

Studies involving the Midwest ISO

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NWCC Webinar

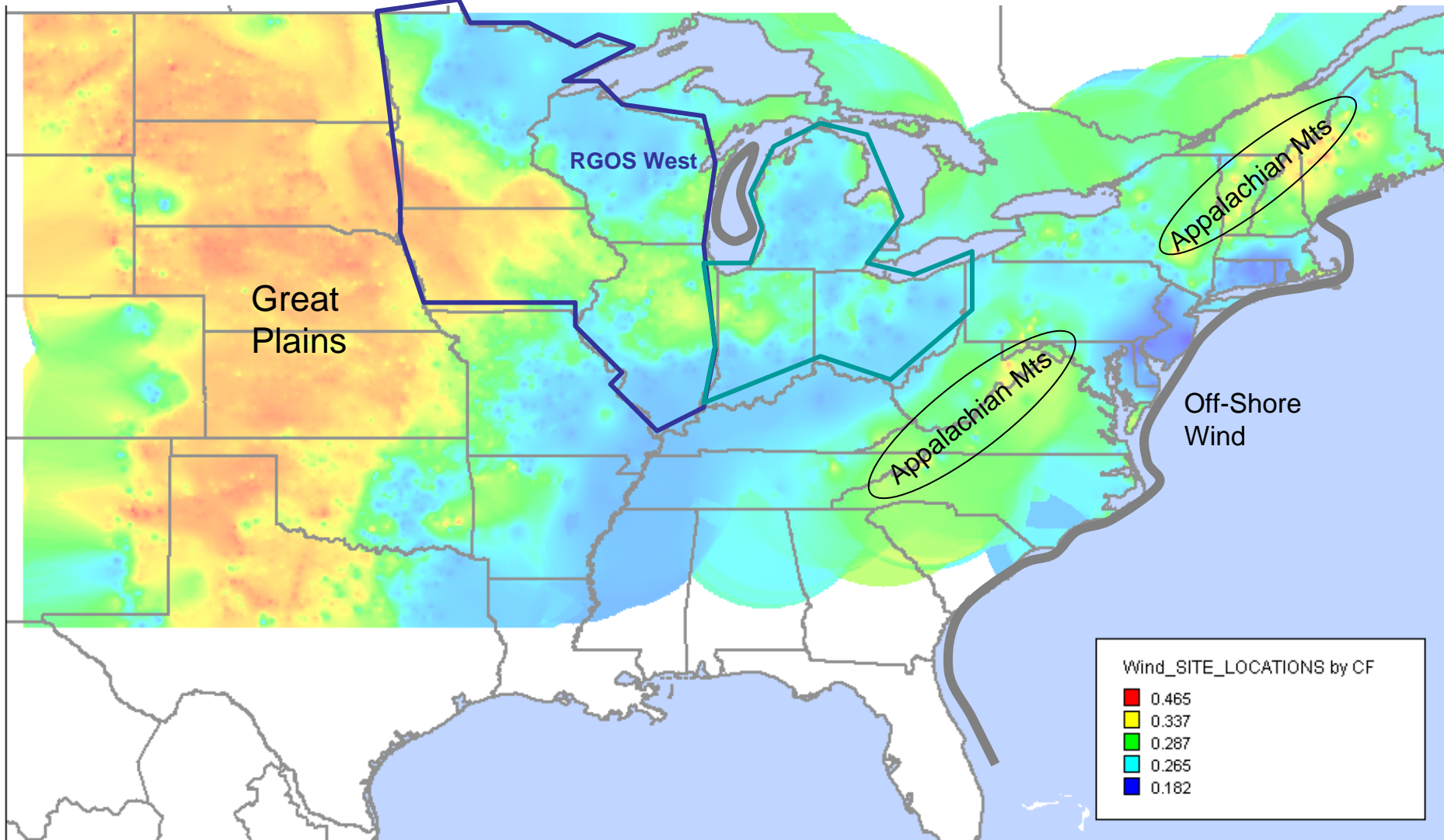
Wind Symposium

December 17, 2008

Wind in MISO

- Expect to have 4,800 MW connected by the end of Dec 2008 in MISO
- Wind mandates are at 22,000 MW in MISO for 2025
- MISO has a 700,000 MW wind generation development potential
- What transmission is required to
 - Deliver the wind generation within MISO
 - Export wind generation

