



# 2021 INTEGRATED RESOURCE PLAN UPDATE

Submitted to the Minnesota Public Utilities Commission  
Docket No. ET2/RP-17-286  
April 1, 2021



INNOVATE, COLLABORATE, AND LEAD TO COMPETITIVELY POWER THE FUTURE



# Strategic power supply changes underway

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Great River Energy (GRE) is building a reliable, affordable and environmentally responsible power supply portfolio by making the following changes in the coming years:

## Shut down or sell Coal Creek Station by the end of 2022

Unless the plant is sold, both units of Coal Creek Station (CCS) will cease operations in 2022. GRE is making plans to sell or find new uses for the high-voltage, direct-current (HVDC) transmission system that connects CCS to Minnesota. The HVDC system will remain an essential transmission link between central North Dakota and Minnesota.

Any updates regarding the status of a potential sale to a counterparty will be promptly provided to the PUC and stakeholders as a Notice of Changed Circumstances in this docket. Due to non-disclosure agreements, we cannot elaborate on the details of any discussions or the extent of any negotiations taking place currently.

## Modify Spiritwood Station to operate primarily on natural gas

GRE has conducted several successful preliminary tests operating Spiritwood Station on natural gas. Ongoing modifications related to operating on 100% natural gas are projected to significantly reduce the plant's operating costs and carbon emissions.

The goal of this ongoing project is to evaluate Spiritwood Station's ability to operate solely on natural gas. GRE plans to run Spiritwood for several months only on gas if no future issues are encountered, and to complete inspections during the scheduled outage in April to identify and evaluate any other issues resulting from the gas conversion.

## Add 900 megawatts of new wind resources by the end of 2023

GRE's renewable capacity is projected to grow from approximately 650 megawatts (MW) in 2020 to more than 1,500 MW by the end of 2023. The GRE board of directors and members approved 600 MW of wind energy projects in May 2020, most of which will be in Minnesota.

These wind projects include three surplus interconnection projects that capitalize on our existing generator interconnection agreements (GIAs) at our peaking units. This is a critical part of our plan, as the interconnection of new generation through the traditional MISO queue has increased in cost and complexity in recent years. Our peaking fleet already provides a capacity and reliability backbone for our power supply portfolio, and we plan to leverage those high value assets to incorporate even more renewables into our resource mix. Use of the existing GIAs is beneficial for our membership as we receive more advantageously priced wind in our portfolio as a valuable hedge while avoiding significant costs, resulting in a net benefit to our members. Each project is referenced briefly in the following section:

- **Dodge County Wind** – This project is a 170-MW wind resource that will be electrically interconnected to MISO via Pleasant Valley Station, a 421-MW unit in Mower County, Minnesota. We anticipate the project to be commercially operational by Q4 of 2023.
- **Three Waters Wind** – This project is a 280-MW wind resource that will be electrically interconnected to MISO via Lakefield Junction Station, a 495-MW unit in Martin County, Minnesota. We anticipate the project to be commercially operational by Q4 of 2023.
- **Timberwolf Wind** – This project is a 150-MW wind resource that will be electrically interconnected to MISO via Pleasant Valley Station. We anticipate the project to be commercially operational by Q4 of 2023.

In addition to the projects using surplus interconnection service with our peaking generation, GRE will begin purchasing energy from a currently commercially operational project in 2023. Deuel Harvest Wind is a project located in South Dakota, of which GRE will take a 200 MW portion.

Buffalo Ridge Wind is the final wind project that completes our wind additions as part of the portfolio transformation associated with the CCS retirement. This project is in Minnesota and GRE will take 109 MW of the wind project. That project is anticipated to begin commercial operation Q4 2022.

## **Add 400 MW of capacity resources**

GRE plans to add 200 MW of capacity by upgrading existing Minnesota peaking stations and to source another 200 MW of market capacity. The peaking station upgrades are very low-cost capital projects that will allow us to extract additional capacity out of our peaking generation to get closer to the full amount indicated in their GIAs with MISO.

The bilateral capacity deals we have executed and continue to pursue offer our membership very low-cost market capacity for multi-year terms. This affords GRE the opportunity to wait for further development and cost curve decreases as technologies mature and leaves options open to pursue additional clean energy contracted or owned capacity for the membership. The current cost of market capacity is extremely competitive. These peaking station upgrades and bilateral agreements begin to address the portion of capacity lost due to the sale or retirement of CCS.

