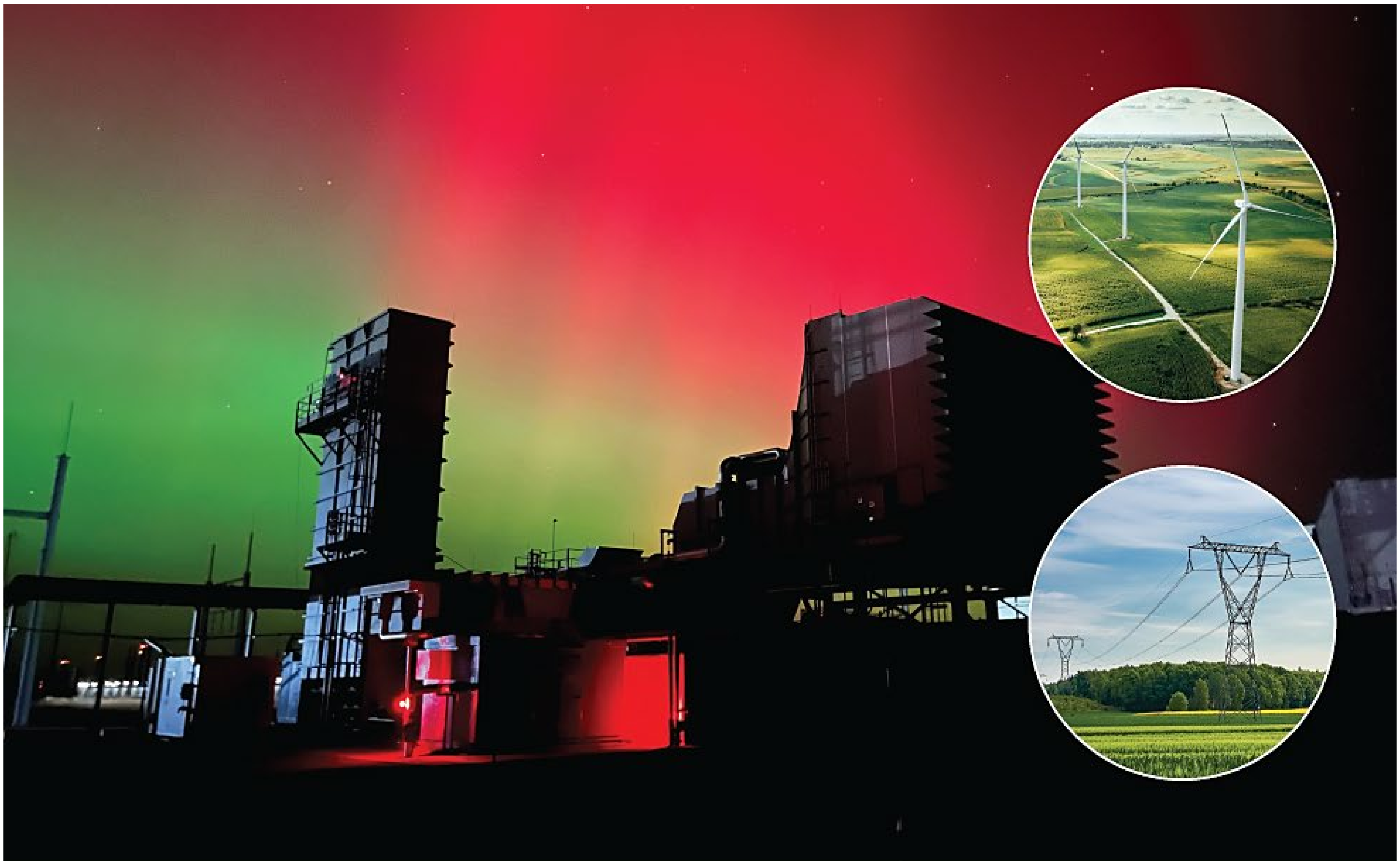


GREAT RIVER ENERGY.

2026-2040 Integrated Resource Plan

Submitted to the Minnesota Public Utilities Commission
Docket No. ET2/RP26-145
April 1, 2026

Dear Commissioners,

On behalf of Great River Energy (GRE) and our 26 member-owner cooperatives, we are pleased to submit GRE's 2026 Integrated Resource Plan (IRP). This plan outlines our approach to meeting the long-term electricity needs of the communities we serve while navigating ongoing change and uncertainty across the energy sector.

Reliability is GRE's highest responsibility. As a wholesale power supplier serving more than 568,000 member-consumers – or about 1.7 million people – we must ensure adequate capacity and operational resilience to meet demand under all conditions. This IRP demonstrates how GRE will maintain resource adequacy as the generation mix evolves, including during periods of extreme weather, market volatility, and changing system requirements.

The plan emphasizes flexibility and risk management. Given uncertainty related to fuel prices, load growth, technology costs, policy, and market dynamics, GRE evaluated a wide range of future scenarios. This approach allows us to identify strategies that perform well across multiple potential futures, helping manage long-term costs while maintaining reliability. In doing so, the IRP outlines a pathway for meeting Minnesota's carbon-free electricity standard while maintaining reliability and affordability for our members.

Load growth is a key consideration in this planning cycle. Economic development, electrification, and broader regional demand growth are placing increased pressure on the grid. The IRP reflects careful analysis of varying load growth projections and identifies resources capable of responding to changing demand patterns while supporting affordable rates for members.

Strong member relationships are central to GRE's planning process. Throughout development of the IRP, we engaged with our member-owner cooperatives to share assumptions, modeling approaches, and preliminary results. Their feedback helped shape the strategies presented in this filing and ensured alignment with member priorities related to cost, reliability, and system performance.

A balanced resource portfolio remains essential. While wind energy continues to be a cost-effective and important part of GRE's system, it is inherently variable. New natural gas-fired resources provide critical dispatchable capacity and flexibility to back up both existing and new wind generation. These resources allow GRE to respond quickly when wind output is low or demand is high, supporting reliability while enabling continued integration of renewable energy.

This IRP does not seek approval of specific projects but provides a roadmap to guide future decisions as conditions evolve. GRE remains committed to transparency, engagement, and ongoing review throughout the regulatory process.

Thank you for your consideration. We look forward to continuing to work with the Commission, stakeholders, and our member-owner cooperatives to deliver reliable, affordable, and resilient power for the long term.

Sincerely,

David Saggau
President and Chief Executive Officer
Great River Energy

Contents

1 Introduction

Great River Energy's (GRE) 2026-2040 Integrated Resource Plan (IRP) presents a long-term strategy to provide affordable, reliable, and increasingly clean energy to our 26 member-owner cooperatives and the communities they serve. As a not-for-profit generation and transmission cooperative, GRE plans on behalf of its members and remains guided by the cooperative principles of local ownership, democratic governance, and service at cost. This IRP reflects that member-driven approach and outlines how GRE intends to meet future energy and capacity needs in a power supply environment shaped by rapid load growth, evolving technology, changing market conditions, and new state and regional requirements.

GRE enters this planning period in a strong position due to prior resource planning decisions and investments. Our power supply portfolio positions the cooperative well to handle uncertainties while allowing flexibility in future decisions. Our 2025 member-consumer survey reaffirms that reliability and affordability remain our members' highest priorities as we continue our transition toward cleaner resources and prudent transmission investment opportunities. Those priorities are foundational to this plan.

In addition to normal variations in weather, economics, and electrification trends, GRE is planning within an environment influenced by potential and uncertain large-load growth, volatile power supply and interconnection costs, supply chain pressures, macroeconomic policy changes, and evolving Midwest Independent System Operator (MISO) seasonal accreditation and reserve margin requirements. GRE therefore evaluated a range of load-growth scenarios, from our Legacy Forecast to substantially higher growth cases, and used extensive capacity expansion, production cost, and risk analysis to identify a Preferred Plan that balances near-term action with long-term flexibility.

The resulting Preferred Plan continues GRE's long-standing resource strategy: dispatchable, reliability resources for accredited capacity and wind resources for energy, in combination with our industry leading demand side management (DSM) programs. The plan retains GRE's existing power supply assets and renewable power purchase agreements (PPAs) while adding new wind generation, energy storage, and dispatchable natural gas combustion turbines (CTs) with emergency fuel oil backup. It also recognizes the value of demand-side resources by continued incorporation of MISO-registered load modifying resources as capacity resources. In addition, it considers transmission investments and grid optimization efforts as important tools for supporting reliability and maximizing the value of our existing infrastructure. Together, these strategies position GRE to meet our members' needs reliably and at least cost while preserving optionality as conditions evolve.

This plan also reflects GRE's continued progress toward compliance with Minnesota's clean energy and emissions requirements. GRE's Preferred Plan is designed to satisfy future resource adequacy needs while meeting every milestone of Minnesota's new Carbon-Free Standard (CFS) and Eligible Energy Technology Standard (EETS) requirements.

GRE's 2025-2040 Integrated Resource Plan builds on years of deliberate transition in our portfolio and reaffirms our commitment to providing affordable, reliable energy while advancing a cleaner energy future for our members, their communities, and all Minnesotans.

2 Great River Energy

GRE is a not-for-profit, member-owned wholesale electric cooperative that provides electricity to more than 568,000 member-consumers – or about 1.7 million people through its 26 member-owner cooperatives and customers. Through this cooperative network, GRE serves roughly two-thirds of Minnesota geographically, supporting communities that range from the Twin Cities metropolitan area to the Arrowhead region of northern Minnesota and agricultural communities in the southern and western parts of the state.

Minnesota's electric cooperatives were founded after the Rural Electrification Act of 1936 to bring reliable electricity to communities that were not served by investor-owned utilities. That cooperative mission supports local ownership, democratic governance, and service at cost. This mission continues to guide GRE's role and decisions today. As a generation and transmission cooperative, GRE plans, builds, and operates power supply and transmission resources on behalf of its member-owners, ensuring that long-term resource investments reflect member priorities for reliability, affordability, and environmental stewardship.

GRE designs and maintains a diverse portfolio of power generation and transmission resources to deliver reliable, affordable wholesale electricity to its members through participation in the Midcontinent Independent System Operator (MISO) market. System-wide energy sales are comprised of approximately 54% residential and 45% commercial, industrial, and 1% seasonal irrigation loads reflecting the broad mix of communities and businesses served by the member cooperative systems.

GRE owns and maintains approximately $3.4 billion in plant assets, including nine power-generating stations and more than 5,000 miles of transmission lines. Our energy supply portfolio includes a range of resources, including wind, hydroelectric, natural gas, coal, and fuel oil. These resources include both owned generation and contracted resources through PPAs, varying in size, location, and fuel type, each contributing distinct operational and economic value to the overall portfolio.

GRE's transmission system includes regional transmission lines and substations. It is designed and constructed to reliably deliver electricity where and when it is needed, supporting both day-to-day operations and long-term system resilience. The power supply portfolio has been developed as a cooperative endeavor, with resource decisions made through a member-driven governance structure and guided by the best interests of the member-owners and the communities they serve.

2.1 Vision and Mission

GRE's purpose is to power people's lives. Our vision and mission are to innovate, collaborate, and lead to competitively power the future by providing affordable, reliable, and cleaner energy.

GRE continues to operate with purpose amid rapid transformation across the energy industry in both energy supply and demand. Together, these principles shape how the cooperative plans, invests, and adapts in evolving regulatory, technological, and market landscapes.

Consistent with this vision and mission, GRE's resource portfolio is steadily changing to meet future needs and policy constraints while maintaining reliable service and competitive wholesale rates for its members. This deliberate approach has positioned GRE to manage risk effectively and remain resilient in the face of uncertainty.

2.2 Financial Strength

GRE maintains a strong financial position supported by robust liquidity and investment-grade credit ratings, providing stable access to capital and flexibility to support long-term investments. In 2025, GRE's credit ratings were affirmed by Fitch (A Stable), Moody's (A3 Stable), and S&P (A- Stable) with the agencies highlighting GRE's broad and stable customer base, long-dated wholesale power contracts, PCA cost recovery mechanism, and solid financial metrics in their credit opinions. These factors cited by the rating agencies are also favorably viewed by the institutional investors in the debt issuance markets where GRE finances its long-term investments. With regular debt issuances, GRE has developed a broad investor base and continues to attract new investors. Another favorable rating agency and investor consideration is that GRE's wholesale electric rates remain significantly below the weighted regional average cost of electricity, even as GRE continues to invest in generation, transmission, and system reliability. Recent rate adjustments reflect prudent financial management and necessary cost recovery, while preserving affordability for the system overall. Additional financial and technical details supporting are available in GRE's public financial disclosures.[1]

2.3 GRE's Member-Owners

Minnesota's cooperatives serve more than 70% of the state's geography, providing affordable, reliable electric service. As a member-owned cooperative, GRE's members are both its owners and its customers. GRE operates on a not-for-profit basis, providing services that meet members' collective needs more efficiently and cost-effectively than could be achieved individually. The cooperative is governed by a Board of Directors (Board) elected from the membership, which establishes rates, creates policies and determines strategic imperatives that are carried out by GRE's management.

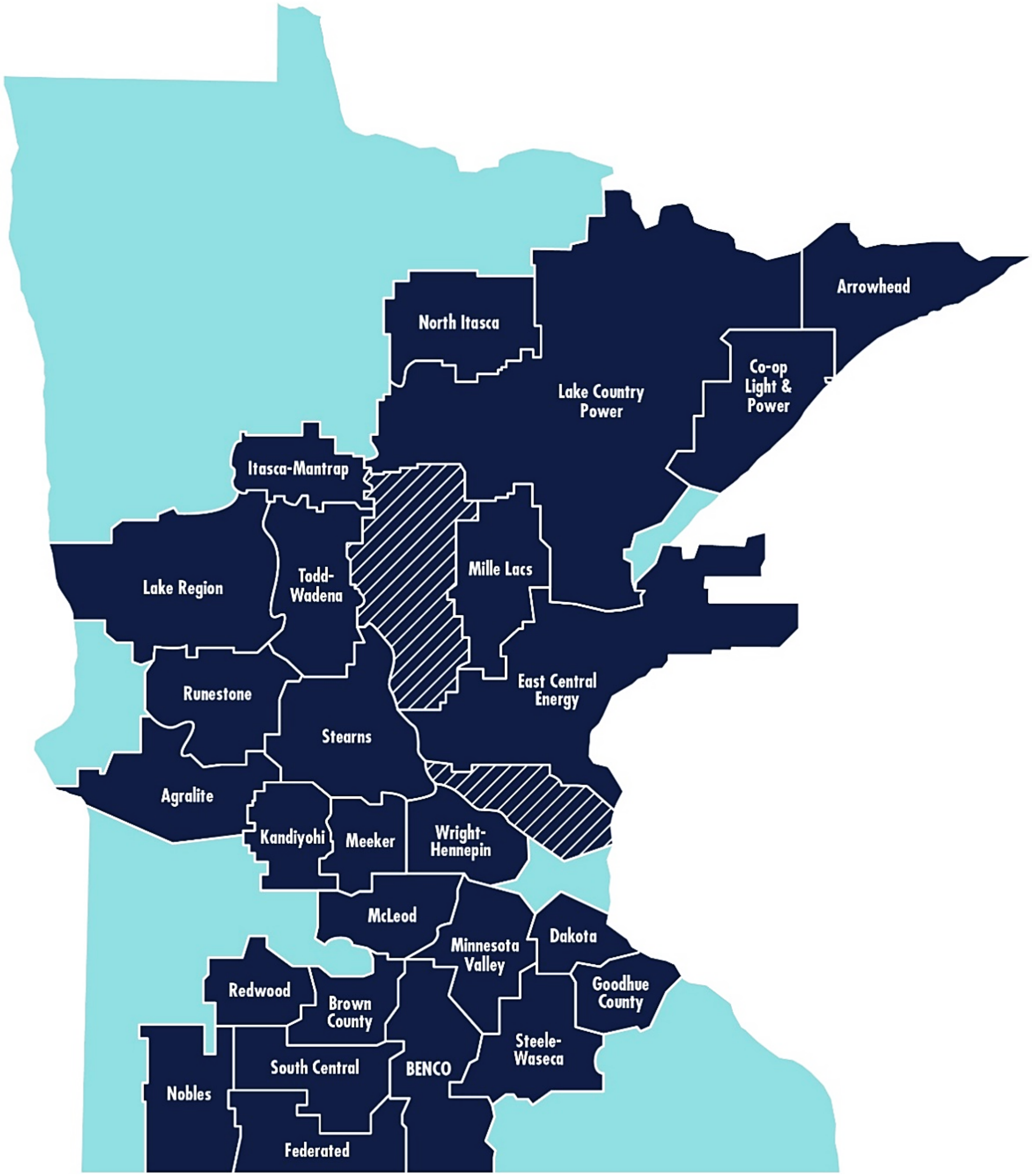
GRE serves two main categories of members: All-Requirements (AR) members and Fixed Obligation (Fixed) members. The 19 AR members purchase all their power supply and transmission from GRE, subject to limited exceptions. The 7 Fixed members purchase a fixed portion of their power supply requirements from GRE and obtain any additional requirements from alternative power suppliers. Table 1 and Figure 1 below show GRE's Member-Owner Cooperatives and the locations of their service territory.

[1] https://greatriverenergy.com/financial/

Table 1 GRE Member-Owner Cooperatives (AR and Fixed)

Member	Location
Agralite Electric Cooperative (Fixed)	Benson, Minnesota
Arrowhead Cooperative, Inc. (AR)	Lutsen, Minnesota
BENCO Electric Cooperative (AR)	Mankato, Minnesota
Brown County Rural Electrical Association (AR)	Sleepy Eye, Minnesota
Cooperative Light & Power (AR)	Two Harbors, Minnesota
Dakota Electric Association (AR)	Farmington, Minnesota
East Central Energy (AR)	Braham, Minnesota
Federated Rural Electric Association (Fixed)	Jackson, Minnesota
Goodhue County Cooperative Electric Association (AR)	Zumbrota, Minnesota
Itasca-Mantrap Cooperative Electrical Association (AR)	Park Rapids, Minnesota
Kandiyohi Power Cooperative (AR)	Spicer, Minnesota
Lake Country Power (AR)	Cohasset, Minnesota
Lake Region Electric Cooperative (AR)	Pelican Rapids, Minnesota
McLeod Cooperative Power Association (AR)	Glencoe, Minnesota
Meeker Energy (Fixed)	Litchfield, Minnesota
Mille Lacs Energy Cooperative (AR)	Aitkin, Minnesota
Minnesota Valley Electric Cooperative (Fixed)	Jordan, Minnesota
Nobles Cooperative Electric (AR)	Worthington, Minnesota
North Itasca Electric Cooperative, Inc. (AR)	Bigfork, Minnesota
Redwood Electric Cooperative (Fixed)	Clements, Minnesota
Runestone Electric Association (AR)	Alexandria, Minnesota
South Central Electric Association (Fixed)	Saint James, Minnesota
Stearns Electric Association (AR)	Melrose, Minnesota
Steele-Waseca Cooperative Electric (AR)	Owatonna, Minnesota
Todd-Wadena Electric Cooperative (AR)	Wadena, Minnesota
Wright-Hennepin Cooperative Electric Association (Fixed)	Rockford, Minnesota

Figure 1 GRE Member-Owner Service Territories[2]



[2] GRE provides transmission service only to shaded regions

2.4 Cooperative Principles

At GRE, we put our values into practice by operating in alignment with 7 guiding cooperative principles. These principles guide how we serve our member cooperatives, support our communities, and plan for a reliable, responsible energy future (Figure 2).

Figure 2 - 7 Guiding Cooperative Principles

1. Voluntary and open membership

Cooperatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.

2. Democratic member control

Cooperatives are democratic organizations controlled by their members, who actively participate in setting their policies and making decisions. Men and women serving as elected representatives are accountable to the membership.

3. Member economic participation

Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members allocate surpluses for any or all of the following purposes: developing their cooperative, possibly by setting up reserves; benefiting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.

4. Autonomy and independence

Cooperatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.

5. Education, training and information

Cooperatives provide education and training for their members, elected representatives, managers and employees, so they can contribute effectively to the development of their cooperatives. They inform the general public – particularly young people and opinion leaders – about the nature and benefits of cooperation.

6. Cooperation among cooperatives

Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional and international structures.

7. Concern for community

Cooperatives work for the sustainable development of their communities through policies approved by their members.

2.5 Board of Directors and Managers

The governance of GRE reflects its cooperative structure, with oversight and strategic direction provided by both the Board and the Member Manager Group (MMG). The Board, which meets nearly every month, is responsible for conducting the formal business of the cooperative. Among its many duties are approval of the annual budget, major capital investments, resource planning decisions, and matters related to rate setting and rate design. Acting on behalf of the 26 member-owner cooperatives, the Board provides fiduciary oversight and ensures that GRE's strategic direction aligns with the long-term interests of its members. Each AR member is represented on the GRE Board, with some level of representation from Fixed members in special circumstances.

Complementing the Board's formal governance role is the MMG. They are comprised of the CEOs of each member-owner cooperative and meet regularly to review key initiatives and provide direct operational and strategic input. While the MMG does not hold formal governance authority, it serves in an advisory role by collaborating closely with GRE leadership and staff and occasionally providing policy and rate recommendations to the Board. This structure ensures that major decisions, including power supply planning and financial strategy, reflect both strong Board governance and direct engagement from the member cooperative systems that own and rely on GRE. Together, this cooperative model of democratic member control reinforces accountability, transparency, and alignment with member needs. [3]

2.6 2025 Member-consumer Survey

In the spring of 2025, GRE conducted a member-consumer survey with 800 respondents to assess attitudes, priorities, and expectations among those served by our member-owner cooperatives. Service ratings remain exceptionally strong, with more than 85% of respondents rating information flow, outage response, and board transparency as “good” or “excellent.” Only 11% rate information flow as “fair” or “poor,” and even among this group, half believe their cooperative meets expectations for transparency. Awareness of GRE stands at 87%, and positive overall opinions increased from 72% in 2021 to 76% in 2025.

Reliability and affordability remain the top strategic priorities identified by respondents. Reliability is universally valued across demographic groups, and 77% of members support new transmission investments as necessary to maintain system reliability. Support for community-owned renewables increased from 7.0 to 8.2 on a 10-point scale. Views on carbon-free energy remain stable, with most respondents supporting “up to half” or “most electricity” from carbon-free resources and expressing a preference for a balanced approach focused on “getting it right” rather than moving faster.

Electrification support continues to grow, with 74% of respondents expressing support. Electric vehicle ownership is currently 6%, with an additional 4% indicating they are likely to purchase an EV within the next five years. Reported motivations include lower operating costs, increased renewable energy use, and environmental considerations, while primary barriers remain in the upfront cost and reliability concerns. Collectively, these results reinforce continued focus on reliability, affordability, prudent transmission investment, and a strategic and measured transition toward cleaner and electrified technologies.

The member-owned cooperative model continues to be strongly supported, with members increasingly identifying as owners rather than customers. Full survey results are included in Appendix B.

3 2025 Nameplate Capacity and Energy by Source

GRE serves our 26 member cooperatives by supplying both wholesale energy and capacity resources to meet MISO reserve margin requirements. Our system-wide load characteristics are composed of roughly 55% residential, 43% commercial, and 2% unique seasonal loads based on annual energy sales. Figure 3 and Figure 4 show the total nameplate capacity of GRE’s power supply resources and the respective energy GRE provided to its members in 2025 by source.

[3] https://greatriverenergy.com/governance/

Figure 3 GRE 2025 maximum nameplate capacity

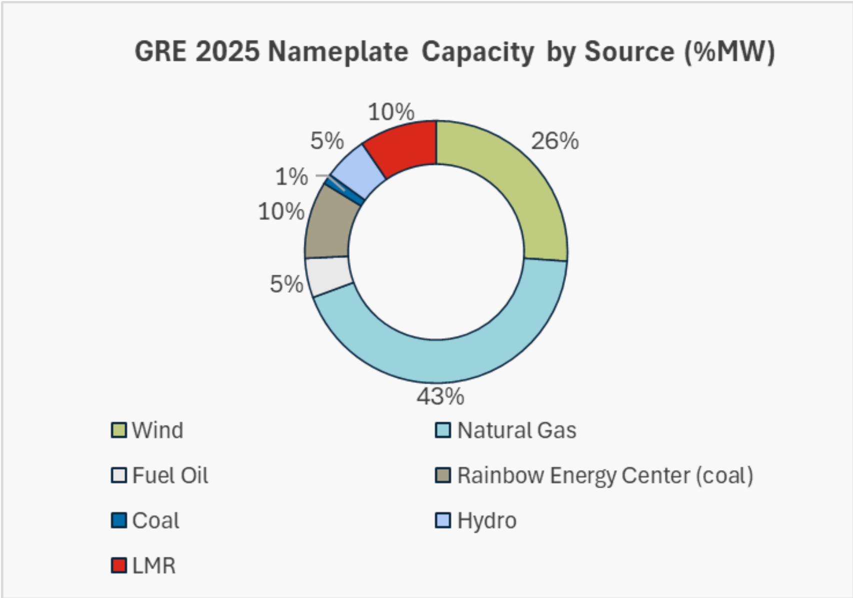
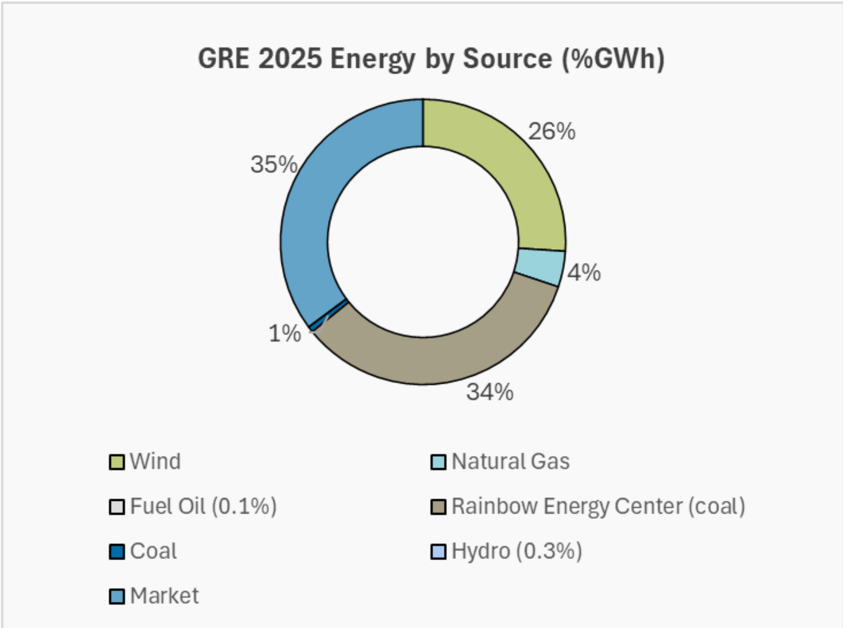


Figure 4 GRE 2025 energy by source



4 The 2026-2040 Preferred Plan

GRE's Preferred Plan is the result of a thorough forecasting and modeling process designed to identify the most cost-effective path to meet our members' future energy and capacity needs while complying with all state and federal regulations. The process begins with development of our Legacy Forecast, which reflects traditional member growth and has historically served as the foundation of our 15-year planning horizon. In prior IRPs, this Legacy Forecast represented the Base Case scenario.

