GREAT RIVER ENERGY

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October 2, 2023
PUBLIC DOCUMENT

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

Dear Mr. Seuffert:

RE: **In the Matter of Great River Energy's 2023-2037 Integrated Resource Plan**
Docket No. ET2/RP-22-75

Great River Energy ("GRE") submits to the Minnesota Public Utilities Commission (Commission) these Reply Comments to Comments received on the 2023-2037 Integrated Resource Plan in the above referenced docket.

In these Reply Comments, GRE largely supports the comments of the Minnesota Department of Commerce (Department) and responds to several topics introduced by other parties to the proceedings in their filed Comments. GRE supports the proposed filing date by the Department for its next Integrated Resource Plan (IRP) in the Spring of 2027.

Additionally, GRE is pleased to include a summary of its funding request to the United States Department of Agriculture (USDA) Rural Utilities Service (RUS) New Empowering Rural America (ERA) Act. GRE and its member owners are excited about the potential benefits these funds can provide for our existing plan for our portfolio and cost-effective decarbonization.

Please contact me at (763) 445-6116 or zruzycki@grenergy.com if you have any questions regarding this filing.

Sincerely,

GREAT RIVER ENERGY

Zac Ruzycki
Director, Resource Planning

c: Service List

Table of Contents

Overview

Great River Energy ("GRE") submits to the Minnesota Public Utilities Commission these Reply Comments to Comments received on the 2023-2037 Integrated Resource Plan in the above referenced docket. The comments below provide an update to GRE's Preferred Plan and briefly respond to comments submitted by other parties.

Update to Preferred Plan

GRE's Integrated Resource Plan (IRP) continues to represent our best intent to meet our member owners' energy needs over the planning period in a reliable, cost-effective, and environmentally responsible manner. GRE has experienced some changes in our portfolio development strategy since the filing of our IRP on March 31, 2023 that will affect the type and timing of resource additions. These changes include application for funding from the federal government for clean energy investments, pursuing an additional 300 MW wind project, a third short-term PPA with Rainbow Energy, and a one-year delay of the Cambridge Station long-duration energy storage pilot project with Form Energy.

New ERA Funding

The USDA RUS New ERA Program comes at an important time of transition for GRE's member owners, our region, and our nation. Three months prior to the signing of the Inflation Reduction Act, GRE and our member owners executed an agreement that will see us nearly completely eliminate coal from our power supply over the next decade, led by the sale of our largest remaining coal asset, the 1,151 megawatt (MW) Coal Creek Station power plant. To enable this far-reaching decision without sacrificing affordability and reliability, GRE entered into an agreement to continue purchasing power from Coal Creek Station. However, with the investments envisioned in GRE's New ERA, we will be able to move quickly, more efficiently, and with greater confidence to bring on new renewable energy resources. Most of these new resources will interconnect with existing grid infrastructure, all while continuing to deliver affordable and reliable power to our member owners.

GRE and 20 Participating member owners submitted a Letter of Interest (LOI) on September 14, 2023; pursuing both Project and System Awards. GRE and five (5) Participating member owners are requesting Project Awards and 15 Participating member owners are requesting System Awards.[1] If invited to apply to the New ERA Program by receipt of an Invitation to Proceed, GRE and the Participating member owners commit to developing a proposal that achieves the greatest reductions in GHG emissions in a way that promotes resiliency and reliability for rural electric systems and affordability for our member owners.

The strategic vision advanced in our New ERA Project's Portfolio of Actions is built around three Portfolio Strategies of Actions: (1) deliver wind energy over regionally coordinated transmission, (2)

[1] https://www.startribune.com/minnesota-electric-cooperatives-great-river-energy-970-million-federal-clean-energy-money/600298089/

coordinate member-owner renewable energy resource deployment, and (3) advance smart grid technologies that enable a virtual power plant. We also propose to refinance three stranded assets to enable these Actions.

Portfolio Strategy 1: Deliver Wind Energy Over Regionally Coordinated Transmission

GRE is proposing utility-scale wind projects totaling 1,264 MW of new clean energy to replace purchases of coal generation. With New ERA funds, we will be able to accelerate and secure these pre-construction projects to begin operation in 2026, using existing generator interconnections to reach regional transmission infrastructure. The developers of these projects prioritize engagement with communities, landowners, and farmers that will host these projects. Some of these projects are still in the negotiation phase, and do not have signed power purchase agreements (PPA) with the developers. As a result, GRE is grouping these projects together in these Reply Comments and will issue a Notice of Changed Circumstances in this proceeding when these projects have a signed PPA.

Discovery Wind is part of both this plan and the New ERA LOI. The project is a 426 MW wind generator in McLean County, North Dakota being developed by Apex Clean Energy near the site of Coal Creek Station. Through a 30-year transmission service agreement, Discovery will use capacity on the HVDC transmission line that is no longer being exclusively utilized by the coal plant to deliver clean power directly to load in the Twin Cities and surrounding area, avoiding significant additional transmission construction. GRE, along with the developer and transmission line owner, is regularly engaging communities, landowners, and farmers to develop plans for local benefits. The project will use an innovative, community-based lease to share financial benefits of the project broadly in rural North Dakota. GRE will act as the project's sponsor to monetize elective pay tax credits, including likely Energy Community adder.

Dodge County Wind is included in both this plan and the New ERA LOI. The project is a 259 MW wind generator located in Dodge County, Minnesota being developed by NextEra Energy Resources. The project will avoid interconnection delays and costs by interconnecting at GRE's Pleasant Valley Station, a natural gas combustion turbine generating facility that operates with a low-capacity factor. GRE and the developer continue to engage local landowners and farmers to develop opportunities for continued farming in the area. We estimate that the project will generate $83M in benefits to landowners and $39M for the hosting counties.

Three Waters Wind is included in both this plan and the New ERA LOI. The project is a 279 MW wind generator located in Jackson County, Minnesota and Dickinson County, Iowa being developed by NextEra Energy Resources. We estimate that the project will generate $70M in benefits to landowners and $42M in revenue for local infrastructure and services. GRE will act as the project's sponsor to monetize elective pay tax credits.

GRE is currently working to develop an additional 300 MW wind project located in Southeast Minnesota. This project is *in addition* to GRE's current IRP Preferred Plan. The project is seeking surplus interconnection to interconnect at GRE's Lakefield Junction Station. We continue working closely with local landowners and state and county officials to plan this project and will submit a Notice of Changed Circumstances if and when appropriate.

Portfolio Strategy 2: Coordinate Member-Owner Renewable Energy Resource Deployment

Nineteen Participating member owners are collectively scoping 255.5 MW of new renewable energy resources to replace purchases of coal generation, including 129 MW of distributed solar energy, 11.5 MW of wind and solar-wind-storage hybrid projects, and 115 MW of member-directed, transmission-connected renewable energy.

When developing plans to sell Coal Creek Station in 2022, GRE worked with our all-requirements member owners to expand the flexibility in their wholesale power contracts to allow them to help replace the energy and capacity previously supplied by Coal Creek Station by providing up to 10% of their energy needs from distribution-interconnected renewable energy resources. After the announcement of the New ERA program, GRE worked with our member owners to launch a competitive request for proposals (RFP) for distribution-connected solar projects to help member owners assess the opportunity to utilize New ERA funding to build distributed renewable projects on their systems. GRE and participating member owners selected a short list of developers for these projects based on proposed pricing and ability to ensure projects are developed to maximize community benefits.