## **Install a 1-MW, long-duration battery demonstration system**

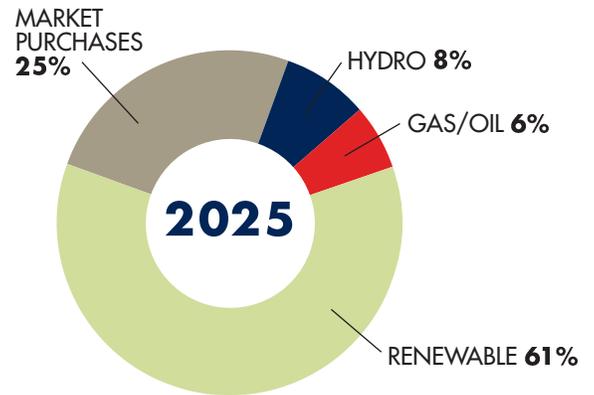
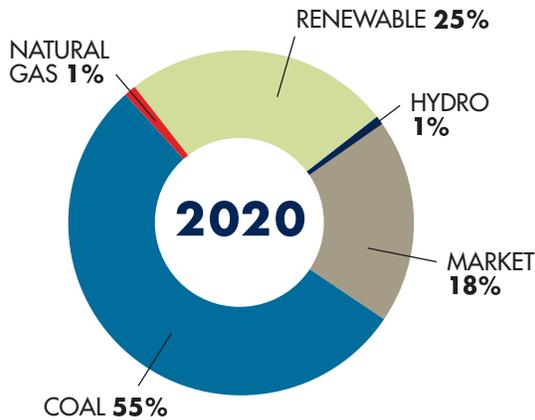
GRE is working with Form Energy, a battery storage technology developer, on a first-of-its-kind demonstration of unique long-duration storage technology. Long-duration storage will help maintain grid reliability in the future during extreme conditions, such as a heat wave or polar vortex.

It will also be important to our system in the future, offering the capability of both firming up our existing and new wind contracts to better replicate a round-the-clock hedge, and for reliability in the face of non-normal weather. As the entire system becomes increasingly decarbonized and variable in nature, being a pioneer in the area of long-duration storage is something we are proud of. We are confident this project will yield multiple benefits to GRE, our membership and the larger grid.

# Power supply plans

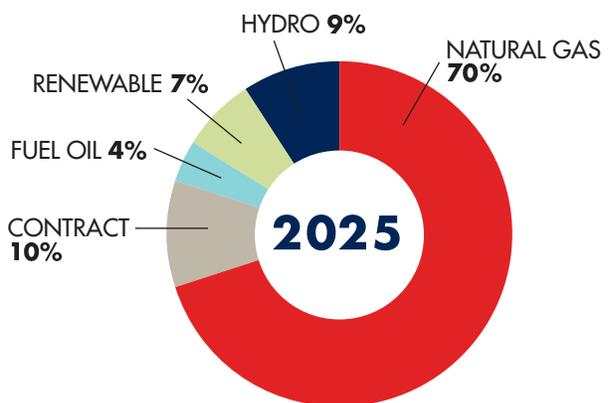
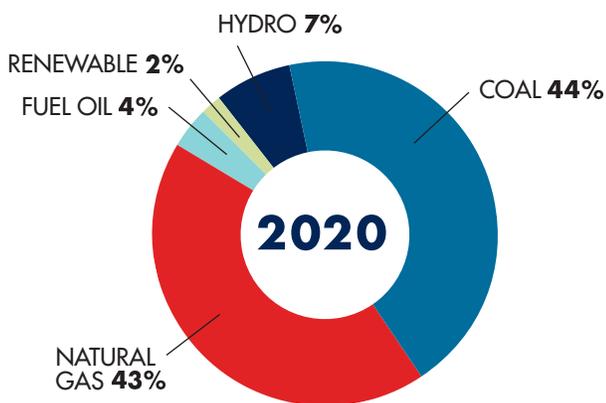
## Energy

GRE's energy supply will transform in the coming years with significant increases in renewable and market energy. Energy from the MISO market will be a key part of our power supply plans in future years, representing a low-cost opportunity for energy to supply to our membership as part of our portfolio. Wind grows to a substantial part of our portfolio and, combined with the market, represents most of our energy product. Compared to 2020, the new resource mix in 2025 will be cleaner and cheaper, and therefore represents our commitment to reliability, affordability and care for the environment.

