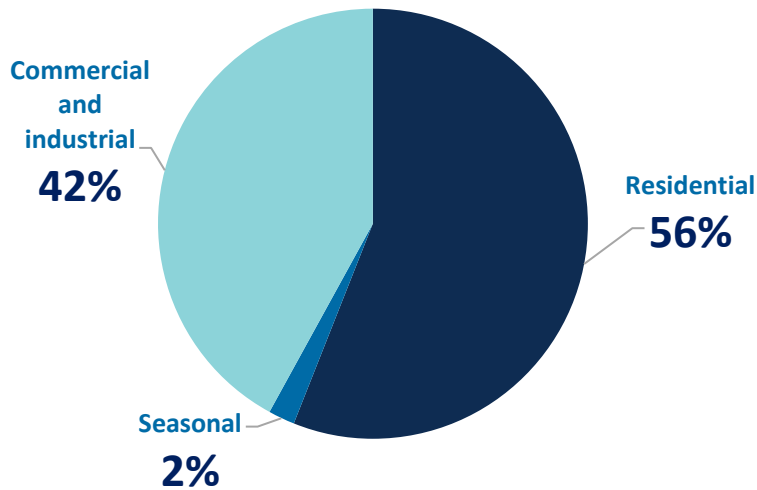

Great River Energy

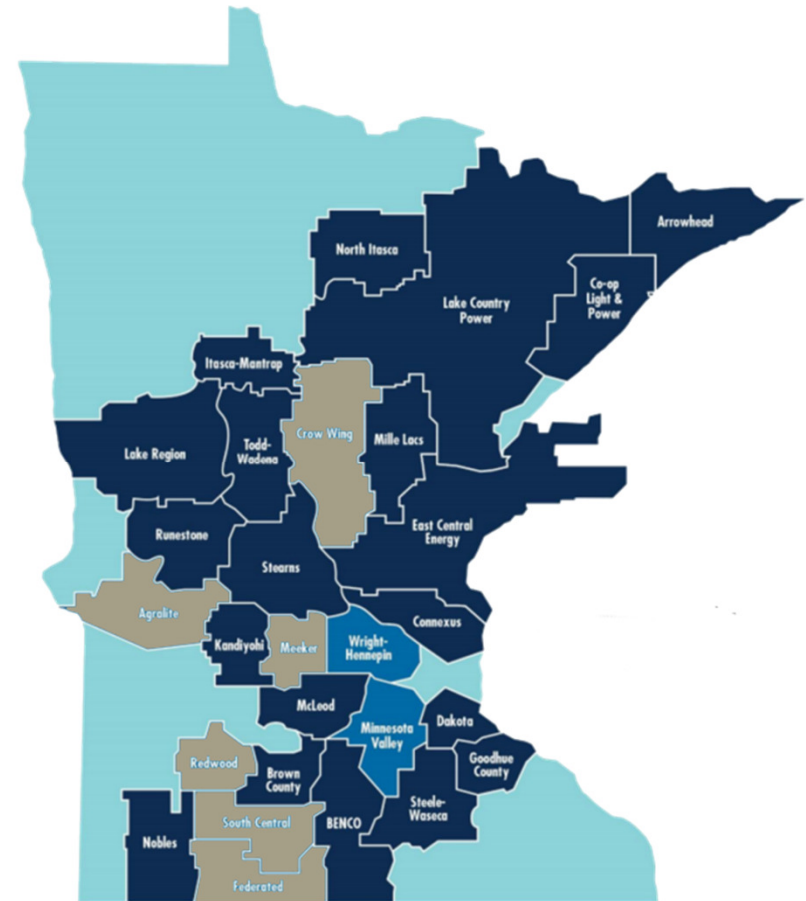
Jon Brekke

VP and Chief Power Supply Officer