Participating member owners are currently screening substations for hosting capacity, and we are working with finalist developers to move these projects forward contingent on funding from the New ERA program. Two participating member owners are also scoping larger, transmission-connected, member-directed renewable projects totaling 115 MW. These renewable projects can help replace capacity and energy needs previously supplied by coal resources, while offering local resiliency, reliability, and affordability through multiple installations closer to loads.

Portfolio Strategy 3: Advance Smart Grid Technologies That Enable a Virtual Power Plant

We are seeking funding to further the deployment and utilization of demand side resources as a virtual power plant (VPP) on 15 Participating member owners' distribution systems. GRE and our member owners have invested in demand response since the 1970s, reducing the need for fossil fuel power generation. Currently, GRE's load control capability can reach 400 MW. These investments reflect our collective commitment to addressing reliability and decarbonization strategies from both the demand and supply sides while creating hundreds of millions of dollars of member-owner savings. Recently, GRE registered member-owner demand response with the MISO capacity market, forming one of the country's largest VPPs, providing over 160 MW of capacity. The GHG emission reduction benefits of our growing VPP will increase with these smart grid advancements making the grid more efficient while electrification and variable renewable generation deployment continues.

Our proposal includes investments to modernize GRE and 13 participating member-owner load management systems, deploy digital grid control software (advanced distribution management systems, DER management systems, distributed energy storage, and other grid-edge control technologies) on GRE and 4 participating member-owners' systems, and deploy distributed energy storage on 3 participating member-owner systems to allow for deeper integration and orchestration of DERs. Collectively, these investments will enable the continued expansion of flexible demand and other DERs as a capacity resource into the future. These proposed investments will allow participating member owners to provide more precise load control and verification and the ability to shape fleets of member-consumers' appliances and devices in a way that responds to renewable generation and expands our system capabilities to adapt to widespread electric vehicle charging and electrified heating.

These investments will provide continued GHG emission reductions, grid reliability, and cost-saving opportunities for our participating member owners.

All proposed investments will be owned (hardware) or directly licensed (software) by an applying member owner, and will complement the utility rebates, federal incentives, and member-consumer investments in consumer-owned devices, appliances, and vehicles.

GHG Emissions Reductions

Based on the New ERA Achievable Reduction Tool (ART), GRE and participating member-owner projects in the proposed Portfolio of Actions will deliver a cumulative reduction of 187.05 million tons CO2e. We project that these Actions will allow GRE and participating member owners to achieve GHG emissions reductions of 6.23 million tons of CO2e per year, a 58.1% reduction from 2022 levels, while increasing renewable energy supply by 5.48 terawatt hours (TWh) per year, a 169% increase (43.6 percentage point increase in the supply mix of GRE and participating member owners) over 2022 levels.

Additionally, the proposed Portfolio of Actions will contribute to unquantified reductions by supporting beneficial electrification and aggregation of DERs operating as a VPP.

Rainbow Energy

GRE recently negotiated a third short-term PPA with Rainbow Energy for the sale of financially settled energy in Minnesota. The agreement, which was executed on June 15, 2023, adds 50 MW of 7x24 energy to GRE's portfolio from July 1, 2023 to December 31, 2025. No capacity is included in this agreement. This agreement was put in place as an energy hedge due to a 1–2-year delay in GRE's upcoming wind generation projects.

Form Energy

As part of GRE's Prefer Plan, GRE intends to add a 1.5 MW Form Energy multi-day storage pilot project at Cambridge Station. The target date for this project was December 2024. Due to manufacturing delays, this project is experiencing a one-year delay. The new in-service date has currently been moved from December 2024 to December 2025. GRE is still in line to receive the first commercially available storage modules from Form Energy.

Responses to Intervenor Comments

GRE appreciates the opportunity to respond to points discussed in the filed Comments of intervenors in this proceeding and values the robust discussion in the record to date. We have communicated extensively will all parties submitting comments, and while we do not agree with many of the characterizations and assertions made by intervenors in this IRP, we understand the importance of a robust record and creating a clear recommendation for the Commission.

Below GRE responds to select portions of filed Comments in this docket.

CURE

Clean Up the River Environment (CURE) submitted comments to Great River Energy's 2023-2037 Integrated Resource Plan Docket No. ET2/RP-22-75 under document 20238-198087-01. CURE's comments discussed load forecast assumptions specifically as related to electric vehicle forecasting methodology, modeling variables - including the lack of a self-build solar scenario, GRE's plan to convert

Cambridge Unit 2 to dual fuel operation, Spiritwood Station retirement, and when GRE should file its next IRP. GRE briefly responds to CURE's comments below.

Forecasting Electric Vehicles

Electric vehicle growth has minimum impact on GRE's near-term capacity expansion modeling and short-term capacity expansion plan in this IRP.

The utility industry as a whole is working to better understand the emerging technologies surrounding electric vehicles and the pace of adoption. Accurately forecasting EV market penetration by 2037 is extraordinarily difficult and highly dependent on many factors that are geographic, economic, political, and commodity based. Therefore, GRE is currently at work evaluating improvements to forecasting future electric vehicle load scenarios. Local research on charging, input from GRE's member owners, manufacturing trends/capabilities and national/local policy will continue to be studied for future electric vehicle forecasts.

GRE has recently joined the Electric Power Research Institute (EPRI) program EVs2Scale2030 to benefit this endeavor.[2] EPRI's EVs2Scale2030™ initiative is a three-year commitment focused on leveraging industry scale to galvanize not only the utility industry, but to align all critical market stakeholders as electric vehicle goals increasingly target 50 percent new vehicle sales by 2030. EPRI will leverage its industry partnerships to mobilize utilities, fleet operators, the automotive industry, and charging providers, and coordinate with federal agencies and labs, to support the rapid deployment of millions of electric vehicles – while minimizing grid impacts and enabling critical benefits to the nation's grid. EVs2Scale2030 is a three-year collaboration that seeks to:

- *Enable the utility industry and its regulators to be in lockstep with vehicle manufacturers, fleet operators, and consumers to build confidence in achieving 2030 goals*
- *Enact systems and processes that support the pace of activity and investment required*
- *Develop and optimize the tools and technologies required to enable EVs at scale and capture the grid benefits of this large and flexible load*

More information on EPRI's EV2Scale2030 is available in Attachment A to these Reply Comments.

Modeling Variables

CURE discusses a number of topics when considering the modeling decisions made by GRE in formation of our plan. First, CURE states that self-build solar was not included in the modeling scenarios, and states that the modeling outcomes are inadequate as a result. GRE purposefully did not include self-build solar in this iteration of our plan, as we know we were not facing a short-term capacity or on-peak energy need. Solar is not an investment decision, self-build or contracted, that GRE is facing in the next five years.

