BIENNIAL TRANSMISSION PROJECTS REPORT

Certification of a High-Voltage Transmission Line

TOWER PROJECT

Public Document – Trade Secret Data Excised

November 2005

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Appendix B Expected Magnetic Field

Appendix C GRE 2004 Conservation Improvement Program

LIST OF ACRONYMS

ACRONYMS	
AC	Alternating current
ACEEE	American Council for an Energy Efficient Economy
ACSR	Aluminum conductor steel reinforced
AM	Amplitude-modulated
ATC	Available transmission capacity
BMPs	Best Management Practices
BWSR	Minnesota Board of Water and Soil Resources
CAP	Community Action Program
CFL	Compact fluorescent lights
C/I-A	Commercial/Industrial-Agriculture
Commission	Minnesota Public Utilities Commission
CIP	Conservation Improvement Program
CH	County Highway
dBA	Decibel (A weighted)
DC	Direct current
DNR	Minnesota Department of Natural Resources
DOC	Minnesota Department of Commerce
DSM	Demand Side Management
EMF	Electromagnetic fields
EMS	Energy Management System
ETS	Electric thermal storage
EQB	Minnesota Environmental Quality Board
ERO	Electric Reliability Organization
FACW	Facultative wet
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FM	Frequency-modulated
Global	Global Energy Partners LLC
GRE	Great River Energy
GSHP	Ground source heat pump
HVAC	Heating, ventilation and air conditioning
HVTL	High voltage transmission line
Hz	Hertz
ICD	Implantable cardioverter/defibrillator
IEE&C	Integrated Energy Education and Communications
IOUs	Investor-Owned Utilities
IRP	Integrated Resource Plan
kHz	kilohertz
kV	Kilovolt

ACRONYMS	
kVA	Kilovolt-ampere
kV/m	Kilovolts per meter
kW	Kilowatt
kWh	Kilowatt hour
LCP	Lake Country Power
LGU	Local governmental unit
LRLF	Long-Range Load Forecast
ma	milliamperes
MAPP	Mid-Continent Area Power Pool
MBS	Modeling Building Subcommittee
mG	milliGauss
MHz	Megahertz
MISO	Midwest Independent Transmission System Operator
Mn/DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MP	Minnesota Power
MRO	Midwest Reliability Organization
MVA	Megavolt ampere
MW	Megawatt
MWh	Megawatt hour
NAC	Noise area classifications
NERC	North American Electric Reliability Council
NESC	National Electric Safety Code
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OBL	Obligate
PSS/E	Power System Simulator Rev 29
PWI	Public Waters Inventory
R & D	Research and Development
ROW	Right-of-way
RUS	Rural Utilities Service
SHPO	State Historic Preservation Office
SPG	Sub-Regional Planning Group
TH	Trunk Highway
UPA	United Power Association
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

Application for Certification of a Large High Voltage Transmission Line to Support Increased Load Growth in Northeastern Minnesota

Pursuant to Minn. Stat. 216B.2425 and Minn. Rules Chapter 7848, Minnesota Power (MP) and Great River Energy (GRE) (collectively "Applicants") hereby seek certification from the Minnesota Public Utilities Commission (Commission) of a high voltage transmission line ("the Project") through the biennial transmission projects report proceeding. The Project would be located in St. Louis County to meet the electrical needs of MP and GRE customers in northeastern Minnesota.

The Application is divided into 12 sections as follows:

1. **INTRODUCTION** – provides background information on MP and GRE, a brief project description, and the completeness checklist.

2. **TRANSMISSION INADEQUACIES** – describes the need for the Project as required by Minn. Rules pt. 7848.1400, subp. 2 (A, P).

3. **DETAILED PROJECT DESCRIPTION** – provides a detailed description of the Project as required by Minn. Rules pts. 7848.1400, subp. 2 (B, D, L, Q).

4. **COST ANALYSIS** – discusses costs of the Project and other information required under Minn. Rules pt. 7848.1400, subp. 2 (E), (F), (H) and (I).

5. **ANALYSIS OF ECONOMIC, ENVIRONMENTAL AND SOCIAL CONSEQUENCES OF THE PROJECT –** provides information on impacts of the Project and possible mitigative measures as required by Minn. Rules pt. 7848.1400, subp.2 (G, J, K).

6. **SYSTEM CAPACITY** – provides information on the relationship between the Project and overall state energy needs, as required by Minn. Rules pt. 7848.1400, subp. 2(S).

7. **PEAK DEMAND/ANNUAL ENERGY CONSUMPTION FORECAST** – contains data concerning energy forecasts and forecast methodologies as required by Minn. Rules pt. 7848.1400, subp. 2 (O).

8. **ENERGY CONSERVATION AND LOAD MANAGEMENT PROGRAMS** – describes energy conservation and load management programs of MP, GRE and GRE's cooperatives as required by Minn. Rules pt. 7848.1400, subp. 2 (M, R).