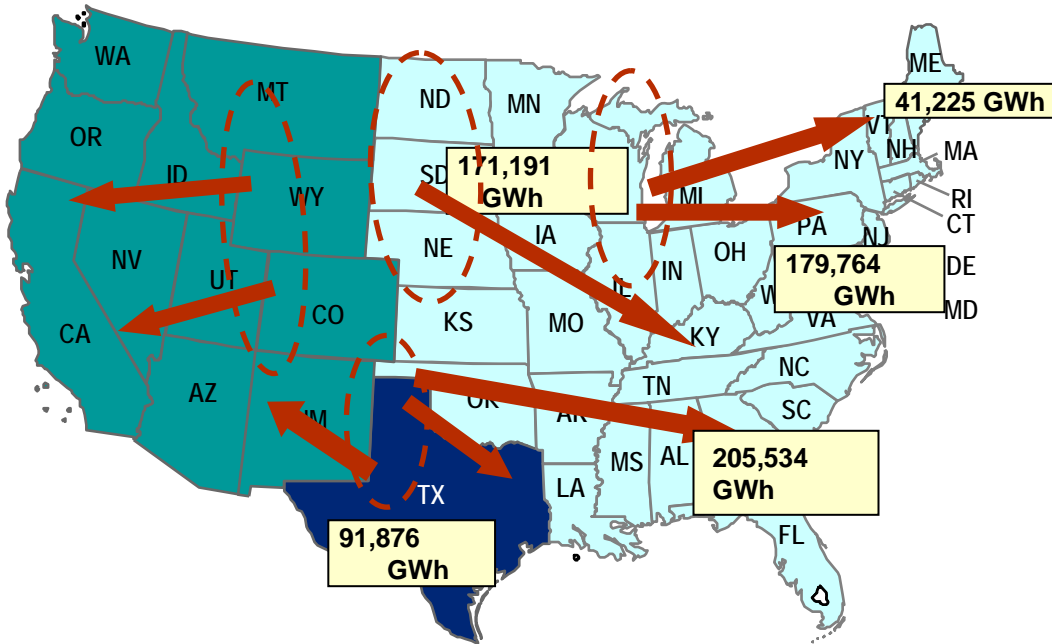
Wind Capacity



State Resource Policy

Midwest RPS Mandate/Goal

Renewable Energy Needed by Eastern Interconnect (2027)



Sources: 20% by 2030 Wind Integration Study
 DSIRE Database (www.dsire.org)

State	RPS Mandate/Goal	Estimated MW
IA	105 MW (M) (Alliant 25% by 2028)	1,105
IL	25% by 2025 (M) (18.75% Wind by 2013)	5,000
MI	7% by 2016 (Lansing)	50
MIN	25% by 2025 (M) (Xcel 30% by 2020, 25% wind)	6,000
MO	11% by 2020 (G) (Colombia 15% by 12/31/22)	2,200
MT	15% by 2015 (M)	TBD
ND	10% by 2015 (G)	TBD
OH	12.5% by 2024 (G)	5,000
PA	18% by 2020-2021 (M)	TBD
SD	10% by 2015 (G)	TBD
WI	10% by 2015 (M)	3,000
Total		22,355+