CURE state in their comments:

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[2] https://www.youtube.com/watch?v=i3B0czK43EY
https://msites.epri.com/evs2scale2030

> *"It is especially helpful to see the reality of climbing costs for combustion-turbine-generated energy and decreasing costs for wind or solar PPAs, or even the falling costs of lithium-ion battery technology."*[3]

And,

> *"We also know that the cost of self-build solar will only decrease throughout the planning period, especially with the millions of dollars available through the IRA loans or tax credits – including a direct-pay option – to defray the costs."*[4]

While GRE agrees that the last decade has witnessed a steady decline in the costs of renewable energy resources, the past is simply not a predictor of the future in this unique economic environment.

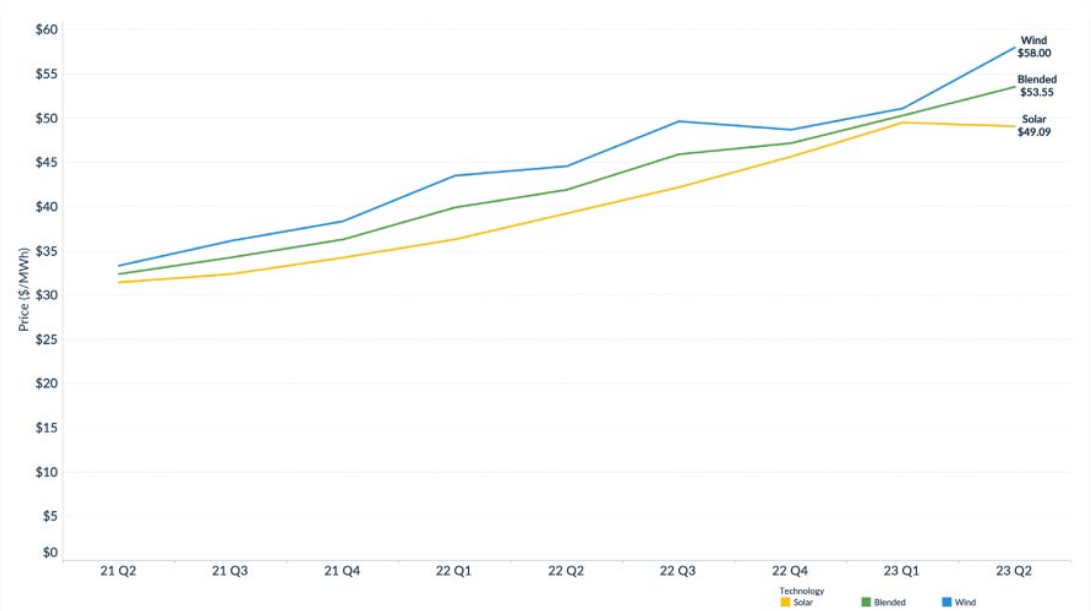
To demonstrate this, GRE illustrates below the trend in wind and solar PPA pricing from Q2 of 2021 to Q2 of 2023 in Figure 1. The trend is generated and provided by LevelTen Energy and illustrates the dramatic increase in both solar and wind PPA pricing over the past 2-3 years. LevelTen Energy is the leading provider of renewable transaction infrastructure, delivering the marketplaces, software, automated analytics, and expertise required to accelerate clean energy transactions. The LevelTen Platform is the world's largest online hub for renewable energy buyers, sellers, advisors, asset owners and financiers. The Platform includes the LevelTen Energy Marketplace, which delivers access to more than 4,500 power purchase agreement price offers spanning 28 countries in North America and Europe. It also includes the LevelTen Asset Marketplace, which brings together over 800 renewable energy project developers and owners, and delivers the online tools and expertise they need to buy, sell and finance assets quickly. Below are three images indicating recent solar and wind PPA trends and prices in MISO derived from the LevelTen Energy Q2 2023 PPA Price Index report.[5]

[3] CURE, Comments on Great River Energy's 2023-2037 Integrated Resource Plan, 3, eDockets Document No. 20238-198087-01

[4] ibid

[5] LEVELTEN ENERGY Q2 2023 PPA Price Index. https://store.leveltenenergy.com/collections/all

Figure 1 – LEVELTEN ENERGY Illustrative Renewable PPA Pricing



Index	2023 Q2 Price	QOQ Percent Change 2023 Q1 to 2023 Q2	QOQ Dollar Change 2023 Q1 to 2023 Q2	YOY Percent Change 2022 Q2 to 2023 Q2	YOY Dollar Change 2022 Q2 to 2023 Q2
Solar P25	$49.09	-1%	-$0.43	25%	$9.84
Wind P25	$58.00	13%	$6.89	30%	$13.42
Blended P25	$53.55	6%	$3.23	28%	$11.63

The significant increase in pricing due a confluence of economic pressures is evident. The industry has seen a significant increase in demand, commodity costs, material costs, has experienced difficulties with supply chains, and increases to the cost of money that have all led to consistently higher pricing quarter over quarter for more than two years.

Self-Build Solar

GRE's preferred plan and base case both selected solar resources in later plan years, with storage, wind, and solar resources forming the only investments in our plan. Whether those resources are contracted, or GRE owned assets is a question that is not ripe to answer for GRE today. As the modeling selected these resources, as GRE gets closer to the implementation date of need for these assets, the decisions regarding location, duration, and ownership structure of those resources will be determined. The omission of GRE owned solar assets does not compromise the validity of the planning work in any way.

Additionally, GRE has formed a consortium with its member owners to submit a funding request to the USDA RUS New ERA program for development of more than 250MW of member-owned small solar resources.

CURE requests that the Commission order GRE to re-run its models with three self-build solar options. GRE opposes this request, as we do not think this additional work will yield results that will alter the short-term action plan. The investment in solar resources per our preferred plan is after 2030, well beyond the period of time in the short-term action plan. The modeling and evaluation of GRE owned

and contracted renewable energy is a question that will be asked and answered in future planning work. As a cooperative, GRE and its member owners have an incentive to create a low-cost, low-risk portfolio, absent any incentives that come from guaranteed returns on investments or other regulatory mechanisms. Any profits of operation are returned to GRE member owners in the form of capital credits.

GRE's IRP Filing Date

CURE recommended GRE's next IRP be filed on April 1, 2025. The DOC recommends GRE file its next IRP in the Spring of 2027. GRE supports this recommendation from the DOC as the Preferred Plan does not add new resources until the early 2030s.

Cambridge Unit 2 dual fuel modification

As part of GRE's Preferred Plan, GRE indicated its intention to install dual fuel capability at its Cambridge Station gas combustion turbine peaking plant to enable GRE and its member owners to realize the clear reliability and economic benefits from having dual-fuel capability at Cambridge Station. This proceeding is currently underway as docket ET-2/GS-22-122 - *In the Matter of a Request for a Minor Alteration to Great River Energy's 170 MW, Natural Gas-Fired, Simple Cycle Combustion Turbine Generator at its Cambridge 2 Peaking Plant Site near Cambridge, Isanti County, Minnesota*.

GRE submitted Comments and Proposed Findings on June 20, 2023, and Reply Comments on July 30, 2023, in this proceeding. These Comments and Proposed findings demonstrated that the EAW is accurate and complete and that the Project (1) does not have a potential for significant environmental effects requiring the preparation of an Environmental Impact Statement ("EIS"); and (2) will not result in significant changes in the human or environmental impact of Cambridge Unit 2. CURE alleges that the Project is inconsistent with the Minnesota Legislature's recent passage of the "Carbon-Free Standard" requiring utilities to procure or produce "100% carbon-free electricity by 2040" relative to total electric retail sales. In passing the Carbon-Free Standard, the Legislature specifically recognized that continued operation of fossil fuel resources may be necessary to ensure reliability and specifically allows their continued operation to be offset through the retirement of Renewable Energy Certificates. The merits of GRE's plans to install dual fuel capability at its Cambridge Station is fully addressed in Docket No. ET-2/GS-22-122 pending before the Commission.