9. **ALTERNATIVES TO THE PROJECT** – discusses transmission and non-transmission alternatives to the Project (Minn. Rules pt. 7848.1400, subp. 2 (N, T, U).

10. **DESCRIPTION OF TRANSMISSION ALTERNATIVE** – provides information on a feasible transmission alternative to the Project as required by Minn. Rules pt. 7848.1500, A-K.

11. **SUMMARY** – summarizes the key elements of the Certification Application (Minn. Rules pt. 7848.1400, subp. 2 (V).

12. **REFERENCES** – a list of documents referenced in the Application.

1.0 INTRODUCTION

Minnesota Power (MP) and Great River Energy (GRE) propose to construct a 115 kilovolt (kV) electric transmission line, approximately 15 miles in length, between a new Tower Substation and a new Embarrass Switching Station in St. Louis County, Minnesota (Figure 1-1). The MP and GRE additions to the power delivery system would allow both utilities to maintain the necessary voltage and reliability requirements in the area. The transmission line and substation improvements are necessary to allow MP and GRE to continue serving their present and future electric customers and their growing electric energy requirements.

1.1 Project Proposers/Contacts

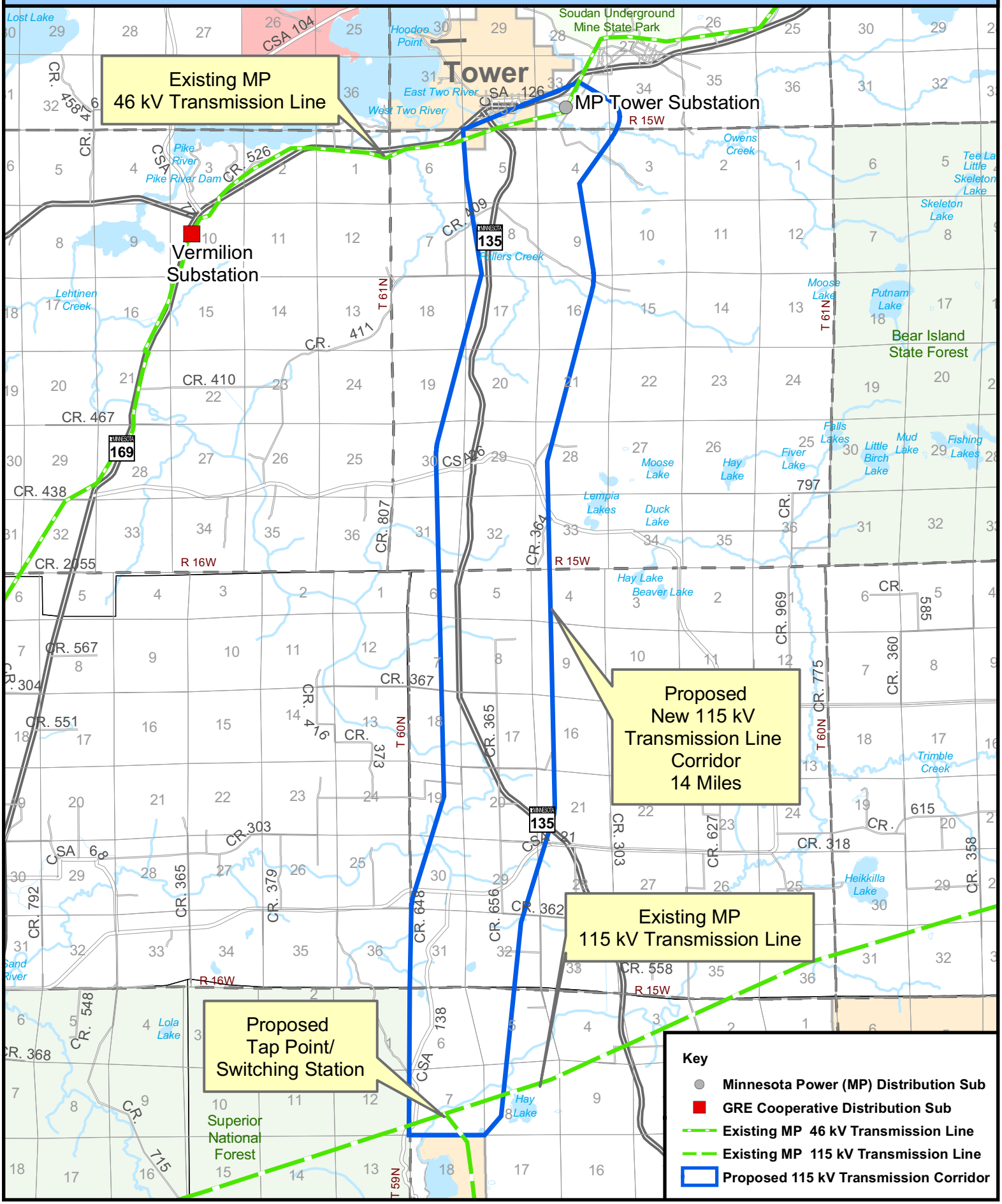
MP is an investor-owned utility headquartered in Duluth, Minnesota. MP supplies retail electric service to 135,000 retail customers and wholesale electric service to 16 municipalities in a 26,000-square-mile electric service territory located in northeastern Minnesota (Figure 1-2). MP generates and delivers electric energy through a network of transmission and distribution lines and substations throughout northeastern Minnesota. MP's transmission network is interconnected with the regional transmission grid to promote reliability and MP is a member of the Midwest Independent Transmission System Operator (MISO).

