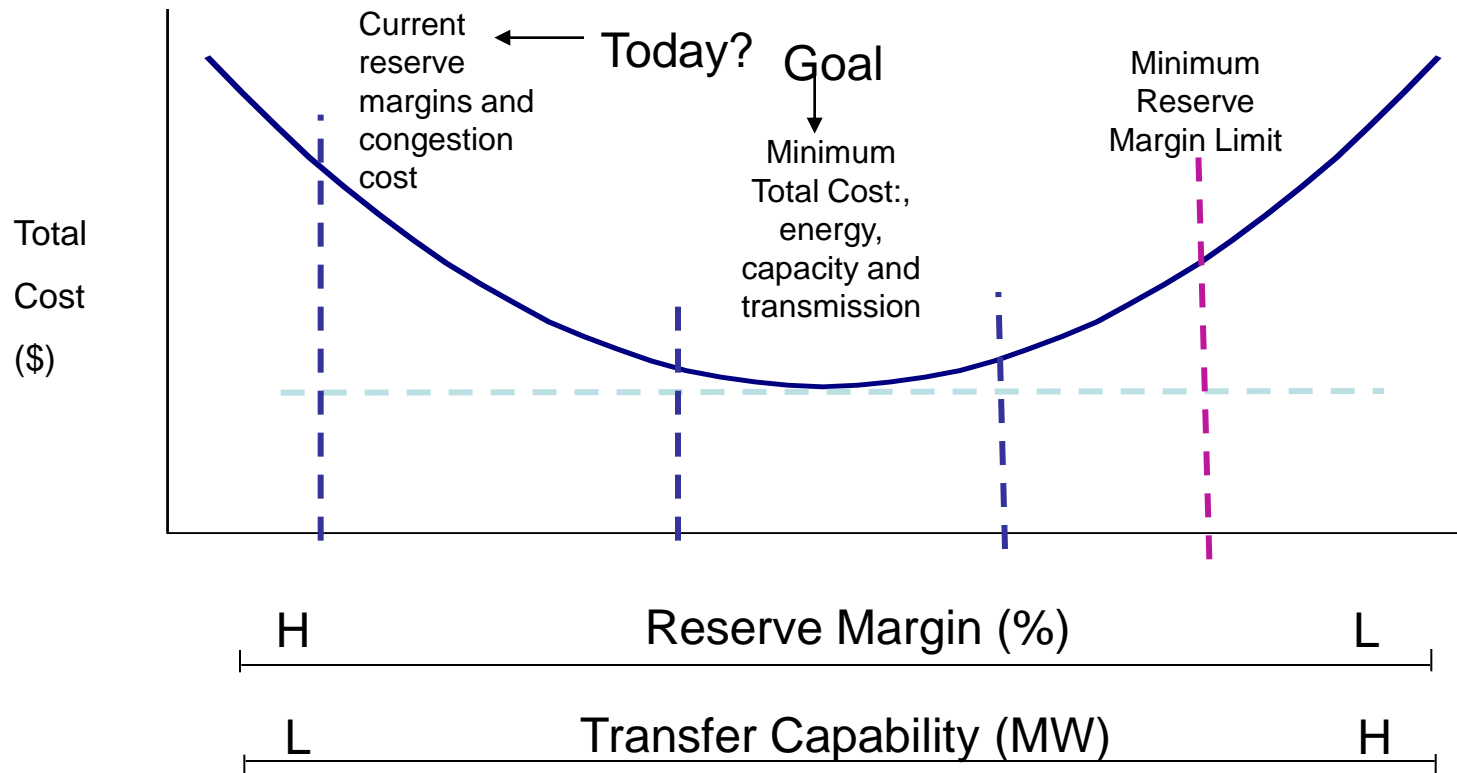
# Eastern Interconnect 11 year average Capacity Factor's for Wind





# Balancing Generation and Transmission Investment

Increased transfer capability, in conjunction with appropriately located generation, could allow for reduced reserve margins, and thus reduced overall cost