However, projected load growth over the coming decade is expected to significantly exceed historical trends. In addition to traditionally representative member growth in their service territories, several of our member-owner cooperatives anticipate large incremental loads over the next 15 years. Accordingly, GRE's 2026–2040 Base Case forecast includes an additional 400 megawatts (MW) of large load growth incorporated into the Legacy Forecast. While uncertainty remains regarding the precise timing and magnitude of this potential growth, GRE determined that incorporating an additional 400 MW represents the most reasonable planning assumption for our Base Case according to discussions with member-owners and their potential customers.

Once the Base Case forecast is established, we evaluate a broad range of alternative scenarios and sensitivities. These include variations in economic conditions, electrification trends such as EV adoption, and differing market and fuel price projections. To meet projected energy and capacity requirements under these conditions, GRE models extensive supply-side resource options. More than 60 sensitivity scenarios were analyzed to identify the least-cost portfolio that ensures energy sufficiency, capacity needs as defined by the MISO Planning Reserve Margin (PRM), and compliance with all regulatory requirements while minimizing uncertainty and risk in the near and medium terms.

GRE's 15-year Preferred Plan reflects the least-cost portfolio that reliably meets member needs under our new Base Case growth scenario. A detailed description of the modeling assumptions, sensitivities, and results is provided in Section 11. The following table (Table 2) depicts the type, timing, and size of the power supply resource needs in GRE's 2026-2040 Preferred Plan.

Table 2: The 2026-2040 Preferred Plan

Preferred Plan[4]		
Year	**MW**	**Type**
2026	+ 1.5	Form Energy battery storage pilot project
2027	+ 228	Dodge County Wind
	+140	Emmons-Logan battery energy storage
	- 99	Elm Creek Wind
2028	+300	Big Bend Wind
2029	+426	New Salem Wind
	+420	Energy Storage
	+250	Wind
2030	+151	Three Waters Wind
	-200	Manitoba Hydro Diversity Exchange
2031	-350	Rainbow Energy Center Power Purchase Contract
	+280	Natural Gas Combustion Turbine with fuel oil backup
2032	+140	Natural Gas Combustion Turbine with fuel oil backup
2033		
2034		
2035		
2036		
2037	-100	Prairie Star Wind
2038		
2039		
2040		

[4] Orange indicates existing resources. Green indicates planned resources. Blue indicates new resources.

4.1 Preferred Plan Highlights

- **Emmons-Logan Battery Energy Storage System (BESS)**
  GRE's first major investment in grid-scale energy storage will be at the Emmons-Logan Wind Project in North Dakota. This project is being developed in conjunction with NextEra. NextEra will lead permitting, construction, and ongoing maintenance activities, while GRE will retain autonomy in the day-to-day market operations of the facility. This project will deploy 140 MW of four-hour lithium-ion batteries. Upon completion by January 2027, it will be one of the largest energy storage facilities in MISO. Through this project, we expect to gain operational experience and a further understanding of the local economic benefits of battery storage resources. GRE is unaware of a widely accepted national job-per-MW formula specific to battery storage construction projects as the technology is still scaling rapidly and project scopes vary.[5] However, Emmons-Logan BESS, in conjunction with Emmons-Logan Wind, will continue to support the local economy by providing employment opportunities, property taxes revenue, and landowner lease payments. Upon completion, the project is expected to support approximately 6–8 full-time operations positions. GRE will continue coordinating with NextEra to document local economic impacts and integrate those results into future storage project planning and deployment strategies.

- **Big Bend Wind**
  GRE is working in conjunction with Apex Clean Energy (Apex) to develop the 300 MW Big Bend Wind project located north of Mountain Lake, Minnesota.[6] Apex estimates approximately 316 personnel will be required at peak employment during construction of the project, and approximately 14 permanent personnel will be required for operation and maintenance of the project over its projected 30-year project lifetime. Apex maintains a strong preference for bids that utilize local union construction craft employees to the greatest extent feasible to maximize the local economic benefits of the project. In addition to employment opportunities, Big Bend Wind will pay revenue to local units of government based on its annual energy production. Apex estimates approximately $35.7 million in local tax revenue contributions over the life of the project.

- **New Salem Wind**
  GRE is working in conjunction with NextEra Energy Resources (NextEra) to develop the 426 MW New Salem Wind project located southwest of New Salem, North Dakota.[7] The project is estimated to support approximately 300 construction jobs and approximately 11 full-time operations jobs upon completion. New Salem Wind represents an approximately $1.2 billion capital investment with estimated tax payments of $43 million over the first 30 years of the project's operation.

- **Three Waters Wind**
  GRE is working in conjunction with NextEra to develop the 151 MW Three Waters Wind project located in Sothern Minnesota.[8] The project is estimated to support approximately 300 construction jobs and approximately 3-5 full-time operations jobs upon completion. Three Waters Wind will solicit bids for an engineering, procurement, and construction (EPC) contractor to construct the project and will prioritize EPC contractor bids that utilize local union construction personnel to the greatest extent feasible. The project is estimated to contribute approximately $600,000/yr to the county and $150,000/yr split between the townships that will be hosting turbines. The tax rate and distribution between county and township is based on the Minnesota Department of Revenue's Wind Energy Production Tax guidelines.

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[5] https://www.nlr.gov/state-local-tribal/state-employment-projection-support
[6] https://www.bigbendwind.com/about_big_bend_wind
[7] https://www.nexteraenergyresources.com/new-salem-wind/project-overview.html
[8] https://www.nexteraenergyresources.com/three-waters-wind.html

- **Dodge County Wind**

  GRE is working in conjunction with NextEra to develop the 228 MW Dodge County Wind project located south of Claremont, Minnesota. This project is estimated to support up to 400 construction jobs and 370 professional services jobs with $200 million in economic development during construction. In addition, the project will support 5-8 full-time jobs upon project completion. Dodge County Wind is anticipated to provide approximately $83 million in payments to Dodge, Mower, and Steele counties landowners over its 30-year operational life. In addition, the project is anticipated to provide $750,000-$1 million in tax annual revenue for Dodge County[9]

- **Form Energy battery storage pilot project**

  GRE has worked in partnership with Form Energy since 2020 to develop and commission their first long-duration energy storage commercial deployment. This pilot project is designed with a 1.5 MW capacity, capable of delivering its rated power continuously for 100 hours.[10] Equipment structures, foundations, and balance of plant construction activities are substantially complete at our Cambridge Station facility. We are awaiting delivery of the remaining modules and anticipating the project to achieve commercial operation by the end of 2026. Once commissioned, GRE will continue to work with Form Energy to operate and test this new technology during varying seasonal conditions and we will update our capacity expansion modeling inputs to reflect the verified results.

- **250 MW of new wind generation**

  In addition to the 1,105 MW of planned wind generation, GRE will also procure an additional 250 MW of new wind generation by 2029. This expansion remains central to our Preferred Plan and will produce additional Renewable Energy Certificates (RECs) that help ensure compliance with both Minnesota's EETS and CFS.

- **420 MW new energy storage**

  GRE's first major step into grid-connected energy storage will be at the Emmons-Logan Wind Project in North Dakota. As stated above, we expect to gain crucial operational experience and further understanding of its local economic benefits. As a result of our new Preferred Plan, GRE anticipates the need for an additional 420 MW of energy storage resources by 2029 to replace lost capacity resources and provide new capacity for continued compliance with MISO's PRM.

  While four-hour lithium-ion storage is today's standard, we are actively monitoring and modeling emerging energy storage technologies such as longer-duration systems, as well as aggregated storage solutions at the distribution, and even end-use consumer level. If superior, more cost-effective options emerge, we will adjust accordingly. Additionally, we are mindful of the changing capacity accreditation of energy storage in MISO and will closely monitor its continued evolution to ensure we accurately model its contribution to resource adequacy requirements in MISO.

  When selecting optimal sites and sizes for additional energy storage, our priority is evaluating the existing MISO interconnections at our current wind generation projects. By working with developers under our existing wind generator interconnection agreements (GIAs) at contracted assets, and leveraging MISO's Surplus Interconnection Service (SIS), we can potentially reduce both interconnection timelines and interconnection costs. GRE intends to expand its analysis to other sites based on optimizing energy arbitrage and ancillary services, relieving congestion, assisting transmission planning, and optimizing our member load.

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[9] https://www.nexteraenergyresources.com/dodge-county-wind/project-overview.html

[10] https://formenergy.com

- **<u>420 MW of new dispatchable combustion turbines</u>**
  In response to growing needs for capacity in our power supply portfolio, GRE's IRP is prioritizing the development of reliability resources for up to 420 MW of dispatchable combustion turbine capacity. These turbines will likely be a mix of highly efficient and flexible aeroderivative and/or large-frame simple-cycle units, utilizing natural gas with emergency fuel oil backup. These state-of-the-art turbines will feature best-available control technologies and class-leading heat rates, providing needed capacity, a hedge against extreme market prices during periods of high energy demand, and robust local reliability benefits. Due to the dynamic nature of current power supply equipment markets, GRE will continue to assess the optimal combustion turbine resource mix that best serves our members.

  Our resource planning, generation engineering, land rights, transmission, and environmental teams are currently evaluating potential sites for these reliability resources. During this site identification process, we consider a list of variables including local community and land-owner support, environmental site conditions, environmental justice areas, interconnection processes, and the opportunity to leverage existing transmission and natural gas infrastructure. Ongoing studies will determine the optimal locations and size of these individual facilities, ensuring the best balance of capacity, reliability, affordability, and environmental stewardship for our member-owners.

  While identifying potential site locations, GRE continues to keep our member-owners informed, ensuring they have the most up-to-date information needed to make our final resource decisions. As we progress toward contractual commitments, interconnection milestones, and construction, we will also determine local economic impacts and employment potential for full-time operational roles upon commissioning.

4.2 5-Year Action Plan

In addition to GRE's 2026-2040 Preferred Plan, we also provide a 5-year action for our member-owners. Below is a list of the key activities, including the development of the new resources identified within our Preferred Plan.

GRE's five-year (2026-2030) action plan:

- Continue collaboration with our member-owners regarding large load additions within their service territories and further confirm their feasibility, size, timing, power demand requirements (2026 and beyond), and resources these large load customers may bring with them
- Continue operation and maintenance of all existing owned generation facilities (2026 and beyond)
- Continue operation and maintenance of the Nexus Line, LLC. (Nexus) HVDC transmission line (2026 and beyond)
- Continue to study transmission availability and capacity augmentation opportunities at current power supply facilities (2026)
- Commission our Form Energy long-duration storage pilot project and begin testing to validate performance by the end of (2026)
- Work toward commercial operation of over 1,100 MW of planned and executed wind PPAs by 2030
- Procure an additional 250 MW wind PPA
- Procure or construct up to an additional 420 MW of energy storage by 2029
  - Assess and identify optimal storage technology and locations based on load and transmission (2026-2027)
  - Conduct feasibility and site studies (2026-2027)
  - Analyze self-build and contracted resource option (2027)
  - Develop specifications and initiate RFPs if desired (2027-2028)
  - Finalize vendor selection and contracting (2027-2028)
  - Oversee construction, interconnection, and commissioning phases (2028-2029)

- Implement operational integration and performance monitoring (2029 and beyond)

- Develop up to an additional 420 MW of natural gas combustion turbine reliability resources with emergency fuel oil backup (2031-2032)[11]
  - Identify and secure suitable land including consideration of options in or near GRE's member-owner territory or existing power supply resource locations (2026-2027)
  - Conduct environmental review (2026-2027)
  - Initiate the interconnection process with MISO (2026-2027)
  - Develop and submit the necessary regulatory filings in relevant jurisdictions (2026 - 2028)
  - Initiate long lead equipment procurement and finalize vender selection (2026-2030)
  - Partner with consultants and contractors to refine our plans, estimates, and schedules for rapid deployment (2028-2030)
  - Oversee construction, interconnection, commissioning, and operations integration (2030-2032)
- Ensure our evolving power supply portfolio remains in compliance with all current and future MISO resource adequacy requirements, state legislative and administrative requirements, and federal environmental requirements (2026 and beyond).

GRE's Preferred Plan and 5-year action plan have been developed within a unique era of power supply uncertainty, including:

- Evolving MISO seasonal accredited capacity rules and MISO seasonal planning reserve margins
- Fluctuating capital costs and delivery timelines for all power supply resources
- Large load additions or reductions (e.g., data centers)
- Transmission buildout and increasing grid interconnection costs
- Supply chain constraints and federal tariff policy impacting imports and construction components
- Planning for future regulatory policy shifts at both state and federal levels

Additionally, the technical readiness levels of new and emerging power supply technologies, such as longer-duration energy storage, remain a significant variable. Should any of these or other factors cause a substantial deviation from our Preferred Plan, we will submit a Notice of Changed Circumstances to the Minnesota Public Utilities Commission. Utility resource planning is forward-looking, and GRE and its members take into consideration short-term developments and market changes. However, despite the dynamic nature of today's power supply and utility business environment, GRE remains focused on maintaining its current strategic mission and vision and planning for an affordable, reliable, and environmental stewardship.

4.3 2040 Preferred Plan Nameplate Capacity and Energy and by Source

Over the past 25 years, GRE has transitioned its power supply portfolio to rely primarily on natural gas CTs, with emergency fuel oil backup, as our primary MISO-accredited capacity resources, and wind generation as our primary energy resource. Our Preferred Plan continues that trajectory by expanding wind to meet energy needs while adding and maintaining dispatchable resources to satisfy MISO's planning reserve margin (PRM) requirements. As alternative capacity products become available, GRE staff will evaluate the cost-benefit impacts to our membership and compare them with this 5-year action plan. Any changes to the near-term plan will be provided to the Public Utilities Commission (PUC) in a Notice in this docket.

Figures 5 and 6 below illustrate GRE's estimated nameplate generating capacity by source and projected energy production by source in 2040 under the Preferred Plan. Nameplate capacity represents the maximum generating capacity of each generating resource. Accredited capacity, however, is determined by MISO. Accredited capacity reflects the amount of energy a resource is expected to reliably contribute toward meeting MISO's seasonal PRM requirements based on a resource's demonstrated performance during MISO resource adequacy hours (RA hours) and availability during system peaks. Dispatchable energy resources such as CTs, load modifying resources

[11] Commercial operation date (COD) beyond 5-year timeline

(LMRs), and energy storage receive a significantly higher percentage of accredited capacity relative to their nameplate than intermittent renewable energy resources. Additional information on how GRE's projected 2040 power supply nameplate capacity and energy by source translate to MISO accredited capacity and regulatory compliance obligations can be found in model results (Section 11).

Figure 5 GRE 2040 maximum nameplate capacity by source (Preferred Plan)

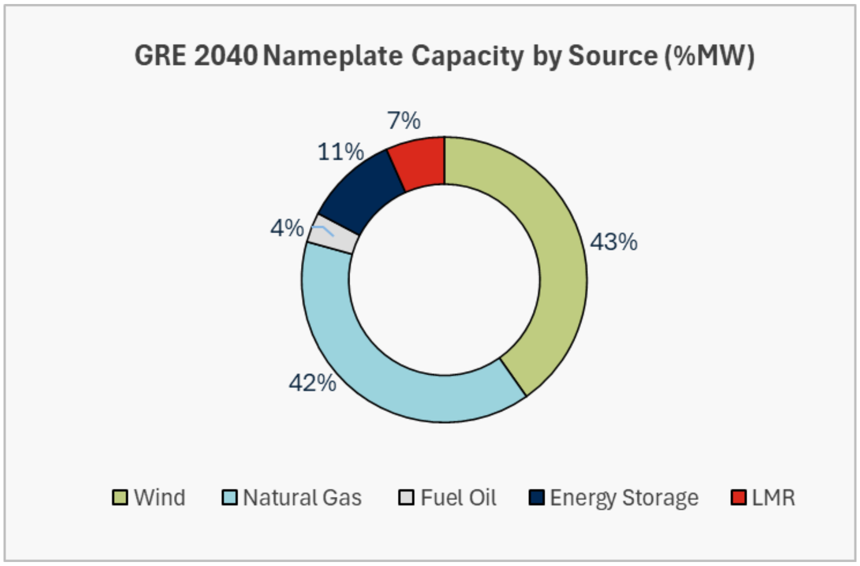
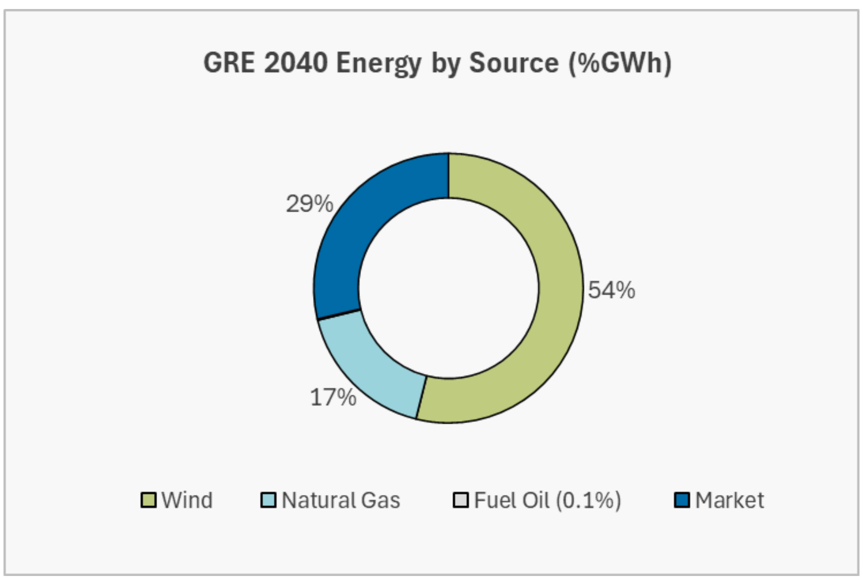


Figure 6 GRE 2040 energy by source (Preferred Plan)



4.4 Empowering Rural America

The Empowering Rural America (NewERA) program was created by the Inflation Reduction Act (IRA) to help cooperatives seek maximum greenhouse gas (GHG) emission reductions. It is administered by the Rural Utilities Service (RUS) within the United States Department of Agriculture (USDA). The $9.7 billion appropriation, capped at $970 million per entity, will be disbursed as grants and low-interest loans for new clean energy projects and zero-interest loans for stranded asset refinancing.

As part of the application process, entities could apply as individual cooperatives or in a consolidated consortium. In 2023, GRE formed a consortium with 20 member-owners to submit a Letter of Interest (LOI). GRE and those member-owners worked to finalize scope and scale of projects to submit a final application in July 2024 as a consortium of GRE and eight member-owner cooperatives.

GRE and the consortium were awarded $812 million and signed a Letter of Commitment in January of 2025 to obligate funds. Grant commitment contracts and negotiations are expected to occur later in 2026. Work continues in parallel with negotiations to develop approximately 1,200 MW of power supply resources indicated in our Preferred Plan in the form of new wind generation and energy storage. Several of GRE's member-owner cooperatives will also benefit from New ERA as a portion of the grant is planned to be used to develop new solar and storage on their respective distribution systems under GRE's Renewable Member Resource (RMR) portfolio option. More information on RMRs can be found in section 5.6 Renewable Member Resources.

4.4.1 A NewERA Community Benefit Plan

A NewEra Community Benefit Plan (CBP) has also been approved by the Rural Utilities Service (RUS) (Appendix K) . A portion of the CBP will invest in the American Workforce. GRE commits a $10,000 a year contribution over five (5) years for a total of $50,000, starting in 2026 to the Minnesota Indigenous Energy Workforce Initiative (MIEWI). MIEWI is a partnership with the Minnesota Department of Employment and Economic Development (DEED) to significantly increase the Indigenous workforce in Minnesota' s growing energy sector. The MIEWI has also taken on the goal to increase procurement of Native-Owned businesses throughout the energy sector in Minnesota. GRE serves as a statewide convener, uniting tribal and county workforce development resources, state and tribal colleges, workforce development nonprofits, labor unions, energy companies, and tribal leadership to align efforts and create education, apprenticeship, and career pathways into energy-sector jobs across the state.

4.4.2 Community Engagement

GRE created a new Community Engagement Specialist role in May 2025, with tribal outreach and relationship-building among the responsibilities of the position, including engagement with Minnesota's 11 federally recognized tribes. Responsibilities include gathering best practices from companies with established tribal outreach policies and procedures, sponsoring and participating in tribal events, providing HR recruiting support in tribal communities, and participating in tribal educational and training events.

GRE joined Xcel Energy, ITC Midwest, Merjent, and HDR Consulting to form a Tribal Subcommittee specific to the PowerOn Midwest Transmission Project. This subcommittee is charged with tribal outreach, ongoing communication, coordination with Tribal Employment Rights Ordinance Offices (TERO), workforce planning, and meetings with tribal leaders to gather input on route design and potential project partnerships.

GRE joined the Minnesota Tribal Contractors Council and the Minnesota American Indian Chamber of Commerce to connect with the Native-owned business community, support member events, and increase the number of Native-owned contractors in GRE's procurement system.

GRE partners with Michels Corporation and the Leech Lake Tribal Employment Rights Office (TERO) to train and employ an Indigenous workforce and engage Native-owned contractors for the Northland Reliability Transmission Project.

GRE maintains close collaboration with Tribal Nations and GRE member-owners on solar, transmission, and carbon-free energy initiatives.

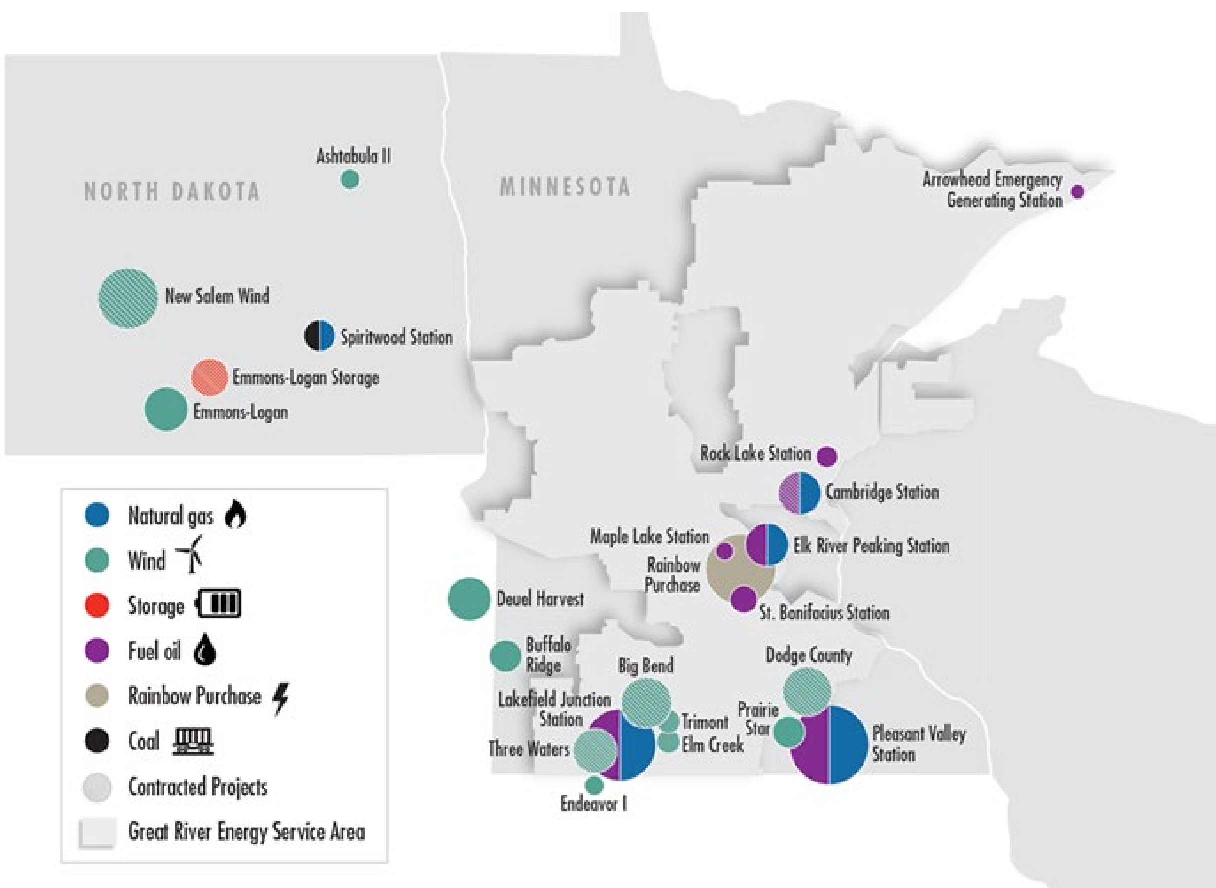
GRE member-owner cooperative North Itasca Electric Cooperative works closely with the Leech Lake Band of Ojibwe on several projects, including:

- Assisting the Tribal South Lake Community Center in obtaining a grant for a water softener system for community building
- Providing an emergency generator for the Leech Lake Tribal Inger Community Center to ensure a place to prepare meals and access drinking water in the event of a significant storm
- Continuing to partner on energy savings programs, air-source heat pump mini-splits, and weatherization

5 GRE Power Supply

GRE's current power supply portfolio includes nine owned power plants, along with PPAs from multiple wind farms and other generating resources and capacity contracts. Our current power supply portfolio consists of more than 3,300 MW of total nameplate generating capability. The portfolio reflects a diverse mix of resources, including wind, natural gas, fuel oil, hydroelectric generation, bilateral contracts, and coal. Figure 7 depicts GRE's current and planned (indicated by hash marks) power supply resource locations, types, and relative size of their nameplate generating capacity. A detailed list of GRE's current and planned power supply resources can be found in GRE's Appendix D – GRE Power Supply Resources.