GRE is a not-for-profit generation and transmission cooperative based in Elk River, Minnesota. GRE was created when Cooperative Power Association (CP) and United Power Association (UPA) formed a joint operating company on January 1, 1999. GRE provides electrical energy and related services to 28 member cooperatives, including Lake Country Power (LCP), the distribution cooperative serving the area that would benefit from this proposed transmission project (Figure 1-3). The distribution cooperatives, in turn, supply electricity and related services to more than 500,000 residential, commercial, and industrial customers in Minnesota and Wisconsin. GRE is also a member of MISO.

GRE’s 2,500-megawatt (MW) generation system includes a mix of baseload and peaking plants, including coal-fired, refuse-derived fuel, and oil plants as well as new wind generators. GRE owns approximately 4,405 miles of transmission line in Minnesota, North Dakota, South Dakota, and Wisconsin.

PROJECT MAP

Figure 1-1



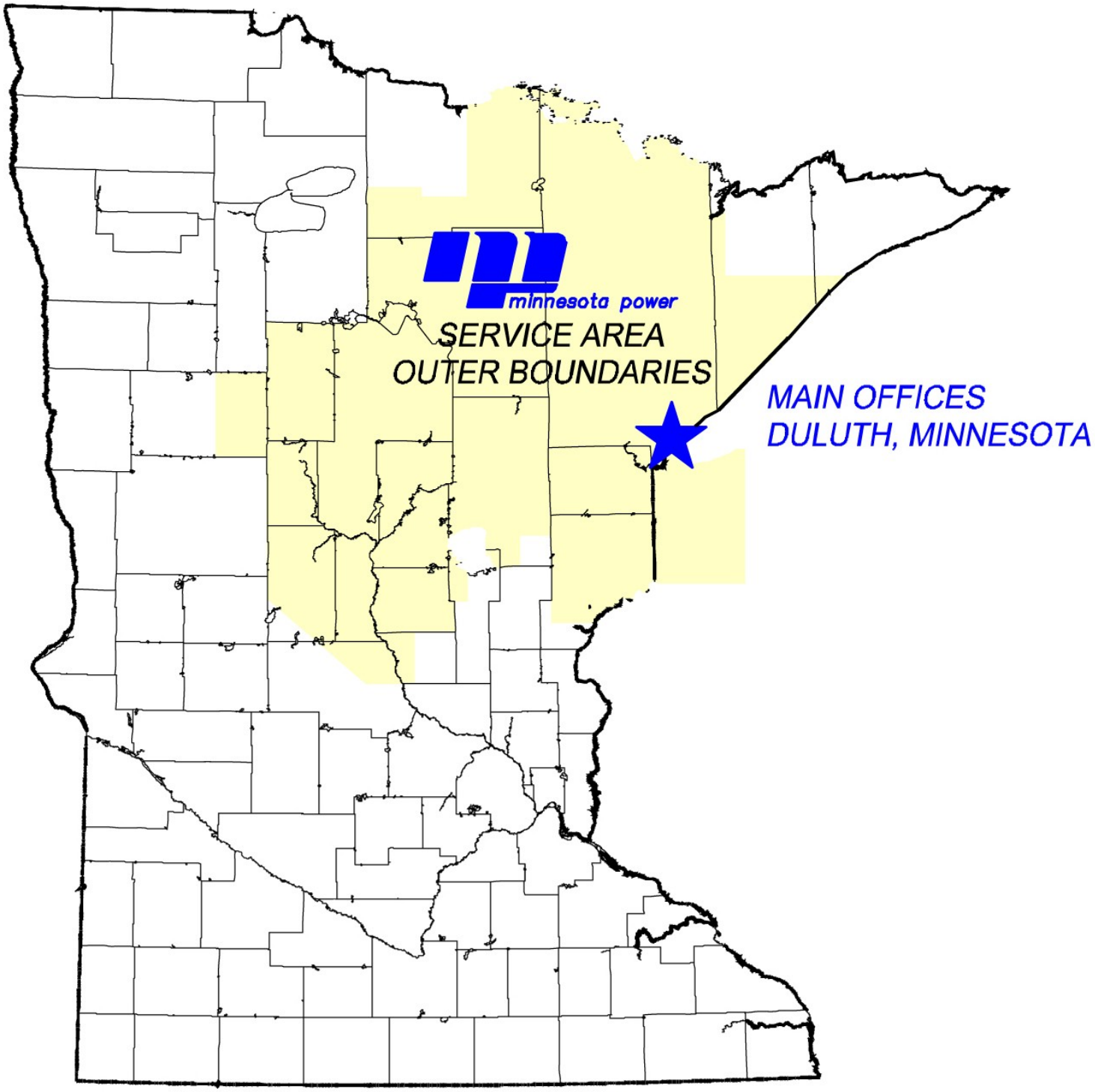
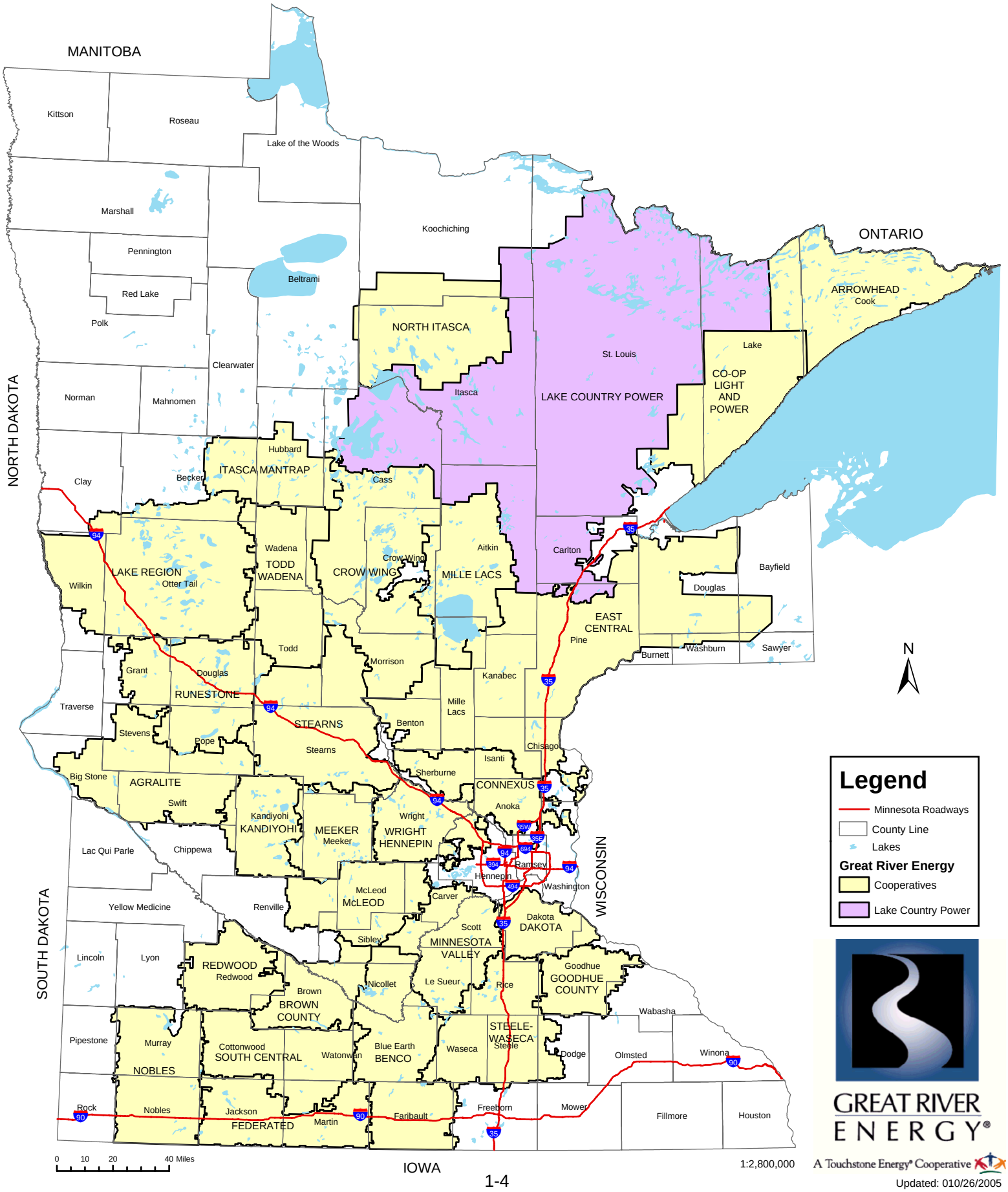

minnesota power
SERVICE AREA
OUTER BOUNDARIES
MAIN OFFICES
DULUTH, MINNESOTA

Figure 1-2

Figure 1-3

GRE Service Territory



Updated: 010/26/2005

The contacts for the Project will be:

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1.2 Project Description

The proposed endpoints of the transmission project would be a new substation near the City of Tower and a new 115 kV switching station at the junction of MP's existing (115 kV) 34 Line and 34 Line Tap (located in White Township, Section 7, Township 59N, Range 15W)(Figure 1-1). A 115 kV transmission line between the two endpoints would be located within a north-south, 6000-foot wide corridor. The transmission alignment would be determined during the route permitting process and would consider existing corridors, public input, and environmental impacts.

