

7.0 ENERGY CONSERVATION AND LOAD MANAGEMENT PROGRAMS

This section describes the current level of energy conservation and load management program participation and demand reductions achieved by GRE and WHCEA in the region of the proposed project. Section 7.6 specifically examines whether an acceleration of Demand Side Management (DSM) programs is a cost-effective means to defer or eliminate the need for the proposed project. The conclusion reached is that it is not possible to eliminate the need for the Large High Voltage Transmission Line (LHVTL) through additional energy conservation load management programs. Difficulties involved with expansion of the DSM programs beyond their current level are identified. In addition, DSM programs are more costly on a per kW basis than the transmission project under consideration.

7.1 Background

In its February 8, 2002 Order Approving Great River Energy's 2000 Resource Plan, the Commission recommended that GRE immediately start developing a production-cost model for determining its Least Cost Plan, including the 50 and 75 percent renewable and DSM scenarios. It was further recommended that this model be completed before the next certificate of need or integrated resource plan filing. As suggested, GRE has begun the process of developing such a model. At this time, GRE is conducting an RUS customer survey that is a critical component needed to develop the data required for the production-cost model.

GRE intends to complete that study and develop the model in time for inclusion in its next Resource Plan, which GRE has requested be filed by July 1, 2003. While that model will provide further evidence of the extent of DSM possibilities, it is unrealistic to think that the results from the model will be dramatically different from those projected in this Application. This Certificate of Need Application demonstrates that by 2005, the Plymouth-Maple Grove demand will exceed transmission capacity by approximately 5.5 MW. It is wholly unrealistic to believe that DSM can bridge that gap in a cost effective manner in time to prevent the type of harm described in this Application, and changing study methodologies would not alter that reality.

It was also recommended that GRE consider implementing eight new DSM programs as described below:

- (1) **Residential Refrigeration** – GRE includes this in its future load management and conservation plans in Appendix A, under Residential ENERGY STAR Appliance Rebate Program. (ENERGY STAR name and logo are registered US marks and are owned by the US government.)

- (2) **Other Energy Star Residential Appliances and Lighting** – GRE includes this in its future load management and conservation plans in Appendix A, under Residential ENERGY STAR Appliance Rebate Program.
- (3) **Stand-Alone Commercial Lighting Project** – GRE has always included high-efficiency commercial lighting within the Commercial/Industrial-Agriculture (C/I-A) Energy Grant project. Although the budget has remained within the C/I-A Energy Grant project, in the summer of 2002, it was marketed individually as 2002 New Construction Lighting Rebate. Details of the C/I-A Energy Grant project can be found in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*.
- (4) **Building Recommissioning** – GRE has always included auditing and recommissioning options within the C/I-A Energy Grant project. To date, no members have participated in building recommissioning. Because of the demographics of GRE's cooperatives members (typically out-state, not many city cores), building recommissioning is not requested. Details of the C/I-A Energy Grant project can be found in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*.
- (5) **Commercial Building Design Assistance** – The C/I-A Energy Grant provides funding for customers who are interested in Building Design Assistance. GRE intends to market this individually in 2004. The budget for Building Design Assistance will always remain in the C/I-A Energy Grant. Details of the C/I-A Energy Grant project can be found in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*.
- (6) **Residential and Commercial Air Conditioning Efficiency** – GRE offered both in 2002. The Air Conditioner Efficiency program for residential customers is described in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*. Commercial customers received air conditioning rebates within the C/I-A Energy Grant project also described in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*.
- (7) **Ground-Source Heat Pumps** – Residential and commercial customers may receive rebates for ground-source heat pumps. The Ground-Source Heat Pump Program for residential customers is described in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*. Commercial customers received ground-source heat pump rebates within the (C/I-A) Energy

Grant project also described in Appendix A and the *GRE Consolidated 2002 Conservation Improvement Program Report*.

- (8) **Appliance Load Control** – Residential customers may participate in a variety of load control programs that substantially reduce summer and winter peak demand. Information on the Electric Thermal Storage (ETS) Water Heating, Peak Shave Water Heating, and Controlled Air Conditioning programs is detailed in Appendix A. Information about Off-Peak Space Heating – Electric Thermal Storage and Off-Peak Space Heating – Electric Thermal Storage and Peak Shave is available in the *GRE Consolidated 2002 Conservation Improvement Program Report*.