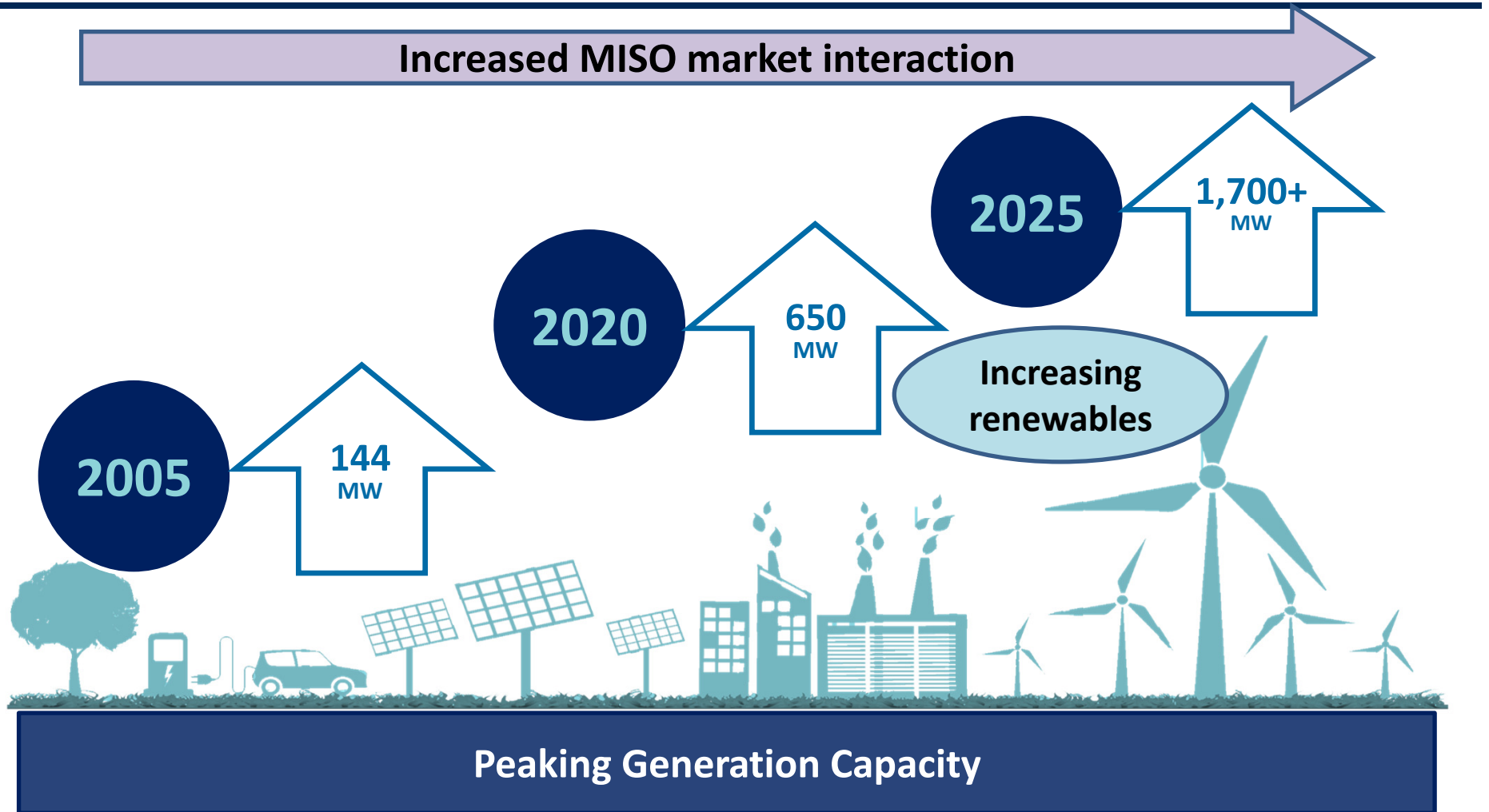
Great River Energy membership



Total member cooperatives.....**28**
Total members served.....**700,000**
Total people served.....**1.7M**