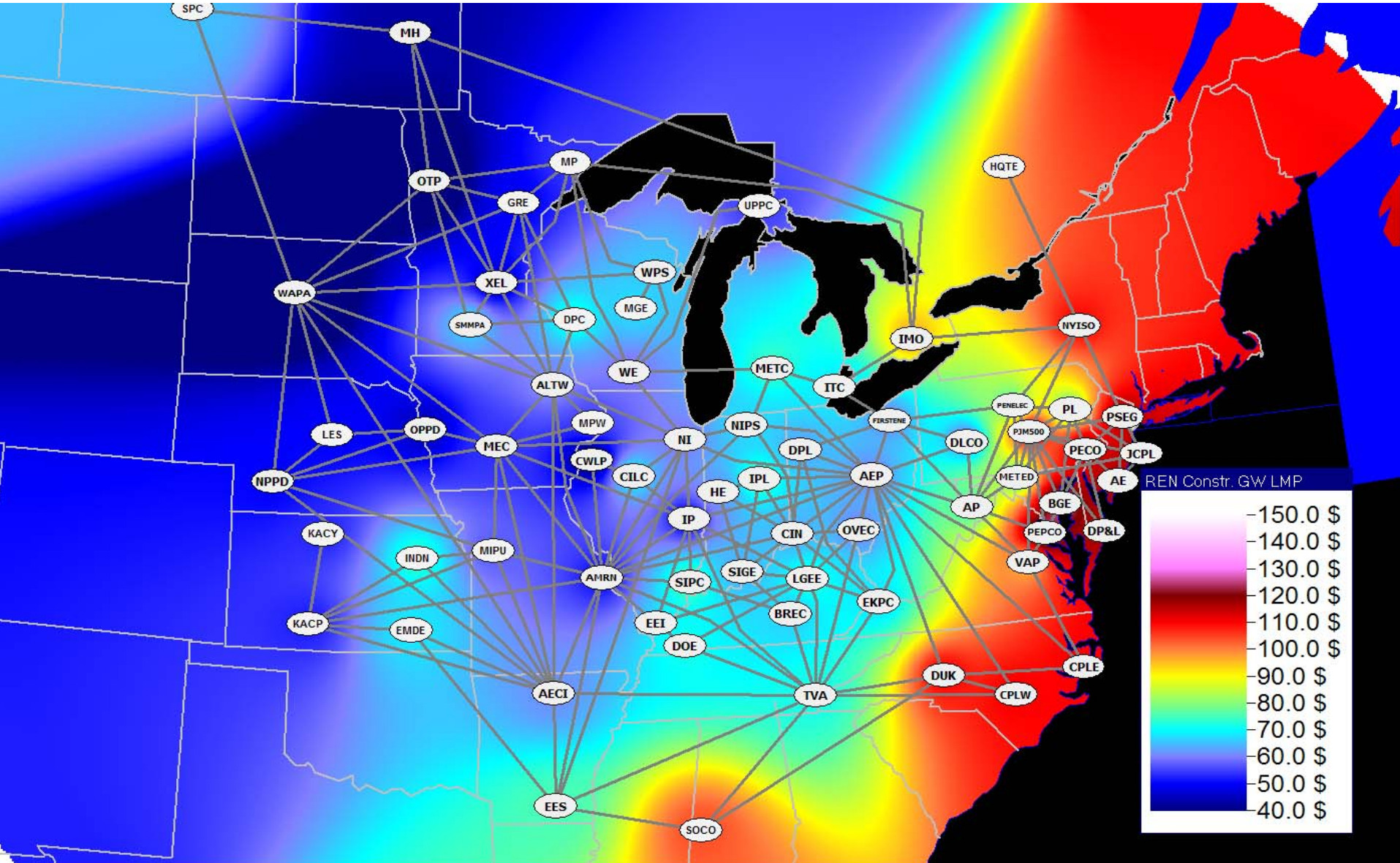
MISO Studies

- Within MISO
 - 22,000 MW MTEP 09- present RPS in MISO
 - 20% MISO Renewable future-50,000 MW in 2024
 - Stability Interface Limit Study
 - 14,000 MW Regional Generation Outlet Study-MN, WI, IA, IL
 - Upper Midwest Transmission Development Initiative
 - 30% ND, SD, WI, MN, IA
- Export wind generation capacity and energy
 - 90,000 MW MISO, 240,000 MW Eastern US
 - Joint Coordinated System Plan-www.jcspstudy.org
 - MAPP and WAPA participated
 - 130,000 MW MISO, 360,000 MW Eastern US
 - Eastern Wind Integration Transmission Study (EWITS)