GRE and WHCEA have implemented a diverse portfolio of energy conservation and load management programs. The primary purpose of these programs is to reduce peak demand, encourage energy conservation, and improve energy efficiency. The programs allow GRE to efficiently utilize existing generation and transmission resources and avoid or defer capital expenses that are shown to cost more than conservation and load management programs. The Demand Side Management/Member Services Department is responsible for GRE's energy conservation and load management programs. At WHCEA, the Customer Sales, Service & Marketing and Power Supply Departments are responsible for energy conservation and load management programs.

Because only energy used during a peak affects the need for an LHVTL, education programs and programs that affect only shoulder times are not included. Examples of such programs are: Commercial and Industrial Electrical Evaluation and Consultation; Energy Education; Fluorescent Bulb Recycling Program; Off-Peak Space Heating – Dual Fuel; Off-Peak Space Heating – Electric Thermal Storage; Renewable Energy; Residential Electrical Evaluation and Consultation; Electric Thermal Storage Pool Heating and Electric Vehicles; and Street and Security Lighting. Details about the programs that do not affect summer peak are included in the Great River Energy Consolidated 2002 Conservation Improvement Program Report (CIP) that was submitted to the Minnesota Department of Commerce on May 31, 2002.

Energy conservation programs reduce energy usage over all hours of operation, including off peak periods. Load management programs dynamically reduce loads during on peak periods. They utilize an infrastructure of communication and control systems to remotely turn the loads off when a peak period is imminent. After the peak period is passed, normally in 4 to 8 hours, power to those loads is restored. Load management programs require knowledge of the expected load profile at all hours of the day to prevent secondary peaks from occurring after power is restored.

GRE has successfully implemented energy conservation and load management programs and continues to develop both new conservation and load management resources and work in close cooperation with the distribution cooperatives to implement those programs. For example, GRE and the member cooperatives are currently working on developing a more comprehensive Residential Low-Income Energy Conservation program. Each year, additional customers choose to participate and the demand reductions obtained from the programs continue to increase.

WHCEA is one of the GRE distribution cooperative leaders in the application of energy conservation and load management programs. Through the successful application of conservation and load management programs, GRE reduced its 2001 summer peak by over 250 MW, equating to about 10% of the peak. WHCEA's contribution to GRE's 2001 summer peak reduction was calculated with losses to 18.7 MW. It is clear that WHCEA has a strong commitment to energy conservation and load management programs. It has taken 20 years for customer participation in these programs to reach this level.

WHCEA has provided a load management and conservation forecast for the 2002-2003 period described in the CIP. Energy conservation and load management programs are projected to reduce another 2 MW over the 2002-2003 timeframe. However, as successful as GRE's and WHCEA's energy conservation and load management programs are, these programs will not provide enough capacity to delay or avoid constructing the proposed project.

Despite progress in controlling load growth, the projected loads (particularly summer peak demand) in the area that would be served by the proposed project will require energy delivery that exceeds the current transmission capabilities. This load growth cannot be offset by further efforts to increase the load reductions already projected to occur. There are several reasons for this, all related to intrinsic limitations in the potential of load management and conservation programs and their costs:

- The proposed project is the most cost-effective means of ensuring capacity to the area. The proposed project will increase capacity in the area at a cost that is lower than any of the existing conservation and load management programs. Current energy conservation and load management programs have been justified when comparing them to the installed cost of peaking generation. Additional peaking generation would have a higher cost than the proposed project (note for example that Option 5 described in Section 3.3.2, new generation, is nearly eight times more expensive than the proposed project).

- Because of the nature of the controlled loads and GRE's system load profile at peak conditions, an increase in participation in DSM and conservation programs would require an increase in interruption time to avoid secondary peaks. Said another way, as total load control increases, the required control time increases.
- Increasing participation in load management and conservation programs typically becomes more difficult as saturation increases.
- Participation in these programs would have to include sufficient customers served off of four specific WHCEA substations to defer or avoid the need for the proposed project. This requires a small customer base to intensely participate in energy conservation and load management programs.

7.2 WHCEA and GRE Conservation Goals and Objectives

GRE and WHCEA consider energy conservation and load management as an important resource in the planning process. GRE coordinates the DSM activities of its member-systems through its DSM and CIP. Individual member-system participation goals are used in conjunction with GRE's diversified demand assumptions and loss factors to calculate total system peak reduction. GRE's goal is to maintain and enhance existing programs and continue to introduce new programs that provide net benefits to cooperatives' members, cooperatives and GRE. The programs are designed to save natural resources and delay the need for additional transmission and/or generation resources for as many years as possible.