GRE portfolio evolution



GRE resource portfolio evolution

Key components

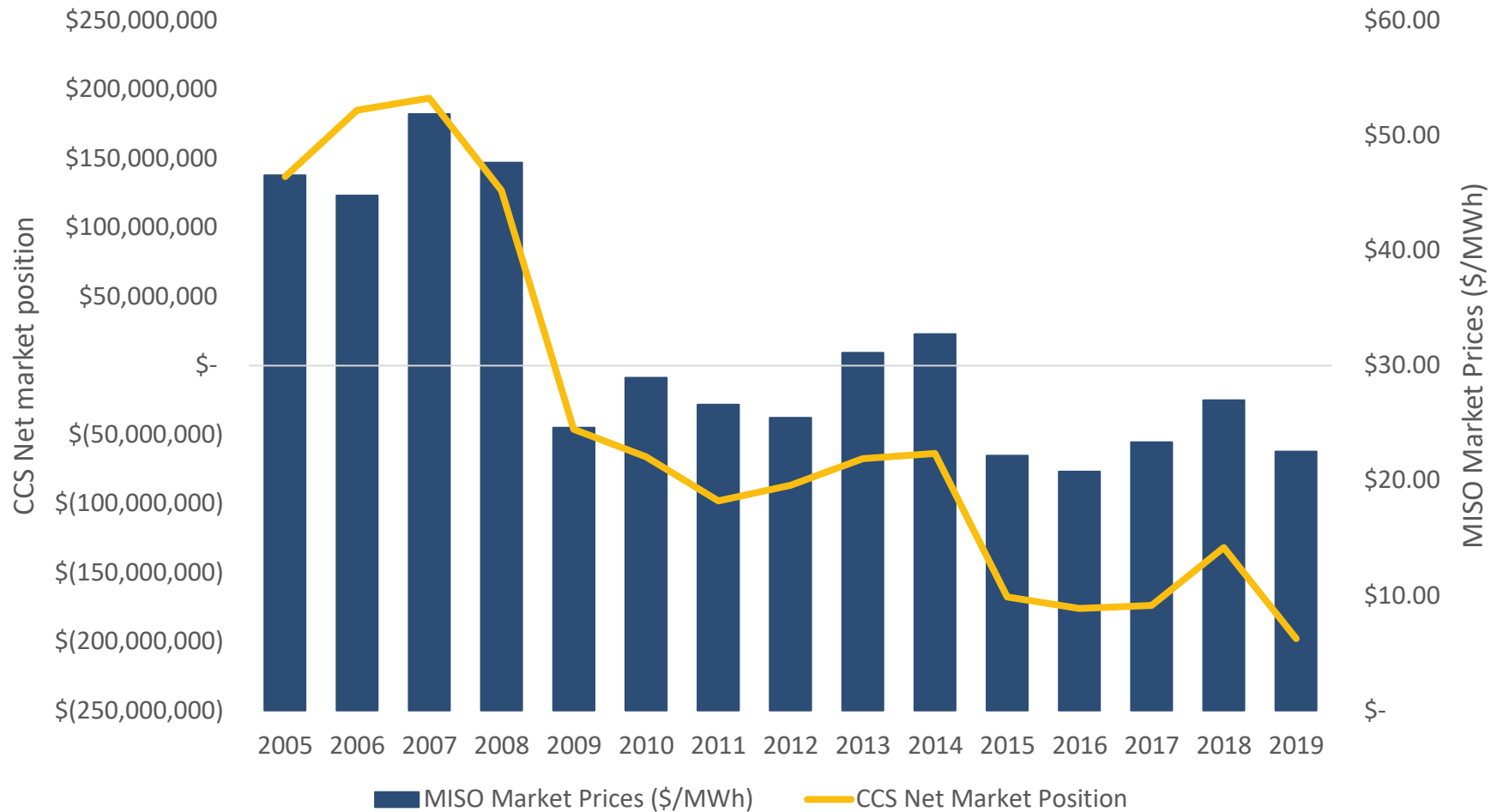
- Shut-down 1,100 MW Coal Creek Station facility by 2023
- Convert Spiritwood CHP Station from coal to natural gas
- Add 1,100 MW of new wind energy in MN, SD, IA and ND
- Invest in existing natural gas facilities to increase capacity
- Increase market energy and capacity sources