Figure 7 GRE Existing and Planned Power Supply Resource Locations



5.1 Dispatchable Generation

GRE's dispatchable power supply resources (often referred to as peaking plants), consist primarily of natural gas combustion turbines with emergency fuel oil backup. They provide highly accredited capacity and operational flexibility to backstop the abundant wind resources in our power supply portfolio, which have variable output. GRE has just over 1,700 MW of peaking generation nameplate capacity in our portfolio – all located within Minnesota. While peaking plants supply a small amount of our member-owners' annual energy needs (historically 1% to 3% of our total annual energy production), they serve as GRE's primary accredited capacity resources to meet MISO's seasonal accredited capacity requirements. In addition, they act as an energy hedge by offsetting our members' MISO market purchases during periods of elevated energy prices which often occur during the coldest and warmest days of the year and when variable renewables are under-performing or unavailable. These resources continue to support reliability MISO-wide as they are available for dispatch and energy production during RA hours and reliability events.

5.2 Renewable Generation

Wind is GRE's primary source of renewable energy generation. Our current wind portfolio consists of 960 MW of nameplate wind capacity that is contracted under fixed-price PPAs. These facilities are in southern Minnesota, Iowa, South Dakota, and North Dakota. Wind generation is a foundational component of GRE's energy portfolio and supplies the Renewable Energy Certificates (RECs) needed to support future compliance with Minnesota's EETS and CFS. In addition to wind generation, GRE maintains a diversity exchange agreement with Manitoba Hydro, which includes seasonal accredited capacity benefits, corresponding obligations throughout the year.

5.3 Energy Storage

GRE has recently executed commercial agreements for a new, large-scale energy storage project which will be co-located at our Emmons-Logan Wind facility in North Dakota (Figure 7). This will be our first grid-scale energy storage project, and upon completion, one of the largest energy storage facilities in MISO.

This new power supply project will consist of 140 MW of 4-hour lithium-ion batteries (560 MWh) and is anticipated to be commissioned and operational by January of 2027. The project will utilize the existing MISO wind interconnection at the Emmons-Logan Wind project to maximize efficiency, economic value, renewable energy utilization, and speed-to-grid.

GRE will have full autonomy over the facility's dispatch, optimization, and market interaction. The project will generate annual revenues through MISO ancillary services, wholesale cost arbitrage, and accredited capacity value. Additional positive financial outcomes include revenue diversity, reduced congestion impacts at the Emmons-Logan Wind project and avoided energy hedge purchases.

This investment comes with some risks, including uncertainties pertaining to MISO's future capacity accreditation values for grid-scale storage resources, as well as managing the facility's state of charge during periods of high market volatility. However, GRE performed and presented extensive economic analysis and scenario planning prior to the project's approval by GRE's Board in 2025. This large-scale energy storage project represents an exciting new evolution in GRE's power supply portfolio and demonstrates our commitment to advancing energy innovation and capacity diversity while ensuring financial benefits for our members.

5.4 Load Modifying Resources and Demand-side Management

GRE has cultivated an extensive portfolio of load-modifying resources (LMRs) and demand-side management (DSM) over the past 40+ years in partnership with our member-owner cooperatives. These LMRs include a wide range of resources including thermal storage, interruptible hot water heating, controllable air conditioning, interruptible agricultural irrigation systems. They provide significant value by reshaping demand rather than generating supply. Unlike dispatchable generation, which ramps up to meet peak demand, these resources reduce those peaks by shedding or shifting load and reducing cost during critical times, helping maintain reliability and affordability across the system.

5.4.1 LMRs - A New Capacity Resource

GRE, in conjunction with our member-owners, has aggregated our fleet of LMRs to develop DSM programs which collectively serve to provide cost controls as well as capacity value to our power supply portfolio. Accreditation values are determined annually through the MISO accreditation process. In 2026, GRE registered seasonal DSM programs with MISO having the ability to control up to 350 MW of load depending on seasonality. As a result of registering these programs' demand reduction capability with MISO, GRE receives zonal resource credits (ZRCs) which are a fungible commodity equivalent to the capacity awarded to various asset classes in MISO. GRE now uses the LMR capacity credits to meet MISO's resource adequacy requirements, ensuring enough supply is available to meet demand and reserve margins for all seasons of the year.

The traditional treatment of DSM value in the IRP modeling context was to assume GRE's historical load control events were reducing the projected demand forecast since the historical events were reducing energy demand at strategic times. In the past, the capacity expansion model continued to account for DSM reductions embedded in the meter data, and in turn, reduced the demand forecast.

As an independent study in 2024, a GRE team gathered to model the full impacts of registering the entirety of the DSM programs as LMRs and calculated the long-range impacts to capacity expansion need for our members. By including LMRs as a resource in the supply stack rather than leaving LMR meter data reductions embedded in meter history and demand forecasts, GRE is projecting a net benefit by eliminating the need to build or buy new combinations of power plants and energy storage. Introducing LMR capacity values into our capacity expansion modeling reduces the need for GRE to build additional resources, resulting in up to 350 MW of additional capacity accreditation. As a result, the capacity value that DSM programs provide to GRE will no longer be embedded into GRE's demand forecast. Rather, by registering DSM programs as MISO-registered LMRs, these resources are now included as a capacity resource in the model to capture their full accredited capacity value. This new approach demonstrated GRE's ongoing commitment to maximizing the value of all existing resources and reducing the future costs of resource acquisition.

5.5 Rainbow Energy Center

GRE began accelerating depreciation of all coal-fired generation facilities in 2013. That decision allowed GRE to divest Coal Creek Station (CCS). GRE sold CCS to Rainbow Energy Center, LLC.(Rainbow) and its associated HVDC transmission line to Nexus Line, LLC. (Nexus) in May of 2021. GRE continues to operate and maintain the HVDC transmission line. As part of the CCS sale, an initial 1,050 MW PPA was also established with Rainbow, covering financially settled energy in Minnesota and MISO ZRCs for capacity.

This contract helps bridge GRE's energy and capacity needs by allowing time for advancing technologies and maturing cost curves to bring new affordable, reliable, and cleaner solutions to our members, while extending and securing the ZRCs needed for MISO planning reserve margin compliance past the date of the asset sale. The original PPA continues to step down in scheduled increments over the 10-year contract term and ends in 2031. The final 350 MW reduction is reflected in all GRE's capacity expansion scenarios, accelerating our transition from carbon-emitting resources to a portfolio based on renewable resources for energy and dispatchable resources for capacity. Until the contract expires, according to GRE's Prior IRP PUC Order Point 3, GRE models the Rainbow contract as a coal-based resource. Its carbon intensity and emissions are reflected in all capacity expansion and production cost calculations.

5.6 Renewable and Storage Member Resources Options

GRE remains committed to providing affordable, reliable, and increasingly cleaner energy to all our members. In doing so, we recognize the importance of flexibility to ensure our members have opportunities to optimize their local energy needs. Under GRE's AR member power purchase contracts, each AR member-owner cooperative can independently procure its own renewable member resources (RMRs) to supply up to 10% of its most recent 3-year average annual energy needs. It can also independently procure energy storage member resources (SMRs) with a size limit based on 10% of the member's average annual energy needs. These local resources, subject to GRE's review for compliance under the allowances in the GRE AR power purchase contract, allow members to integrate projects within their own service areas and support local innovation, collaboration, and a more customized path toward a sustainable energy future.

6 GRE Transmission

GRE's electric transmission system consists of high-voltage power lines that transmit electricity from power generation facilities to our member-owner cooperatives. Unlike vertically integrated utilities, GRE operates, owns, and constructs regional transmission lines. GRE's system includes over 5,000 miles of transmission lines and over 100 substations and is part of the overall regional transmission grid. GRE's system operates in coordination with transmission owners throughout the Upper Midwest and eastern United States.

6.1 Load serving transmission

GRE utilizes its own transmission facilities and also contracts to use transmission facilities of other transmission owners. GRE delivers energy to distribution substations owned and operated by its member-owned cooperatives across six MISO transmission pricing zones. GRE operates a local balancing authority area through its primary North American Reliability Corporation (NERC) registered control center that is supplemented by a back-up control center.

GRE supports member and customer reliability through substantial annual investments in the maintenance, replacement, and upgrade of its transmission facilities. Historically, GRE's transmission system has maintained 99.99% reliability. GRE also continues to improve system resilience in response to the increasing frequency and duration of outages, using findings from studies of future weather-related risks and lessons learned from major storm responses to help prioritize line rebuild projects. GRE's goal is to replace 55 to 80 miles of aging transmission infrastructure annually. In 2025, GRE completed nearly 44 miles of rebuilds and began construction on another 43 miles. Additional information on ongoing transmission projects is available on GRE's website.[12]

6.2 Regional Transmission

In addition to improving resiliency and reliability of its load serving transmission system, regional transmission solutions are being developed in collaboration with neighboring utilities to maintain reliable and resilient regional power as new generation is brought online, existing power plants are retired, demand for electricity continues to grow, and extreme weather events become more impactful.

MISO approved its first portfolio of transmission projects on July 25, 2022, as Tranche 1 of its Long-Range Transmission Plan (LRTP). MISO approved 18 projects across its Midwest subregion in total, and three of those are in Minnesota. GRE has an ownership stake in two of the 18 projects.

6.2.1 The Northland Reliability Project

The Northland Reliability Project is an approximately 180-mile, double-circuit, 345-kV line between Grand Rapids, St. Cloud, and Becker, Minnesota, and is a joint development between GRE and Minnesota Power. On January 23, 2025, the Minnesota Public Utilities Commission (MPUC) approved the certificate of need and route permit for the Northland Reliability Project. Construction on the project is underway, and the project is expected to be in service in 2030[13]. GRE partners with Michels Corporation and the Leech Lake Tribal Employment Rights Office (TERO) to

[12] https://greatriverenergy.com/transmission-projects/
[13] https://northlandreliabilityproject.com/

train and employ an Indigenous Workforce and obtain Native Owned subcontractors for the Northland Reliability Transmission Project.

6.2.2 Alexandria to Big Oaks

The Alexandra to Big Oaks project includes the installation of a second 345-kV circuit on the open (spare) position on the existing CapX2020 transmission line structures between the Alexandria and Monticello Substations. It will interconnect near the crossing of the Mississippi River at the new Big Oaks Substation. This project is part of a larger, approximately 239-mile, project extending from eastern South Dakota to central Minnesota. Construction of concrete foundations started in 2025, and the project is expected to be in service in 2027.[14]

6.2.3 MISO Tranche 2.1

On December 12, 2024, MISO's board of directors approved Tranche 2.1 of their LRTP. This plan is a high-voltage buildout of over 3,600 miles of transmission across eight Midwestern states. GRE is involved in three projects.

6.2.4 Lakefield to Pleasant Valley to North Rochester

This project consists of a 160-mile, 765-kV line from Jackson County to Mower County to Goodhue County in Minnesota. The certificate of need application for the project was filed with the MPUC on February 3, 2026.[15]

6.2.5 Maple River to Cuyuna

This project consists of approximately 160 miles of double-circuit capable, 345-kV line from Cass County, North Dakota, to Crow Wing County, Minnesota. The certificate of need application for the project was filed with the MPUC on January 30, 2026. [16]

6.2.6 Alexandria to Bison

This project consists of stringing the second circuit of an existing 136-mile, 345-kV line from Douglas County, Minnesota, to Cass County, North Dakota. The certificate of need application for the project was filed with the MPUC on January 15, 2026.

6.3 Transmission Partners

GRE will co-develop these LRTP projects with ITC Midwest, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, and Xcel Energy. Public engagement for each project started in 2025 with additional outreach planned in 2026. GRE joined Xcel Energy, ITC Midwest, Merjent and HDR Consulting to form a Tribal Subcommittee specific to the PowerOn Midwest Transmission Project. This subcommittee is charged with tribal outreach, ongoing communication, Tribal Employment Rights Ordinance Offices (TERO) coordination, workforce planning and Tribal leader meetings to gather input into route design and potential project partnerships.

6.4 Maximizing existing transmission capacity

GRE has multiple ongoing efforts to maximize capacity of the existing transmission grid in conjunction with its power supply. A pilot project launched between GRE and Heimdall Power received global recognition as the energy tech company's "Neurons" were included among *Time* magazine's "Best Inventions of 2025."[17] The Neuron is a sphere-shaped transmission line rating sensor that collects real-time information about the line and its environment with the goal of increasing transmission capacity, or the amount of electricity that can flow down the line. In 2024, GRE installed 87 Heimdall Neurons on 10 transmission lines spanning 175 miles of monitored grid to unlock additional transmission capacity beyond static seasonal line ratings. After 12 months with the dynamic line

[14] https://www.alexandriatobigoaks.com/
[15] https://www.poweronmidwest.com/
[16] https://mrctransmissionproject.com/
[17] https://time.com/collections/best-inventions-2025/7318346/heimdall-power-neuron/

rating sensors at work, GRE and Heimdall Power released a report of the results, including the findings that GRE unlocked up to 63% more transmission capacity during peak demand and projects $3 million in avoided congestion costs over five years. These benefits are especially critical in an era of rising demand, aging infrastructure, and increasingly extreme weather.

GRE also began a pilot project with Prisma Photonics to deploy its PrismaPower monitoring technology across approximately 90 miles of transmission lines in Minnesota.[18] This multi-year project will implement Prisma's technology solutions across five critical transmission lines connected to four substations through fiber optic lines to strengthen grid resilience. Unlike traditional monitoring solutions that require installing physical sensors on power lines, Prisma's solutions transform existing optical fiber infrastructure into an advanced sensing system. This approach enables seamless and rapid deployment without service interruption or the need for specialized installation crews. This technology covers every section of the monitored lines in all weather conditions and delivers real-time alerts for various grid events, including electrical faults, physical disturbances, and severe weather conditions with precise location information down to the specific tower. This enhances operators' visibility into grid conditions and enables maintenance crews to respond more efficiently, reducing downtime and improving overall grid reliability.

GRE also conducted and coordinated Minnesota's first grid-enhancing technology (GETs) study on behalf of the Minnesota Transmission Owners and Grid North Partners in 2025. The study, mandated by enhancements to Minnesota Statutes Section 216B.245 passed in 2024, analyzed historical and forward-looking congestion trends to evaluate the cost-effectiveness of mitigation technologies including dynamic line ratings (e.g., Heimdall Neurons), advanced power flow controllers, advanced conductors, and traditional transmission and substation equipment upgrades. The study identified 30 solutions which will be developed by Minnesota transmission owners over the next three years to reduce congestion. This 2025 GETs study is built upon a 2022 study conducted by GRE for Grid North Partners which identified 19 congestion-reducing solutions and gained national attention for the collaborative approach between transmission owners. This study also accounts for power supply assets and locations. The 2025 GETs study was included as Appendix B to the 2025 Biennial Transmission Projects Report.

7 Beneficial Electrification and Energy Efficiency

Member-consumers such as homeowners, renters, small businesses, commercial, agricultural, and industrial, serve as the bedrock of the member-owned cooperative business and governance structure. As a member-owned cooperative with a democratically elected board of directors, these member-consumers drive all decisions made by GRE and its member-owners. GRE's portfolio of energy efficiency and beneficial electrification programs provide cost-effective means of delivering energy services, as well as cost savings to member-consumers while playing a key role in the decarbonization of Minnesota's economy. Residential consumers account for 83% of total accounts and 55% of the energy sales across the GRE membership. These residential consumers are spread across nearly two-thirds of Minnesota. The density of homeowners, contractors, and service providers brings about many opportunities as well as hurdles to deliver cost-effective, coordinated energy efficiency and beneficial electrification programs. Additionally, about 35% of overall energy savings achievements are realized by commercial and industrial consumers, which account for about 15% of total members across the membership.

GRE works with our member-owners to offer a portfolio of energy conservation and efficient fuel switching programs, referred to as beneficial electrification. The foundation of most of the savings' realization and potential are found in heating, ventilation, and air conditioning (HVAC). Energy efficiency projects that are dependent upon HVAC upgrades typically include upgrades, time, effort, and a skilled workforce.

A central focus of our efficiency portfolios is the close relationship GRE's member-owners have with their member-consumers, which creates trust between the cooperative and the member-consumer that eases and streamlines

[18]https://greatriverenergy.com/company-news/great-river-energy-partners-with-prisma-photonics-to-deploy-advanced-grid-monitoring-solution-across-minnesota/

the opportunity for cost-saving beneficial electrification projects. GRE's member-owners market and communicate these programs through annual meetings, monthly newsletters, bill inserts, word of mouth, emails, and many other forms of communication. Many member-owners host events such as electric vehicle ride-and-drives, energy issues events, contractor engagement through breakfasts, meetings, trainings, appreciation days, and regional meetings.

7.1 Historical achievements

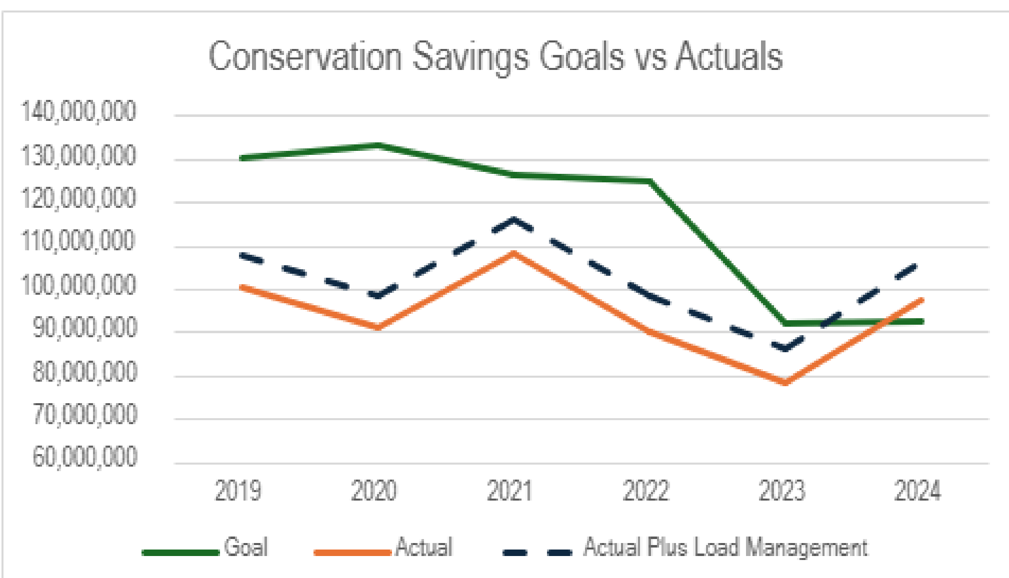
In 2021, the Conservation Improvement Program transitioned to the Energy Conservation and Optimization Act. Now, the energy savings goal consists of 0.9% of energy conservation and 0.6% efficient fuel switching. Energy conservation measures come in the form of projects that reduce energy consumption, whereas efficient fuel switching projects aim to meet criteria set by the Department of Commerce that switch energy consumption from one fuel to another. Those projects might be water heating, air source heat pumps (ASHP), or electric vehicles, among other opportunities.

Opportunities for energy conservation depend on market saturation of products such as lighting, the appetite for commercial investment into energy efficiency, and the density of homeowners, contractors, and service providers provide hurdles and opportunities for energy efficiency.

Beginning in 2019 with the challenges of COVID-19, energy savings actuals have been diminished. In Figure 8, the green line represents the varying goal of Minnesota demand-side realized kilowatt-hour (kWh) savings achievements while the orange line represents actuals. The blue dashed line represents actual goals with load management savings added. Energy policy in Minnesota allows for inclusion of a deemed amount of energy savings per load management event. These savings have not historically been included in actual savings.

In 2024, GRE's member-owners achieved combined energy reductions of nearly 98 million kWh through energy conservation and efficient fuel switching. GRE's annual Department of Commerce approval letters for our Conservation Improvement Program are included in Appendix F. Figure 8 depicts historical AR member achievements 2019-2024.

Figure 8 GRE's Conservation Savings Goals vs Actuals



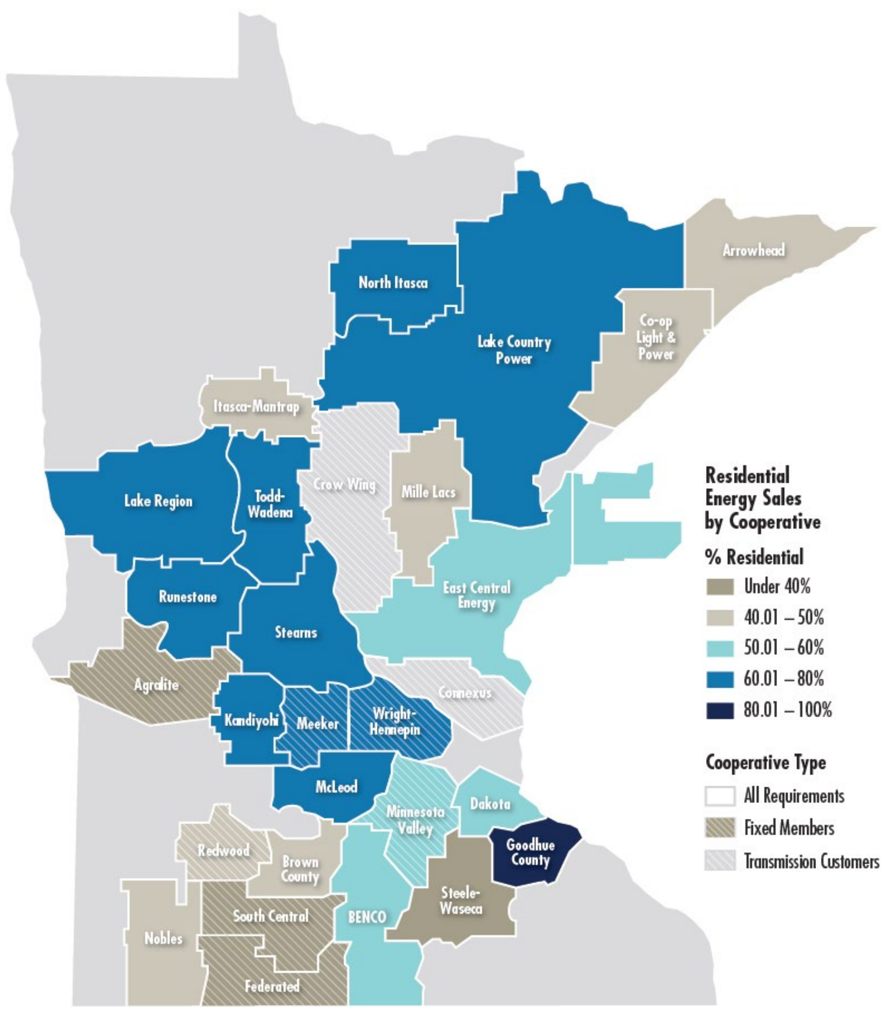
Annual variation in achievements can be expected, especially those reductions made by larger C&I members or utility infrastructure investments which do not always yield a smooth reduction curve as their efficient projects are intermittent. Annual goals also change based on variations in prior year's energy sales.

7.2 End-use members

As shown in Figure 9, GRE's member-owners serve mostly residential end-use consumers. In fact, most of GRE's member-owners have residential sales that are more than 50% of total electricity sales. The portfolio of energy efficiency and beneficial electrification depends on the context where HVAC projects are central to energy conservation and efficient fuel switching savings and the density of projects, homeowners, renters, and contractors are a reality that must be overcome to realize energy savings across most of the land area of Minnesota.

Residential programs require significantly more coordination than C&I programs. For these residential programs, the coordination required can offer both greater motivation for future energy savings and beneficial electrification opportunities, while also decreasing energy savings per home visit. Much of the more cost-effective energy savings measures such as LED lighting have already been implemented, and more beneficial electrification programs such as ASHPs and heat-pump water heaters come with enhanced quality of living and diminished incremental energy savings.