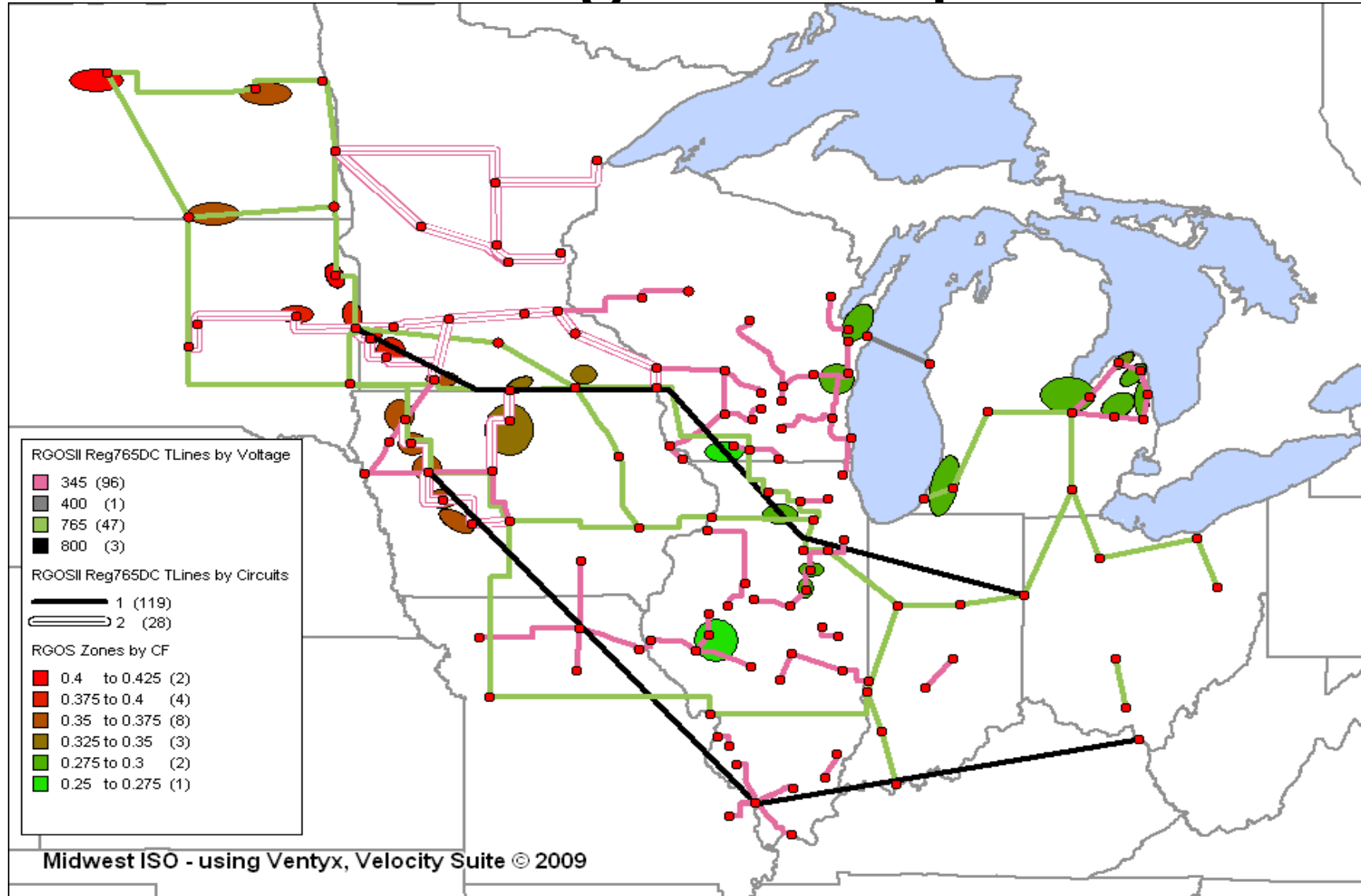
# Wind Siting Cost Tradeoff Example

- Assume a 10% wind energy mandate in the Midwest ISO System
  - Midwest ISO 2008 demand approximated 600,000 GWh
  - 10% Energy goal equates to approximately 60,000 GWh

