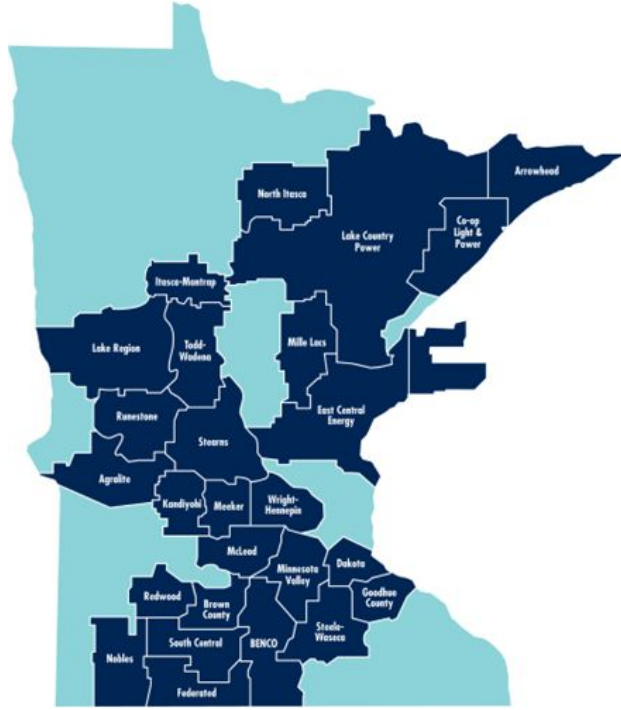


MES - Winter Peaking Panel

Rodney De Fouw

January 28, 2026

Great River Energy (GRE)

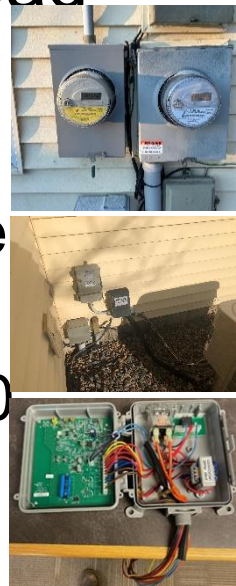


- ▶ Cooperative generation & transmission utility serving
 - 700,000 members & customers
 - 1.7 million people
 - 5,100 miles of transmission lines
 - 82,000 miles of distribution lines
 - Average of 6.8 members per mile of line
 - Cold climate (-42°F lowest air temp 2025)

GRE load management

background

- The GRE member co-ops have been running load management (LM) programs since the 1980s
 - ~50 years of experience
 - 300,000 active LM switches/loads across GRE system
- Current heating season program enrollments
 - Electric thermal storage (ETS space heat) = ~13,000
 - Dual Fuel systems = ~60,000
 - ASHPs (cycled A/C + dual fuel) = ~18,000
 - Interruptible C&I accounts = ~1,450



ETS space heating programs

- ▶ Electric resistance heat systems incorporating a thermal mass “charged” during nightly off-peak times (11PM-7AM) to provide space heating during daily system peak times
 - Usage is submetered
 - 16-hour daily control periods
 - Participants receive a discounted kWh rate on ETS system usage
- ▶ 50 MWs average

Dual fuel rate programs

Dual Fuel Heating & Cooling Systems

▼ Air Source Heat Pumps

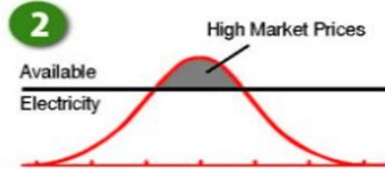
Electric Rate:

Dual Fuel with Cooling: 5.8¢/kWh

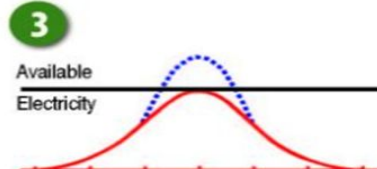
Dual Fuel without Cooling: 5.8¢/kWh (September - May),
13.17¢/kWh (June-August)



Home uses electric heat at lower off-peak rate under normal conditions.



Electricity demand exceeds current power supply and economical energy purchases are not available.