Figure 9 Member residential energy sales 2024



7.3 Beneficial Electrification

The cooperative business model is founded on seven cooperative principles. Two of these principles — economic participation and concern for community — help guide GRE and its members in advancing beneficial electrification. Through this work, member-consumers can participate in programs that deliver both individual and community benefits, including demand response (DR), incentivized electric rates, and lower energy bills. Beneficial electrification has evolved over time, from electric washers and dryers, refrigerators, and space heating to newer technologies such as electric vehicles, heat pump water heaters, ASHPs, and battery storage.

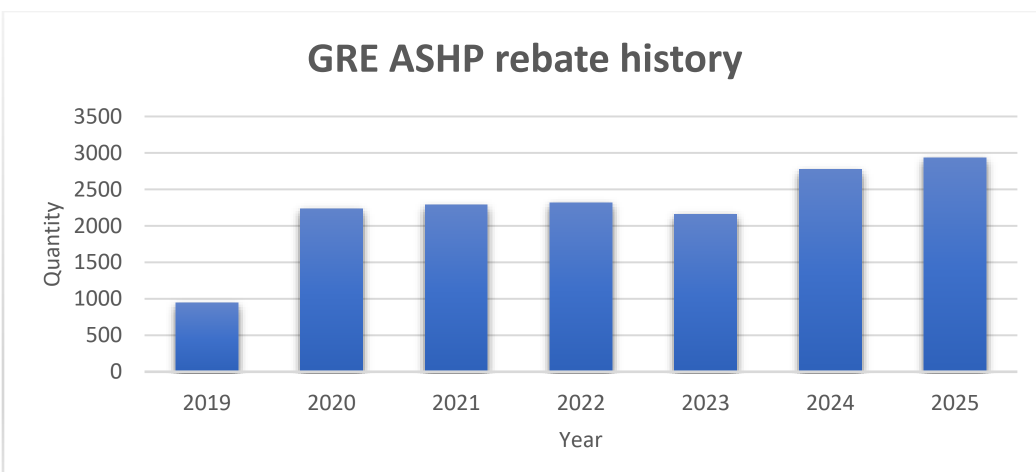
In the cooperative business model, beneficial electrification is often paired with a lower electric rate to pass the communal benefits onto the individual member-consumer. These programs, including interruptible water heating, dual fuel, electric vehicle charging, and many more, shift energy consumption to less costly times and provide wholesale and distribution benefits. Beneficial electrification combined with demand side management programs offer a program that is greater than the sum of its parts.

7.4 Air-Source Heat Pumps

ASHPs provide economic and energy-saving benefits to end-use members, and GRE is actively working to increase ASHP adoption across its member-owners' service area. GRE's efforts include sponsoring the Minnesota ASHP Collaborative, which has helped expand ASHP education for members and contractors. Through this partnership, GRE supports member communications and marketing, evaluates ASHP market potential, and helps train contractors on load management connections, new technologies, and utility rebates.

GRE member-owners also provide significant rebates for ASHP systems through the State's Energy Conservation and Optimization (ECO) program. Since 2020, GRE member-owners have provided rebates to their end-use consumers for nearly 15,000 ASHPs, and adoption continues to grow (Figure 10). In addition, member-owners offer off-peak rates and programs that help make ASHP heating and cooling a low-cost option in the rural communities they serve. GRE is preparing for continued growth in ASHP installations across its member-owner systems.

Figure 10 ASHP rebates on an annual basis



7.5 Water Heating Programs

GRE and member-owners offer many different water heating programs, including electric thermal storage and peak shave in addition to general coordination and assistance in electric water heating. Many member-owners host contractor lists, some are water heater distributors, and others have electricians that will assist in connecting load management wiring to the water heaters or will wire the water heaters. Heat pump water heating programs are being pursued, and there is significant market research still being conducted to understand the efficacy and market saturation potential of these recent technologies. Member-owners offer significant rebates for heat pump water heaters, and GRE continues to monitor trends and uptake in coordination with members-owners, wholesale water heater distributors, and researchers.

7.6 Electric Vehicles

In 2023, GRE signed on to be a founding utility partner for EVs2Scale, an initiative led by the Electric Power Research Institute (EPRI) and has since added an electric cooperative voice to discussions among critical stakeholders as electric vehicle (EV) goals target 50% market share by 2030. GRE continues to be active with a variety of market stimulation, education, and awareness campaigns, and direct incentive offerings for on-road and off-road electric transportation and the associated charging infrastructure. GRE and our member-owners offer EV-specific rates for both residential and commercial EV charging that encourages flexible and off-peak charging with the build out of EV infrastructure

To advance our EV objectives, GRE is continually active with our member-owners in sponsoring demonstration projects and events for fleet EVs, electric forklifts, ride and drive events, and various EV related educational activities in greater Minnesota.

8 Energy Conservation

Minnesota's Energy Conservation and Optimization (ECO) program (formally CIP) reflects the state's long-standing policy that cost-effective energy savings are a preferred energy resource and should be pursued aggressively to reduce customer costs, defer new utility infrastructure, and reduce emissions. Under this framework, utilities develop and implement conservation portfolios subject to oversight by the Minnesota Department of Commerce, with statutory energy-savings goals that guide program design and performance. As a result, conservation and other demand-side measures remain an important component of utility resource planning in Minnesota. GRE's 2024 ECO approval letters can be found in Appendix F.

8.1 Primary Drivers

In years past, lighting had been the primary driver of commercial, industrial, and agricultural (CI&A) energy savings. New lighting efficiency opportunities have dramatically diminished due to historical projects, changes in policy, and lighting technology ubiquity. Today, a mix of various technologies make up the energy savings portfolio.

ASHPs are today's main source for residential energy conservation. As shown in Figures 11 and 12, GRE and our member-owners implemented about 25% of C&I energy savings in 2024 from lighting projects. This was driven in large part by the reductions in the cost of LED technologies and the wider availability of this technology for end use applications, but also due to the widespread historical installation of lighting projects. Residential lighting programs were dramatically changed in 2021 through the elimination of new construction lighting energy savings. In the residential sector, only retrofit lighting projects qualify as energy savings. This has had a great impact on savings opportunities as the GRE membership is largely residential. Through this change, ASHPs have taken prominence as the greatest driver to energy savings. This change is demonstrated in Figure 12 with 63% of total residential energy savings realized from ASHP technology.

Figure 11 Commercial energy savings – 2024 top programs

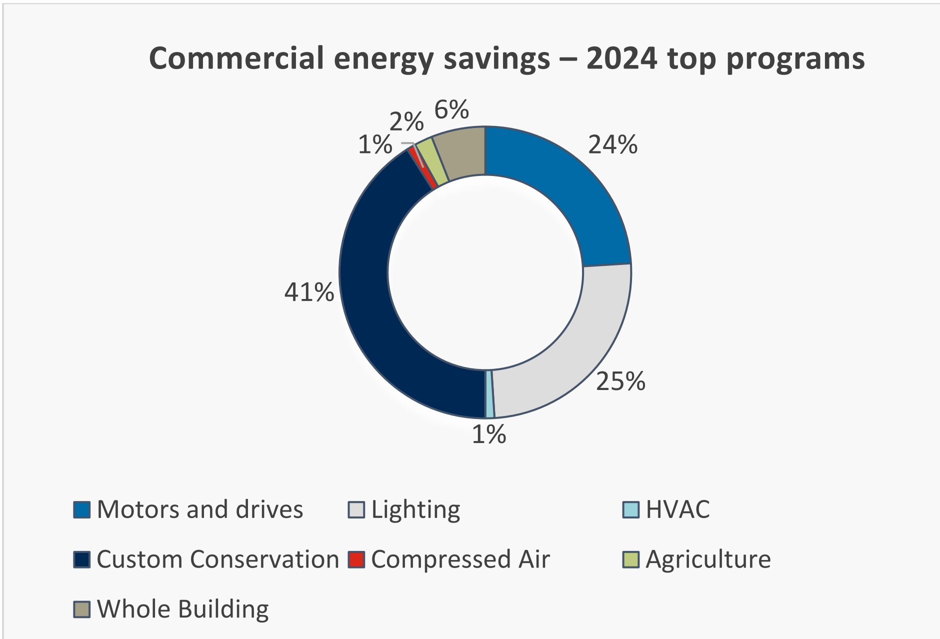
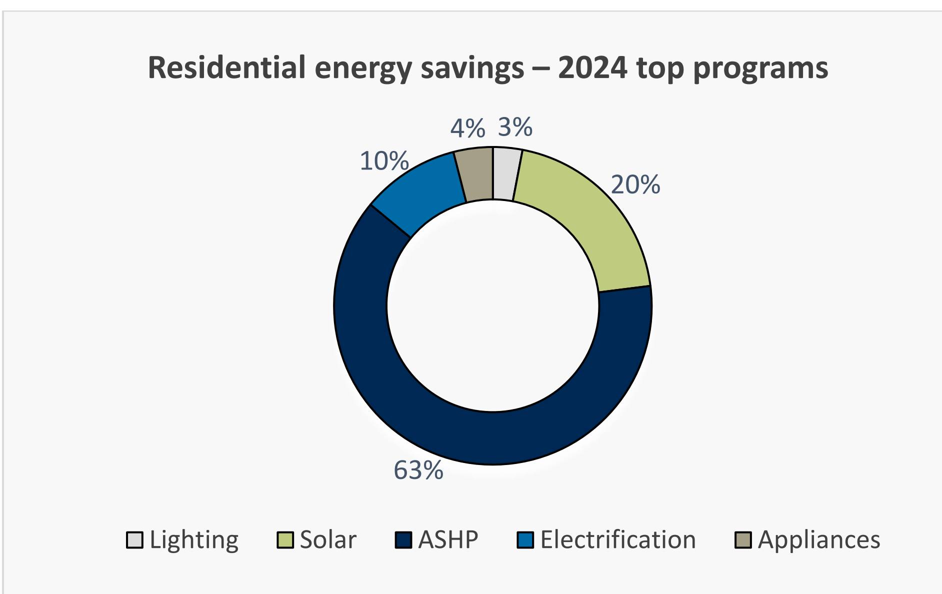


Figure 12 Residential energy savings – 2024 top programs



8.2 Energy efficiency programs

Energy efficiency programs are based on the idea that, without rebates or incentives, customers may choose a lower-efficiency product because of its lower upfront cost. These policies were created to reduce or offset the added cost of a higher-efficiency product and encourage its adoption.

GRE's energy efficiency programs use an "all of the above" approach to member energy efficiency engagement. The total program is made up of five components:

- **Equipment incentive programs**
  GRE's portfolio of programs provides rebates to member-consumers for equipment that exceeds current federal efficiency standards. Incentive levels depend on available budget and the commercial maturity of the technology. As technologies mature, markets evolve, and efficiency opportunities change, rebate levels for certain equipment may be adjusted.

- **Consumer behavior programs**
  Consumer behavior programs focus on educating member-consumers about their energy use and providing relevant comparisons that seek to illustrate ways in which the member-consumer can reduce their consumption and lower their overall cost of energy. Member-owners highlight energy efficiency programs and behavioral adaptations in monthly newsletters, annual meetings, and events such as community events, energy issues forums, and contractor training. These events and engagement highlight the opportunities for equipment like smart thermostats, ASHPs, time of use rates, and residential demand billing to drive even further savings for member-consumers.

- **Supply-side efficiency**
  GRE will look for supply-side efficiency opportunities as the cooperative continues to upgrade the transmission system. In 2024, GRE partnered with Heimdall to install "power neurons" to assist GRE in determining dynamic line ratings for existing transmission lines.

- **Market transformation**
  GRE's long history of rebate programs, marketing and communications, and contractor engagement alongside our member-owners has resulted in member-consumers who are familiar with the benefits associated with these sorts of investments. As the market share of energy saving technologies has expanded, many members have adopted these technologies without taking advantage of rebate programs.

- **Innovation**
  GRE is a leading anchor in the Air Source Heat Pump Collaborative, a partner with Minnesota Center for Energy and Environment. This relationship has expanded into a heat pump roof top unit program for commercial applications as well as a lighting control opportunity. GRE has partnered with ZeroHomes, a software company that coordinates sizing, contractor scheduling, and equipment delivery to streamline energy efficiency projects such as heat pumps. GRE also partners with many organizations such as Frontier Energy, Wildan, and the Center for Energy and Environment to module and demonstrate specific or potential energy savings.

- **Demand response**
  GRE's robust DR efforts are focused on modifying the load curve during the periods of monthly peak demand, as well as ongoing efforts to cost effectively shift end uses to less costly consumption periods. The effort to shift end uses to off-peak periods is most pronounced in the areas of electric storage water heating and EV charging efforts.

GRE plans the following energy efficiency program activities throughout the five-year action plan:

- Survey of members in 2026 regarding key electric uses within homes and businesses
- Participate in research to further characterize energy efficiency end-use technologies, including the expansion of the efficient fuel switching and load management opportunities under the Energy Conservation and Optimization Act
- Work with members to identify and market new programs that improve awareness of energy consumption and conservation, increase the adoption of efficient end-use technologies where practical, and minimize rate impacts
- Further evaluate the efficiency opportunities within our member-owners' service territories.

While GRE and its members are committed to achieving the energy-efficiency goals that have been established by the state of Minnesota, there are several challenges that could adversely affect the realization of these savings. Broadly speaking, these challenges fall into several categories:

- Rural, residential nature of GRE's service territory
- Advancements in codes and standards, which limit both the number of opportunities and the incremental energy benefit associated with those opportunities
- Market transformation of efficient technologies
- End users' investment appetites

More than 80% of GRE members' end users are rural. Today, there are fewer residential energy savings opportunities due to continued improvements to building codes, historical installations of energy saving equipment such as efficient lighting and appliances, appliance standards, and limited new home construction in Greater Minnesota. Additionally, nearly 80% of Minnesota residential cooperative members have income levels below the state average. This complex reality limits consumer investment in costly home projects solely for energy conservation and beneficial electrification.

9 GRE's 2026-2040 Integrated Resource Plan

In Minnesota, utilities are required to file an IRP approximately every two years. The IRP is a long-term strategic tool that assesses how we will meet future energy needs while balancing reliability, cost, and environmental goals.

The IRP runs multiple scenarios based on inputs and sensitivities. These include a range of power supply resources, fluctuating resource costs, forecasted energy demand, and regulatory compliance factors. By analyzing these variables, the IRP produces a range of scenarios to guide decision-making.

This IRP cycle brings new opportunities and challenges. Like other Minnesota utilities, GRE uses the IRP process to inform our member-owners, the public, and other stakeholders about potential future resource paths. While advisory for cooperatives, the process is key to shaping our collective energy future. Great River Energy is committed to delivering a thoughtful and robust resource plan. We look forward to providing this IRP to our member-owner cooperatives and the Minnesota Public Utilities Commission, ensuring we chart a clear, strategic path as we plan for the future of our power supply.

9.1 Challenges and Opportunities

The challenges in this resource plan stem from a dynamic resource cost environment driven by supply-demand fluctuations, and the potential for significant load growth within our member-owners' service territories. Furthermore, the current volatility of capital equipment costs, evolving regulatory frameworks, and environmental standards add complexity. In response, GRE has developed over 60 sensitivity scenarios, encompassing a wide range of potential futures. This broad analysis provides a comprehensive foundation to guide our member-owners in making informed resource decisions for the future.

One opportunity reflected in this IRP is the growing role of energy storage in GRE's resource selection. While storage has not yet been widely deployed in MISO, advances in technology and operating experience in other markets support its inclusion in this IRP. Storage broadens the set of options available to meet future portfolio needs by providing highly accredited capacity, energy arbitrage, and ancillary services. This IRP also updates how LMRs and DSM resources are incorporated into the modeling framework, further expanding the tools available to provide flexibility and meet future system needs.

GRE's 2026-2040 IRP provides an opportunity to reflect on two decades of power supply decisions, reaffirming that our past strategic direction anticipated an evolving energy landscape. This IRP continues to reflect GRE's current power supply portfolio, balancing dispatchable resources to provide capacity with renewable resources to supply energy, resulting in a resilient portfolio, and a continued focus on affordability, reliability, and sustainability.

9.2 Public Outreach and Member Engagement

As GRE develops this 15-year IRP, we remain committed to incorporating input from our members, the public, and other interested stakeholders.

In January of 2026, GRE held open house meetings in Maple Grove, Grand Rapids, and Mankato, inviting participation through notifications on social media, newsletters, and member communications, as well as a filed notification with the Minnesota Public Utilities Commission. These sessions allowed attendees to ask questions and share their perspectives directly with our resource planning team.

Each open house was staffed by between 5-8 GRE staff, including experts on topics such as modeling, forecasting, cooperative membership, transmission, and resource strategy.

Key themes emerged from these discussions. Participants focused on rising energy costs and reliability, balancing affordability with environmental compliance, regional transmission initiatives, and future power supply options. We also discussed GRE's process for reviewing and modeling the potential impacts of new large-loads, like data centers, as well as demand-side management optimization and energy efficiency goals. Furthermore, we discussed the history of electric cooperatives in Minnesota, the role our membership plays in selecting and approving our 15-year Preferred Plan, and how the cooperative process differs from an investor-owned utility.

In addition to the three public open houses, GRE has provided ongoing presentations and updates on IRP analysis results to the board of directors, member managers, and the joint member advertising and communications team.

GRE's public outreach and member engagement efforts provided meaningful insights and raised concerns that are directly addressed in this IRP. This process helped GRE refine scenarios and focus on the issues that matter most to members. This is not a one-time effort, and GRE remains committed to ongoing collaboration as future needs evolve. The feedback gathered through this engagement will continue to shape GRE's planning and decision-making. Summary information on GRE's public engagement open house meetings can be found in Appendix C. External Collaboration

As part of GRE's power supply planning process, we regularly collaborate with external experts, including professional institutions and working groups, original equipment manufacturers, software developers, and MISO subcommittees focused on energy, capacity, and reliability. We also engage with emerging energy technology startups to stay current on new developments. Together, these collaborations help ensure the IRP is informed by current perspectives and built on the best available data and analysis. Below are some of the key industry partners and expert organizations that contributed to the development and refinement of GRE's IRP.

9.2.1 Minnesota Utilities

GRE regularly collaborates with resource planning representatives from electric utilities across Minnesota. This group meets quarterly, rotating among utilities, with each host setting the agenda and leading that quarter's discussion. Meetings focus on timely resource planning issues and provide a forum to discuss emerging trends, regulatory changes, technology readiness, and cost considerations. The group also shares best practices in modeling, approaches to externality and environmental costs, and evolving MISO reliability standards.

9.2.2 The Electric Power Research Institute

The Electric Power Research Institute, or EPRI, was founded in 1972 as a nonprofit organization focused on advancing safe, reliable, affordable, and environmentally responsible electricity[19]. EPRI conducts research on all parts of the power system, working with hundreds of companies worldwide. GRE has been an EPRI member for over 25 years, actively participating in numerous EPRI programs. Our engagement with EPRI is mutually beneficial. We gain valuable insights from EPRI's research and contribute our expertise and industry knowledge while collaborating with other utilities. The programs in which GRE is regularly involved include:

- Gas turbine life cycle management
- Cyber security for generation assets
- Air quality and multi-media assessments
- Groundwater and land management
- Transmission asset management
- Transmission line management
- Transmission planning
- Bulk system integration of renewables and DER
- Resource planning
- Energy storage and distributed generation
- DER integration
- Distribution operations and planning
- Electrification
- Electric transportation
- Telecommunications (ICCS)
- EVs2Scale2030
- Artificial intelligence (OpenAI)

9.2.3 External Expert Collaboration

In shaping our IRP and power supply strategies, GRE also collaborates with external industry experts, including OEMs and power developers, who keep us informed on current pricing, delivery timelines, and resource availability. We also partner with leading analytical firms such as LevelTen Energy, The Brattle Group, PowerGEM, Ascend Analytics, Yes Energy, and ACES Power Marketing, along with MISO market specialists like Priority-Based Generation Control Engineering. These collaborations help validate our assumptions and ensure the robustness of our modeling.

10 Energy and Demand Forecasting

As part of this IRP, GRE developed and evaluated multiple load forecast scenarios to reflect a range of potential outcomes associated with emerging large load additions. These scenarios include a Legacy Forecast that reflects GRE's traditional load growth assumptions without additional large load growth, such as new data centers. GRE developed three additional scenarios that incorporate varying levels of potential large load growth: a Base Case that includes an additional 400 MW of large load, a Medium Case that includes 900 MW, and a High Case that includes 2,700 MW of large load growth. After evaluating these scenarios, GRE determined that the Base Case represents the most likely planning assumption at the time of this filing. While GRE's members could reasonably see a higher or lower amount of large load development, the 400 MW level is the most probable at the current time. The Base Case forecast was developed by layering the projected timing of 400 MW of large load additions on top of our Legacy Forecast to reflect the anticipated pace of new large load additions within GRE's members' service territories. The High Case scenario represents a future in which additional large load inquiries come to fruition.

10.1 Forecasting Software

GRE develops its advanced load forecasts using Itron's suite of utility forecasting software, including Forecast Manager, MetrixND, and MetrixLT.[20] These tools support detailed analysis of historical load patterns, weather sensitivity, and economic drivers, enabling GRE to develop long-range energy and demand forecasts. Itron is widely

[19] https://www.epri.com/
[20] https://na.itron.com/en

used across the electric utility industry and is recognized as a leading provider of forecasting and analytics platforms designed specifically for utility planning and load analysis. The use of these tools allows GRE to apply industry-standard methodologies when developing its long-term load forecasts.

10.2 Collaboration with the Minnesota Department of Commerce

On June 11, 2024, the Minnesota Public Utilities Commission issued an Order accepting GRE's 2023-2037 Integrated Resource Plan. The order included future filing requirements to be addressed in our next IRP. Order Points 1 and 2 directly addressed GRE's forecast development.

> *1. The Commission accepts Great River Energy's preferred resource plan with the understanding that GRE's forecasts in this proceeding do not demonstrate need sufficiently to justify the grant of a Certificate of Need for a large energy facility under Minnesota Statutes § 216B.243.*
>
> *2. Before filing its next resource plan, GRE shall work with the Minnesota Department of Commerce to address forecasting issues.*

On October 2, 2025, Great River Energy met with the Minnesota Department of Commerce (Department) and delivered a presentation intended to address the issues that had been raised and to facilitate further discussion (Appendix L). Key topics included:

- **Statistically Adjusted End-use Forecasting**
  In 2020, GRE transitioned to a superior forecasting product for the current day - Statistically Adjusted End-Use (SAE) forecasting methodology. SAE combines end-use modeling with statistical adjustments, differing from traditional econometric methods by focusing on end-use patterns, not just macroeconomic variables, which have broken down over the last 15 years as defensible independent variables to predict energy and demand patterns. Because SAE forecasting requires specialized methods and the Department did not have access to GRE's specific software, the Department would have had to recreate numerous models and was not capable of replicating GRE's forecast in a reasonable manner. Thus, GRE and the Department explored econometric approaches and settled on a tailored methodology that aligns with GRE's SAE practice, but reduced the analytical workload involved for the Department, ensuring forecasts are accessible and replicable.

- **Forecasting Electric Vehicle Adoption**
  In GRE's 2023–2037 IRP, GRE utilized the U.S. Energy Information Administration's Annual Energy Outlook (AEO) 2021 for projected EV adoption rates. By the time the IRP underwent regulatory review, newer outlooks had been published. As part of the Minnesota Public Utilities Commission's acceptance order, GRE submitted a supplemental filing incorporating AEO 2023 data. This update refined our EV adoption forecasts and expanded growth rates to include both light-duty vehicles and trucks.

  In this IRP, GRE incorporated data from EPRI's EVs2Scale2030 initiative, which focuses on grid readiness, infrastructure planning, and EV load forecasting.[21] As a contributing member, GRE found this data well-aligned with evolving grid conditions. While we previously utilized AEO projections, this plan marks a shift to EPRI's dataset, reflecting a complementary perspective on EV adoption trends.

During our October 2025 meeting, GRE and the Department agreed that GRE would provide access to a shared folder containing its most current Advanced Forecast. Providing the Department with access to these materials allows staff the opportunity to review the forecasts and discuss any questions or concerns with GRE prior to the filing of this IRP. In January of 2026, GRE provided the Department with a link to a shared folder including the Advance Forecast utilized in this IRP (Appendix D).

[21] https://www.epri.com/evs2scale2030

10.3 GRE AR and Fixed Members

GRE's serves 26 member-owner cooperatives comprised of 19 AR members and 7 Fixed members. AR members rely on GRE to meet all their current and future power supply needs. For Fixed members, the amount of power supplied by GRE remains constant, and any additional power supply needs are met through other suppliers. Fixed members continue to share the costs and benefits of their allocated portion of GRE's power supply portfolio based on the date their requirements became fixed.

10.4 Forecast Development

GRE's IRP forecasts extend from January 2026 through December 2040. The forecasts are developed in three phases:

1. GRE's AR member-owner cooperatives' hourly forecasts are developed based on class monthly sales and the AR system load.
2. Then, GRE's fixed member-owner cooperatives' hourly forecasts and other major adjustments are developed based on known fixed obligations.
3. Finally, external forecasts for EVs and behind-the-meter photovoltaics (PVs) are created.

The results from these three phases are aggregated to create our final hourly system forecast. These three main modeling processes are summarized below.

- **AR forecast**

  The IRP forecast begins with developing the long-term energy forecast for GRE's AR cooperatives. This forecast combines three modelling processes. First, the monthly class sales forecast is developed by modelling individual class sales and combining the results into the monthly AR system forecast. Second, the AR system peak forecast is developed by modelling the AR monthly peaks. Third, the AR system shape forecast is developed by modelling the AR system hourly load shape. The three forecasts are combined by calibrating the system shape forecast to the monthly sales and peak forecasts. The result of this process is the hourly forecast for AR cooperatives.