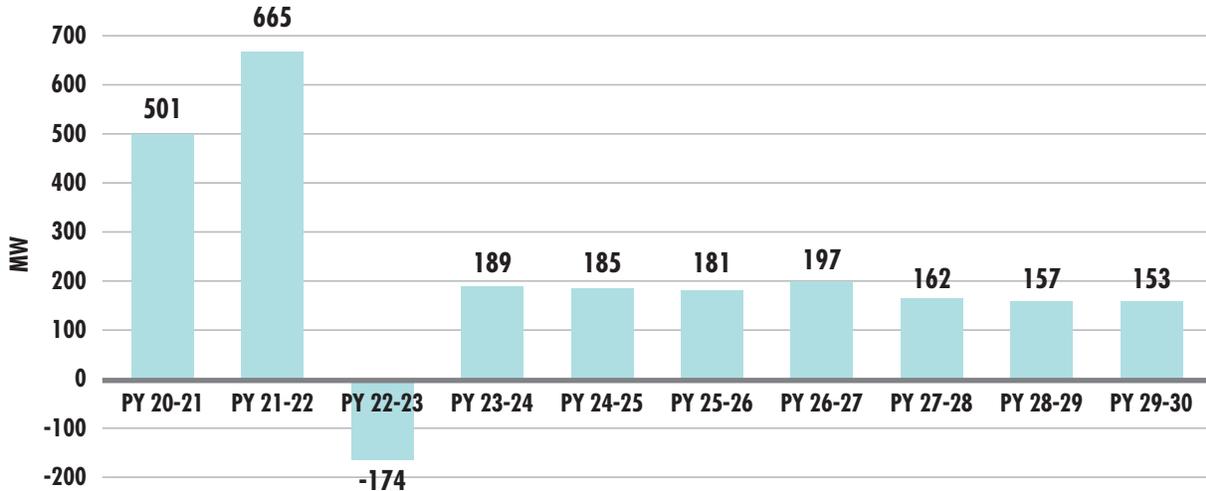


## Capacity projection

Upcoming power supply changes will right-size GRE's portfolio of accredited capacity with upgrades to its fleet of natural gas peaking plants and new capacity sources.