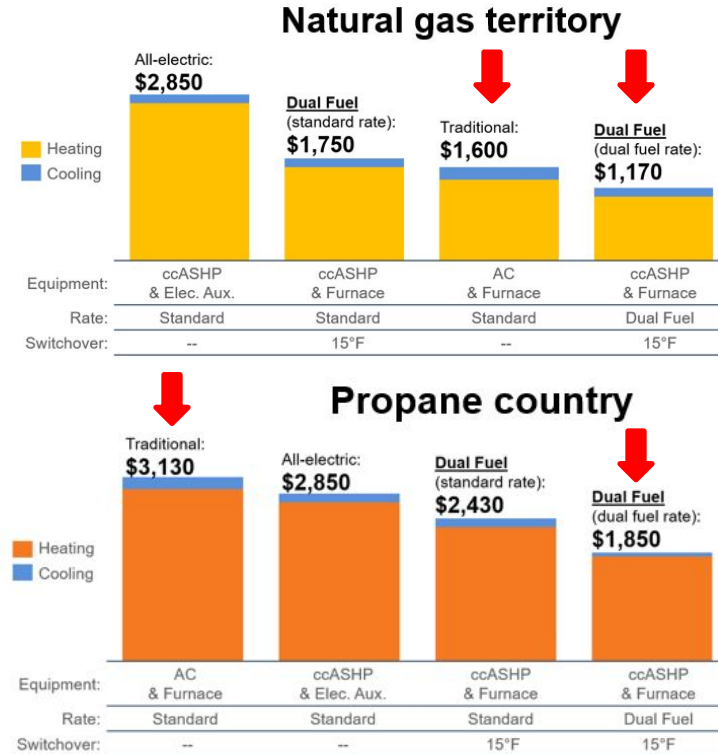
Load control is used to avoid uneconomical energy purchases and maintain system reliability.



Home is automatically switched from electric to backup heating source. No change in comfort should be noticed between the two systems.

Dual fuel rate programs

- Up to 12-hour curtailment periods
- Delivered fuel back-up required (propane, natural gas, fuel oil)
- Options for electric resistance and ASHP based heating dual fuel systems
- 142 MWs average



Interruptible CI&A programs

- ▶ Up to 10-hour curtailment periods
- ▶ Most participants rely on gensets to serve load during curtailment
 - Gensets must be ready for cold weather performance
 - Cold weather kits
 - #1 diesel recommended
 - #2 diesel can and will gel in subzero temperatures
- ▶ 88.5 MWs average

What conditions are we controlling for?

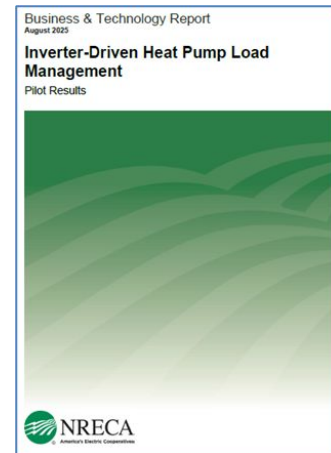
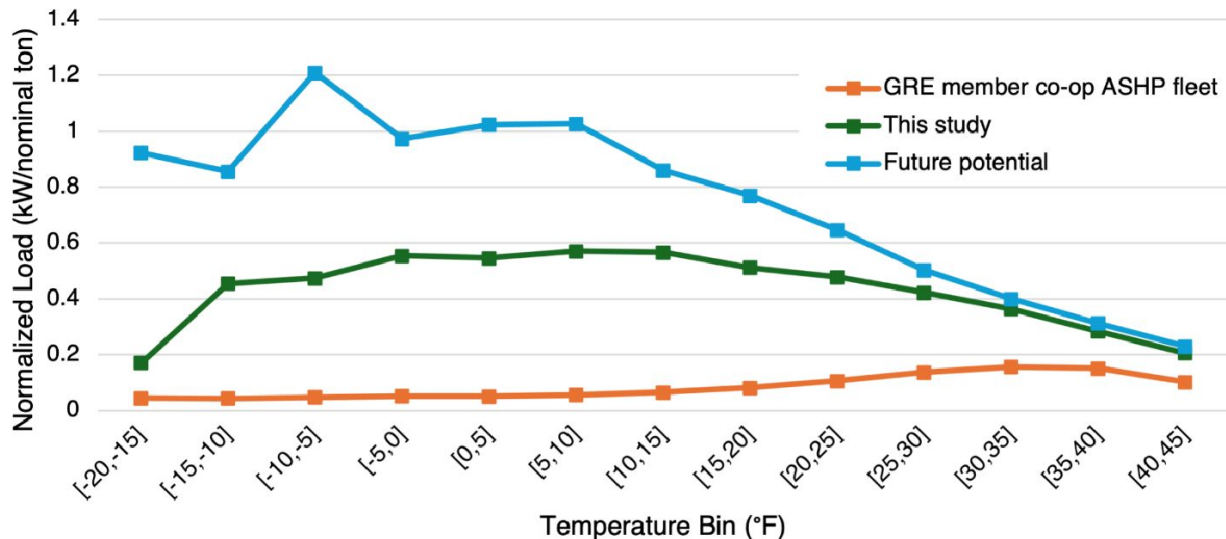
Dual Fuel Curtailment Event Details (2024-2025)		Dual Fuel Event Day Temperature Details (2024-2025)		
Number of events	37	Event Day Low Temperature (°F)	Number of Events	MW of DR Delivered (AVG)
Average event duration	5 hours	20+°F	3	88
Average event day high temp	16	10 thru 20°F	5	106
Average event day low temp	-2	10 thru 0°F	6	137
		less than 0 thru -10°F	14	146
		less than -10°F	9	178
Interruptible CI&A Curtailment Event Details (2019-2025)		Average MW of Demand Response		
Number of events	3	Program Name		MWs
Average event duration	4.75 hours	Dual Fuel		142
Average event day high temp	-7	Interruptible CI&A		88.5
Average event day low temp	-23	ETS Space Heating		50
ETS Space Heating Curtailment Event Details				
Number of events	deployed daily			
Event duration	16 hours			