7.3 Existing Load Management and Energy Conservation Programs and Accomplishments

WHCEA has energy conservation and load control programs that reduce the 2002 summer peak demand by a total of 18.7 MW. GRE has developed and promoted programs to reduce the summer peak demand, thus deferring the need for additional peaking capacity and transmission facilities as long as possible. Tables 7-1 and 7-2 summarize the kW reduction and participants of the WHCEA programs that have the greatest impact on the summer peak demand in the area. The tables show the load reductions and participant levels achieved in 2001 and the expected load reductions and participation in 2002 and 2003 which includes losses.

The total peak reduction of the load management and conservation programs is calculated by multiplying the average kW reduction by the projected number of participants for each program. Distribution and AC Losses are also included in this calculation to show the total impact on the summer peak demand.

Table 7-1 shows the peak kW reductions for each program and also includes the WHCEA total.

Table 7-1 WHCEA DSM Summer Peak kW Load Reductions Including Distribution and AC Losses (kW)

Year	Cooling System Rebates ¹	Electric Thermal Storage Water Heating and Peak Shave Program	Home Light Program	Low-Income A/C Tune-up	C&I-A Energy Grant	Controlled Rates ²	Total
2001	855	4,917	55	0	132	11,868	18,682
2002	1,170	5,158	58	2	246	12,951	20,754
2003	1,518	5,433	62	22	361	14,034	22,948

¹ Cooling System Rebates include Residential High-Efficiency AC Rebate, Residential Air-Source Heat Pump Rebate, Commercial Ground-Source Heat Pump, and Commercial Ground-Source Heat Pump programs.

²The controlled cooling savings is calculated from the Interruptible Air Conditioning program, Large C&I Interruptible Rate, and Interruptible Irrigation program.

Forecasting the number of participants in the programs is the other main component to estimating the total effect of the programs on reducing the summer demand. WHCEA created the projection shown in Table 7-2 based on historic participation in the CIP, projected consumer growth, and the program saturation.

Table 7-2 WHCEA Program Participants (Participants)

Year	Cooling System Rebates ¹	Electric Thermal Storage Water Heating and Peak Shave Rebate	Home Light Program	Low-Income A/C Tune-up	C&I-A Energy Grant	Controlled Rates ²	Total
2001	526	7,154	1,597	0	20	10,203	20,026
2002	779	7,504	1,697	5	35	11,071	21,870
2003	1,061	7,904	1,807	65	50	11,942	23,890

¹ Cooling System Rebates include Residential High-Efficiency AC Rebate, Residential Air-Source Heat Pump Rebate, Commercial Ground-Source Heat Pump, and Commercial Ground-Source Heat Pump programs.

²The controlled cooling savings is calculated from the Interruptible Air Conditioning program, Large C&I Interruptible Rate, and Interruptible Irrigation program.

A comprehensive overview of GRE and WHCEA DSM programs and accomplishments is contained in Appendix A.

7.4 Other DSM Programs Considered

A number of programs have been considered but not implemented due to the low cost-benefit ratios or other market barriers. These include:

Residential

- Shading of central AC unit
- Multi-speed furnace fan

Agricultural

- Low Temperature Grain Drying
- Heat Pump Grain Drying

Commercial

- Convection oven Rebate

All of these programs are discussed in more detail in Appendix A.

7.5 Future Load Management and Conservation Plans

GRE is projecting more participants for the existing energy conservation and load management programs by providing appropriate incentives to the customer. Other cost-effective programs that provide value to the customer and accomplish GRE's objectives will be considered for implementation. The impact of the load control programs on the peak day will continue to be monitored to avoid secondary peaks.

GRE plans on expanding beneficial programs to all of the GRE member cooperatives before or within the next biennial CIP due to be filed with the Minnesota Department of Commerce. Some of the programs that will be expanded include:

Residential

- Energy Star Appliance Rebate
- Cycled Air-Conditioning Rebate
- Low-Income Programs

Commercial, Industrial and Agricultural

- Motor, VSD, Lighting Rebates
- Commercial and Industrial Energy Audit Program
- Commercial Cooling Rebate

These programs are discussed in detail in Appendix A.

7.6 Cost Comparison of Transmission Project to Conservation Programs

WHCEA has made significant investments in load management and conservation programs. WHCEA load management and conservation program expenditures for 2001 was over \$725,000. This investment exceeded the statutorily required level of spending for CIP programs. Participating customers also bear a share of the program costs. These costs tend to be for equipment and a share of the installation costs. Rate credits to the distribution cooperatives and consumers help promote the programs and offset some of the expenses.