- **Fixed and other adjustments**

  The hourly forecast is then adjusted to reflect the impacts of Fixed Members, Dakota Spirit Ag, Alliant, and transmission losses. For each of these components, hourly shapes are developed and calibrated to the monthly energy forecasts, so the final hourly forecasts reflect those expected impacts.

- **Electric vehicles and photovoltaics**

  The forecast is adjusted for two major uncertainties: EVs and behind-the-meter PVs. Hourly shapes for these factors are calibrated to monthly forecasts to create the hourly forecasts.

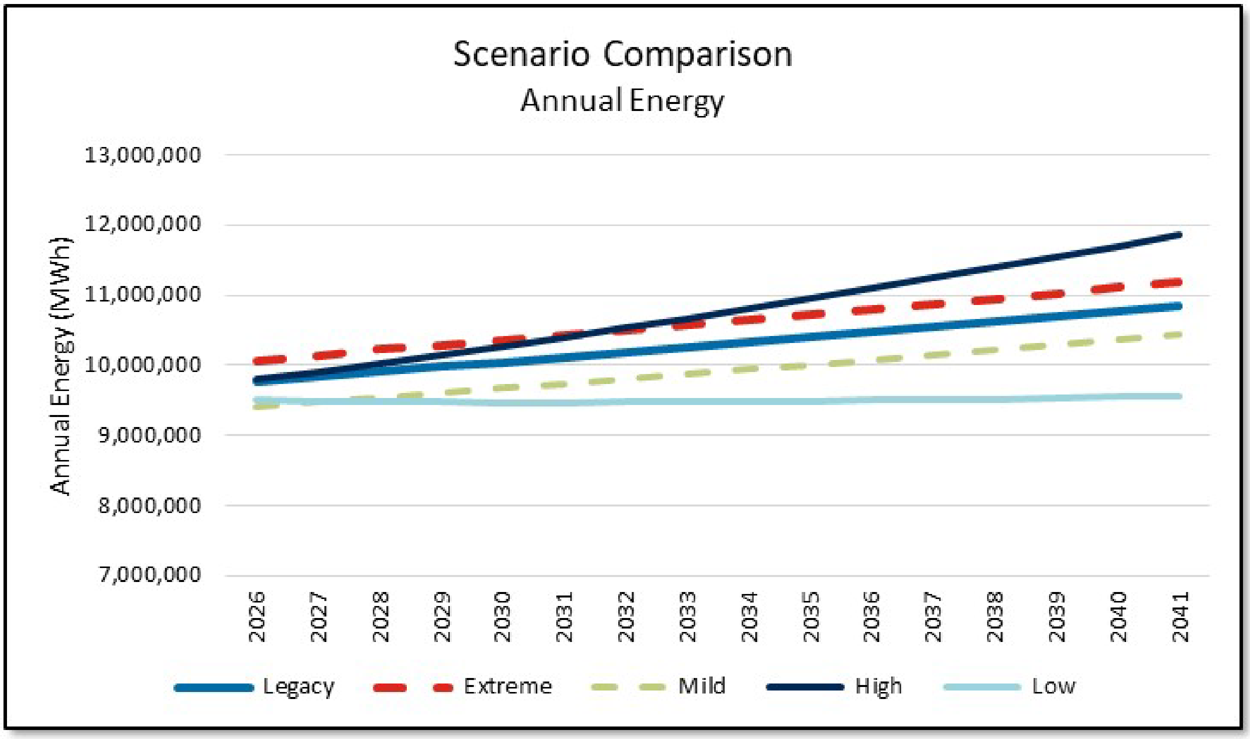
These three main modeling results are combined to develop GRE's hourly Legacy Forecast. This forecast captures the impact of economic drivers, weather, and load shapes. GRE then developed our Base Case forecast by integrating the anticipated timing of 400 MWs of large load growth into the Legacy Forecast to represent probable additions within GRE's member systems.

10.5 Forecast Results – Legacy Forecast

- **Energy**

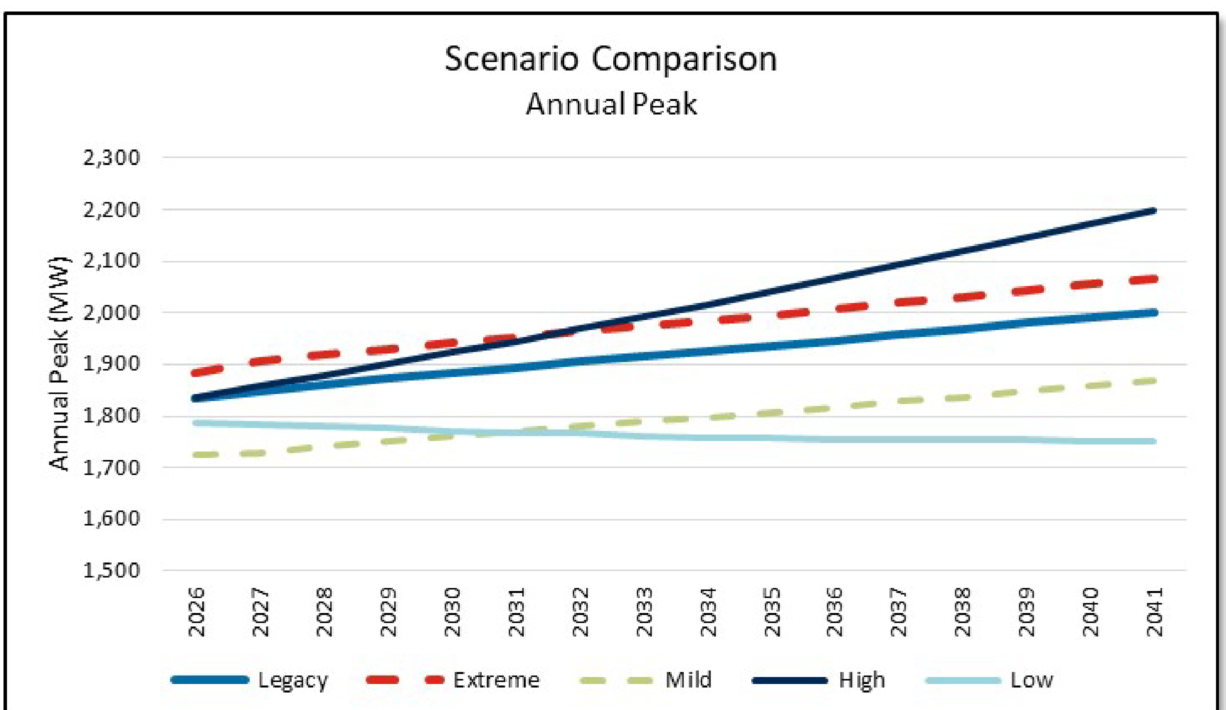
  Energy utilization in GRE's Legacy Forecast increases from 9,766 GWh in 2026 to 10,772 GWh by 2040: a compounded annual growth rate (CAGR) of 0.70%. Weather sensitivities (mild weather and extreme weather) and economic sensitivities (high growth and low growth) create a forecast band around the Legacy Forecast, ranging from about 9,550 GWh to 11,700 GWh in 2040 (Figure 13). The Legacy Forecast's energy and these respective sensitivities become the foundation for the IRP's Base Case forecast.

Figure 13 GRE's Legacy Forecast with Sensitivities - Energy



- **<u>Demand</u>**
  Demand utilization in GRE's Legacy Forecast increases from 1,834 MW in 2026 to 1,991 MW by 2040: a CAGR of 0.59%. Weather sensitivities (mild weather and extreme weather) and economic sensitivities (high growth and low growth) create a forecasted band around the Legacy Forecast, ranging from about 1,750 MW to 2,190 MW in 2040 (Figure 14.) The Legacy Forecast's demand and these respective sensitivities become the foundation for the IRP's additional large load growth scenarios.

Figure 14 Legacy Forecast with Sensitivities - Demand



10.6 Incremental Large Load Growth

The potential for new large load growth is primarily driven by emerging data center development in GRE member service territory. This potential growth represents a level of uncertainty that is not captured within GRE's Legacy Forecast. Because these loads can materialize rapidly and increase system energy and demand requirements, we developed dedicated large load-growth scenarios to evaluate a wide range of their possible impacts on energy and capacity needs, infrastructure planning, and long-term resource adequacy.

Rapid growth in artificial intelligence and data center development is creating new opportunities across GRE's member-owners' service territories. These facilities can provide meaningful economic benefits to local communities, including construction activity, long-term employment, and increased tax revenues that support schools and public infrastructure. At the same time, large new loads raise important considerations related to energy consumption, potential impacts to member rates, and land and natural resource use.

GRE and its member-owners are actively evaluating these opportunities and risks in parallel with this IRP. We are working with our members and potential customers to determine how much of this anticipated load growth will be incorporated into GRE's AR pool and how much energy and demand will be supplied by the prospective customers. Today, GRE has committed to serving a portion of this large load growth, and requiring potential customers to bring additional resources desired to serve their terminal load ramps, funded themselves. This strategy is expected to provide some service to large loads, but largely internalizing power supply costs, protecting GRE members that are not experiencing growth.

GRE's IRP Base Case scenario combines our Legacy Load and 400 MWs of additional growth. The Base Case represents GRE's most current assessment of probable large load growth (Figure 15 and Figure 16). GRE modeled the above-mentioned Legacy Load sensitivities around our Base Case scenario as well as Commission-required regulatory and externality cost sensitivities.

Figure 15 IRP Base Case - Energy

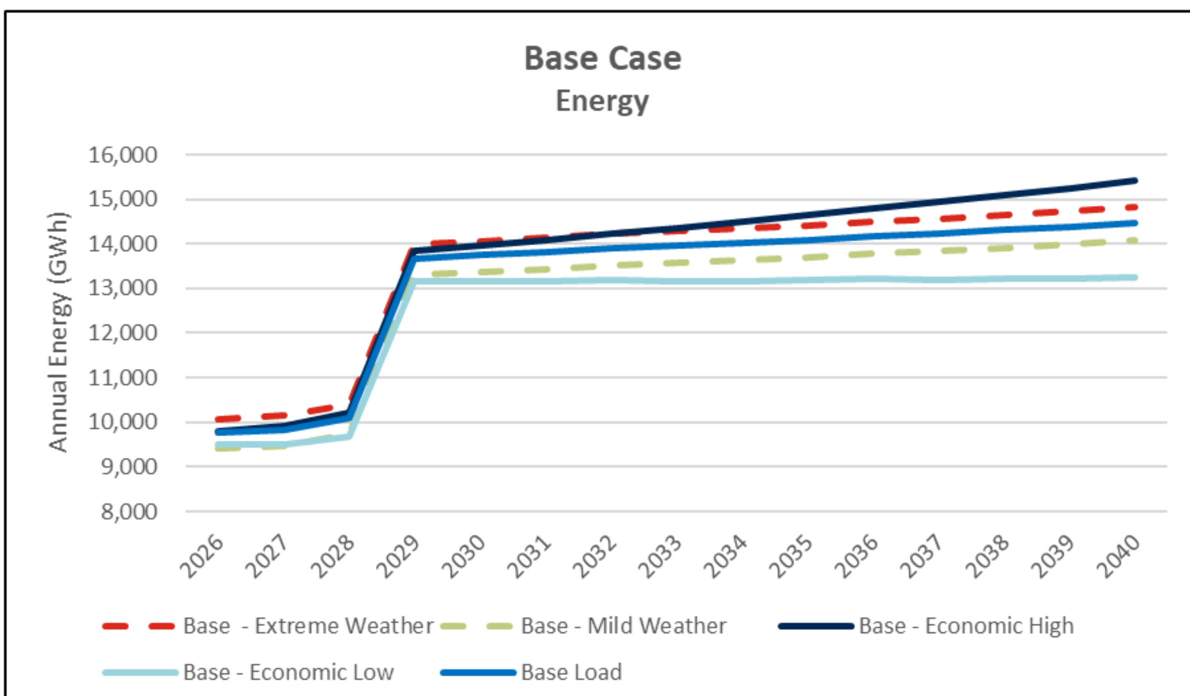
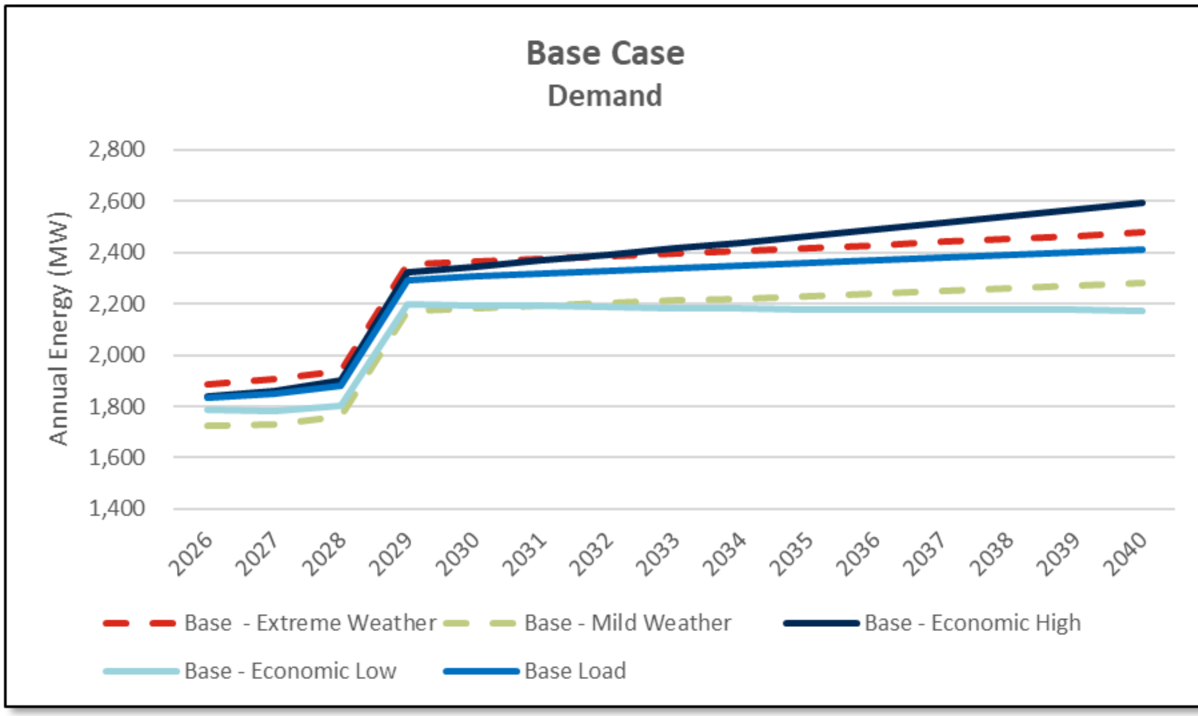


Figure 16 IRP Base Case - Demand



10.6.1 Final IRP Load Growth Scenarios

After analyzing sensitivities around our IRP Base Case forecast, we modeled the additional Medium Load Forecast (Legacy Load +900 MW); and High Load Forecast (Legacy Load +2,700 MW). The final summary of GRE's four energy and demand load growth scenarios modeled in this IRP are displayed below (Table 3, Figure 17 and Table 4, Figure 18.)

Table 3 IRP Legacy, Base, Medium, High Forecasts - Energy

System Forecast Summary (GWh)								
Year	Legacy Load	Base Load	Base - Extreme Weather	Base - Mild Weather	Base - Economic High	Base - Economic Low	Mid Load	High Load
2026	9,766	9,766	10,069	9,404	9,798	9,502	9,766	9,766
2027	9,838	9,838	10,144	9,473	9,911	9,489	9,838	9,838
2028	9,912	10,098	10,407	9,729	10,217	9,669	10,376	10,376
2029	9,976	13,673	13,985	13,301	13,843	13,171	15,983	15,983
2030	10,046	13,743	14,058	13,368	13,965	13,168	16,516	16,516
2031	10,117	13,813	14,131	13,435	14,093	13,167	17,510	17,510
2032	10,191	13,898	14,218	13,517	14,240	13,182	18,531	21,312
2033	10,255	13,952	14,275	13,568	14,360	13,170	18,573	25,042
2034	10,324	14,021	14,346	13,634	14,497	13,174	18,642	28,808
2035	10,396	14,093	14,419	13,703	14,639	13,182	18,713	31,652
2036	10,474	14,181	14,509	13,788	14,799	13,206	18,814	34,568
2037	10,543	14,240	14,570	13,844	14,933	13,204	18,861	35,496
2038	10,617	14,314	14,647	13,915	15,083	13,217	18,935	35,570
2039	10,692	14,389	14,723	13,987	15,237	13,232	19,010	35,645
2040	10,772	14,479	14,815	14,074	15,407	13,262	19,113	35,794
5YR CAGR (2026,2031)	**0.71%**	**7.18%**	**7.01%**	**7.40%**	**7.54%**	**6.74%**	**12.39%**	**12.39%**
10YR CAGR (2026,2036)	**0.70%**	**3.80%**	**3.72%**	**3.90%**	**4.21%**	**3.35%**	**6.78%**	**13.47%**
15YR CAGR (2026,2040)	**0.70%**	**2.85%**	**2.80%**	**2.92%**	**3.29%**	**2.41%**	**4.91%**	**9.72%**

Figure 17 IRP Legacy, Base, Medium, High Forecasts - Energy

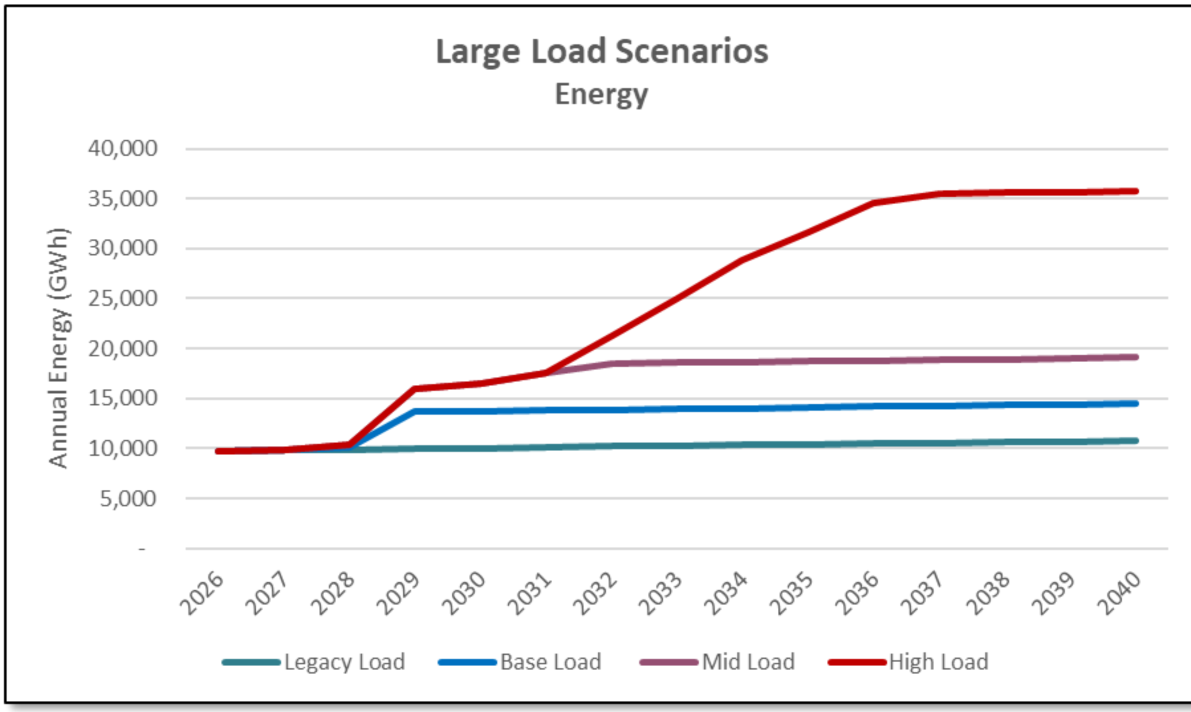
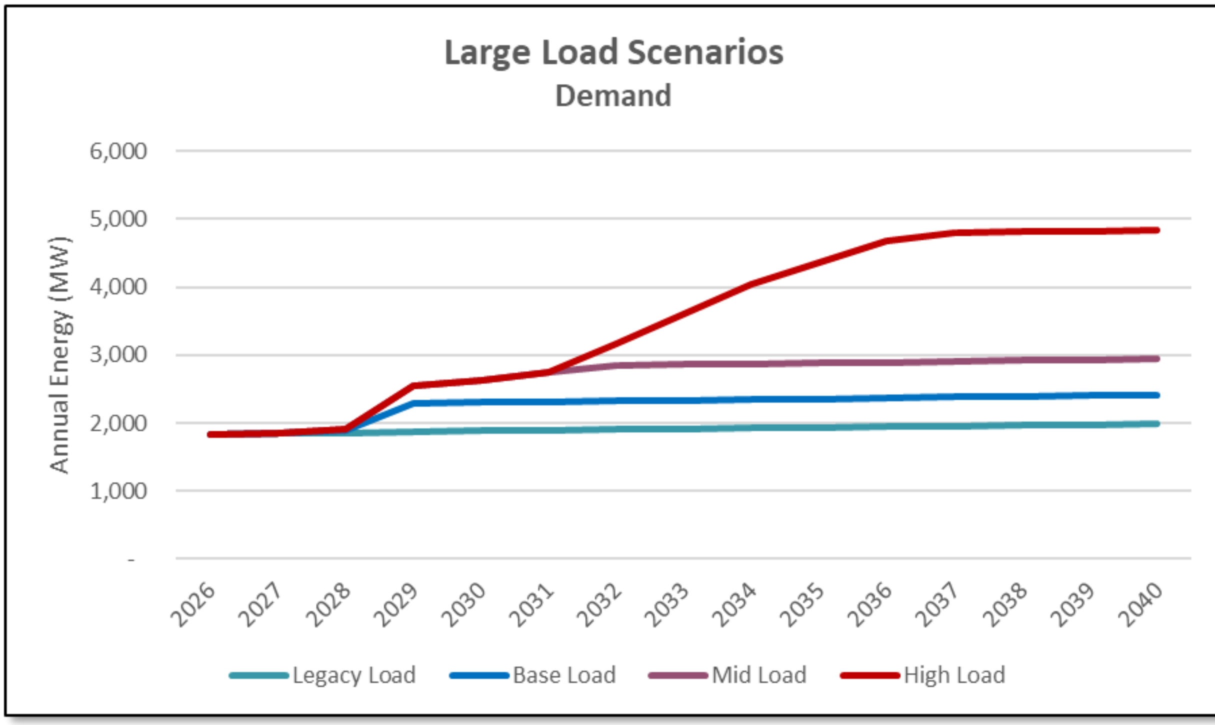


Table 4 IRP Legacy, Base, Medium, High Forecasts - Demand

System Forecast Summary (MW)								
Year	**Legacy Load**	**Base Load**	**Base - Extreme Weather**	**Base - Mild Weather**	**Base - Economic High**	**Base - Economic Low**	**Mid Load**	**High Load**
2026	1,834	1,834	1,885	1,724	1,837	1,787	1,834	1,834
2027	1,848	1,848	1,905	1,729	1,859	1,783	1,848	1,848
2028	1,860	1,881	1,939	1,761	1,901	1,801	1,913	1,913
2029	1,872	2,294	2,352	2,172	2,323	2,198	2,557	2,557
2030	1,883	2,305	2,364	2,182	2,345	2,194	2,622	2,622
2031	1,894	2,316	2,375	2,192	2,367	2,191	2,738	2,738
2032	1,905	2,327	2,386	2,202	2,391	2,188	2,854	3,171
2033	1,915	2,337	2,397	2,211	2,414	2,184	2,865	3,603
2034	1,925	2,347	2,407	2,220	2,438	2,181	2,875	4,035
2035	1,936	2,358	2,418	2,230	2,463	2,179	2,885	4,362
2036	1,947	2,369	2,429	2,240	2,489	2,177	2,896	4,690
2037	1,957	2,379	2,441	2,250	2,515	2,176	2,907	4,806
2038	1,968	2,390	2,454	2,259	2,541	2,176	2,918	4,817
2039	1,980	2,402	2,466	2,270	2,568	2,175	2,929	4,828
2040	1,991	2,413	2,477	2,280	2,595	2,174	2,940	4,839
5YR CAGR (2026,2031)	**0.64%**	**4.78%**	**4.72%**	**4.93%**	**5.21%**	**4.16%**	**8.34%**	**8.34%**
10YR CAGR (2026,2036)	**0.60%**	**2.59%**	**2.57%**	**2.65%**	**3.08%**	**1.99%**	**4.67%**	**9.84%**
15YR CAGR (2026,2040)	**0.59%**	**1.98%**	**1.97%**	**2.02%**	**2.50%**	**1.41%**	**3.43%**	**7.18%**

Figure 18 IRP Legacy, Base, Medium, High Forecasts - Demand



11 Model Development

GRE utilized version 8.0.7 of Yes Energy's EnCompass software to conduct capacity expansion and production cost modeling. This software is standard among all Minnesota utilities and Department of Commerce. This is significant because it allows the Minnesota Department of Commerce and the Minnesota Public Utilities Commission to reproduce GRE's modeling when evaluating the IRP, ensuring transparency and consistency in the evaluation process.

In addition, GRE has greatly increased internal server capacity and processing power over the past two years, improving modeling speed and enabling evaluation of a broader range of scenarios and sensitivities than in previous IRPs. As a result, GRE's members and Board of Directors have a stronger analytical foundation for selecting the preferred plan in this IRP and making resource decisions.