	<b>Option 1 (20% Capacity Factor)</b>	<b>Option 2 (40% Capacity Factor)</b>
Energy per MW of installed capacity	1.75 GWh	3.50 GWh
Installed capacity required to meet 60,000 GWh energy goal	34.3 GW	17.1 GW
<b>Total Installed Generation Cost @ \$2000/kW (\$2.0 billion per GW)</b>	<b>\$68.6 billion</b>	<b>\$34.2 billion</b>

•All other cost impacts being equal, installed generation cost difference could allow for more than \$30 billion incremental transmission costs to access higher capacity wind

# RGOS indicative transmission design example



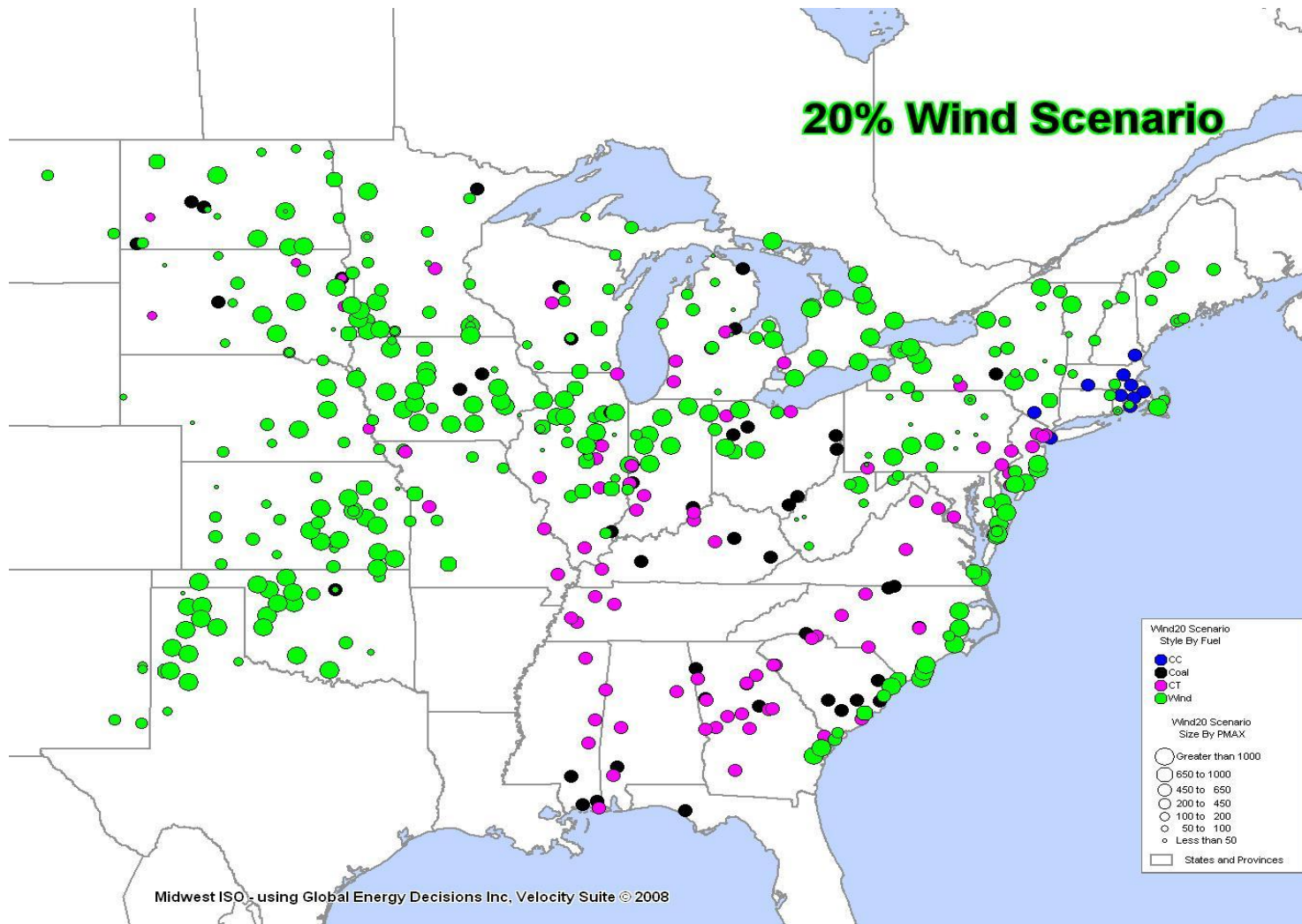
# National RPS

- Proposed legislation establishes a 20% renewable energy requirement by 2021
- A National RPS would significantly increase the need to utilize high capacity factor wind resources from the Midwest
- Interconnection wide planning will be necessary to integrate the amount of generation needed to meet this need