Note: Used Saint Cloud, MN weather data for temperatures (central location to our service area)

The heat pump times are a ~~changing...~~

- ▶ Inverter drives dominate
 - Modulates heating/cooling output (e.g., 30-100%) to precisely match needs of space
- ▶ Cold climate functionality continues to improve
 - ASHPs are maintaining higher BTU heating capacities at lower temperatures (0°F thru -15°F)
 - Creates greater chance for coincidence with utility winter peak times

Inverter-Driven Heat Pump Load Management Study - Key



study report

- ▶ kW of demand response per nominal ton of ccASHP
 - ≥ 0.3 kW between 35°F and -10°F

Study learnings summary

- ▶ The load management (LM) values of controlling ASHPs for winter peaks are changing significantly
 - These values will continue to change as ASHP technology continues to advance
 - The biggest variable is contractor/consumer behavior with regard to switchover and lockout temperature setpoints
 - More member and contractor education is needed
 - More universal ASHP equipment LM compatibility is essential to enable us to provide value to consumers

ASHP LM compatibility and utility connection resource sheet

- Two-sided sheet that will assist homeowners, contractors, and equipment suppliers with
 - Finding 2-wire LM compatible ASHP systems
 - Links to access model specific instructions for LM connections



ENERGY WISE FOR CONTRACTORS, DISTRIBUTORS, AND OTHER INDUSTRY PARTNERS

ASHP models compatible with load management controllers

Air source heat pump (ASHP) performance in Minnesota's cold climate has greatly improved over the past decade with the rise of inverter-driven technology, boosting ASHP popularity among Minnesota homeowners. Special "load shed" electric rates and off-peak programs offered by [\(insert co-op name here\)](#) have also increased ASHP popularity. Participation in these utility programs can save homeowners hundreds of dollars each year and can drive consumer purchasing decisions.

The key to unlocking this annual savings potential is for contractors and homeowners to work with their utility to connect a load management (LM) receiver to their qualifying dual fuel ASHP system. This receiver responds to signals from the utility to reduce the electric load when the cost of electricity is high. With the improved performance and expected lower outdoor temperature operation of today's ASHPs, several manufacturers have developed new instructions for connecting their ASHPs to utility load management receivers. It is important that contractors follow these instructions to ensure proper performance and prevent equipment damage.



ASHPs can provide three times more efficient forced-air and elect heating systems.

ENERGY WISE FOR COOPERATIVE MEMBERS

ASHP models compatible with special rate and load management programs

A resource has been developed to assist members with identifying ASHP models that are compatible with our load management systems. This resource is accessible via the QR code below. This resource will help you:

- Identify ASHP models that are compatible with two-wire relay based load management system or advanced demand response management systems (DRMS).
- Access the ASHP manufacturer load management wiring instructions.



ASHPs can provide heat up to three times more efficiently than forced-air and electric-resistance heating systems.