Key driver

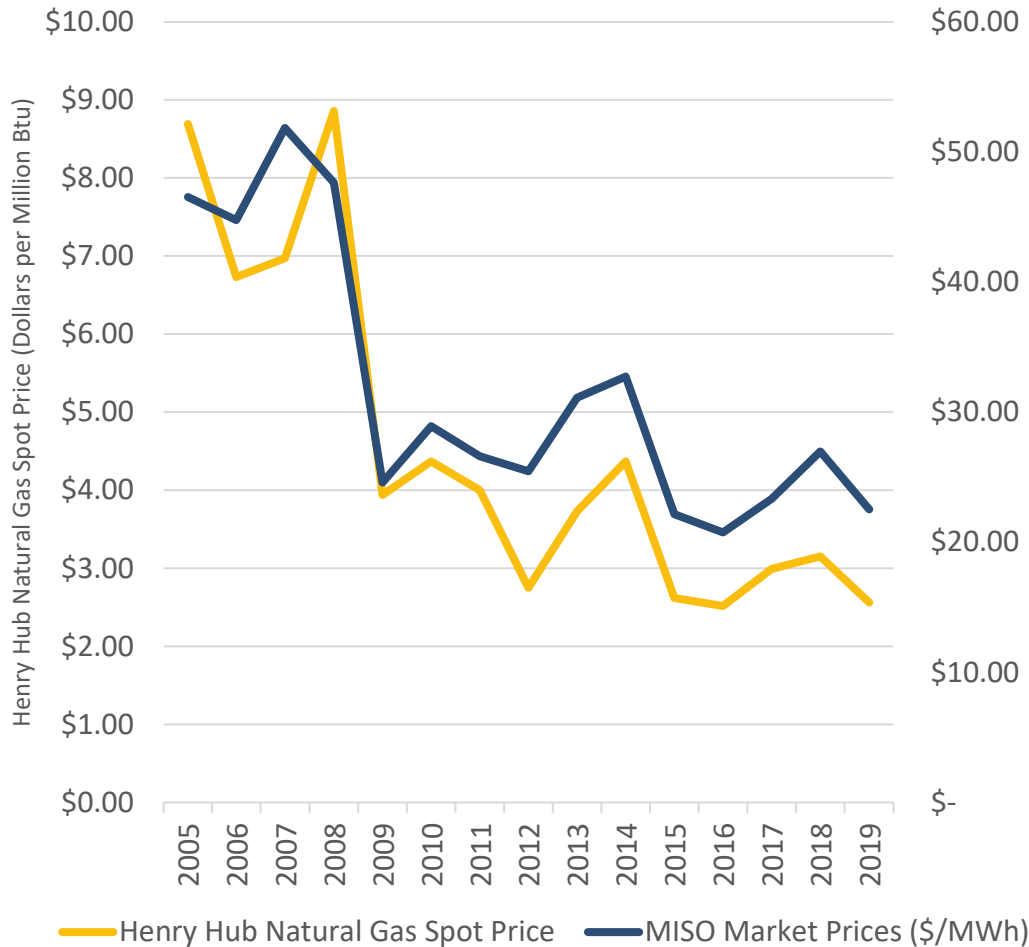
- Economic best-interest of our members



Coal Creek Station (CCS) cost and market prices



Average annual gas prices 2005-2019



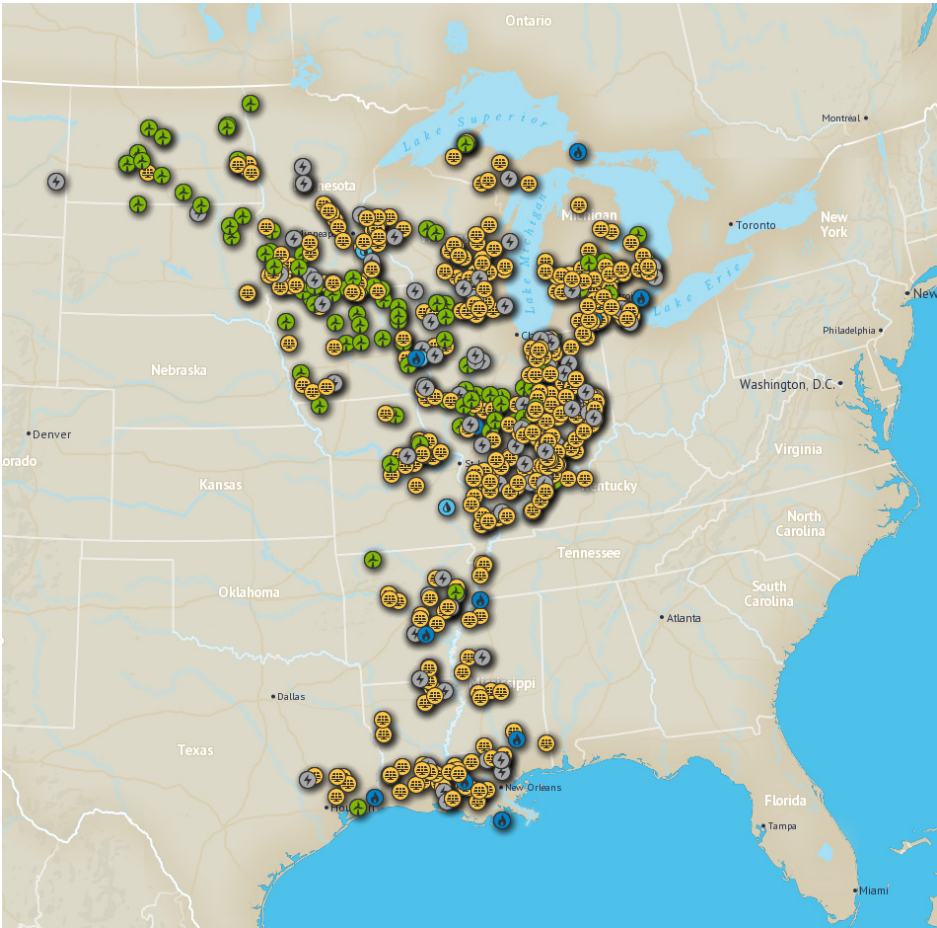
■ Natural gas heavily influences MISO energy prices