Sierra Club Comments

The Sierra Club submitted comments to Great River Energy's 2023-2037 Integrated Resource Plan Docket No. ET2/RP-22-75 under document 20238-198084-01. The Sierra Club's comments focus on additional Encompass modeling requests which include New ERA funding scenarios as well as carbon accounting.

New ERA Funding

Details about GRE's New Era funding efforts are described on page 3 above including GRE's Portfolio Strategies of Actions: (1) deliver wind energy over regionally coordinated transmission, (2) coordinate member-owner renewable energy resource deployment, and (3) advance smart grid technologies that enable a virtual power plant. We also propose to refinance three stranded assets to enable these Actions. GRE appreciates the Sierra Club's recommendations regarding full utilization of New ERA funding to continue facilitating the clean energy transition that GRE has been enacting for our member owners.

Carbon Accounting Methodology

In GRE's response to DOC IR 7A, a step-by-step description was provided describing how GRE calculated its CO2 emissions. GRE is not opposed to making this methodology public. The methodology is described in Appendix B.

While this topic is important, GRE does not believe this is a priority decision in this IRP. When the PUC opens a proceeding into the demonstration of compliance with the new carbon free standard, GRE believes that is the correct forum for a full stakeholder process and comment period on this issue. Many other utilities transact financial hedge agreements and understanding the complexities of this issue among the other utilities, with respect to the Rainbow PPA, and future potential agreements is a topic more appropriately addressed in a full Commission proceeding.

Department of Commerce

The Minnesota Department of Commerce (Department) submitted comments to Great River Energy's 2023-2037 Integrated Resource Plan Docket No. ET2/RP-22-75 under document 20238-198066-01**.** The DOC comments included recommendations for GRE's future modeling specifications, its next IRP filing date, and future CO2 accounting methodology. The Department also made several statements throughout the comments that GRE would like to clarify at this time.

Modeling Recommendations

GRE appreciates the thorough modeling review conducted by the Department staff. The Department's Comments state:[6]

> *"Nothing in GRE's Five-Year Action Plan is objectionable, although the Department notes that the step down of the Rainbow PPA has the potential to create the most risk for GRE's ratepayers because of the Cooperative's market exposure. GRE's further plan to delay the battery addition until 2030 when the model prefers to add it in 2027 keeps GRE in this riskier position longer. However, the Cooperative's reserve margins will theoretically provide enough of a cushion to shield its ratepayers. Further, the Department notes that GRE's delay will allow the Cooperative more time to study the battery pilot project, hopefully mitigating unforeseen operational risks. Ultimately, the Commission is not responsible for costs at GRE, and so the increased risk on the cost side, while important, is of lesser concern for a generation and transmission cooperative than an investor-owned utility. The Department considers GRE's Preferred Plan to be generally reasonable in terms of cost, reliability, and risk. Relative environmental impact at this time is unknown. Therefore, the Department is generally supportive of GRE's Preferred and Five-Year Action Plans."*

The Department additionally states:[7]

> *First, the Department recommends that, in the next IRP, GRE provide updated summary information on compliance and a discussion of GRE's work toward achieving compliance with the CIP letters, especially with the energy savings and low-income standards.*

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[6] Minnesota Department of Commerce, Division of Energy Resources, Comments on Great River Energy's 2023-2037 Integrated Resource Plan, 41, eDockets Document No. 20238-198066-01

[7] Id, 53-54

Second, the Department recommends that GRE should separately calculate emissions sold to the market with a factor reflective of carbon emissions due to electricity production from GRE. Whereas emissions purchased from the market should be calculated using an emissions factor representative of the MISO market.

Third, Department recommends GRE incorporate the following modeling suggestions in its next IRP:

- *Ensure that the appropriate input files correspond to reported exports;*
- *Consider the use of a "setup" file for storing and transferring databases via spreadsheets;*
- *Develop a database around variables the utility has control over (scenarios), variables the utility does not have control over (contingencies), and the Commission's carbon cost and externality futures (futures), as depicted in Figure 3 above;*
- *Incorporate some level of externality and carbon costs into Base Case assumptions;*
- *Appropriately incorporate the Commission's regulatory costs into the model;*
- *Confer with other utilities and potentially other interested parties to determine a best practice to address externality and environmental costs;*
- *Include in its model a slightly broader range of potential resources, potentially determined through a more exhaustive pre-input study;*
- *Incorporate all known or planned resources into its model or explain why known or planned resources have been omitted;*
- *Try to pinpoint a moderate level of market sales to include in its base case, or at least in some scenarios, while being vigilant about avoiding capacity that is built solely to chase market prices;*
- *Provide a comparative analysis of emissions across sensitivities, using MISO carbon intensity rates for energy purchases from Rainbow if the Rainbow contract does not involve actual energy purchases and removing REC accounting for purposes of comparing sensitivities;*
- *Provide the relevant portions of the Rainbow contract(s) to demonstrate why a market carbon intensity rate is the more appropriate value;*
- *Develop a MIP stop basis and convergence tolerance cost analysis and consider these factors when developing the size of potential resources; and*
- *Continue to monitor battery arbitrage uncertainties in the modeling software and provide an update about further knowledge learned in its next IRP.*

GRE does not oppose the recommendations made by the Department in its review of the modeling decisions and methodology. Understanding that there are complexities involved with the determination of carbon attribution for financial transactions that will be explored by this Commission and stakeholders in future proceedings, GRE largely agrees with the process changes suggested by the Department.

GRE's Next IRP Filing Date

The DOC recommends GRE file its next IRP in the Spring of 2027. GRE supports this recommendation as the Preferred Plan does not add new resources until the early 2030s.

Carbon Accounting Methodology

GRE would refer to comments made in response to the points raised by Sierra Club on page 13 of these Reply Comments. We recommend the Commission fully consider this issue in a forthcoming proceeding on carbon free standard compliance.

Additional Reply Comments to the Department

The Department makes several statements in their comments that GRE would like to address in these Reply Comments.