  - The Joint Coordinated System Plan was the first attempt at this. <http://www.jcspstudy.org/>

# National RPS

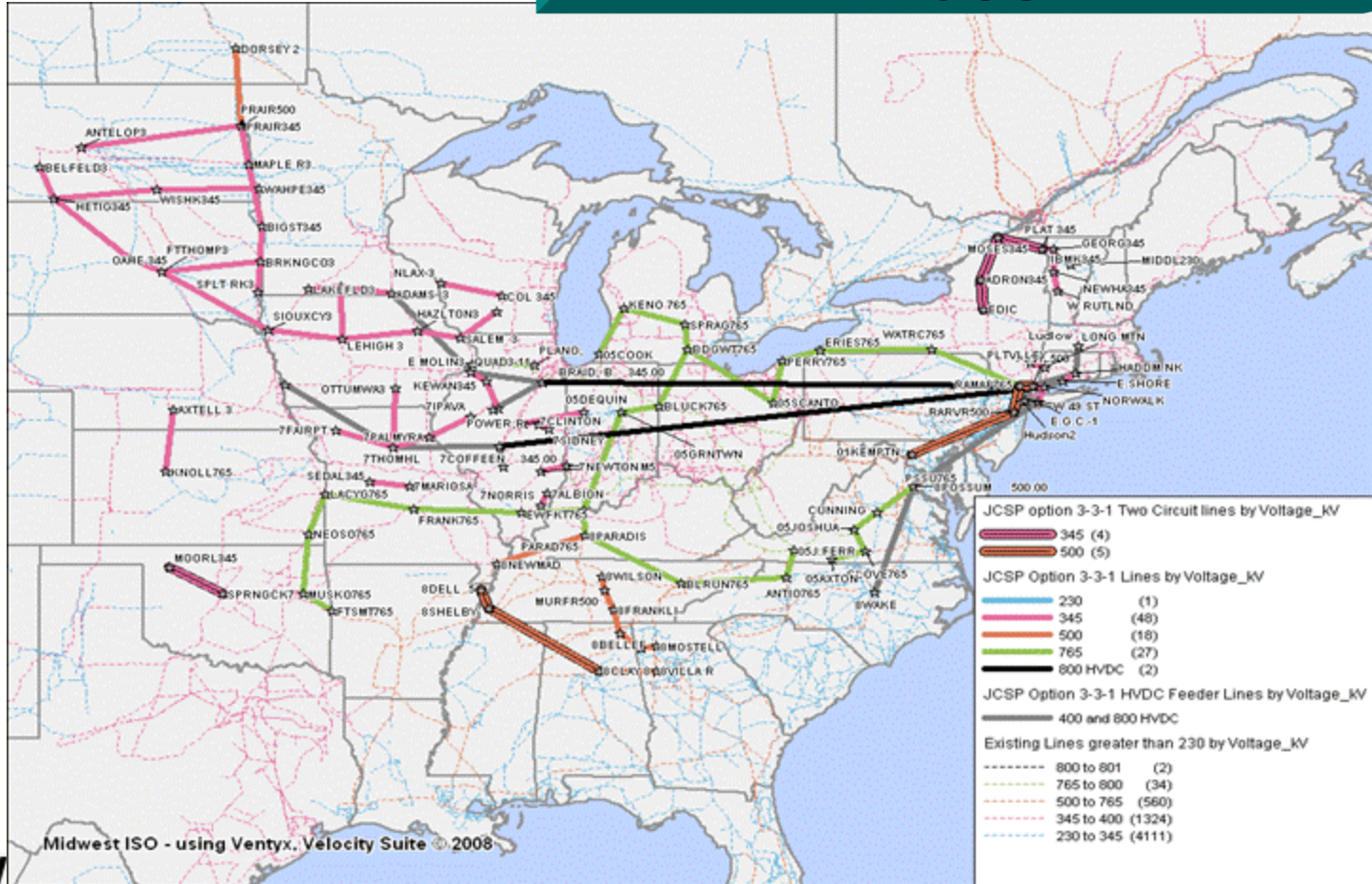
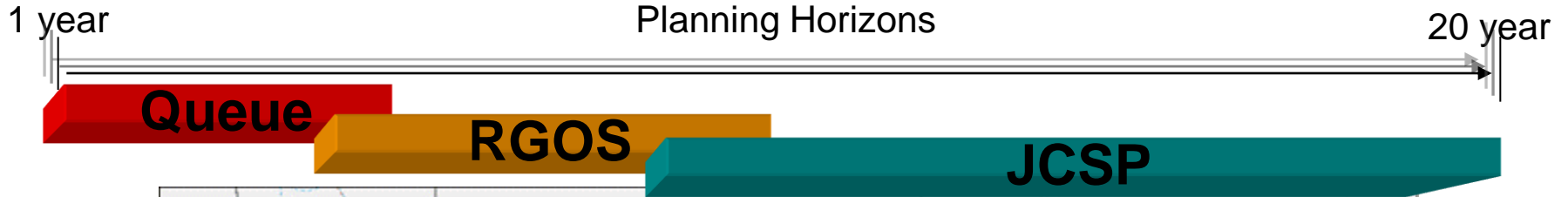
- Many different types of renewable resources that could qualify, including solar, hydro, biomass and geothermal
- However, wind is the most prevalent and would likely be the primary source in meeting a national RPS.
- Roughly 240GW of wind would need to be connected to the Eastern Interconnect to meet a national RPS