The analysis for this filing focuses primarily on programs with the largest impact in reducing summer peak demand. Comparisons can be made in two ways, either with benefit/cost ratios, or by comparing total \$/kW costs of the proposed transmission project and the DSM programs. The benefits included the avoided cost of the proposed project.

Typically, DSM programs are compared to a generation alternative. Quantifying the benefits of DSM programs that would result in avoiding the transmission project is much more complicated. A common measure needed to be developed to compare the cost and demand reduction of expanding the DSM programs to the cost and additional transmission capacity of the proposed project. A comparison of costs of the transmission project and the load management and conservation programs follows.

The proposed transmission project would increase the summer system capacity to 184 MW. The project cost is \$9,550,000, from which a per kW cost of \$52 is calculated. This is the avoided transmission cost to which the DSM programs should be compared.

The per kW cost of selected DSM programs can now be compared to cost of the transmission project. The results are summarized in Table 7-3.

Table 7-3 WHCEA Cost Comparison of Transmission Project to Conservation and Load Management Programs¹

Program	115 kV Transmission System Upgrade	Cooling System Rebates ²	Electric Thermal Storage Water Heating and Peak Shave Rebate	Home Light Program	Low-Income A/C Tune-up	C&I-A Energy Grant	Controlled Rates ³	Total
Average kW reduction per Project (kW)		855	4,917					18,682
Average Cost per kW Saved (\$/kW)	52	201	896	866	640	522	275	3,400

¹Saved kW and cost per kW results were obtained from the GRE Consolidated 2002 Conservation Improvement Program Report.

²Cooling System Rebates include Residential High-Efficiency AC Rebate, Residential Air-Source Heat Pump Rebate, Commercial Ground-Source Heat Pump, and Commercial Ground-Source Heat Pump programs.

³The controlled cooling savings is calculated from the Interruptible Air Conditioning program, Large C&I Interruptible Rate, and Interruptible Irrigation program.

Clearly, the proposed transmission project is a far less expensive way to increase system capacity than comparable investments on the demand side.

A further obstacle is that at an annual rate of 2 MW per year load reductions on the demand side, it will be more than 20 years before actions on the demand side achieve the same level of capacity expansion as the transmission project.

7.7 Effect of Programs

DSM programs have a significant impact on reducing the summer peak demand. The programs are a cost effective means of reducing demand to delay the need for additional generation resources. Table 7-4 shows the average kW reduction per participant of the existing DSM programs. This estimate is based on a comparison of the expected diversified peak demand of the end use without the conservation and load management program compared to the expected diversified peak demand with the program. The actual demand reduction is dependent on the system hourly load shape and hours where the load management is implemented.

Table 7-4 Summary of Average kW Reduction per Participant of Conservation and Load Management Programs (kW/ Participant)

Program	Cooling System Rebates ¹	Electric Thermal Storage Water Heating and Peak Shave Rebate	Home Light Program	Low-Income A/C Tune-up	C&I-A Energy Grant	Controlled Rates ²
Average kW Reduction per Participant	1 / 12	0.60	0.03	0.3	N/A	1 / N/A /25

¹ Cooling System Rebates include Residential High-Efficiency AC Rebate, Residential Air-Source Heat Pump Rebate, Commercial Ground-Source Heat Pump, and Commercial Ground-Source Heat Pump programs. The residential programs reduce 1kW per participant. The Commercial programs reduce 12kW per participant.

²The controlled cooling savings is calculated from the Interruptible Air Conditioning program (1kW per participant reduction), Large C&I Interruptible Rate (not available), and Interruptible Irrigation program (25 kW per participant reduction).

A comprehensive overview of the GRE and WHCEA DSM programs and accomplishments is contained in Appendix A.

7.8 Ability to Meet Forecast Demand Through Conservation and Load Management Activities

The load forecast that is the basis for justifying the need for the proposed project includes the impact of the load management and conservation programs. The projections for these programs are based on reasonable assumptions of consumer growth and program saturations. Load management and conservation programs are justified primarily based on the avoided cost of new generation resources. Based on the information provided in Section 7.6, expanding the programs to avoid the need for the proposed project is not a cost-effective option. Growth in energy use by new and existing customers in the Plymouth - Maple Grove load center is the primary driver of the load growth that is causing the need for this project.