1.3 Completeness Checklist

A completeness checklist is provided in Table 1-1. This checklist directs the reader to the portion of the Application that addresses the requirements of each rule.

Table 1-1 Completeness Checklist - Satisfaction of Minn. Rules 7848

Citation	Information	Location
1300 (E)	Alternative Means of Addressing Tower Inadequacy	9.0
1300 (F)	Tower Studies	2.0
1300 (G)	Economic, Social and Environmental	5.0, 10.0
1300 (H)	Summary of Input	2.3, 5.1
1400 (A)	Transmission Inadequacies	2.0
1400 (B)	Detailed Description of Line	3.1, 3.2
1400 (C)	Line Map	Figure 1-1
1400 (D)	Narrative of Corridor	3.1
1400 (E)	Construction Cost and Rate Effect	4.1, 4.4, Table 4-2
1400 (F)	Operational Cost and Rate Effect	4.2, 4.4, Table 4-2
1400 (G)	Summary of Input	5.1, Appendix A
1400 (H)	Depreciation and Service Life	4.3
1400 (I)	Reliability Effect of Line	4.5
1400 (J)	Economic, Social and Environmental	5.0
1400 (K)	Mitigation	5.0
1400 (L)	ROW, Land Use and Routing	3.1
1400 (M)	Energy Conservation and Load Management	8.0
1400 (N)	No Build Alternative	9.1
1400 (O)	Energy Forecasts	7.0
1400 (P)	Promotional Activities	2.5
1400 (Q)	Permits and Approvals	3.5
1400 (R)	Future Energy Conservation	8.0
1400 (S)	State Energy Needs	6.6

Citation	Information	Location
1400 (T)	Feasible Alternatives	2.4.2
1400 (U)	Non-Feasible Alternatives	9.0
1400 (V)	216B.243 Factors Not Addressed Above	11.1
1500 (A)	Feasible Alternative Description	10.1
1500 (B)	Economic, Social and Environmental	10.2 (5.0)
1500 (C)	Alternative Locations	10.1
1500 (D)	Construction Cost and Rate Effect	10.3 (4.1, 4.4) Table 9-1
1500 (E)	Operational Cost and Rate Effect	10.3 (4.2, 4.4)
1500 (F)	Summary of Input	10.1.2 (5.1), 2.3
1500 (G)	Depreciation and Service Life	10.3 (4.3)
1500 (H)	Reliability Effect of Line	10.3.1
1500 (I)	Mitigation	10.2 (5.0)
1500 (J)	Right-of-Way and Existing Land Use	3.1, 5.8
1500 (K)	Permits and Approvals	10.4 (3.5)

2.0 TRANSMISSION INADEQUACIES ADDRESSED BY THE PROJECT

2.1 Planning History of the Tower Project

MP and GRE have been evaluating and addressing voltage support and line capacity issues on the Virginia-Ely-Babbitt 46 kV loop for the last decade. Capacitors are located at Winton and were added at Ely in 2001. These capacitors increased the load that could be served by the existing 46 kV system. Relay schemes have also been revised to remove line loading restrictions and decrease clearing times. This increased line capacity and improved relay schemes reduced the likelihood that the Winton hydroelectric generation will trip due to remote line faults. Additional capacitors are planned to be installed at the 46 kV Tower Substation in 2006 and transformer capacity at the Babbitt Substation will be increased in 2006. These projects will increase load serving capability to approximately 28 MW. These past and planned additions have delayed, but do not eliminate the need for a significant upgrade to the electric system serving the area. Due to capacitor switching control issues, adding additional capacitors to further delay the need for a new source to the area beyond those planned is not practical.

The 46 kV loop inadequacies and alternatives being considered were discussed during the 2003, 2004 and 2005 State Transmission Plan meetings, and in the 2003 Minnesota Biennial Transmission Projects Report (*2003 Biennial Report*)(Minnesota Transmission Owners, 2003). Alternatives that have been considered include increasing the operating voltage of existing lines serving the area, new 46 kV or 115 kV transmission, local area diesel generation, and energy storage devices.

2.2 Past Biennial Filings and Planning Reporting

The need for the Project was first identified in the *2003 Biennial Report*. The inadequacies and alternative solutions leading to the need for this project are presented in the *2003 Biennial Report* in the Northeast Transmission Planning Zone section. Transmission facilities required to address the inadequacies associated with the Project are discussed on pages 40 through 43 of the *2003 Biennial Report*.