What Drives Wind Development and Transmission Expansion

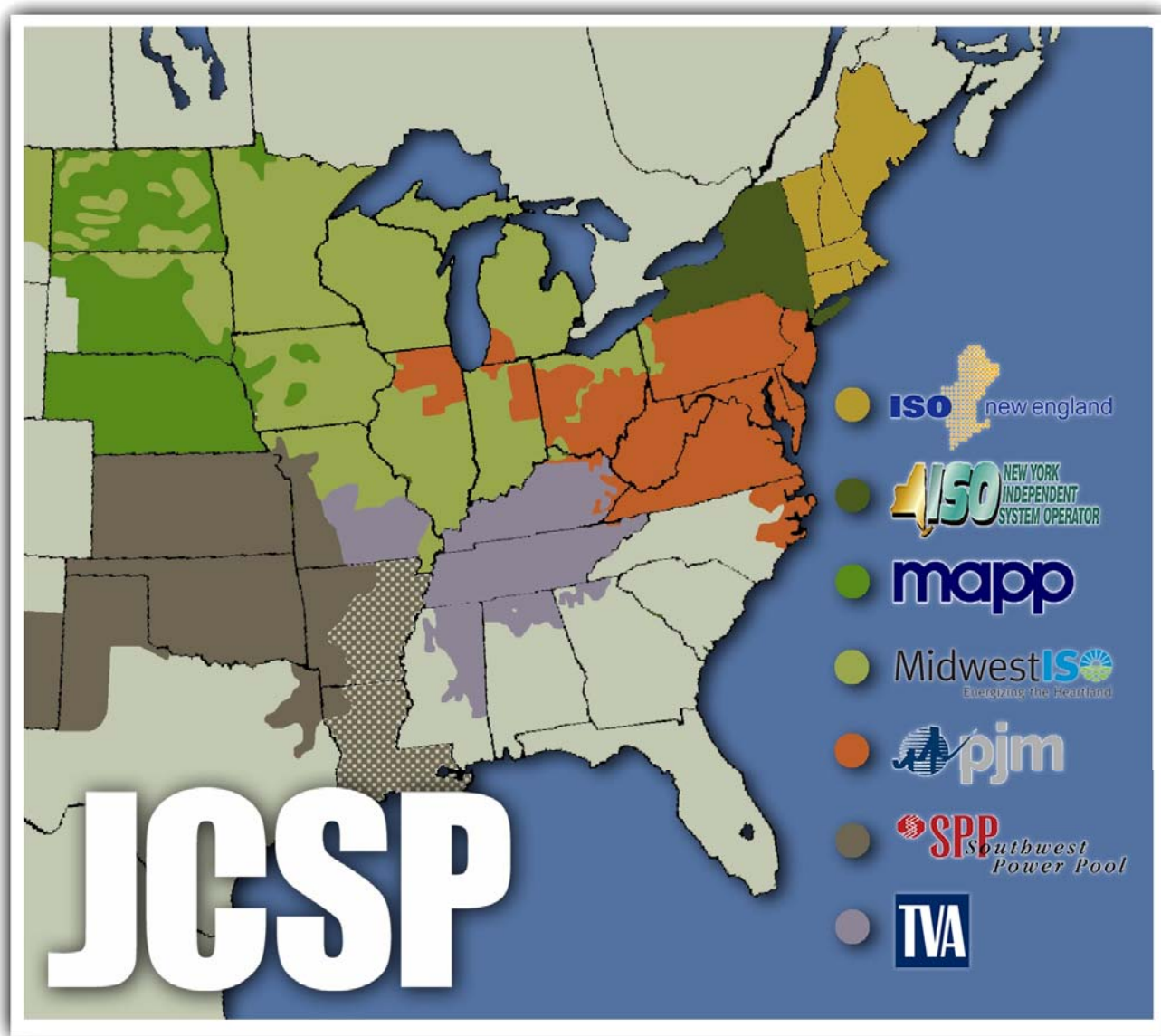
- Renewable Portfolio Standards
 - 22,000 MW
 - Off ramps for economic reasons
- Production Tax Credit
 - Renewed by congress about every two years
- Transmission return on investment agreements
 - Minnesota
 - Wisconsin
 - Michigan
- Agreements for return on investment
 - Iowa
- Merchant wind is not competitive in most areas of MISO due to low energy costs