In footnote 27 of the Departments Comments, the Department states:[8]

> *"The decision of whether to include greenhouse gas emissions from Rainbow Energy's Coal Creek plant involves several issues. (a) The contract is financial in the sense that GRE is purchasing electricity. Whether GRE has the right to choose which customers it will make financial contracts with based upon their energy resources is at question. (b) The Commission eventually must determine under what conditions greenhouse gases associated with power purchase agreements (PPA) should be counted. That is, when are PPAs and financial transaction independent of associated parties use of resources to supply the electricity? If GRE's bilateral contracts with Rainbow Energy are determined to be financial, without regard to the supplier, then GRE's burden in meeting the greenhouse gas standard could be lessened. It might also lower GRE's burden to meet the standards in the Carbon-free act and the standards on renewable energy. If this case can be generalized to other bilateral PPAs, then it could serve as precedent for other utilities, which could further allow for more Carbon emissions. There is also a local control versus statewide control issue. Some may suggest that the state has a right to impose a minimum statewide standard since everyone in Minnesota could in-theory be harmed. On the other hand, GRE's cooperative members do not have to purchase electricity from GRE. They could alternately purchase electricity from some other utility, assuming flexibility in contracting. If a local member cooperative wanted greenhouse gas standards to apply equally to all its generation and purchases, then it may have the choice to contract with another utility, albeit perhaps more expensive. Ultimately, the local choice issue is whether state should impose upon all its consumers a standard for utilities that assigns some of the responsibility for pollution from greenhouse gases to itself, even if not wanted by communities, and even if it may resultantly emit more harmful pollutants because of no assignment of responsibility."*

[8] Id, 47 footnote 27

While GRE has stated its recommendation to defer a decision on the attribution of carbon to the Rainbow contract to a future proceeding, there are some issues with the Department's assertions in footnote 27 that GRE would like to clarify.

First, the Department states that there is a question as to whether GRE has the right to choose which customers it will make financial contracts with based upon their energy resources. As a cooperative, the power supply decisions are made by GRE's board of directors and member-owner cooperatives. The interpretation of how those contracts may be characterized with respect to demonstrating compliance with a policy goal, but the autonomy of GRE as a cooperative to execute transactions in the best interest of its membership is not in question.

Second, the Department of Commerce states that, depending on their power supply contracts, GRE's distribution cooperative member owners may not have to purchase electricity from GRE and could alternately purchase electricity from other power suppliers. GRE's all-requirements member owners have signed a power purchase contract with GRE that designates GRE as their sole provider of power supply. Some member owners of GRE are partial requirements for power supply, or fixed member owners, and have a different power purchase contract with GRE. These fixed member owners purchase a fixed amount of power supply from GRE, and the rest of their power supply needs from another power supplier. GRE's all-requirements members have a 10% renewable self-supply option. Outside of that option, GRE is obligated to provide all power supply to those members. All of GRE's member owners, both all-requirements and fixed, have signed a transmission service contract with GRE that designates GRE as their sole provider of transmission service.

The Department's Comments also considered a number of Federal requirements that are discussed including the Coal Combustion Residual (CCR) Rule and the Good Neighbor Rule.[9]

As GRE is no longer the owner of the plant, we cannot comment on the current compliance of the unit with EPA CCR regulations. GRE continues to collaborate with Rainbow and the site's qualified professional engineer (QPE) who has certified compliance with these federal requirements. Should EPA decide to issue a final denial of the Part B alternative liner application, GRE can then comment on the potential impact to the expansion plan if there are limitations to station operations.

The Department also discussed the Good Neighbor Rule, or the Interstate Transport provision of the Clean Air Act in its comments. GRE appreciates the Department's thoroughness with respect to rules with potential to impact the preferred plan. However, GRE anticipates no issues complying with the Minnesota State Implementation Plan (SIP), if reinstated by the courts. The decision by the EPA to disapprove of Minnesota's SIP has been stayed for numerous states by the eight-circuit court and several other circuits. Given these court actions, it remains to be seen if EPA's Federal Implementation Plan (FIP) will remain law. Further, GRE itself would have been compliant with the EPA's FIP given allowance allocations in the first few years as discussed in our IRP comments. Further updates can be provided to the Commission or stakeholders as needed.

The Department's Comments additionally state:[10]

[9] Id. 50-51
[10] Id. 44

"In a separate docket, the Department reviews GRE's plans for compliance with the goals in GRE's CIP. As describe below, GRE has historically not met CIP standards in energy savings and low-income spending. Going forward, changes have been made to the energy conservation goal, making it somewhat uncertain whether GRE will comply in the future. But at least for the low-income standard, GRE has a record of noncompliance. If trends continue, GRE may continue to remain noncompliant."

GRE and its member owners participated in the changes to the energy conservation goals that allowed for a greater emphasis on efficient fuel switching. The promotion of heat pump technologies and electric vehicles is well in line with both state and federal energy policy goals focused on the promotion and adoption of these technologies, which seek to further decarbonize other sectors of the economy by leveraging the decarbonization successes of electric generation. Given the expected financial rebates and tax incentives that the Department will be central to promoting, GRE is confident that the savings will be met.

However, the landscape of energy efficiency continues to change as federal and state standards change, resulting in increased baselines and reduced savings associated with other measures. GRE and its member owners discontinued offering rebates for lighting projects in new construction due to the expectation that the market had shifted and that these projects could proceed without relying on dollars from our member owners. While this action did impact the amount of quantifiable energy savings that were claimed, efficiency continued to be realized with new construction projects implementing efficient lighting as the standard.

GRE and our member owners are always aggressively working on energy efficiency programs, however, the downward trend in energy savings is the result of the elimination of new construction lighting and to a degree the COVID-19 pandemic.

The Department discusses its recommendation that in the next IRP, GRE provide updated summary information on compliance and a discussion toward our work achieving compliance with the CIP letters. In these comments the Department states:[11]

"Also, the legislation included more goals than the energy conservation goal in 2007. Some of these goals are now specific to cooperatives.

- *Total energy savings of 1.5 percent of Gross Annual retail Sales, which is somewhat less challenging than the 1.75 percent goal for public utilities. Prior to the ECO Act, both cooperatives and public utilities had the same goal at 1.5 percent."*

While the goal may be less challenging based on the absolute requirement of 1.5% versus 1.75%, this does reflect the unique challenges of the services territories of rural electric cooperatives. Service territories that are largely residential, with lower density and less of a network of energy service providers provide significant challenges to the achievement of these goals in the face of changing standards.

[11] Id. 45

Regarding meeting the spending requirements, the Department's Comments discuss non-compliance, which GRE would like to clarify:[12]

> *"Attachment 2 includes further analysis regarding compliance with CIP goals. As described, GRE has historically not met CIP standards in energy saving and low-income spending for each of the years 2016-2020. Changes have been made to the calculation of energy savings, so it is uncertain whether GRE will comply in the future. GRE has a record of noncompliance for the low-income standard. However, average shortfall from the goal is small ($17,516), in part because the member cooperatives are small. The lack of compliance in low-income spending may be more relevant if there are vulnerable or important communities within the member cooperative territories. For those communities, it may be more important to monitor compliance in future IRPs."*

GRE would note that in all years, the overall spending requirement was met. While there were small shortfalls from the goal in the case of some member owners, this reflects the challenges inherent in spending relatively smaller amounts of dollars within a specific utility service area. GRE also notes that portions of the total income eligible spending reflect voluntary participation of CIP exempt member owners in continuing to provide these programs.

Finally, the Department's comments regarding GRE's CIP compliance consider the importance of the CIP goals themselves:[13]

> *"CIP goals are relevant because compliance can impact GRE's mix of energy sources for electricity and its future plans to ensure sufficient capacity for its customers. For example, if GRE falls short of compliance with the CIP goals, compliance can be remedied through increased spending and achievement in the area of conservation and energy efficiency. In turn energy conservation and energy efficiency measures may increase the use of renewable energy sources to produce electricity and may also decrease the demand for electricity. In some cases, the CIP may further affect upcoming certificates of need and energy investments."*

GRE would note that the nature of our energy efficiency programs continues to evolve. The ECO Act reflected the changes that are underway as new technologies, especially technologies that fall under the broad umbrella of "beneficial electrification," are adopted by consumers. These technologies are typically characterized as providing reduced overall energy consumption with increased reliance on the electric system. The benefits include improved efficiency and lower emissions, even with increased electric consumption. Electric vehicles and air source heat pumps are two key technologies that fall into this category. GRE has been focused on the education and promotion of both technologies.