# JCSP Wind Zones



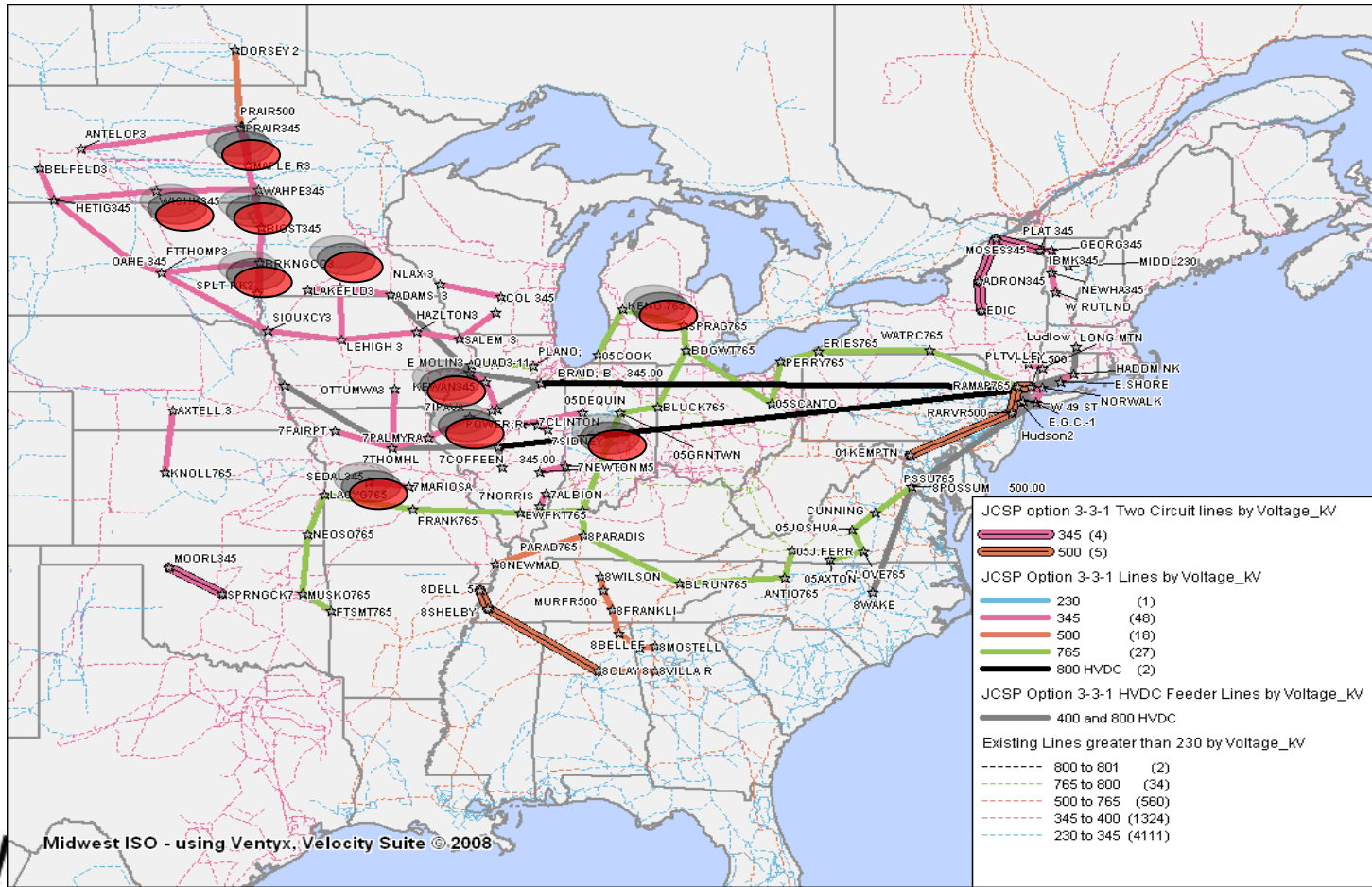
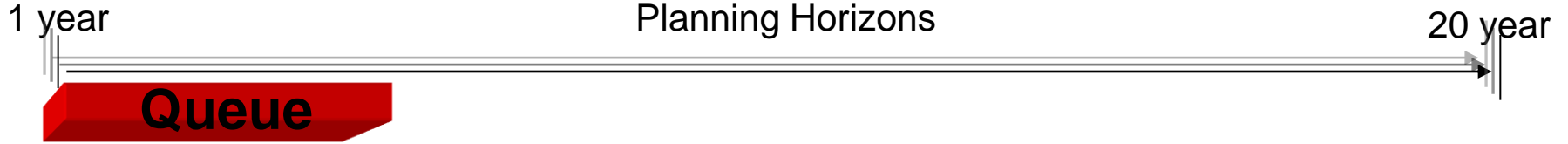