In GRE's IRP process, we begin by creating a menu of power supply resource options to meet energy, demand, capacity, and regulatory requirements. We consider our current resources, planned additions, and potential new resources consisting of both mature and emerging technologies. Each resource is carefully evaluated for its performance characteristics, costs, and in-service availability dates. Potential new resources are then modeled and optimized portfolio combinations emerge for each forecasted power supply scenario. The resource type, timing, and size are selected based on the least-cost power supply portfolio that ensures we meet planning reserve margins, energy sufficiency, and all state and federal regulatory obligations.

11.1 Current Resources

GRE's current power supply resource mix consists of both owned resources and long-term PPAs. GRE owns and operates a mix of natural gas combustion turbines with emergency fuel oil back up (NG/FO) in addition to combustion turbines and reciprocating engines that operate solely on fuel oil (FO). These resources have a combined maximum nameplate capacity of approximately 1,700 MW. Additionally, GRE owns and operates one 99 MW combined heat and power plant (Spiritwood) which generates using primarily natural gas with the ability to co-generate with coal. Our operational renewable resources consist of eight wind (PPA) facilities with a total maximum nameplate capacity of 960 MW (Table 5.)

GRE's legacy cooperative member Connexus Energy (now a GRE customer) retains a share in several of these resources. The maximum nameplate capacity of these resources is pro-rated accordingly to reflect their share of those resources during the modeling process, resulting in some of GRE's AR modeled resources having slightly lower nameplate capacity figures than their total. In addition to GRE's owned and contracted power supply resources, we also have a small number of shorter-term bilateral energy and capacity contracts (including with Rainbow Energy Center) as well as LMRs. Each respective resource is modeled using historic operational and financial inputs. The full list of GRE's power supply resources, including maximum nameplate capacity adjustments, operation inputs, heat rates, average capacity factor for wind resources emission rates, fixed and variable expenses - can be found in Appendix E - Power Supply Resources.

Table 5 GRE Owned and Contracted Resources

Facility Name	Location	Resource Type	Unit Number (s)	Make/Model	Fuel	Max Nameplate Capacity (MW)
Cambridge Station	Cambridge, Minnesota	Combustion Turbine	1	GE (Frame 5)	FO	217
		Combustion Turbine	2	Siemens (V84.3A2)	NG/FO	
Elk River Peaking Station	Elk River, MN	Combustion Turbine	11	Siemens (SGT6-5000F4)	NG/FO	230
Lakefield Junction Station	Martin County, MN	Combustion Turbine	1-6	6 x General Electric (MS7001EA)	NG/FO	630
Pleasant Valley Station	Mower County, MN	Combustion Turbine	11,12	2 x Siemens (V84.3A2)	NG/FO	487
	Mower County, MN	Combustion Turbine	13	Siemens (501D5A)	NG/FO	
St. Bonifacius Station	St. Bonifacius, MN	Combustion Turbine	1	P&W FT4000	FO	75
Rock Lake Station	Pine City, MN	Combustion Turbine	1	GE (Frame 5)	FO	28.5
Maple Lake, MN	Maple Lake, MN	Combustion Turbine	1	GE (Frame 5)	FO	28.5
Spiritwood Station	Spiritwood, ND	Heat and power	1	Siemens (SST 800)	NG/Coal	99
Arrowhead Station [22]	Cook County, MN	Recip. Engine	1-9	9 x Cummins (QSK60 G6)	FO	18
Ashtabula II	Barnes, Griggs, Steele, MN	Wind Turbine PPA	N/A	GE	Wind	51
Buffalo Ridge	Lincoln County, MN	Wind Turbine PPA	N/A	GE	Wind	105
Deuel Harvest	Deuel County, MN	Wind Turbine PPA	N/A	GE	Wind	200
Elm Creek	Jackson/Martin County, MN	Wind Turbine PPA	N/A	GE	Wind	99
Emmons-Logan Wind	Emmons/Logan County, MN	Wind Turbine PPA	N/A	GE	Wind	200
Endeavor I	Osceola County, IA	Wind Turbine PPA	N/A	GE	Wind	100
Prairie Star	Mower County, MN	Wind Turbine PPA	N/A	Vestas	Wind	100
Trimont	Jackson/Martin County, MN	Wind Turbine PPA	N/A	GE	Wind	105

[22] Transmission reliability resource – not included in capacity modeling

11.2 Planned Resources

In addition to GRE's owned power supply resources, our IRP also includes additional resources that are currently under contract for future construction and operation. These resources include over 1,100 MW of wind generation expected to be operational by the end of 2029 and 140 MW of 4-hour energy storage expected to be operational by the end of 2026. Additional information regarding GRE's planned resources is discussed in this IRP Section 4 – The 2026-2040 Preferred Plan and a comprehensive list of their respective modeling inputs can be found in Appendix E.

11.3 New Resource Options

GRE considered a wide range of new power supply resources. After careful evaluation, GRE categorized these resources into two types: *mature technologies* and *emerging technologies*. Mature technologies are commercially proven, widely deployed, and considered financeable by the investment community. These resources have established performance records, well-understood operating characteristics, and predictable development timelines. Emerging technologies, by contrast, are earlier in their development lifecycle and typically have lower technology readiness levels. While these technologies may ultimately provide valuable energy, capacity, and reliability benefits, key factors such as capital costs, operating performance, and commercial availability remain less certain and are expected to evolve as the technologies continue to mature. Below are the mature and emerging technologies modeled as selectable power supply resources. Additional details can be found in Appendix E. In addition to the selectable power supply resources evaluated in GRE's IRP modeling, we are also examining transmission-related solutions that may increase the capacity value of existing resources.

11.4 Mature Technologies

- **Combustion Turbines with Emergency Fuel Oil Backup**
  GRE included dispatchable natural gas combustion turbines (CTs) ranging from 50 MW to 250 MW selectable increments, including both aeroderivative and frame technologies. All CTs include the addition of emergency backup fuel oil. These reliability resources are mature technologies and receive favorable capacity accreditation within the MISO resource adequacy framework. CTs respond quickly to changing grid conditions and support intermittent renewable resources when renewable output is limited or system demand is elevated. The addition of fuel oil at these units offers fuel diversity and expands the availability of these assets during times of system stress for critical reliability support.

- **Combined Cycle**
  GRE included combined-cycle natural gas turbines in 600 MW selectable increments. Combined-cycle plants integrate a large-frame CT with a heat recovery steam generator (HRSG), harnessing the wasted heat from the CTs exhaust to drive a steam turbine for additional power. This setup significantly enhances efficiency. Combined Cycle plants deliver intermediate and base load generation and receive favorable capacity accreditation within the MISO resource adequacy framework.

- **Wind**
  GRE included wind generation in 100 MW selectable increments. Wind generation continues to serve as GRE's primary source of renewable generation and is expected to become the leading contributor to energy supply by 2040. The Upper Midwest has some of the most favorable wind resources in the United States, with relatively high capacity factors and substantial land availability suitable for development. While wind resources only provide a small amount of MISO accredited capacity (Table 7), they provide large quantities of carbon-free energy while also generating Renewable Energy Certificates (RECs) that support compliance with Minnesota's clean energy standards.

- **Solar**

  GRE included solar generation in 100 MW selectable increments. Currently, GRE does not have any large-scale solar facilities. Solar productivity in Minnesota is generally about one-third lower than in the highest-resource areas of the American Southwest[23]. Solar also receives the lowest seasonal accredited capacity of any power supply resource in MISO (Table 7). However, solar can still provide value, especially when modeled in conjunction with wind and energy storage. Solar's primary value is its ability to deliver on-peak energy during summer months, when system peaks are typically highest. Additionally, solar energy produces RECs, which can be utilized to meet regulatory requirements and support clean energy standards.

- **Energy Storage**

  GRE included 4-hour grid-connected energy storage (lithium-ion) in 60 MW selectable increments. Energy storage provides numerous value streams by reducing congestion of renewable resources: it charges when renewables are operating, typically leading to lower market prices and then arbitrages that energy by discharging when renewable output is low and market prices are higher. GRE typically expects this resource arbitrage cycle to be a daily operational directive. Energy storage is also a valuable capacity resource. Storage currently has the highest projected seasonal accredited capacity in MISO (Table 7). Large-scale energy storage is still relatively new in MISO and GRE recognizes that its accredited capacity may evolve depending on how it performs during MISO's identified resource adequacy hours.

  Energy storage also provides value through ancillary service markets (ASM), including spinning reserves, frequency regulation, and short-term reserves. These services support grid stability while providing additional revenue opportunities. However, based on experience in other Regional Transmission Organizations (RTOs), ASM value tends to decline as storage penetration increases. Therefore, while ASM revenues may provide incremental value, GRE does not rely on them as primary long-term revenue drivers. In addition, long-term hourly forecasts for ASM markets are subject to significant uncertainty and do not provide a sufficiently reliable basis for resource selection over a 15-year horizon. Therefore, after selecting storage based on arbitrage, congestion relief, and accredited capacity value, GRE evaluates site-specific ASM opportunities when determining optimal locations. We perform this analysis both internally and with external consultants to capture a range of potential incremental benefits. Ultimately, the analysis considers ASM value while recognizing that these revenues may decline over time as the MISO market becomes increasingly saturated.

  GRE is actively evaluating additional 4-hour storage opportunities and distributed generation, including distributed deployments at regional and distribution substations, as well as behind the meter applications. Aggregating and accrediting smaller and more diversified storage can create a single load-modifying resource (LMR) or operate as a virtual power plant (VPP). As cost certainty and grid applications mature, we may find opportunities to substitute some 4-hour grid-connected storage with distributed solutions.

- **Load Modifying Resources**

  GRE included LMRs in up to 3 MW per year selectable increments. As outlined in Section 5.4.1, unlike traditional generation resources, LMRs do not add supply. Instead, they are aggregated into a single DR resource, enabling a coordinated reduction in member demand during periods of elevated MISO prices. By registering these assets as capacity resources with MISO, GRE can help offset the need for additional supply-side generation.

[23] Based on National Renewable Energy Laboratory (NREL) state-average solar resource data comparing Minnesota and Arizona https://www.nlr.gov/gis/solar-resource-maps

- **Energy Efficiency**
  GRE included energy efficiency measures of up to 2 MW per year selectable increments. Energy efficiency is another resource that lowers overall energy needs and reduces the amount of capacity required to meet planning reserve margin requirements. As a result, these measures can help defer the need for additional power supply resources over time.

11.5 Emerging Technologies

- **Long Duration Energy Storage**
  GRE included 8-hour long-duration energy storage (LDES) in selectable increments of 125 MW and 100-hour LDES in selectable increments of 60 MW. Because LDES can discharge over extended periods, it can improve system reliability during sustained periods of grid stress. However, MISO currently does not assign additional capacity accreditation to storage durations beyond four hours, limiting LDES competitiveness relative to 4-hour storage. While these technologies are progressing toward broader commercial deployment, GRE has limited operational experience with LDES, and industry performance data and cost projections remain uncertain. GRE currently is planning a 1.5 MW Form Energy pilot project that will further modeling specifications as operational data is generated following an anticipated 2026 commercial operation.

- **Small Modular Nuclear Reactors**

  GRE included small modular nuclear reactors (SMRs) in 320 MW selectable increments. SMRs offer the potential for safe, carbon-free, distributed baseload energy with projected operating lives exceeding 50 years. Although costs, development timelines, and regulatory pathways remain uncertain, GRE actively engages with SMR developers to monitor technology readiness. Minnesota's current moratorium on new nuclear development continues to add further constraints to potential SMR deployment, restricting resource choice.

11.6 Transmission Solutions

In addition to new selectable power supply resources, GRE is evaluating transmission-related solutions in parallel with its Preferred Plan to determine whether the capability of existing resources can be increased at a lower cost and on a shorter timeline than constructing new power supply resources. One such opportunity is to increase the accredited capacity of existing resources by optimizing plant performance and assessing whether the transmission system can accommodate higher output levels through updated interconnection studies. These efforts allow GRE to evaluate whether existing infrastructure can be used more efficiently while maintaining reliability and minimizing the need for new transmission upgrades and interconnections.

Within the MISO market, each generating facility operates under a Generator Interconnection Agreement (GIA), which establishes the maximum injection level allowed at the point of interconnection based on the transmission studies completed when the facility originally entered service. Since several of GRE's combustion turbines were constructed, GRE has implemented operational improvements that increase the output capability of these units. For example, combustion tuning and compressor washing have increased the maximum output of certain CTs. In addition, because CT output is a function of the mass flow of air through the compressor and combustor, technologies that increase inlet air density can further increase output - particularly during hot summer conditions. Options under consideration include evaporative inlet cooling, wet compression, and mechanical inlet chilling. GRE is assessing the cost and feasibility of these technologies in conjunction with potential increases to associated GIAs, recognizing that under MISO rules, a resource's accredited capacity cannot exceed the injection limit established in its GIA.

GRE is also evaluating opportunities to increase the capacity value of certain renewable resources. Planned wind facilities such as Dodge County Wind, Three Waters Wind, and Big Bend Wind will operate under MISO Surplus Interconnection Service (SIS) arrangements. SIS allows a generator to use existing interconnection capability at an established point of interconnection without entering the full MISO interconnection queue. This approach enables these projects to be developed in a timely and cost-effective manner by leveraging existing transmission infrastructure. However, because these renewable facilities share interconnection capability with other resources at the same point of interconnection, their combined output remains limited by the existing GIA injection level. As a result, these wind resources are currently modeled with zero accredited capacity contribution toward GRE's planning reserve margin. Increasing these respective GIA limits could allow GRE to recognize additional accredited capacity from these facilities while maintaining compliance with MISO interconnection requirements.

To evaluate these opportunities, GRE has initiated studies with MISO to analyze potential increases to the relevant GIA limits. These studies are being performed through MISO's Definitive Planning Phase (DPP) process, during which MISO conducts detailed power flow, stability, and short-circuit analyses to determine whether additional injection capability can be accommodated at a given interconnection point and to identify any required transmission upgrades. As this process progresses, MISO will provide GRE with the incremental costs associated with increasing the applicable GIA limits. GRE will evaluate these results alongside other resource alternatives in our Preferred Plan. This analysis will determine whether augmenting existing facilities and expanding interconnection capability offer a more cost-effective means of increasing system capacity and maintaining reliability for GRE's member-owners.

Additionally, GRE is closely tracking discussions at MISO that may lead to the potential for merchant HVDC assets to be accredited as capacity resources. If these assets are granted accreditable capacity, it will expand the currently constrained capacity options in the planning process, and the modeling efforts.

11.7 Resource Characteristics and Costs

The overnight construction costs of power supply resources, grid interconnection costs, and power purchase agreement pricing are currently highly volatile. Cost uncertainty is being additionally challenged by rapid load growth and the broader need to expand grid capacity across MISO. For renewable resources in particular, increased commodity costs, labor costs, and tariff uncertainty are key drivers of rising costs, while uncertainty surrounding the phaseout of renewable production (PTC) and investment tax credits (ITC) further complicates cost assumptions. In our previous IRP, GRE primarily relied on power supply resource costs and trends based on NREL's Annual Technology Baseline (ATB). However, the latest ATB, released in 2024, is already outdated due to the rapidly changing nature of the markets and industry. Today's costs for many resources exceed these projections. Consequently, GRE developed the resource pricing for this IRP using several more-current sources, including LevelTen[24], market pricing data, original equipment manufacturers (OEMs), and our partnership with ACES Power Marketing (ACES). These updated costs, future projections, and resource timelines are reflected in our modeling. For details, see Appendix E – Power Supply Resources.

11.8 MISO Planning Reserve Margin and Capacity Accreditation

The modeled planning reserve margin requirement (PRMR) and resource class capacity accreditation assumptions are based on MISO's April 2025 indicative results for PRMR and resource class accreditation under the Direct Loss of Load (DLOL) methodology (Tables 6 and 7).[25][26]MISO is transitioning from the current Seasonal Accredited Capacity (SAC) methodology to DLOL. In contrast to SAC, DLOL evaluates resource performance during the highest-risk loss-of-load hours, providing a capacity accreditation framework intended to better reflect reliability contributions of differing resources during periods of system stress.

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[24] https://www.leveltenenergy.com/

[25] https://cdn.misoenergy.org/PY%2025-26%20Indicative%20DLOL%20Results657893.pdf

[26] https://cdn.misoenergy.org/20250409%20RASC%20Item%2008%20LOLE%20Modeling%20Enhancements%20Storage%20Modeling689245.pdf

Table 6: Planning Reserve Margin Assumptions

	Summer	Fall	Winter	Spring
PRM %	2.3%	6.0%	5.6%	1.0%

Table 7: Resource Class Capacity Accreditation Assumptions

	PY 2025/2026 - PY 2029/2030				PY 2030/2031+			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
Combined Cycle	NA	NA	NA	NA	95%	91%	77%	78%
Dual Fuel Oil/Gas	87%	84%	79%	77%	87%	83%	79%	75%
Nuclear	NA	NA	NA	NA	94%	90%	87%	81%
Solar	45%	28%	19%	28%	10%	4%	2%	5%
Wind	8%	15%	23%	15%	9%	14%	23%	15%
Storage	61%	88%	85%	90%	91%	99%	93%	99%

11.9 MISO Market and Fuel Price Forecasts

GRE is a member of ACES, a cooperative energy management company and power marketer. [27] MISO market and fuel price forecast inputs were sourced from ACES's Spring 2025 Fundamental Forecast, and GRE used the power and fuel price forecasts from ACES's base case scenario. These inputs are fundamental to IRP modeling because they shape resource dispatch decisions, market purchase economics, and the relative competitiveness of the power supply resources available for selection in the model. Forecasted power and fuel prices help determine when it is more economic to dispatch GRE-owned generation versus procure energy through the MISO market, while also influencing the selection of new power supply resources over the 2026–2040 IRP planning period.

11.10 MISO Market Interaction

The market interaction between GRE and MISO was set up to reflect GRE's internal long-range energy hedging policy, allowing for approximately 30% of GRE's load to be met with net market purchases. In the past, GRE's model allowed energy purchases from the market, but not market sales. For this IRP, energy sales from GRE to the market were allowed up to 10% of the value of GRE's load. Allowing a small amount of market sales was recommended by the Department and Commission during GRE's 2023 IRP. This approach alleviates some renewable curtailment and better represents our power supply portfolio under real-world operational conditions. However, it notably does not provide an incentive to build power supply assets for the sole purpose of selling energy to the MISO market.

11.11 Regulatory Costs and Environmental Externalities

Regulatory costs and environmental externality costs are planning tools established in statute, and do not represent direct compliance costs or costs that may be included and recovered in MISO market offers or dispatch decisions.

During IRP development, regulatory costs are applied to carbon-emitting resources at varying levels established by the Minnesota Public Utilities Commission (PUC) for purposes of comparing the outcome of different IRP scenarios. These assumptions are incorporated prior to modeling and influence resource selection by testing how different power supply portfolios may perform under a more carbon-constrained future, thereby reducing the risk that new carbon-emitting investments could become uneconomic over time. Because these assumptions increase the modeled cost of carbon-emitting resources by increasing the operating costs of the units subject to

[27] https://www.acespower.com/

the values, they lead to a different power supply resource mix than the otherwise lowest-cost plan. These additional regulatory costs are a future estimate, and do not reflect actual MISO market bidding, dispatch, or operating decisions, as they are not compliant with the Independent Market Monitor (IMM) nor are they compliant with the MISO Tariff.

In MISO, power supply resources are subject to must-offer requirements, and MISO and the IMM review offer behavior for potential physical and economic withholding. Accordingly, regulatory cost assumptions are appropriate for scenario analysis in the IRP, but they are not allowable inputs for real-world market offers or operating decisions. GRE modeled scenarios with and without regulatory costs to better compare all scenarios. Environmental externality costs, by contrast, do not impact resource selection. They are calculated after selection to illustrate broader impacts associated with emissions. GRE modeled scenarios with and without regulatory and environmental externality costs to better compare all scenarios. The current carbon free standard is a requirement in Minnesota, and compliance demonstration with that standard represents the real-world incorporation of a carbon standard that has been put in place by the state of Minnesota. Additional dispatch adders and environmental costs beyond those required by the United State Environmental Protection Agency (EPA) in modeling efforts would likely result in a sub-optimal plan for GRE's members, and ultimately additional resource costs that are required to be recovered.

In compliance with Minnesota dockets Nos. CI-07-1199, CI-14-643, and DI-19-406 GRE included sensitivities that varied the regulatory cost of CO_2 and environmental externality costs. Environmental externality costs are included for CO_2, CO, NOx, Pb, PM2.5 and SO_2. Environmental externality costs are applied by EnCompass in post-processing and do not influence resource dispatch or capacity expansion decisions. The regulatory costs were applied as a dispatch cost adder and do impact resource dispatch and capacity expansion decisions. The environmental and regulatory costs for CO_2 were also applied to market purchases, and costs for all pollutants were assigned to energy associated with the Rainbow Energy contract.

Table 8: Regulatory Cost of CO_2, nominal dollars per short ton

	Low	Mid	High
2026	$0	$0	$0
2027	$0	$0	$0
2028	$5	$40	$75
2029	$5	$40	$75
2030	$5	$40	$75
2031	$5	$40	$75
2032	$5	$40	$75
2033	$5	$40	$75
2034	$5	$40	$75
2035	$5	$40	$75
2036	$5	$40	$75
2037	$5	$40	$75
2038	$5	$40	$75
2039	$5	$40	$75
2040	$5	$40	$75

Table 9: Externality Cost of CO2, $nominal per short ton, rounded[28]

	CO_2		
	Low	Mid	High
2026	$136	$220	$373
2027	$142	$228	$386
2028	$148	$237	$399
2029	$153	$245	$412
2030	$159	$254	$425
2031	$166	$264	$439
2032	$173	$273	$453
2033	$180	$283	$467
2034	$186	$293	$482
2035	$193	$303	$498
2036	$201	$314	$513
2037	$208	$325	$530
2038	$216	$336	$547
2039	$225	$348	$563
2040	$233	$360	$581

Table 10: Externality Cost of Criteria Pollutants, $2024 per short ton, rounded[29]

	Low	Mid	High
CO	$0.38	$0.58	$0.78
NOx	$2,582	$6,195	$8,286
Pb	$767	$811	$854
PM2.5	$4,471	$8,091	$10,980
SO_2	$4,458	$8,012	$10,865

11.12 Scenarios and Sensitivities

The following tables summarize the different scenarios (Table 11) and sensitivities (Table 12) used in GRE's IRP modeling. The combination of these resulted in the sensitivity scenarios, listed in Table 13.

Table 11: Model Scenario Descriptions

Scenario	Description
S1: Base Load	400 MW of large load is added to GRE's legacy load forecast
S2: Retire Spiritwood by 2040	Spiritwood Station is retired by 2040 and 400 MW of large load is added to GRE's legacy load forecast
S3: Legacy Load	No large load is added to GRE's legacy load forecast
S4: Mid Load	900 MW of large load is added to GRE's legacy load forecast
S5: High Load	2700 MW of large load is added to GRE's legacy load forecast

[28] Externality costs for CO2 are based on the U.S. Environmental Protection Agency's *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* from November 2023. Values were converted to short tons and adjusted for inflation.
[29]Externality costs for criteria pollutants are based on values in the Order Updating Environmental Cost values issued on January 3, 2018 in Minnesota docket CI-14-643. Values were adjusted to 2024 dollars using the GDP implicit price deflator and are inflated annually at 2% in the EnCompass model.