Full Constrained Case Annual Gen Weighted LMP

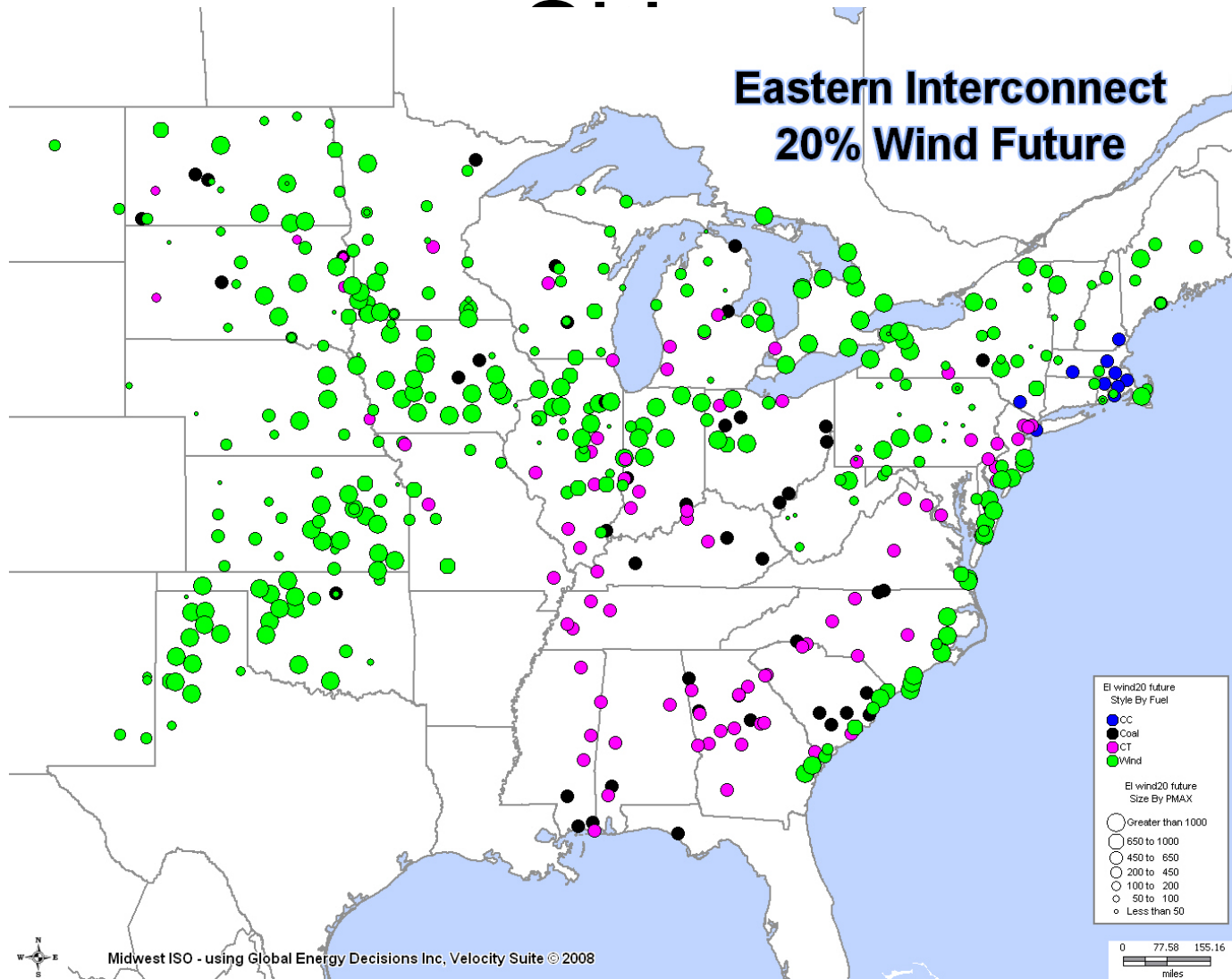


What Limits Wind Development

- Uncertainty on return on investment
- Cost allocation
- Transmission Availability
 - Time to build transmission-7 years in MN and 4 years in OK for a 345 kV line
 - Queue processes
 - Transmission design and approval processes
 - Focus on too low of voltages
 - Approval one line at a time- keeps the status quo
 - Focus on too small of marketing area
 - Political boundaries
- Market
 - Minimum loading on generation-20,000 MW
 - Very limited access to the highest priced markets
 - JCSP opens these doors
- Parochial rather than Regional views
 - No one utility, state or RTO has the resources to supply an efficient transmission overlay and has the price diversity to justify the transmission
 - The minimum sized system is MISO and PJM Adding NYISO and NE-ISO is better.