# Conceptual Progression of Plans





# Queue Development Continues with near term upgrades...



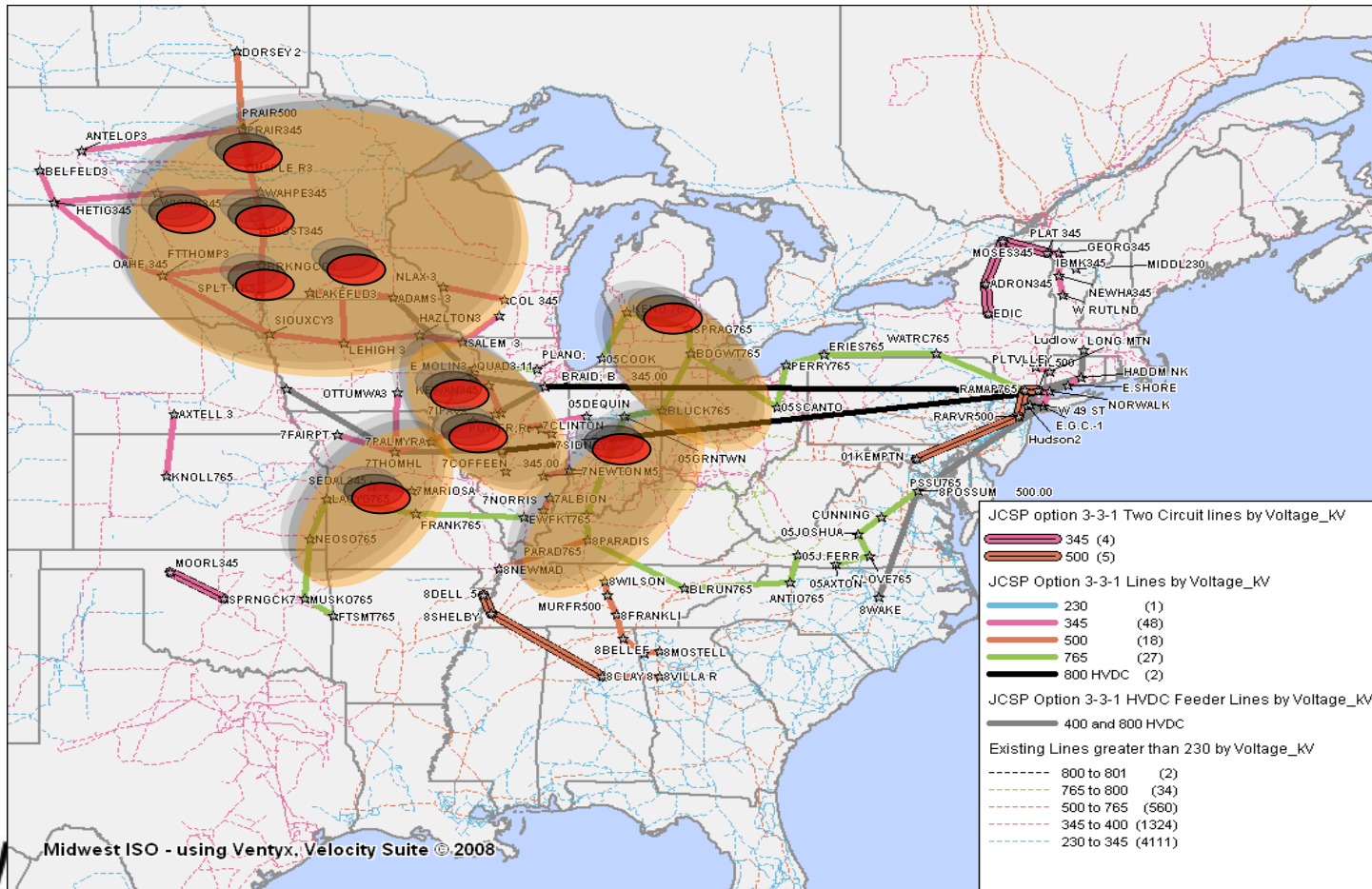
# ...Until RGOS Aggregate Plans better inform...