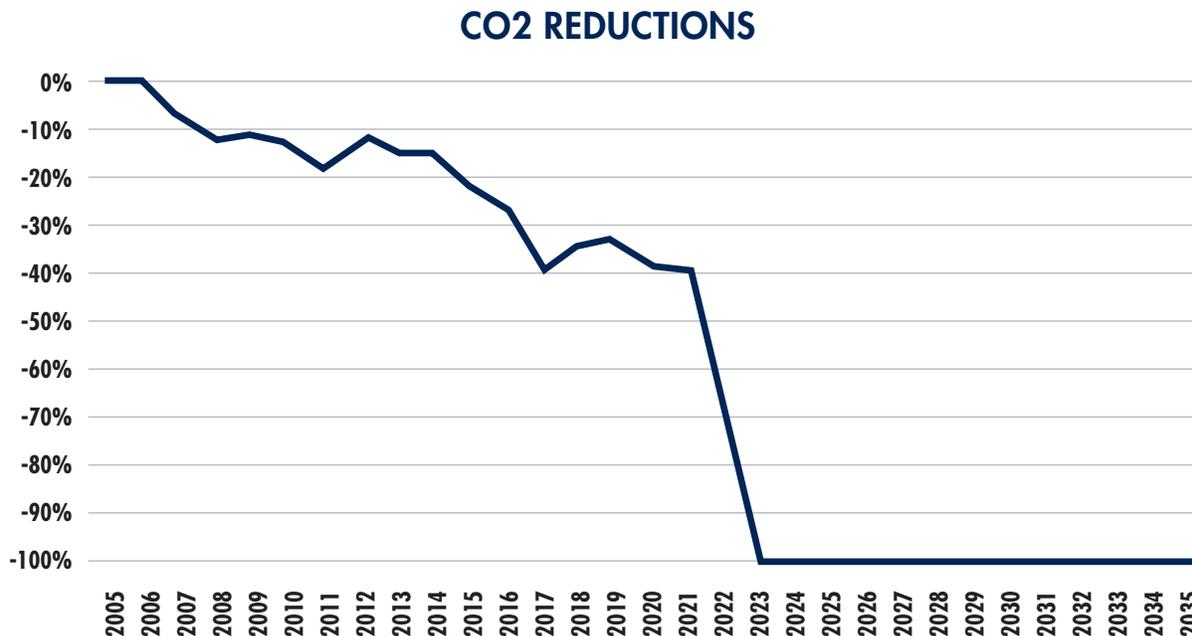


The forward position with MISO’s resource adequacy requirements and our current plan is illustrated below. We maintain surplus capacity until MISO PY22-23, at which point additional resources are required to fulfill our obligations to MISO. We are continuing to seek bilateral capacity resources and plan to obtain zonal resource credits as necessary in compliance with MISO resource adequacy obligations. When complete, this portfolio transformation will optimize our resource mix and provide the essential reliability and hedge characteristics we seek in a low-cost and low-risk manner while not being significantly long to our MISO requirements.



## Carbon reductions

Our carbon emissions will dramatically decrease over the next five years as a result of our power supply transition.



Relative to 2005 levels, our carbon emissions will decrease by 95% while our power supply product becomes even more cost-effective to our membership. This decarbonization is an incredibly positive development. Not only does it save our membership on their power supply from GRE, but it provides peace of mind for any future state or federal carbon reduction requirements while establishing a clean power supply for economic development opportunities in their service territories.

Providing a product that is 95% decarbonized from 2005 levels and doing so efficiently and cost effectively received unanimous support from our board of directors and membership.

## Benefits to membership

GRE's models show the planned power supply changes will result in benefits to forecasted rates. Retiring CCS and replacing it with wind, bilateral agreements and other lower cost resources is in the best interest of our membership.

This plan will assure electric service remains reliable. Most long-term power supply capacity needs will be provided by owned physical assets. We plan to diversify our capacity portfolio with market capacity sources for a portion of our MISO resource adequacy needs. As we have since 2005, we will continue to source all our members' energy needs with and through the MISO energy markets. These decisions provide one of the most aggressively implemented portfolio transformation plans among utilities, all while providing decarbonization and rate relief.

## Other changes since 2017 Integrated Resource Plan

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### Elk River Resource Recovery Project closure

GRE retired the 30-MW, waste-to-energy project on March 15, 2019. The Resource Processing Plant property was sold in 2020, and the demolition of the Energy Recovery Station is scheduled to be completed in 2021. The site will be restored to match the surrounding landscape.

### Stanton Station site restoration

Following the 2016 closure of the 188-MW, coal-based Stanton Station power plant, the plant was safely demolished and the site was restored to resemble the landscape of more than 50 years ago.

### Emmons-Logan Wind Farm

GRE began receiving energy from the south-central North Dakota wind farm in 2020. At 200 MW, it is the largest renewable resource currently serving GRE's membership.

### Flexible power supply contract

GRE partnered with two of our fixed obligation members to develop a flexible power supply contract that became effective Jan. 1, 2019. This new contract provides these members with the ability to direct the selection of resources that will meet up to 50% of their purchases from GRE. We refer to such resources as "member-directed resources" or "MDRs." MDRs can range from purchase agreements to physical generation resources, including distributed energy resources. In collaboration with these members, GRE will add MDRs as existing resources retire. In addition, these members will also be served by GRE's portfolio of resources that serves GRE's all-requirements members.

## 2021 planning process

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### Consideration of demand-side resources

GRE launched a new Demand Response Management System (DRMS) in 2016 to help support new demand response (DR) technology adoption among the membership. This DRMS platform enables multi-system integrations with various load management systems that communicate via members' chosen Advanced Metering Infrastructure, supporting modern DR switch technology with enhanced control and monitoring capabilities. The DRMS also provides footing for internet-based load management opportunities, including Wi-Fi enabled water heater controls or thermostat management for air conditioning load management. Along with advancing GRE's operational capabilities, the DRMS enables better event performance analytics and resource availability modelling by using imported meter data to build historical event observations into the memory of the system.