Discussion in the *2003 Biennial Report* presented information on the need to provide adequate voltage support and reliable electric service to the Tower-Ely-Babbitt area especially during peak load periods. The report identified three alternatives to meeting the area's electric reliability requirements. One alternative was the construction of a 115 kV line between MP's 115 kV Line (#34 Line) and Tower. A second alternative would be the construction of a 46 kV line between the MP's #34 Line and Tower. A third alternative would be the installation of 4 to 8 MW of diesel generation in the Ely or Winton area.

The report indicated that a preferred alternative had not been selected. Cost and load considerations would be used to determine the preferred alternative for serving this area.

The *2003 Biennial Report* concluded that comments from local area residents and regulatory agencies would help MP and GRE select the preferred alternative.

2.3 Summary of Project Information – Zonal Meetings

2.3.1 General

Zonal meetings are held annually in response to Commission requirements under Minn. Rules Chapter 7848. A public input segment is provided at the end of the meetings to solicit questions and/or comments from the attendees about proposed solutions and alternatives that address transmission needs in this zone.

Attendees are also asked to submit any additional questions and/or comments they may have after the meeting directly to the utilities via an on line form by using the website at www.minnelectrans.com. Members of the public can also use this website to be placed on the utilities transmission planning mailing list.

2.3.2 2003 Zonal Meeting

The 2003 Northeast Zonal public meeting was held on August 20, 2003 at 7:00 p.m. at Central Lakes College in Brainerd, Minnesota. Six members of the general public attended this meeting.

MP representatives presented information on the Project. Copies of the presentations were available to the public.

There were no questions asked about this Project by the public at the meeting. Additionally, no questions, comments or public input have been submitted to the www.minnelectrans.com link about the Project since the 2003 meeting.

2.3.3 2004 Zonal Meeting

The 2004 Northeast Zonal public meeting was held on October 13, 2004 at 7:00 p.m. at the Blackwoods Banquet and Conference Center in Proctor, Minnesota. Over 30 individuals attended the meeting including members of the public, representatives from area utilities, a St. Louis County Commissioner, and representatives from the Minnesota Department of Commerce, the Commission, and the Minnesota House of Representatives.

MP representatives presented information about the Project. Copies of the presentations were available to the public.

Questions asked about Project at the meeting are summarized below. No questions, comments or public input have been submitted to the www.minnelectrans.com link about the Project since the 2004 meeting.

Zonal Meeting Public Input Summary

The following comments and questions were received about the Project during the meeting's public input segment. The comments/questions are in bold followed by the utilities' response.

It has been mentioned during these presentations, especially with the Wrenshall-Mahtowa area, that utilities must conduct studies to determine solutions to the transmission needs. Who conducts these studies?

Studies are typically conducted in-house by the utilities. Minnesota Power and Great River Energy will work together on that specific line. Our staff will perform the modeling, run the analysis and provide a report of the results at a Sub-regional Planning Group (SPG) meeting, which is held every few months.

At what point does the public get to participate in the process?

Proposed projects are presented at transmission planning meetings, like this meeting tonight, and they are outlined in the Biennial Transmission Projects Report, which will be published next fall, November 1, 2005. We encourage members of the public to provide input and comments during the early phase of the transmission planning process. Comments, questions and input from the public will be addressed at these meetings, through the utilities website, or by contacting the utilities directly. In addition, the SPG meetings are open to the public.

During the in-house studies, how much consideration is given to alternative energy sources, alternative generation?

There are a number of different cases where generation options are reviewed. We will take a look at those options and if they work, great - otherwise we have to look at the transmission alternatives.

How are these meetings advertised to the public?

Display ads were published in local newspapers and written notices were mailed. Extensive efforts were made by the utilities to provide notice of the transmission planning meetings to members of the public, local and tribal government officials, county officials and legislators.

2.3.4 2005 Zonal Meeting

The 2005 Northeast Zonal public meeting was held on May 10, 2005 at 7:00 p.m. at the Hawthorn Inn and Suites in Baxter, Minnesota. Two members of the general public attended this meeting. Representatives from GRE and MP provided presentations covering current and projected electric transmission system needs in the zone,

proposed projects and alternative solutions, tentative project timelines, and studies conducted in northeast Minnesota to ensure continued reliability in the electric system serving this area.

A representative from MP provided a presentation covering low voltage impacts and methods to improve low voltage issues. The PowerWorld software program was used as a visual tool to demonstrate power flow and voltage issues on the transmission system. The program allowed the presenters to simulate current and future conditions, to illustrate the need for transmission in the area, and to demonstrate the effect the proposed solutions and alternatives have on reliability of the electric transmission system in this area.

MP representatives presented information about the Project. The presentation included detailed information about load-serving issues and solutions for the Tower-Ely-Babbitt area. There were no questions or comments from the public on the Project.