Table 12: Model Sensitivity Descriptions

Variable	Sensitivity	Description
Legacy Load Growth	**Base assumption**	50/50 forecast
	A: Extreme Weather	Extreme weather forecast (90/10 Forecast)
	B: Mild Weather	Mild weather forecast (10/90 Forecast)
	C: Economic High	High economic growth
	D: Economic Low	Low economic growth
	E: High EV	High electric vehicle growth
	F: Low EV	Low electric vehicle growth
MISO Market and Natural Gas Prices	**Base assumption**	ACES Fundamental Forecasts
	G: High	Expected values +100%
	H: Low	Expected Values -30%
Tax Credits	**Base assumption**	Reflect existing ITC and PTC phase out for wind and solar
	I: Tax Credits Extended	Extends ITC and PTC for wind and solar
Environmental Costs	**Base assumption**	Mid regulatory cost of carbon and mid externality costs
	J: High ext + High reg	High regulatory cost of carbon and high externality costs
	K: High Ext	High externality costs, No regulatory cost of carbon
	L: Low ext + Low reg	Low regulatory cost of carbon and low externality costs
	M: Low ext	Low externality costs, No regulatory cost of carbon
	N: Member look	No regulatory or externality costs
Carbon Emissions	**Base assumption**	Carbon emissions allowed in 2040, but with the aim to meet to Carbon Free Standard
	O: Zero carbon in 2040	No carbon emission allowed in 2040, existing gas units retired by 2040
Technologies for Selection	**Base assumption**	Only mature technologies are available for selection in expansion plan
	P: Emerging technologies	SMR, 100 hr storage, and 8-hour storage are available for selection in expansion plan in addition to mature technologies
Aeroderivative CT Capacity factor	**Base assumption**	Annual capacity factor of aeroderivative units is limited to 25%
	Q: Aero CF 40%	Annual capacity factor of aeroderivative units is limited to 40%
250 MW Wind option	**Base assumption**	Wind available for selection in 100 MW units
	250 MW Wind option	250 MW wind PPA with commercial operation date (COD) 2029 available for selection. Additional wind available for selection in 100 MW units

Table 13: GRE IRP Sensitivity Scenario List

Name	Scenario	Sensitivities Applied
Preferred Plan	**S1**	**N, Q, 250 wind option**
Base Load	S1	
Base - Extreme Weather	S1	A
Base - Mild Weather	S1	B
Base - Economic High	S1	C
Base - Economic Low	S1	D
Base - High EV	S1	E
Base - Low EV	S1	F
Base - High market and NG prices	S1	G
Base - Low market and NG prices	S1	H
Base - Tax credits extended	S1	I
Base - High ext and reg	S1	J
Base - High ext	S1	K
Base - Low ext and reg	S1	L
Base - Low ext	S1	M
Base - Member look	S1	N
Base - Member Look - Aero 40% CF	S1	N, Q
Base - Zero Carbon 2040	S1	O
Base - Zero Carbon 2040 - Emerging tech	S1	O, P
Base - Emerging tech	S1	P
Base - Aero 40% CF	S1	Q
SWS 2040	S2	
SWS 2040 - High ext and reg	S2	J
SWS 2040 - Member Look	S2	N
Legacy Load	S3	
Legacy - Tax credits extended	S3	I
Legacy - High ext and reg	S3	J
Legacy - Member look	S3	N
Legacy - Member look - Aero 40% CF	S3	N, Q
Mid Load	S4	
Mid - Tax credits extended	S4	I
Mid - High ext and reg	S4	J
Mid - Member look	S4	N
High Load	S5	
High - Tax credits extended	S5	I
High - High ext and reg	S5	J
High - Member look	S5	N
High - Zero Carbon 2040	S5	O
High - Zero Carbon 2040 - Emerging tech	S5	O, P

11.13 Capacity Expansion and Production Cost Modeling

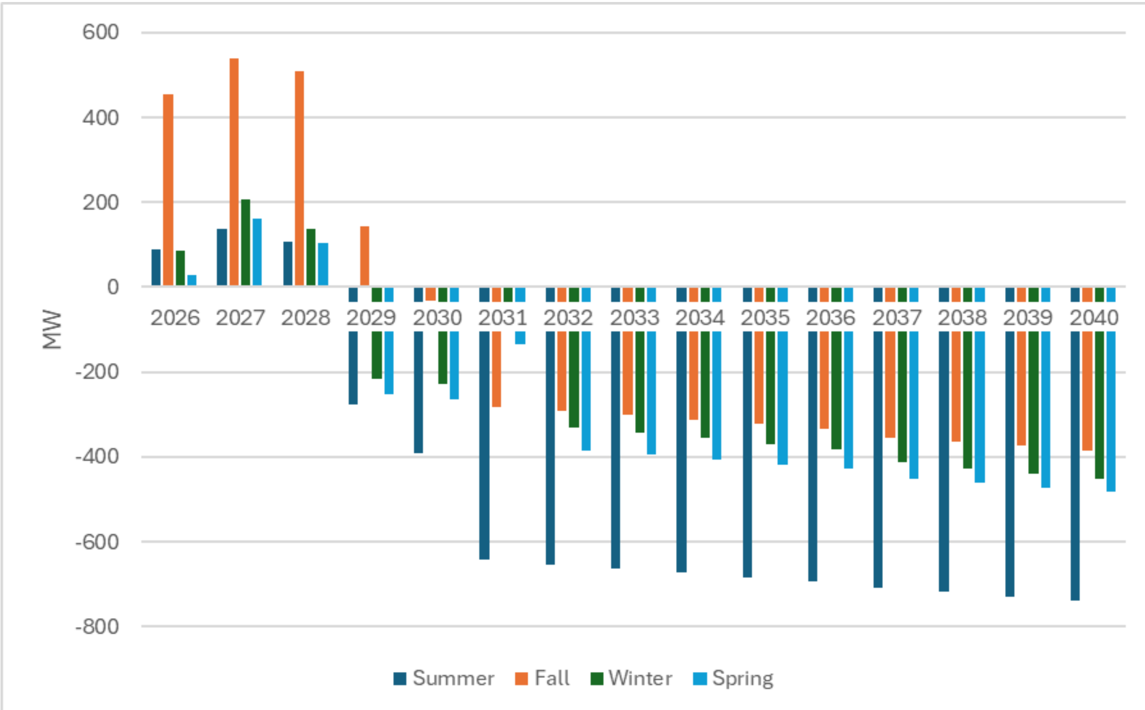
A capacity expansion plan (CEP) was modeled for all scenarios and their applicable sensitivities. The capacity expansion step establishes the build plan that determines the type, size, and timing of resources to ensure energy and capacity adequacy. Following the CEP process, GRE ran a production cost model (PCM) for each CEP. The PCM uses an hourly resolution, whereas GRE's CEP uses a typical week representation. The higher resolution in the PCM provides a better estimate of the operational performance of each plan. The resulting plan cost from the PCM, represented by the present value of revenue requirements (PVRR), was used to rank all respective plans from least to most cost. This process provides members with a clear, big-picture analysis, enabling informed decisions based on future power supply, resource adequacy, and energy demand.

11.14 Model Results

In GRE's resource planning process, the load and energy requirements of our members must be met along with MISO's resource adequacy requirements. GRE aligned the modeling assumptions for the planning reserve margin and resource accreditation with the indicative results from MISO's DLOL methodology. MISO's DLOL methodology goes into effect in the 2028/2029 planning year, however, GRE chose to utilize the indicative DLOL results for the entire planning period (2026-2040). The figures below reflect the capacity length of GRE's system under the DLOL.

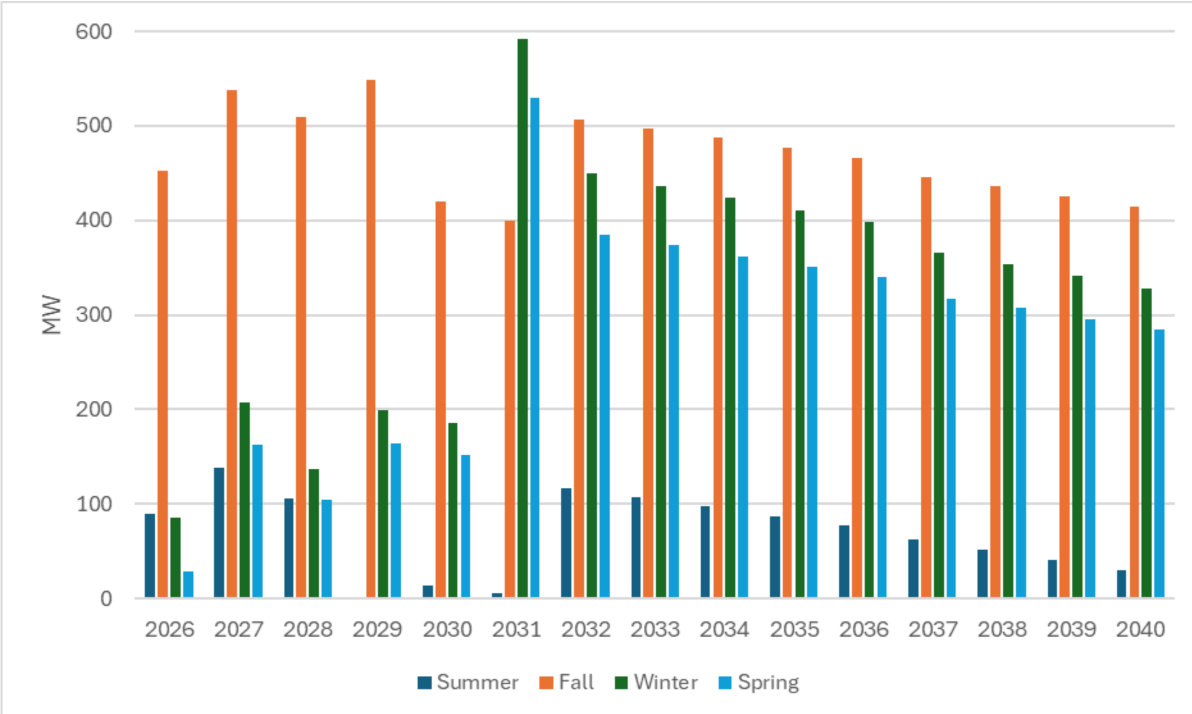
Figure 19 shows the net position of GRE's current and planned resources under the Base Case load (400 MW). The impact of the large load ramp means that GRE's capacity needs arise in 2029. Without the addition of the large load, GRE's capacity needs would not arise until the early 2030s.

Figure 19: Planning Model Length - No New Resources, Base Case



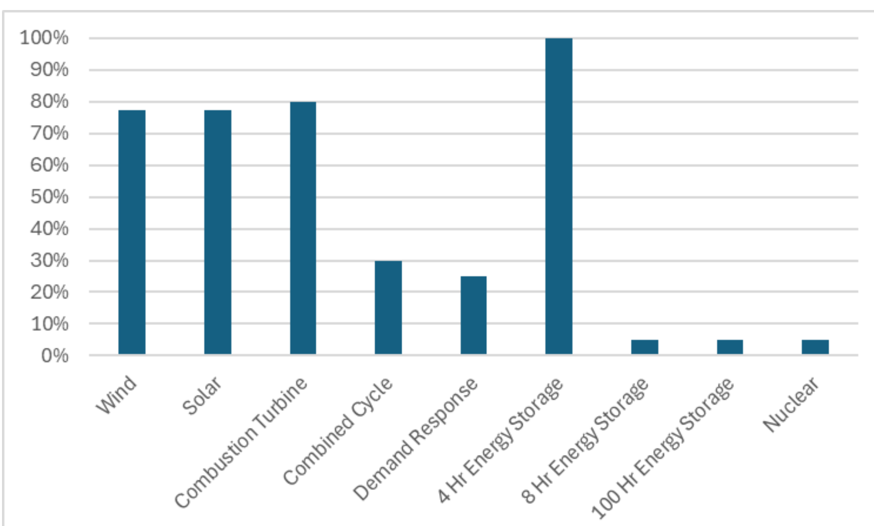
GRE's Preferred Plan meets energy and capacity requirements with the addition of energy storage and wind in 2029 and combustion turbines in the early 2030s. Energy storage and wind are necessary to cover the energy and capacity needs of the large load before combustion turbines can come online. The gas generation units are required in the early 2030s to meet energy and capacity needs for GRE's system after several GRE contract purchases end. Figure 20 shows GRE's portfolio length under the Preferred Plan. Summer is the tightest season throughout the 15-year modeling period. Years 2029-2031 have the tightest summer seasons because of the combination of the large load ramp, COD of combustion turbines, existing contract terms, and expected capacity accreditation for energy storage. The planning length decreases from 2032 through the end of the modeling period as GRE's legacy load continues to grow and no new resources are built. GRE believes the Preferred Plan is robust and flexible and we will continue to evaluate energy and capacity needs as large load ramps are finalized, and MISO updates indicative DLOL values. GRE will update modeling internally as we plan with our member-owners.

Figure 20: Planning Model Length – Base Case Preferred Plan[30]



The Preferred Plan was directly informed by EnCompass modeling. The sensitivity scenarios modeled by GRE (Table 13) were used to evaluate the robustness of the Preferred Plan and identify drivers of different resource additions. As depicted in Figure 21, energy storage was selected in every expansion plan. Combustion turbines, wind, and solar were the most frequently selected resource types after energy storage. Thermal resources were selected in 90% of the plans – either combustion turbines or a combined cycle unit were selected in every sensitivity scenario except for those that evaluated Sensitivity O – Zero Carbon by 2040. Plans that did not select additional renewable energy are associated with Scenario 3 – Legacy Load sensitivities. Without a large load ramp, GRE's planned resources meet the needs of GRE's system until the early 2030s.

Figure 21: Proportion of sensitivity scenarios with each resource type



[30] Figures 19 and 20 are meant to be representative looks at future capacity positions and vary from MISO Module E process.

Table 14 summarizes the change in resource type and amount by modeled scenario sensitivities as compared to the Preferred Plan. For example, the Base Load expansion plan is made up of 400 MW of wind (150 MW over the Preferred Plan), 200 MW of solar (200 MW over the Preferred Plan), 420 MW of combustion turbine (same as the Preferred Plan), and 360 MW of battery (60 MW less than the Preferred Plan).

In scenarios with large load additions, generally, renewables and batteries are selected in the early years before thermal resources can come online due to supply chain and construction timing constraints. Thermal resources are selected in the later years to make up for energy and capacity contract retirements. In sensitivities where renewable tax credits are extended/restored, the impact of those tax credits did not displace thermal unit selections with additional renewables.

GRE's Preferred Plan was based on Sensitivity N - Member Look. The Member Look sensitivity was defined to exclude regulatory and environmental externality costs, and to reflect only market and power supply costs that impact member rates. This aligns the Preferred Plan with the way resource value and availability are encountered in the MISO market. The Base – Member Look was not selected as the preferred plan due to the inclusion of a combined cycle. GRE sees the value in a new combined cycle investment, but today's power supply strategy prioritizes geographic and fuel diversity. While one of the more economic plans, the inclusion of the combined cycle is forecasted to require GRE to purchase RECs, rather than relying on GRE's carbon-free generation to meet Minnesota's Carbon Free Standard in 2040. Instead, when the aeroderivative combustion turbine units are permitted to run up to a 40% annual capacity factor (CF), the combined cycle unit is dropped from the plan in favor of combustion turbines (Base – Member Look – Aero 40% CF). This more closely reflected the thermal selection in many scenario sensitivities and included wind and solar build. The primary difference between Base-Member Look – Aero 40% CF and the Preferred Plan was the selection of a 250 MW wind unit. While wind was selectable in 100 MW increments, the 250 MW wind unit represented the opportunity to procure additional near-term wind, prior to the phase-out of renewable tax credits. As a result of the additional energy generation gained from the 250 MW of wind, solar was no longer selected. However, additional energy storage was selected to meet capacity needs in the summer season before thermal resources were available. This resulted in GRE's Preferred Plan.

Table 14: Sensitivity scenario results compared to Preferred Plan

Plan Name	Wind (MW)	Solar (MW)	Combustion Turbine (MW)	Combined Cycle (MW)	Demand Response (MW)	4 Hr Storage (MW)	8 Hr Storage (MW)	100 Hr Storage (MW)	Nuclear (MW)
Preferred Plan	**250**	**0**	**420**	**0**	**0**	**420**	**0**	**0**	**0**
Base Load	+150	+200	-	-	-	-60	-	-	-
Base - Extreme Weather	+150	+200	-	-	-	0	-	-	-
Base - Mild Weather	+50	+100	-	-	-	-180	-	-	-
Base - Economic High	+250	+100	+140	-	-	-	-	-	-
Base - Economic Low	+50	-	-140	-	-	-120	-	-	-
Base - High EV	+250	-	-	-	-	-	-	-	-
Base - Low EV	+150	-	-140	-	-	+60	-	-	-
Base - High market and NG prices	+650	+500	-280	-	-	+120	-	-	-
Base - Low market and NG prices	-150	+300	+140	-	-	-180	-	-	-
Base - Tax credits extended	+150	+200	-	-	-	-60	-	-	-
Base - High ext and reg	+250	+300	-	-	+33	-120	-	-	-
Base - High ext	-250	+100	-420	+600	-	-	-	-	-
Base - Low ext and reg	-150	+300	+140	-	-	-180	-	-	-
Base - Low ext	-250	+100	-420	+600	-	-	-	-	-
Base - Member look	-250	+100	-420	+600	-	-	-	-	-
Base - Member Look - Aero 40% CF	-150	+100	-	-	+33	-60	-	-	-
Base - Zero carbon 2040	+850	+2500	-420	-	-	+2460	-	-	-
Base - Zero Carbon 2040 - Emerging tech	-150	+800	-420	-	-	-	+375	+60	+960
Base - Emerging tech	+150	+200	-	-	-	-60	-	-	-
Base - Aero 40% CF	+150	+200	-	-	-	-60	-	-	-
SWS 2040	+150	+200	+140	-	-	-120	-	-	-
SWS 2040 - High ext and reg	+350	+100	-	-	-	-	-	-	-
SWS 2040 - Member Look	-250	+100	-420	+600	-	-	-	-	-
Legacy Load	-250	-	-280	-	+33	-240	-	-	-
Legacy - Tax credits extended	-250	-	-280	-	+33	-240	-	-	-
Legacy - High ext and reg	-250	-	-280	-	+33	-240	-	-	-
Legacy - Member look	-250	-	-140	-	+33	-360	-	-	-
Legacy - Member look - Aero 40% CF	-250	-	-140	-	+33	-360	-	-	-
Mid Load	+50	+400	-280	+600	-	+180	-	-	-
Mid-Tax credits extended	+50	+400	-280	+600	-	+180	-	-	-
Mid - High ext and reg	+850	+400	+140	-	-	+300	-	-	-
Mid - Member look	+50	+400	-280	+600	-	+180	-	-	-
High Load	+950	+1100	+700	+1200	+33	+540	-	-	-
High - Tax credits extended	+1650	+200	+700	+1200	-	+600	-	-	-
High - High ext and reg	+950	+1100	+840	+1200	+33	+420	-	-	-
High - Member look	+1250	+700	+420	+1800	-	+240	-	-	-
High - Zero Carbon 2040	+5050	+6800	-420	-	-	+7380	-	-	-
High - Zero Carbon 2040 - Emerging tech	+2050	+4000	-420	-	-	+420	+1875	+300	+1920
High - Emerging tech	+950	+1100	+840	+1200	+33	+420	-	-	-

Figure 22 and Table 15 show each plan's PVRR over the 15-year modeling period. The PVRR of the Preferred Plan is the least expensive of all the sensitivities modeled under Scenario 1 – Base Load. The primary driver of portfolio cost is the amount of large load growth in each scenario. Although creating higher cost plans from an investment perspective, these large loads offer significant economic development potential for member systems and GRE by way of increased tax base, employment, and energy and demand sales. Consequently, the Legacy Load sensitivities have the lowest PVRRs, and the High Load sensitivities have the highest PVRRs. The objective value, the solution to which EnCompass solves, was also analyzed. This analysis is in Appendix H – Mixed Integer Programming (MIP) Tolerance Analysis. Other trends observed in the modeling included:

- **Emerging Technologies**
  Emerging technologies were available for model selection in the Base and High Load scenarios, with and without the Zero Carbon in 2040 sensitivity (Table 13). Without a zero-carbon constraint, emerging technologies were not selected. However, emerging technologies proved to be a more economical way to meet a zero-carbon future. All three types of emerging technologies were selected in the Base and High Load with Zero Carbon by 2040 scenarios. However, even with the selection of emerging technologies, the 15-year PVRR of Base - Zero Carbon 2040 - Emerging Tech was over $1.3 billion more expensive than the Preferred Plan. Without emerging technology, Base-Zero Carbon 2040 was over $1.6 billion more expensive than the Preferred Plan during the 15-year period. The cost gap widened under higher load growth. In the High Load scenario with Zero Carbon by 2040 sensitivities, the introduction of emerging technologies reduces the 15-year PVRR by $2.8 billion but the plan remained $4.8 billion more expensive than the High Load – Member Look.

- **Spiritwood Station**
  Commission order point 6s required modeling the retirement of Spiritwood Station by 2040. GRE evaluated three sensitivity scenarios incorporating a 2040 retirement, each of which included the costs of fully depreciating and decommissioning the plant. In two of the three sensitivities, the resulting expansion plans remained the same, but all were more expensive than their corresponding Base Load sensitivity.

Figure 22: Present Values of Revenue Requirement (PVRR) by sensitivity scenario

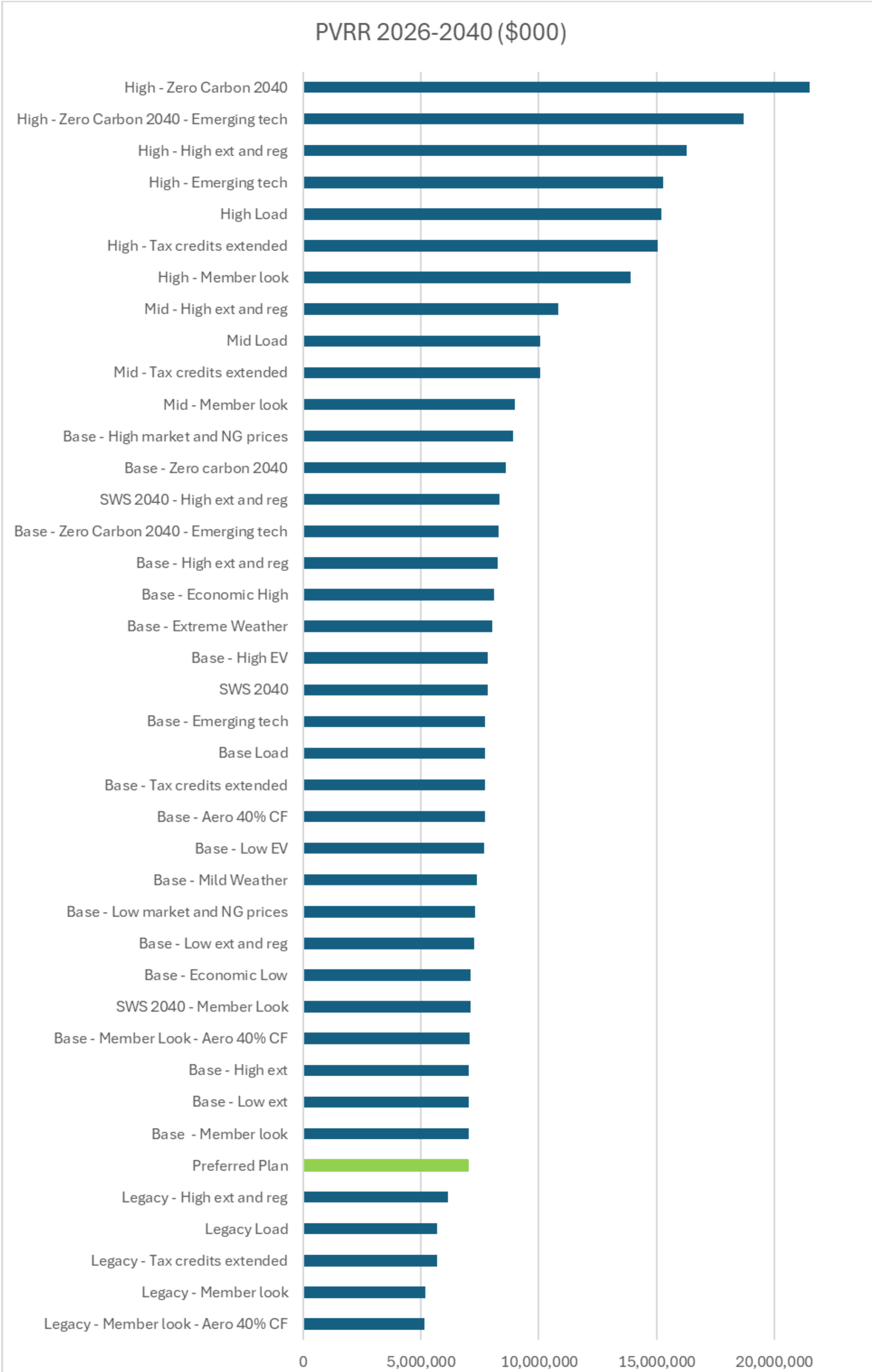


Table 15: PVRR and PVSC 2026-2040 by sensitivity scenario

Plan Name	PVRR ($000)	PVSC[31] ($000)
Legacy - Member look - Aero 40% CF	5,147,239	5,147,239
Legacy - Member look	5,187,683	5,187,683
Legacy - Tax credits extended	5,689,564	11,103,201
Legacy Load	5,689,624	11,105,350
Legacy - High ext and reg	6,153,183	14,976,485
Preferred Plan	**6,982,158**	**6,982,158**
Base - Member look	7,025,445	7,025,445
Base - Low ext	7,025,686	13,173,083
Base - High ext	7,025,835	23,269,439
Base - Member Look - Aero 40% CF	7,055,555	7,055,555
SWS 2040 - Member Look	7,085,553	7,085,553
Base - Economic Low	7,107,640	13,106,854
Base - Low ext and reg	7,256,703	12,158,343
Base - Low market and NG prices	7,283,619	13,742,777
Base - Mild Weather	7,369,091	13,445,821
Base - Low EV	7,681,908	13,837,861
Base - Aero 40% CF	7,722,257	13,721,035
Base - Tax credits extended	7,731,257	13,739,984
Base Load	7,732,040	13,737,820
Base - Emerging tech	7,732,273	13,738,244
SWS 2040	7,829,179	13,815,999
Base - High EV	7,843,656	13,991,378
Base - Extreme Weather	8,004,010	14,200,350
Base - Economic High	8,099,725	14,222,824
Base - High ext and reg	8,266,580	17,432,667
Base - Zero Carbon 2040 - Emerging tech	8,290,609	14,529,315
SWS 2040 - High ext and reg	8,321,213	17,607,533
Base - Zero carbon 2040	8,596,154	14,495,227
Base - High market and NG prices	8,900,647	14,307,858
Mid - Member look	8,994,250	8,994,250
Mid-Tax credits extended	10,047,015	18,614,712
Mid Load	10,050,000	18,521,863
Mid - High ext and reg	10,842,009	21,134,194
High - Member look	13,916,027	13,916,027
High - Tax credits extended	15,050,597	25,520,923
High Load	15,217,909	25,512,746
High - Emerging tech	15,261,882	25,470,036
High - High ext and reg	16,289,461	31,958,795
High - Zero Carbon 2040 - Emerging tech	18,703,310	25,046,567
High - Zero Carbon 2040	21,492,517	27,723,788

11.15 Risk and Uncertainty Analysis

While risk and uncertainty have always been present in resource planning, utilities today face more uncertainty than ever before. In particular, the pace of change in load growth, resource pricing, resource accreditation, and federal policy risk have made it a necessity for GRE to select a flexible plan. Interest from large loads looking to ramp load in the next five years has driven uncertainty in the load forecast – both in the timeline of large load ramp as well as the magnitude of the load. New generation is required to meet this demand, and GRE has seen rapid upward changes in resource capital costs and contract prices over the last year.