1 year

Planning Horizons

20 year

**RGOS**

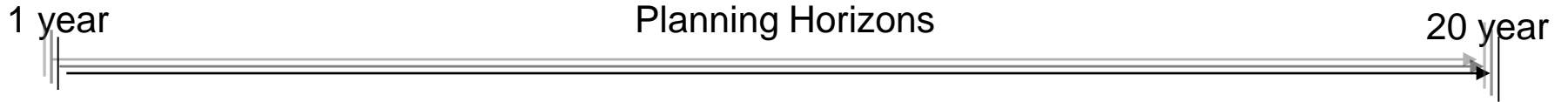


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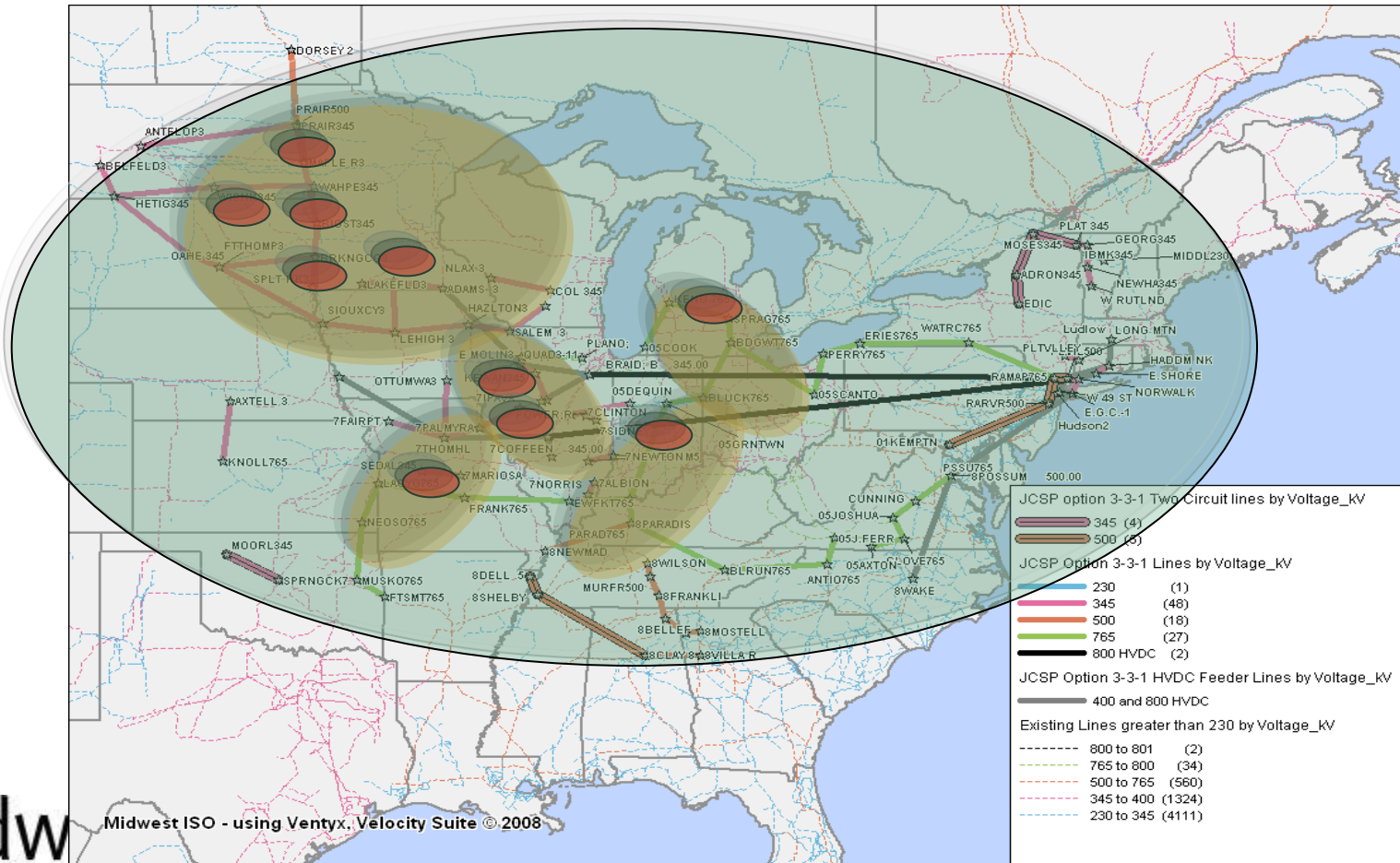
Midwest ISO - using Ventyx, Velocity Suite © 2008

Engnergizing the Heartland

# ...Consistent with an inter-regional plan with a longer term view



## JCSP



# Conditions Precedent to Increased Transmission Build

- A robust business case for the plan
- Increased consensus around regional energy policy
- A regional tariff that matches who benefits with who pays over time
- Cost recovery mechanisms that reduce financial risk

# Summary

- New planning problems require new planning techniques
- Value based planning does not eliminate the need for Capacity based planning
  - Any transmission plan must be reliable
- RTO's, utilities, regulatory agencies and regional organizations must continue to work together to address national challenges