The attendees were asked to submit any further questions, comments and input they may have after the meeting directly to the utilities by using the website at www.minnelectrans.com. Click on "Contact Us" and then use the e-mail link at generalinfo@minnelectrans.com. No questions, comments or public input have been submitted to this link since the 2005 meeting.

The meeting slide presentations and a list of current and projected transmission needs, proposed projects and alternative solutions, projects in review and project updates for the Northeast Zone are available at www.minnelectrans.com. Click on "Northeast Zone" listed under "Planning Zones" to obtain a list of transmission needs/issues specific to this zone, projects in review, and project updates.

2.4 Project Need

Continuing economic growth in the part of northeastern Minnesota from Babbitt to Virginia to Hibbing/Chisholm has caused a considerable increase in electrical use in the region. The addition of new electrical services and the increase in demand from existing services are causing electricity delivery concerns in the area. The existing electrical system, consisting of transmission lines and substations, is approaching its physical limit. Loss of a facility may result in potential long-term outages. This situation has become a growing concern for winter peak periods, but with continued growth, the number of critical hours during the year will continue to increase.

The North American Electric Reliability Council (NERC), which develops standards for implementing secure and safe electrical delivery, mandates that certain levels of service be maintained to insure that the transmission grid operates efficiently and reliably. In severe cases the transmission grid could collapse, which could result in regional blackouts. The standards are designed to minimize the possibility that a regional blackout could occur by insuring that the interconnected transmission system is

planned, designed, and operated to withstand probable forced maintenance outages and other service interruptions. Electric utilities must also maintain power quality at a level that prevents damage to all customers' electrical loads. Based on these mandates, transmission improvements are necessary for this region.

MP and GRE are responsible for meeting these mandates by constructing, operating and maintaining a reliable transmission system in northeastern Minnesota.

2.4.1 Existing Transmission System

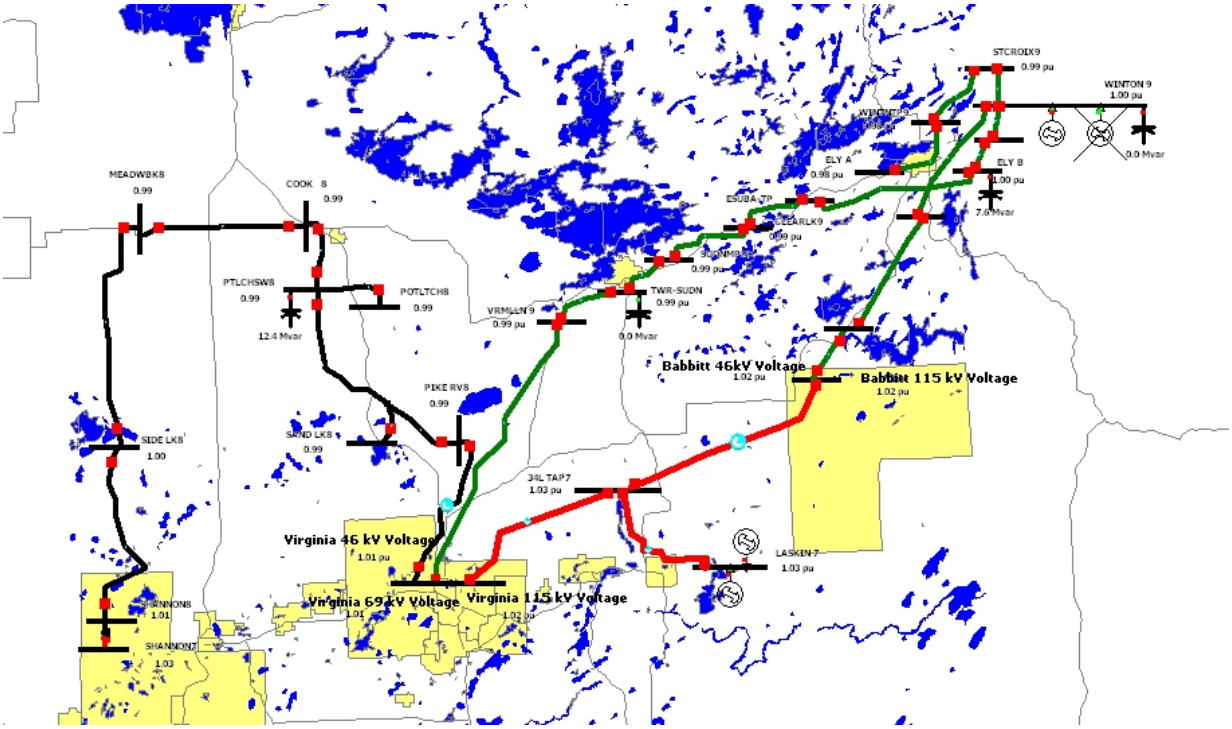
MP and LCP loads in the Lake Vermilion, Tower, Ely, Winton, Babbitt and surrounding rural areas are presently served by a 46 kV loop (Figure 2-1). The electric energy and voltage support for this area is supplied from the Virginia and Babbitt 115 kV substations and the Winton Hydroelectric station. The Winton generation consists of two 2 MVA generators, which is insufficient to supply the load served by this loop.