Additionally, MISO is in the process of updating their resource adequacy methodology for calculating resource accreditation and planning reserve margin requirements. Under the new DLOL methodology, firm capacity

[31] Present Value of Social Costs (PVSC). The PVSC is the PVRR plus the present value of externality costs.

accreditation for resources may change. MISO has released periodic updates that provide indicative estimates of resource accreditation and planning resource margins, but additional updates are forthcoming. In the latest update of indicative DLOL capacity accreditation values, numbers for energy storage were not released.[32] This uncertainty in energy storage accreditation poses a risk, as energy storage is the resource of choice to fulfill capacity needs before thermal resources can be built. This can put a utility's ability to be resource adequate in jeopardy if the actual accreditation ends up lower than current estimates.

Traditionally, resource planning analyses produce a single investment plan over a 15-year horizon. An alternative approach is to construct a plan that is partitioned into an initial phase of projects that begin in the first several years of the planning horizon, followed by contingent plans in the latter portion. Contingent plans make different investments depending on the conditions observed in a future year (e.g., midway in the planning horizon). The analysis here extends the analysis from the previous section by constructing flexible plans in which the initial phase implements the projects from three plans identified in section 11.11: Base Load, Preferred Plan, and Base - Member Look. The important difference from the previous section is that for each flexible plan, the investments after the initial phase can differ across scenarios. Because the initial set of projects is binding, this approach can identify the additional benefit of a plan for managing risks.

GRE collaborated with EPRI via their 'Uncertainty Management, Stochastics and Hedging Techniques for Resource Planning'[33] project to develop a decision tree analysis for comparing flexible plans. A decision tree analysis can help to evaluate plan flexibility through comparison of plan outcomes when assumptions about the future differ. By testing plans in this way, an understanding of the ability of one plan to meet alternate futures, risks, and possible contingencies can be considered. The decision tree analysis compared how the Preferred Plan performed against the two other plans when 1) the expected large load growth in 2029 does not come to fruition; 2) the capital cost of combustion turbines increases; and 3) the effective load carrying capacity (ELCC) of energy storage is lower than current DLOL projections. This required running eight additional capacity expansion and production cost sensitivity scenarios for each of the three plans (24 total), outlined in Table 16.

To test the flexibility of each plan, the first six years (2026-2031) of the CEP were locked into the model. This is Phase 1 of each plan. Under each new sensitivity scenario, capacity expansion occurs around the Phase 1 plan, the results of which represent Phase 2 of each plan. It is expected that Phase 2 can change compared to the original plan selected in the deterministic scenarios (the results of which were discussed in section 11.14. Phase 1 represents resource decisions that must be made in the short term, while Phase 2 resource decisions can be put off for a time. This allows GRE to see which Phase 1 plan is likely to pose the least risk when met with uncertain futures.

Table 16: Sensitivity Scenarios applied to each Phase 1 in the decision tree analysis

Scenario Label	Large Load Growth (MW)	Storage ELCC	Combustion Turbine Price
Base-Ref-Ref	400 Base	Base Assumption	Base Assumption
Base-Ref- HighCT	400 Base	Base Assumption	High Capital Cost
Base-LowELCC-Ref	400 Base	Low ELCC	Base Assumption
Base-LowELCC-HighCT	400 Base	Low ELCC	High Capital Cost
Legacy-Ref-Ref	0 Legacy	Base Assumption	Base Assumption
Legacy-Ref- HighCT	0 Legacy	Base Assumption	High Capital Cost
Legacy-LowELCC-Ref	0 Legacy	Low ELCC	Base Assumption
Legacy-LowELCC-HighCT	0 Legacy	Low ELCC	High Capital Cost

[32] https://cdn.misoenergy.org/20260226_Workshop%20Item%2002%20Resource%20Adequacy_Update%2020260225742968.pdf
[33] https://www.epri.com/research/products/000000003002032151

The three plans tested under the decision tree analysis were: the Preferred Plan, Base Load, and Base - Member Look (Table 13). Base Load was selected to test a plan with higher renewable build. Base – Member Look was selected to test a plan that has a higher thermal resource build. Table 17 outlines Phase 1 for each of these plans.

Table 17: Phase 1 Plan total capacity build through 2031

Resource Type	Base Load	Preferred Plan	Base- Member Look
Wind	400 MW	250 MW	0 MW
Solar	200 MW	0 MW	100 MW
Energy Storage	300 MW	420 MW	420 MW
Combustion Turbine	420 MW	280 MW	0 MW
Combined Cycle	0 MW	0 MW	600 MW

The results of the decision tree analysis show that the Phase 1 Preferred Plan offers the most flexibility of the three plans. Having optionality allows GRE to continually evaluate next steps over the coming years as more certainty develops around GRE's large load forecast, pricing of resources, and resource capacity accreditation under the DLOL methodology.

Figure 23 Decision tree analysis plan costs, PVRR

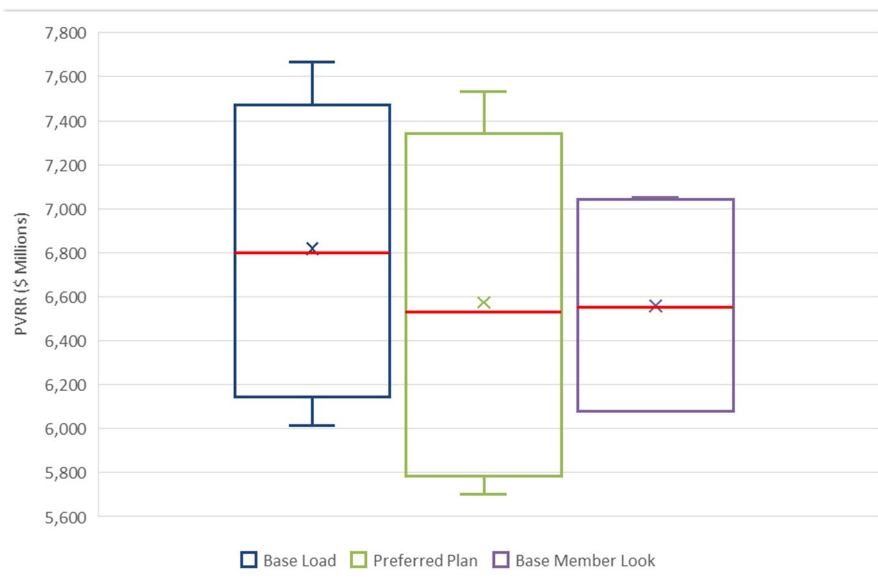


Figure 23 plots the range of PVRR costs for each plan under the decision tree analysis. All sensitivity scenarios in the decision tree analysis excluded the regulatory cost of carbon, so that the PVRR costs could be easily compared. The results illustrated in the figure show that the Preferred Plan is more economic than the Base Load plan under the uncertain futures mapped out in the decision tree. And, in all futures where the large load does not come to fruition, the Preferred Plan is the least cost option. This is because the Preferred Plan does not build all its thermal capacity resources by 2031, reducing the potential for sunk costs. The other two expansion plans select all thermal capacity by 2031. With a five-to-six-year lead time now required of most thermal assets, a plan that allows some of the thermal capacity to be built after 2031, only when conditions warrant, offers an opportunity to back down on capacity build if it is not required.

The Preferred Plan also provides more flexibility than the other plans in sensitivities with the large load, as visualized in Figures 24 and 25. Across all sensitivity scenarios for the Base Load and Base Member Look plans, there is no variation in Phase 2 capacity expansion. Again, this is a result of the resource decisions made early in the planning process (Phase 1), which does not leave GRE time to pivot as the planning landscape changes. However, in the Preferred Plan, the same or fewer thermal resources are selected in Phase 2 compared to the original Preferred Plan (Figure 24). And the amount of energy storage selected also varies, as the build of the two resource types are interdependent (Figure 25).

Figure 24 Decision Tree Analysis Cumulative Thermal Additions (MW)

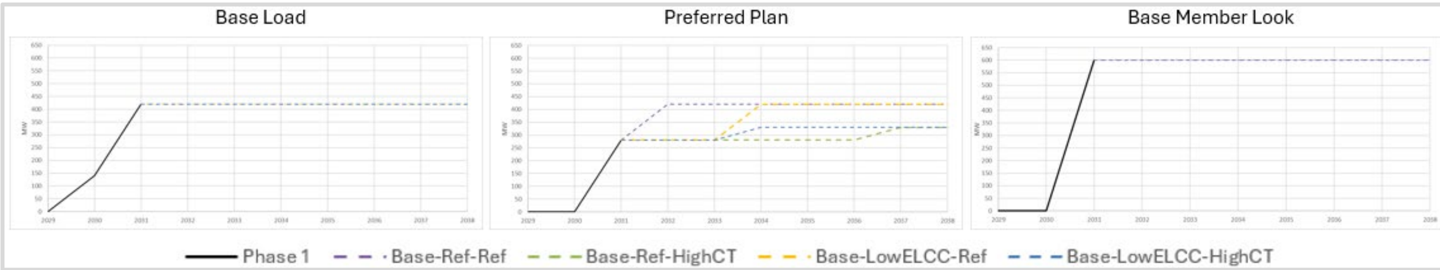
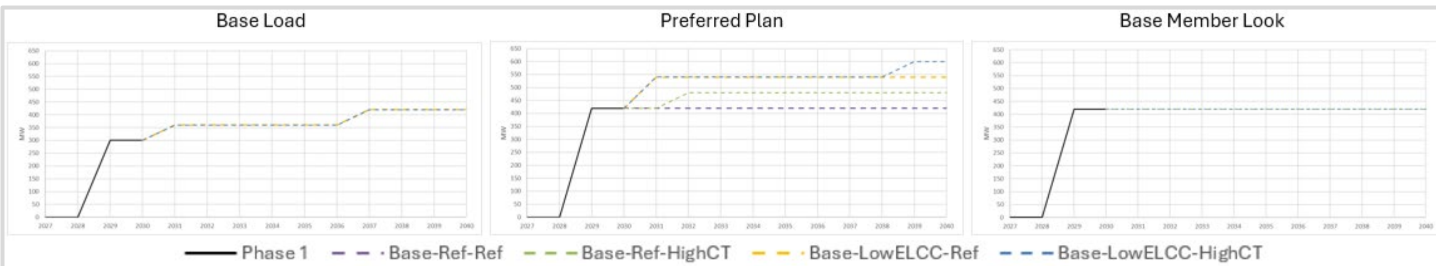


Figure 25 Decision Tree Analysis Cumulative Energy Storage Additions (MW)



The higher cost outcomes from the Base Load and Base Member Look plans indicate the risks of sunk costs in scenarios where additional capacity was not needed. This type of risk is more difficult to mitigate afterward. The outcomes from GRE's Preferred Plan in some scenarios indicate a different risk: in sensitivities with a lower energy storage ELCC, the Preferred Plan falls short of meeting the planning reserve margin requirement in summer 2030. In combination with a lower storage ELCC, summer is expected to be GRE's tightest season, and in 2030 the combustion turbines are not yet online, but the large load is online. GRE can manage risk by periodically reevaluating the capacity needs before 2030 and developing contingency plans.

Lastly, although the Base - Member Look plan has less variation in the cost and is more economic than the other plans when the large load additions are realized (Figure 23), there are potential costs to this plan that are not reflected in the analysis. First, the high capital cost sensitivity only increased the price of combustion turbines and not combined cycles, which is the thermal resource selected in the Base Member Plan. It is expected that the same drivers impacting combustion turbine prices will also impact combined cycles. Second, the Base - Member Look plan is forecasted to require REC purchases to meet the CFS, and this analysis did not consider price uncertainty of RECs. If these costs had been included, a broader cost range for the Base - Member Look would have been expected.

Overall, the Preferred Plan offers the most flexibility to GRE given the longer timeline for adding thermal resources. This provides GRE with the opportunity for continued evaluation as the planning landscape changes, which will result in reduced risk and a more cost-effective plan.

12 Regulatory Compliance

In early 2023, Minnesota enacted the CFS requiring electric utilities to serve 100% of retail electric sales with mixture of qualifying resources that do not emit carbon dioxide, and RECs by 2040. Minnesota member-owned cooperatives have interim requirements of 60% by 2030 and 90% by 2035. The law also included an increase to the RES, now the EETS, to 55% by 2035. The previous RES was 25% by 2025. Importantly, GRE is on track to meet these requirements.

12.1 Minnesota Next Generation Energy Act

Minnesota's Next Generation Energy Act of 2007 established economy-wide goals to cut state greenhouse gas emissions. It aimed for a 15% reduction from 2005 levels by 2015, 30% by 2025, and 80% by 2050. Since 2005, GRE has made significant progress toward a lower-carbon power supply, which reflects our commitment to our triple bottom line of reliability, affordability, and environmental stewardship energy. Through the ongoing evolution of our power supply portfolio, GRE has meaningfully reduced both carbon emissions and carbon intensity, demonstrating continued movement toward cleaner energy while maintaining dependable and cost-effective service for our members. This progress helps reduce our members' exposure to future carbon-related regulatory risk and strengthens the value of GRE's power supply for our members and their end-use consumers that value lower-carbon electricity.

12.1.1 Methodology for Calculating GRE's CO_2 Emissions

GRE's historical and forecasted contributions to statewide CO_2e emissions are calculated using the retail ratepayer methodology recommended by the Department of Commerce[34]:

- Calculate direct emissions from GRE owned generation.
- Calculate emissions associated with energy from PPAs by multiplying annual energy by the corresponding carbon intensities.
- Calculate the emission associated with energy sold to the market using the blended intensity of GRE owned generation and PPAs (consistent with order point 6c). This mass value is subtracted from overall emissions.
- Calculate emissions associated with energy purchases from the market using the MISO carbon intensity factor for LRZ 1-7 (consistent with order points 6c and 6d). This mass value is added to overall emissions.
- If GRE's Renewable MWh (generated or purchased through PPAs) exceeds REC retirements in M-RETS, the difference will be multiplied by the MISO intensity. This mass value is added to overall emissions. If REC retirements in M-RETS exceed GRE's Renewable MWh (generated or purchased through PPAs), the difference will be multiplied by GRE's residual fossil intensity. This mass value is subtracted from overall emissions.

It is important to note that the Department of Commerce retail ratepayer method is silent with respect to treatment of RECs. GRE believes that by making the accounting correction described in this last bullet, the result is conservative and consistent with the recently promulgated CFS that explicitly states that REC retirements correspond with carbon free energy.

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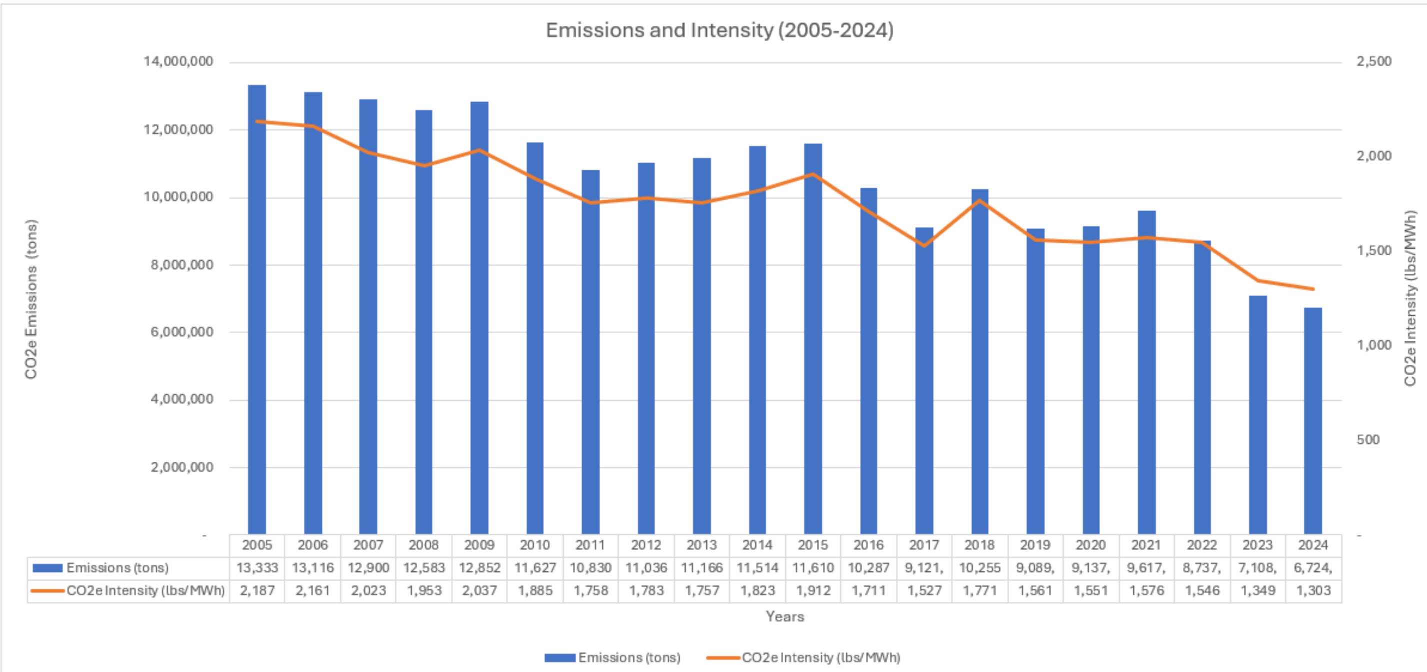
[34] Public Comments of the Minnesota Department of Commerce, Division of Energy Resources, January 4, 2016, Minnesota Power 2015-2029 Integrated Resource Plan, Docket No. E015/RP-15-690; Comments of the Minnesota Department of Commerce, Division of Energy Resources, March 27, 2014, Southern Minnesota Municipal Power Agency 2014-2018 Integrated Resource Plan, Docket No. ET9/RP-13-1104.

In the case of the PPA with Rainbow, the energy received is part of a MISO Financial Schedule arrangement, which is a financial instrument that does not affect the flow of electricity and does not specify an individual generator. However, GRE has assigned the carbon intensity of Rainbow to the energy associated with this PPA.

In addition to further reductions in the CO_2e emissions from our energy portfolio, GRE is participating in innovative initiatives that can help reduce emissions from other sectors of the economy.

GRE’s CO_2e emissions have decreased by 50% from the 2005 baseline, and our CO_2 intensity (emissions per unit of electricity generated) has also trended downward by 40%. (Figure 26)

Figure 26 GRE'sCO2e emissions trend



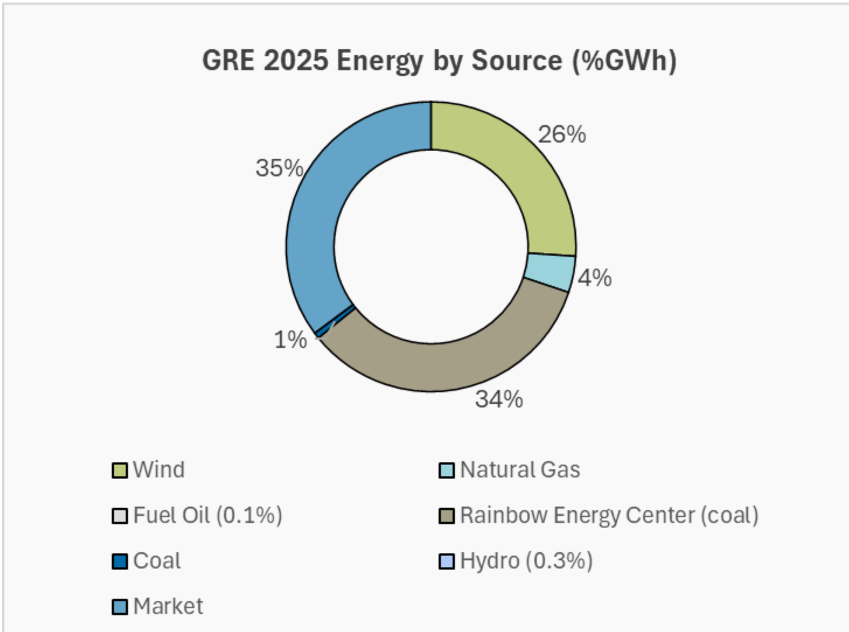
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Emissions (tons)	13,333	13,116	12,900	12,583	12,852	11,627	10,830	11,036	11,166	11,514	11,610	10,287	9,121,	10,255	9,089,	9,137,	9,617,	8,737,	7,108,	6,724,
CO2e Intensity (lbs/MWh)	2,187	2,161	2,023	1,953	2,037	1,885	1,758	1,783	1,757	1,823	1,912	1,711	1,527	1,771	1,561	1,551	1,576	1,546	1,349	1,303

12.2 Eligible Energy Technology Standard

Minnesota's EETS, previously known as the renewable energy standard (RES) under statute 216B.1691, sets renewable energy requirements of 12% by 2012, 17% by 2016, 20% by 2020, 25% by 2025, and 55% by 2035.

To date, GRE has met or exceeded these requirements each year. In 2025, 26% of GRE's energy came from renewable sources (Figure 27), and GRE projects compliance with the EETS through the study period.

Figure 27 GRE 2025 Energy by Source

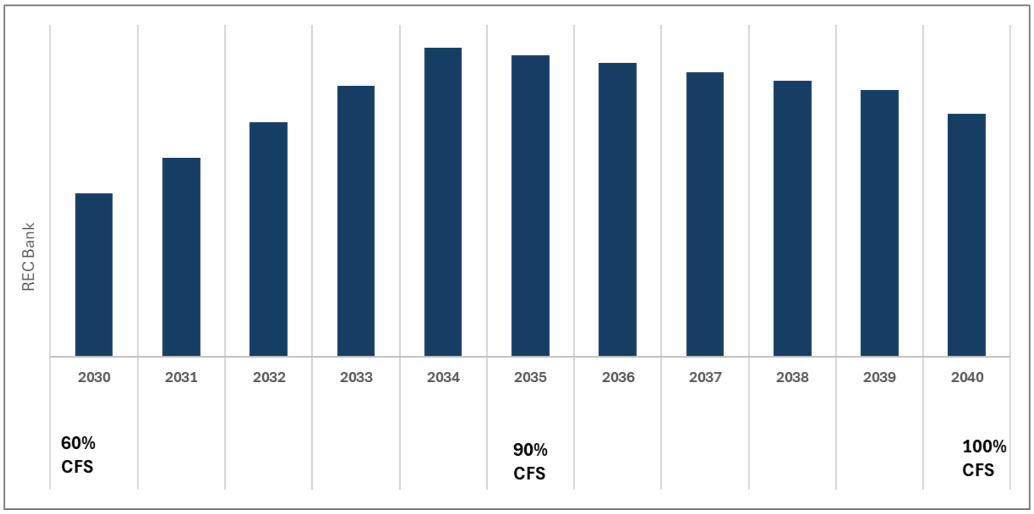


12.3 MN Carbon Free Standard

The Minnesota CFS, enacted in 2023 under Minn. Stat. § 216B.1691, requires Minnesota cooperatives to achieve 60% carbon-free electricity by 2030, 90% by 2035, and 100% by 2040. Our 2025-2040 Preferred Plan complies with the CFS statute and the associated Commission's September 16 Order under Docket No. E999/CI-23-51. The final details and compliance mechanisms for the CFS are still evolving and we will continue to monitor and participate in related sub-dockets, analyzing their outcomes to inform future planning.

Figure 28 shows the modeled REC bank under the Preferred Plan, assuming RECs are retired to demonstrate compliance with the CFS. In 2040, GRE is forecasted to continue to have banked RECs that will enable GRE to meet the CFS into the late 2040s without external REC purchases. GRE's planned resource mix remains positioned to maintain compliance while preserving flexibility as regulatory requirements continue to evolve.

Figure 28: GRE's forecasted REC bank under the Preferred Plan



12.4 Rate Impact of Regulatory Compliance

As part of the Minnesota IRP process, each electric utility must submit a report containing an estimation of the rate impact of activities of the electric utility necessary to comply with this section.

In GRE's IRP, the Preferred Plan represents the least-cost solution to meet our members' forecasted energy and demand needs under the Base Case scenario the Preferred Plan not only achieves the CFS and the EETS but does so without incremental rate impacts as there were no additional renewable resource needed for regulatory compliance beyond what was already included in this least-cost plan. In sum, GRE's Preferred Plan provides a cost-effective, compliant power supply while ensuring reliability and adaptability in a dynamic economic and regulatory environment.

13 Conclusion

GRE's 2026–2040 IRP outlines a balanced and adaptable plan for meeting our member-owners' future energy and capacity needs. The Preferred Plan is a balanced strategy that builds on the strengths of GRE's existing portfolio while adding a diversified mix of new wind, energy storage, and dispatchable reliability resources in combustion turbines to maintain reliability and affordability. Just as importantly, the Preferred Plan is positioned to comply with Minnesota's EETS and CFS.

This IRP also recognizes that resource planning now requires ongoing evaluation as key assumptions continue to evolve. Uncertainty related to large-load growth, capital and interconnection costs, emerging technologies, and changing MISO accreditation rules underscores the need to regularly reassess planning assumptions and resource decisions. GRE's analysis shows that the Preferred Plan provides that flexibility. It performs well across a range of futures, preserves optionality in later years, and reduces the risk of stranded or unnecessary costs if load growth, market conditions, or accreditation outcomes develop differently than expected. GRE will continue to monitor these developments and test the Preferred Plan against changing conditions as part of an ongoing planning process. In that way, the Preferred Plan is not only a reliable, cost-effective and compliant resource strategy, but also a prudent framework for navigating uncertainty on behalf of GRE's member-owners.

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Appendix C – GRE 2026 IRP Open Houses

Appendix D - Advance Forecast

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Appendix I – EnCompass MIP Whitepaper

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