In addition, GRE and our member owners focus on the integration of load management as consumers adopt these technologies. One of the challenges of beneficial electrification is guarding against the unintended consequences of increasing peak demand. GRE and our member owners continue to leverage our history of demand response to raise awareness and build out these capabilities as technology adoption proceeds. Minnesota's Climate Action Framework[14] calls for 20% of the vehicles on

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[12] Ibid

[13] Id. 45-46

[14] https://climate.state.mn.us/sites/climate-action/files/Climate%20Action%20Framework.pdf

the road to be electric by 2030. In addition to the federal tax incentives that are available, the Minnesota Department of Commerce is planning to implement the Minnesota Electric Vehicle Rebate Program.[15] Increasing electric vehicle adoption is a key strategy for our state's decarbonization efforts, which will require considerable effort and planning to ensure the benefits of these technologies are fully realized.

In Minnesota GRE has been engaged in the Center for Energy and the Environment's Air Source Heat Pump Collaborative[16] to develop education, contractor training and market transformation efforts related to the adoption of air source heat pumps. GRE along with the Minnesota Department of Commerce have also joined onto the Department of Energy's Cold Climate Heat Pump Challenge[17]. GRE and several of our member owners are currently engaged with the National Rural Electric Cooperative Association (NRECA) on research to improve the demand response capabilities of air source heat pumps.

GRE looks forward to working with the Department on efforts to continue these activities that are aligned with decarbonization efforts and balance investments in efficiency, electrification and demand response as technologies realized updated standards and increased market saturation.

GRE would note that in addition to energy efficiency, demand response resources have a direct impact on reducing capacity needs. During the 2022 and 2023 MISO planning year, GRE worked with seven of its member owners to pilot the registration of interruptible commercial, industrial, and agricultural (CI&A) resources as Load Modifying Resources (LMRs). During the 2023 and 2024 planning year, this effort was expanded to include all member-owner interruptible CI&A resources. GRE plans to continue to incorporate additional resources in subsequent planning years as we work with our member owners on program requirements.

[15] https://mn.gov/commerce/energy/consumer/energy-programs/ev-rebates.jsp
[16] https://www.mnashp.org/
[17] https://www.energy.gov/eere/buildings/residential-cold-climate-heat-pump-challenge

Appendix A - EVs2Scale2030

EVs2Scale 2030

epri.com/EVs2Scale2030 EPRI

PROGRAM OVERVIEW

EPRI's EVs2Scale initiative is a three-year commitment focused on leveraging industry scale to galvanize and align critical market stakeholders as electric vehicles (EVs) are deployed at scale to achieve 2030 goals.

PROGRAM GOALS:

Ensure utilities (and utility oversight bodies) are in lockstep with vehicle manufacturers, fleet operators, charging providers and consumers to build confidence in achieving 2030 goals.

Streamline the systems and processes needed to support the pace of activity and investment required to meet large-scale electrification by 2030.

Develop the needed tools and technologies required to enable and sustain EVs at scale and capture the grid benefits of this large and flexible load

KEY PROGRAM BENEFITS INCLUDE:

- **Validated data and best practices** to share with utilities and utility oversight bodies to describe grid needs for EVs at scale and be better equipped to execute planning for wide-scale electrification with critical stakeholders.
- **Better customer support** for EV drivers, fleet operators, and underserved communities enabled by programs developed using the initiative's research and knowledge.

EPRI will leverage its industry partnerships to mobilize utilities, car and truck manufacturers, fleet operators, and charging providers, and coordinate with federal agencies and labs to support the rapid deployment of millions of electric vehicles – while minimizing grid impacts and enabling critical grid benefits.

PROGRAM DELIVERABLES INCLUDE:

- A 50-State Roadmap that lays out the year-over-year actions and investments required to meet EV loads, grid impacts, utility leadtimes, workforce, and costs through 2030
- Quarterly Utility-OEM-Fleet convenings
- An assessment of the existing utility regulatory/oversight framework and options for achieving 2030 electrification goals
- A national electric transportation equity blueprint
- A national electric transportation workforce development blueprint
- A consumer marketing research database of EV and non-EV drivers
- An Approved (Vetted) Product List for EVSE compliance with industry standards and NEVI guidance
- A reliability benchmarking analysis and streamlined industry standards to address EV and EVSE interoperability
- A secure online data exchange platform that improves transparency in EV charging planning to inform grid investments and accelerate grid interconnects
- A charging innovation and affordability whitepaper
- A managed charging at scale roadmap
- A roadmap for NEHC/NEVI collaboration
- Best practices for planning resilience/evacuation of EVs at scale during power outages

THE EVs2Scale2030™ INITIATIVE FEATURES THREE KEY PILLARS:

1

Coalitions and Roadmaps:
The outcomes from this pillar frame the 2030 challenge by creating a definitive and multi-stakeholder 50-state roadmap that lays out year-over-year industry/government-driven vehicle electrification goals, charging infrastructure and grid needs, utility lead times, workforce requirements, and costs.

2

Structural System Reforms:
This pillar will identify and/or create the systems and processes needed to support the pace of activity and investment required to meet large-scale electrification by 2030. Topics include grid interconnection, charger maintenance and reliability, affordability, equity, workforce development, and regulations.

3

Unifying Tools and Pilots:
This work delivers a set of tools and pilots critical to meeting and sustaining large-scale electrification objectives, and includes establishing a secure data exchange platform to allow utilities to better plan and invest in grid upgrades, driving the National Electric Highway Coalition (NEHC) project to implementation (with EEI), and validating best practices for EV resilience and evacuations at scale during widespread power outages.

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Appendix B – Carbon Accounting Methodology

GRE's approach to calculating our CO2e emissions has been refined since our submittal of the IRP. The approach is designed to calculate the emissions associated with Minnesota electric sales to member owners based on the ratepayer method. Great River Energy's understanding of the Minnesota Ratepayer Method is based on a review of the Department of Commerce's comments on previous IRP filings. These comments are provided in response to Minnesota Power's 2016 Resource Plan (Docket E015/R-15-690).

It's important to note that the approach outlined here is one of many alternatives for accounting for GHG emissions. Great River Energy uses alternative approaches depending on the situation and continues to evolve our approach as standards and industry practice evolve. The ratepayer method as outlined in this source is described in general terms and doesn't specify all factors. Therefore, a number of steps in our calculations are based on our professional judgment of how to most accurately estimate the emissions that are associated with the electric power we provide to our member owners in Minnesota. GRE understands that the PUC will be providing further guidance as part of separate proceedings on how Minnesota utilities should estimate carbon emissions associated with market and bilateral transactions.