The integrated resource planning process has historically been focused on the supply-side. As GRE owns no distribution assets, supply-side has historically been the limits of our planning process. However, planning a power supply portfolio as a part of today's grid and technological backdrop requires changes in consideration.

For the last several years we have been involved in events, workshops, conferences and studies contemplating a more holistic consideration of resource planning – one that includes generation, transmission, distribution and load. The 2022 filing will include DR technologies and incremental energy efficiency as selectable resources in the capacity expansion modeling that we conduct, and we are actively considering the potential utility of DR and distributed energy resources across the membership. These are resources we must evaluate alongside traditional supply-side opportunities in order to continue providing a power supply product that prioritizes affordability and reliability.

## **Forecasting**

GRE moved to implementing Statistically Adjusted End-Use Modeling (SAE) for this planning cycle and thereafter. This change will better allow us to understand and forecast changes in efficiency and electrification moving forward.

Long-term energy forecasting has historically been primarily driven by economic activity, weather and other factors such as energy prices. We have seen a disassociation in how these traditional indicators have predicted energy and demand forecasts and moved to a methodology we feel is more inclusive of end-use information. At a high level, the SAE approach uses information produced by the Energy Information Administration to develop saturation and efficiency trends for multiple end-uses which are then adjusted for this region of the country using regional appliance saturation data. These energy usage data are then combined to create an average usage per customer metric which we multiply across number of customers to identify the projected forecast amounts. The same process is conducted across all member rate classes.

Using SAE will better enable us to estimate energy efficiency savings occurring both naturally and from federal appliance standards and tax credits. Identifying energy usage by end-use and customer class also allows us better insight as electrification programs and initiatives are further developed.

## **EnCompass modeling**

As low market price trends continue, GRE is conducting an economic evaluation of continued operation of CCS and potential future portfolio resources. The EnCompass planning software was used to perform capacity expansion modeling in order to identify the least cost future resource portfolio. GRE has implemented the EnCompass model since its previous Integrated Resource Plan. CCS unit retirements and their estimated retirement costs were modeled as resource options that could be economically selected in the capacity expansion modeling. Each unit's retirement was modeled separately, so the model could choose to retire one or both units. CCS unit retirement was also modeled in multiple different retirement years with commensurate estimated load reduction. The resulting resource portfolios and their costs were compared. Across scenarios, retirement of both units earlier in the planning period were the least-cost resource plans.

Future resource addition options offered in the EnCompass capacity expansion modeling were wind power purchase agreements (PPAs), solar PPAs, combustion turbine units and bilateral capacity contract purchases. These new resources were available to be selected in multiple years throughout the scenario analysis to avoid overly constraining the model, especially in the initial runs. In later runs, resource addition options were refined to model potential units more specifically. PPA costs for both wind and solar have continued to decline since GRE's last Integrated Resource Plan portfolio evaluation. Sensitivities with varying PPA prices and natural gas prices were also completed during the expansion plan evaluation. Renewable PPAs were a consistent selection throughout the scenario modeling along with bilateral contracts for near-term capacity needs. Based on capacity expansion modeling results and internal analysis, GRE proceeded with working toward a future resource plan that includes retirement of both CCS units and new replacement capacity from a combination of bilateral contracts, peaker capacity upgrades that were identified for equal or lesser cost than estimated bilateral contract prices, and additional wind PPA capacity.

Moving into 2021 for the 2022 filing, the emphasis will be on continued refinement of forecasting along with sensitivity analysis around electrified loads and supply-side resources for future capacity and energy needs.

# Summary

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GRE has taken steps to completely transform our power supply portfolio over the period of just a few years. Through unanimous support from our board of directors and membership, we will be providing a low-cost and low-risk power supply portfolio into the future.

We are capitalizing on our position in the MISO market to take advantage of competitively priced energy while maintaining adequate and robust hedges to ensure the protection of our membership from high priced market events.

Our addition of wind resources since 2015 and planned for the years ahead make up an important part of our energy solution in combination with the market. Innovative partnerships like those we have begun with Form Energy are exciting and critically important to integrating higher amounts of variable resources on the system while preserving reliability.

We welcome any questions from the Commission, stakeholders or other interested parties, and will offer any additional information we are able to share about this exciting transition of our power supply portfolio to a clean, affordable and reliable product for our membership.