■ Prices down ~70% since 2005

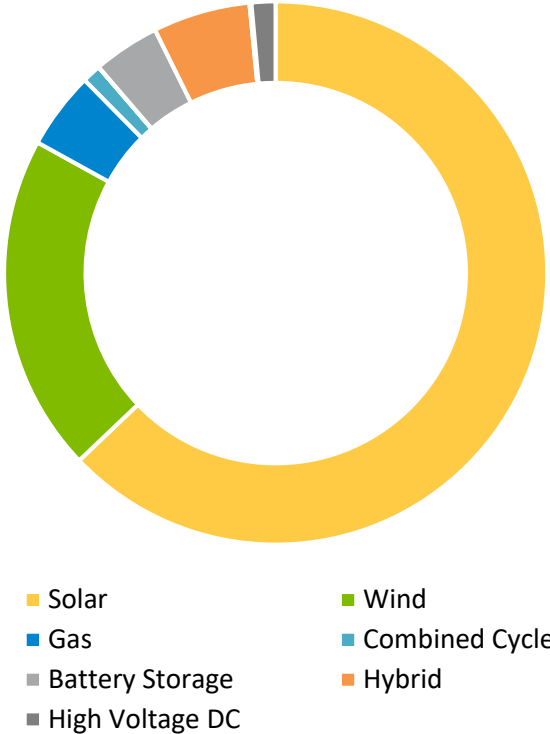
■ Future – New generation in MISO queue > 95% wind/solar

■ MISO energy prices forecasts remain low as renewables provide increasing market share

MISO generation changes



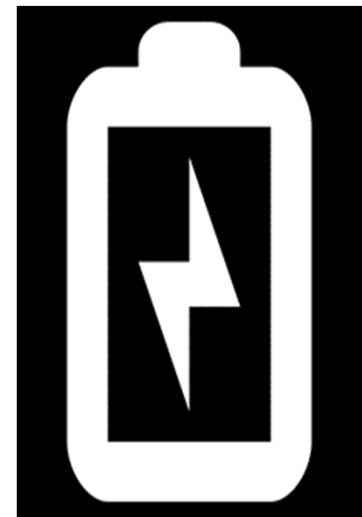
Active MISO Queued Generator Interconnection Requests*



*Interconnection data downloaded from MISO 10/12/20

GRE storage pilot project

- ▶ 1 MW/150-hour long duration storage project
 - Commercial operation in Q3-2023
 - Located in Cambridge, Minnesota
- ▶ Approved by GRE member-owners
 - Intra-day and multi-day capability
 - Seasonal flexibility
 - Reliability and cost management at scale



GRE storage pilot project - goals

- ▶ Technology capability
 - Proof of concept for future grid scale projects
 - Design modifications and improvements
- ▶ Use case analysis – assess future cost savings potential
 - Reliability – generation and transmission
 - Energy market hedging
 - Generation optimization
 - Ancillary services
 - Transmission deferral



Storage as a Minnesota resource



Minnesota electric needs peak in summer and winter. Extreme weather creates reliability needs for days, not hours.



Storage still predominantly 2-4 hour duration capacity asset, typically used for evening demand peaks



Storage getting cheaper, but cost effectiveness limited to niche applications at current prices

Performance review: nuclear, fossil fuels, and renewables during the 2019 Polar Vortex
North America Power & Renewables | February 2019



Trusted Power and Renewables Intelligence

woodmac.com

**Wood Mackenzie study after 2019 polar vortex*

18 40 hours of firm dispatch resources would have been needed if had been using a 100% renewable system with no transmission constraints

*Source: <https://my.woodmac.com/document/99948>



GREAT RIVER ENERGY™

How can Minnesota be helpful?

- ▶ Recognize the importance of peaking generation for reliability
- ▶ Encourage wind and solar development
 - Permitting support
 - Economic development opportunity
- ▶ Recognize the unique needs to manage cost and reliability

Summary

- ▶ GRE exists to serve its member-owners
- ▶ Resource decisions based on needs of, and the economic benefits for, our member-owners
 - Reliability – provided by gas peaking plants
 - Flexibility – adapt to market and technology changes
- ▶ As GRE's portfolio changes, our focus remains on our triple bottom line of competitive rates, reliability of service and environmental stewardship