There are two areas where these decisions have significant impacts on reported emissions. First, we have attributed carbon emissions to our contract purchases from Rainbow Energy Center, which has owned the previously GRE-owned Coal Creek Station generating facility in North Dakota since May, 2022. Great River Energy's purchases from Rainbow Energy Center are strictly financial transactions and do not include physical transfers of energy; rather they are i.) structured as a contract of differences and ii.) financially settled based on energy prices in Minnesota. The financial settlement schedules in the purchase agreements outline the dates and terms for settling the respective financial obligations associated with these transactions. GRE believes no carbon emissions should be attributed to such financial settlement transactions, but until clarification is provided by the PUC, we have calculated emissions from Rainbow Energy Center and applied them to this financial settlement transaction as part of our total emissions values reported. An alternative approach would be to utilize the carbon intensity of energy from the MISO market to calculate the amount of carbon emissions associated with purchases of energy from the MISO market and other bilateral purchases. GRE routinely procures short-term energy hedges from other marketing entities and utilities, which can be either physical or financial in structure. If GRE had applied this second approach to the Rainbow Energy Center transaction it would have resulted in lower emissions as the carbon intensity of the market is lower than Rainbow Energy Center. However, we chose to not apply this market approach to the financial settlement with Rainbow Energy Center for this resource plan.

The second decision with significant implications for our carbon emissions is our treatment of renewable energy certificates (RECs) in our greenhouse gas emission calculations. Under the approach described in more detail below, we consider renewable energy carbon-free only when a REC is retired in that same calendar year. In years with more renewable energy purchased than RECs retired, we use the carbon intensity of the market for energy without verifiable REC retirements by GRE. In years when we retire more RECs than are generated, we considered each retired REC to offset a MW of fossil generation from GRE's generating fleet and PPAs with fossil sources. (See description of GRE carbon intensity of fossil energy used for REC adjustments below)

In addition to the above adjustments, there are two additional steps of note with smaller impacts on our total GHG emissions values:

- We present all values as CO2e. These values include the GHG impacts of N2O and methane by converting their emissions to CO2 equivalents. This emission impact is less than 1%.
- We have included the impacts of fugitive SF6 emissions in our total emissions values. This emission impact is less than 1%.

Note that GRE GHG emission values have changed slightly from those provided in the IRP. The changes are primarily attributable to the following corrections or adjustments to our calculations:

- Emissions associated with transmission losses were not included in the values presented in the IRP. Emissions associated with transmission losses are now included in the calculations.
- We have changed the annual emission intensities after making verifiable REC retirement adjustments, as described.
- We have included final 2022 emissions data.
- We have used more recent modeling results and slightly different energy values in our calculations.

The table in GRE response to DOC IR 7A contains the data associated with these calculations from 2015 to 2037.

There was a shift in the percent reduction in emissions since 2005 from the original IRP filing. This shift is driven by two factors. First, the 2005 emissions associated with transmission losses, which are now included, were relatively higher than the period from 2015 to 2022. As an example, the 2005 value was 1,184,694 million tons of CO2e. In 2022, transmission losses represented only 403,684 tons of CO2e. This relative difference results in slightly higher percent CO2e reductions between these years. Second, we identified an inconsistency in our calculation of emissions associated with market sales in the 2005 emission data. The 2005 values presented in the IRP were not based on net annual market sales/purchases. Correcting this inconsistency increased the value for the 2005 emissions by approximately 600,000 tons. These two changes are the primary cause for the shift in percent reduction values from the original IRP filing.

This next section provides definitions and descriptions to assist in understanding the terms and calculations.

GRE Fleet Emissions

Annual energy from owned generation (MWhr): The net generation from the GRE-owned generating units on an annual basis.

Total direct CO2e emissions from GRE-owned generation (tons): Annual CO2e emissions from all GRE-owned generating units. CO2e emissions from each unit are calculated using EPA-approved methods. At most facilities, these calculations utilize data from continuous emission monitors (CEMS). EPA QAQC procedures are used to ensure the data from the CEMs are reliable. For units that do not use CEMS, CO2e emissions are calculated based on the amount of fuel used, following EPA QAQC procedures for

fuel meter accuracy, and applying the appropriate fuel-based emission factor published by EPA[18]. Projected emissions are based on modeled energy generation as described in the IRP.

Total direct CO2e emissions from GRE-owned generation in MN (tons): Annual CO2e emissions from GRE-owned generating units located in Minnesota. CO2e emissions are quantified as described in the previous definition. Projections are based on modeling results corrected for the five-year average emissions contribution from GRE's single remaining out-of-state generation facility, Spiritwood Station.

Combined heat and power (CHP) adjustment (tons): GRE's Spiritwood Station and the former Coal Creek Station are CHP facilities. The CO2e emissions from these facilities are adjusted using EPA's 40 CFR 60 Subpart TTTT methodology. This methodology subtracts the CO2 attributable to the steam provided for the co-located facility from the total CO2e emitted. Emissions associated with the steam sold by Coal Creek Station are included in this line item for the period that GRE owned the facility. After the sale, the emissions associated with steam sales by Rainbow Energy Center are not included in the emissions associated with the PPA and therefore are not separately accounted for. Projected CHP adjustments are set at the average value for Spiritwood Station between 2018 and 2022.

Direct emissions associated with electric power deliveries (tons): The total direct CO2e emissions from GRE-owned generation plus the combined heat and power (CHP) adjustment (which is a negative value). This value represents the emissions associated with electric energy generation from GRE-owned facilities.

Emissions associated with purchase power agreements (PPAs)

Purchased energy obtained from PPAs with carbon-free sources (MWhr): The sum of energy purchased through PPAs with energy sources that do not emit carbon. This includes renewables and hydro energy. Note that prior to 2020 these values include a small portion of curtailed energy. In other words, they overstate the amount of renewable energy. We had insufficient data to eliminate the curtailed prior to 2020. After 2020, curtailed energy represented about 5-10% of wind energy. We believe these values were lower in previous years. Also, this value includes purchases of large hydro that are not eligible for RECs that are consistent with the Minnesota Renewable Energy Standard criteria.

Purchased energy from PPAs with fossil sources (MWhr): The annual amount of energy associated with bilateral agreements with power producers that rely on fossil energy. The agreement with Rainbow Energy Center is the only significant agreement of this type. Note that this agreement does not involve the direct purchase of power from Rainbow Energy Center. Instead, the agreement is for the sale to GRE of financially settled energy in Minnesota. Projected energy is based on the amount contracted from this source. GRE has other bilateral purchases. (In 2022, these minor sources accounted for approximately 2% of the total energy. In prior years, these sources accounted for less than 1% of total energy.) They are not accounted for separately in this line but instead are accounted for in the market purchases values and calculated based on market carbon intensity.

Emissions associated with PPAs with fossil sources: Projected emissions are based on the amount of energy contracted with Rainbow Energy Center in the future and the average carbon intensity of the

energy produced by this facility over the past 5 years. As described above, emissions associated with steam sales are not included in this value.

Emissions associated with net annual market purchases or sales:

Net annual market purchases: The net annual amount of energy that is either purchased from or sold to the wholesale MISO market or through small bilateral purchases/PPAs not accounted for separately. In 2022, these small bilateral/PPA sources accounted for approximately 2% of the total energy. In prior years these sources accounted for less than 1% of total energy. Negative values indicated we are a net seller and positive indicate we are a net purchaser. Projections are based on modeling results.