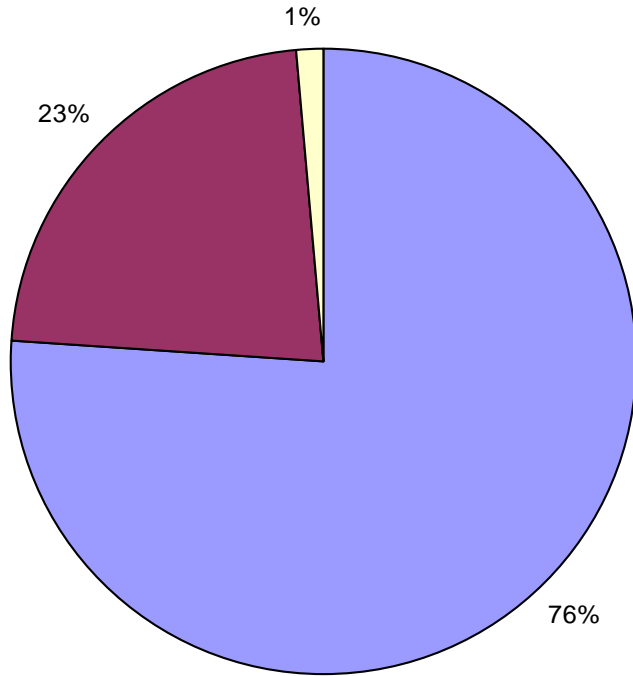


20% Wind Energy Scenario

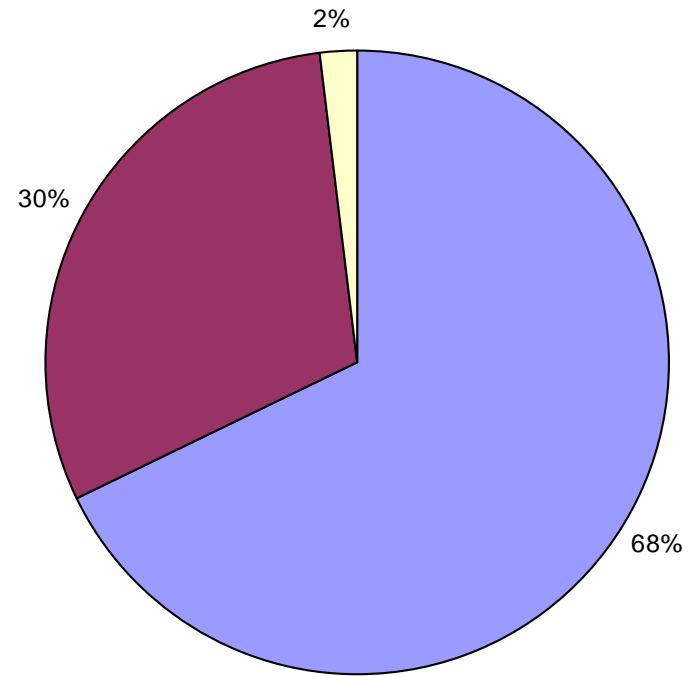


Cost Perspective

Reference Future Cumulative
Costs through 2024



20% Wind Future Cumulative
Costs through 2024



■ Production ■ Generation Capital ■ Transmission Capital

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Implementing the Solution

- First step is reaching consensus on the correct approach based on a robust business case which considers economic as well as operational impacts
- Implementation still presents major challenges
 - Determining how costs will be allocated
 - Ensuring appropriate cost recovery
 - Physically implementing the system (e.g. determining siting, gaining right of way, construction, etc.)