Carbon intensity of grid energy: The annual average CO2e intensity (lb CO2e/MWh) for the Midwest Reliability Organization West (MROW) as provided in the EPA eGRID database. For2022 and associated projections, the 2021 grid intensity value is used. Note that this results in a significant over estimation of future emissions associated with market purchases as the grid is expected to be less carbon intensive in the future.

GRE Carbon intensity for sales to market. The annual average CO2e intensity (lbs/MWhr) of GRE's portfolio during periods when we are net sellers of energy. This includes power from renewable and fossil PPAs, and GRE's generating fleet adjusted for REC treatment (see below). This is calculated as: (Direct emissions associated with electric power deliveries + emissions associated with PPAs with fossil sources + emissions adjustments for REC treatment) / (annual energy from owned generation + purchased energy obtained from PPAs with carbon free sources + purchased energy from PPAs with fossil sources).

Emissions associated with net annual market purchases: For years when GRE is a net annual purchaser of power to the market, CO2e emissions from net annual wholesale power purchases are calculated as: (carbon intensity of grid energy) * Net annual wholesale purchases. For years when GRE is a net annual seller of power to the market, CO2 emissions from net annual wholesale power sales are calculated as GRE carbon intensity for sales to market * Net annual wholesale sales. For projections of emissions, current market intensities are used despite predictions of increasing renewable penetration. For other bilateral purchases/PPAs, the market intensity is applied to the purchased energy. In 2022, these minor sources accounted for approximately 2% of the total energy. In prior years these sources accounted for less than 1% of total energy.

Adjustments for renewable energy certificate (REC) Treatment

As indicated, this approach has been implemented by GRE on a voluntary basis.

Annual RECs issued: The number of renewable energy certificates issued with the renewable energy GRE obtains on an annual basis. This includes only energy that meets the definition in the Minnesota Renewable Energy Standard and has renewable energy certificates associated with it. It does not include carbon-free energy from sources that do not meet this definition (e.g. large hydro prior to the 2023 revisions to MRES). Projections are based on the expectation that one REC will be issued with each MWh of the modeled energy from renewable sources.

Annual REC retirements: The number of RECs retired on an annual basis on behalf of GRE's member owner in the MRETs system. Projected retirements are based on retiring sufficient RECs for our member

owners to achieve compliance with the recently revised Minnesota Renewable Energy Standard and the newly enacted carbon-free standard.

Difference between RECs issued and RECs retired: RECs generated may be either banked for use in future years, sold, or retired. It is defined as the amount of renewable energy purchased that does not have a corresponding REC retired[19] in a given calendar year. This value is calculated as: annual RECs issued - annual REC retirements. Years with a positive value indicate that there was a greater amount of renewable energy generated than RECs retired; negative values indicated that more RECs were retired than generated.

GRE carbon intensity of fossil energy used for REC adjustments: The average carbon intensity of energy from GRE's owned fossil fleet and fossil PPAs. This value is calculated as: (Direct emissions associated with electric power deliveries + emissions associated with PPAs with fossil sources) / (annual energy from owned generation + purchased energy from PPAs with fossil sources).

Emissions adjustments for REC treatment: Renewable energy is treated as carbon-free when an equivalent number of RECs are retired in MRETs within the accounting year. When fewer RECs are retired than renewable MWh generated, the annual market carbon intensity of grid energy for that year is applied to this energy. This value is calculated as follows: Carbon intensity of grid energy * Difference between RECs issued and RECs retired. During years when excess RECs are retired, each excess REC offsets a MWh of energy generated by GRE's fossil sources. During these years, this value is calculated as GRE carbon intensity of fossil energy used for REC adjustments *difference between RECs issued and RECs retired.

Total Energy

The amount of energy produced by GRE's energy sources. This is calculated as follows: annual energy from owned generation + purchased energy obtained from PPAs with carbon free sources + net annual market purchases. Note that this value is prior to transmission and distribution losses.

Adjustments for sales outside of MN

A small portion of the energy provided by GRE is sold to member owners in Wisconsin and Iowa and a customer in North Dakota. The emissions associated with this energy are removed from GRE's emissions calculated using the Minnesota Ratepayer method.

Total sales outside Minnesota: The amount of energy sold to the small portion of GRE's member owners residing in Wisconsin and Iowa and a customer in North Dakota. Projections are based on the average sales outside Minnesota over the past 5 years.

CO2e intensity of GRE total portfolio: The average carbon intensity of the entire GRE power supply including market purchases, PPAs, and direct emissions. This value is calculated as: (direct emissions associated with electric power deliveries + emissions associated with PPAs with fossil sources + emissions associated with net annual market purchases + emissions adjustments for REC treatment) / total energy. Note that during years when GRE is a net seller of power the value for emissions associated

with net annual market purchases is a negative value resulting in the associated emissions being subtracted from this intensity calculation.

Emissions associated with sales outside Minnesota: This value is calculated as: - Total sales outside Minnesota * CO2e Intensity of GRE total portfolio. The value is negative as the emissions associated with sales to member owners in Iowa and Wisconsin are removed from the Total CO2e emissions associated with MN electric sales Ratepayer method.

CO2e emissions associated with fugitive SF6 emissions: Fugitive SF6 emissions are tracked by summing total SF6 gas added annually to existing equipment throughout our transmission system. The total annual SF6 emissions are converted to CO2e using the conversion factor of 1 ton of SF6 = 22,800 tons of CO2e from 40 CFR 98 Subpart A Appendix table A-1 - Global Warming Potentials. Projections are based on the average SF6 emissions in 2021 and 2022, as reflective of future operation. Prior to 2021, SF6 emissions were higher due to GRE's multi-year program of retiring older SF6 equipment.

Total CO2e emissions associated with Minnesota electric sales based on the ratepayer method

This value represents the total CO2e emissions associated with the electric sales to Great River Energy's end-use member owners located in Minnesota. The value is calculated as: direct emissions associated with electric power deliveries + emissions associated with PPAs with fossil sources + emissions associated with net annual market purchases + emissions adjustments for REC treatment + Emissions associated with sales outside Minnesota + emissions associated with fugitive SF6 emissions

% Reductions from 2005: This is calculated as the percent change in the Total CO2e emissions associated with MN electric sales Ratepayer method and the relevant year. Note that data from 2005 for making the REC adjustment or removing non-Minnesota sales is not available. However, the amount of renewable energy generated during that year was relatively low (approximately 400,000 MW) and the non-Minnesota sales also have a very small impact on the overall value. Therefore, we consider this value a reasonable approximation.

Transmission losses

Line losses due to transmission from the generating location to the transfer to the distribution system. Projections are based on the five most recent years of losses.

Emissions association with transmission losses: This value is calculated as Transmission losses * CO2e Intensity of GRE total portfolio. The emissions associated with these losses are included in the total CO2e emissions associated with Minnesota electric sales based on the ratepayer method.

Distribution losses

Line losses in the distribution system. Projections are based on the 5 most recent years of losses.

Emissions associated with distribution losses: This value is calculated based on Distribution losses * CO2e intensity of energy delivered to Minnesota member owners. The emissions associated with these losses are included in the total CO2e emissions associated with Minnesota electric sales based on the ratepayer method

Tabulated emission calculations can be viewed in GRE's Trade Secret version reply to DOC Information Request 7A.