Historically, load served by this loop had been growing slowly; however, in the past few years the rate of electric load growth has been increasing. The load is approaching the point where voltage will no longer be acceptable if either one of the two existing 115 kV sources is lost. In addition, the thermal rating of the 46 kV lines serving the area will become a concern in the near future during peak load periods if either one of the two 115 kV sources is lost.

The western side of the Lake Vermilion area is served by a 69 kV loop, with 115/69 kV sources at the Shannon Substation (located near Hibbing/Chisholm) and the Virginia Substation (Figure 2-1). The 69 kV system serves large loads at Cook and the Potlatch Board Plant (located south of Cook) and other smaller rural loads along the 69 kV loop. Load served by this 69 kV system has increased significantly in the last few years. GRE has recently added capacitor banks to the 69 kV loop to delay the eventual need for a third 69 kV source to the loop. At present, a loss of either 115/69 kV source requires manual adjustments by the operators to maintain appropriate voltage. Eventually these manual adjustments will reach their limit, which will result in voltage degradation as the load continues to grow.

Figure 2- 1 Power System Serving the Project Area

(115 kV shown in red, 69 kV shown in black, 46 kV shown in green)



2.4.2 Proposed Transmission System Additions to Resolve Problem

MP and GRE have studied the power service to the region and have determined that new electrical facilities are needed to meet existing electric load and future electric load requirements. The proposed plan to address the transmission system voltage issues in the area includes:

- Approximately 15 miles of new 115 kV transmission line from Tower, MN to near Embarrass, MN.
- A new 115/46 kV substation to be constructed near Tower. New 46 kV lines would be constructed from the new Tower Substation to the existing 46 kV system serving the area. The substation would be designed for future addition of 69 kV facilities as described below.
- A new 115 kV switching station to be located adjacent to the MP 115 kV Line # 34 near Embarrass.

2.4.3 Future Transmission System Additions Needed

LCP has experienced extensive growth in electrical demand in the area between the existing distribution substations at Cook and Vermilion. This continuing growth in electrical demand will require that a new 69 kV delivery point be located between these two substations.

Eventually a new 69 kV line (approximately 25 miles) will be necessary between the Tower Substation and a new distribution substation near Frazer Bay on Lake Vermilion and then extending to the Ainsworth Board Plant near Cook, MN. This would provide a much needed third 69 kV source into the load center of the 69 kV system that would serve existing load and new load development along Lake Vermilion. Because this is a 69 kV project, a Certificate of Need would not be required. A Route Permit would be required from either a local governmental unit or the Commission.

2.5 Effect of Promotional Practices on Creating Need

The growth in demand in this part of Minnesota is a result of growth in the number of customers and not MP or GRE promotional activities. MP and GRE promote conservation and load shifting programs, not increased usage. While some load shifting programs (e.g., off-peak water and space heating) may result in a slightly higher demand during off-peak times, none of the increase in demand occurs at peak times. The need for new transmission is caused by projected increases in peak demand. Nearly all of the projected increase in this area of Minnesota is a result of residential and commercial development in the MP and GRE service territories, especially residential development in and around Lake Vermilion. As discussed in Section 8.0, conservation programs will not have a significant impact on reducing this developing load. Nothing MP or GRE have done, or could do, would have any significant impact on the factors giving rise to the need for this project.

3.0 DESCRIPTION OF THE PROJECT

3.1 Corridor Description

3.1.1 General Description of Corridor

The Project corridor is approximately 6,000 feet wide and extends on a north-south axis from the City of Tower to the Giants Ridge Recreation Area in St. Louis County (Figure 3-1). The north terminus (site of proposed new 115 kV substation) is located approximately one mile east of Tower near the intersection of Junction Road and Tower Road. The southern terminus would be a new 115 kV switching station located at the junction of MP's existing (115 kV) 34 Line and 34 Line Tap (White Township, Section 7, Township 59N, Range 15W).

3.1.2 Land Use Patterns

Land uses throughout the Project area are rural and typical to northern Minnesota. Land use in the Project area is a reflection of the forest cover that dominates the landscape. Timber production and land management for timber harvesting is widespread throughout the Project area as reflected by the clear cut, selectively cut, and second growth land cover commonly observed. The abundant wetlands in the Project area also influence land use, as wetlands are often vacant lands with or without forest cover. Together, forested upland and wetland land uses also provide recreational-based opportunities in the form of trails, hunting land, and wildlife observation.

Agricultural-based land uses are nearly absent within the Project area. The most common agricultural land uses include pastures and hay fields. Occasionally, cornfields are present and comprise the only cultivated land in the Project area.

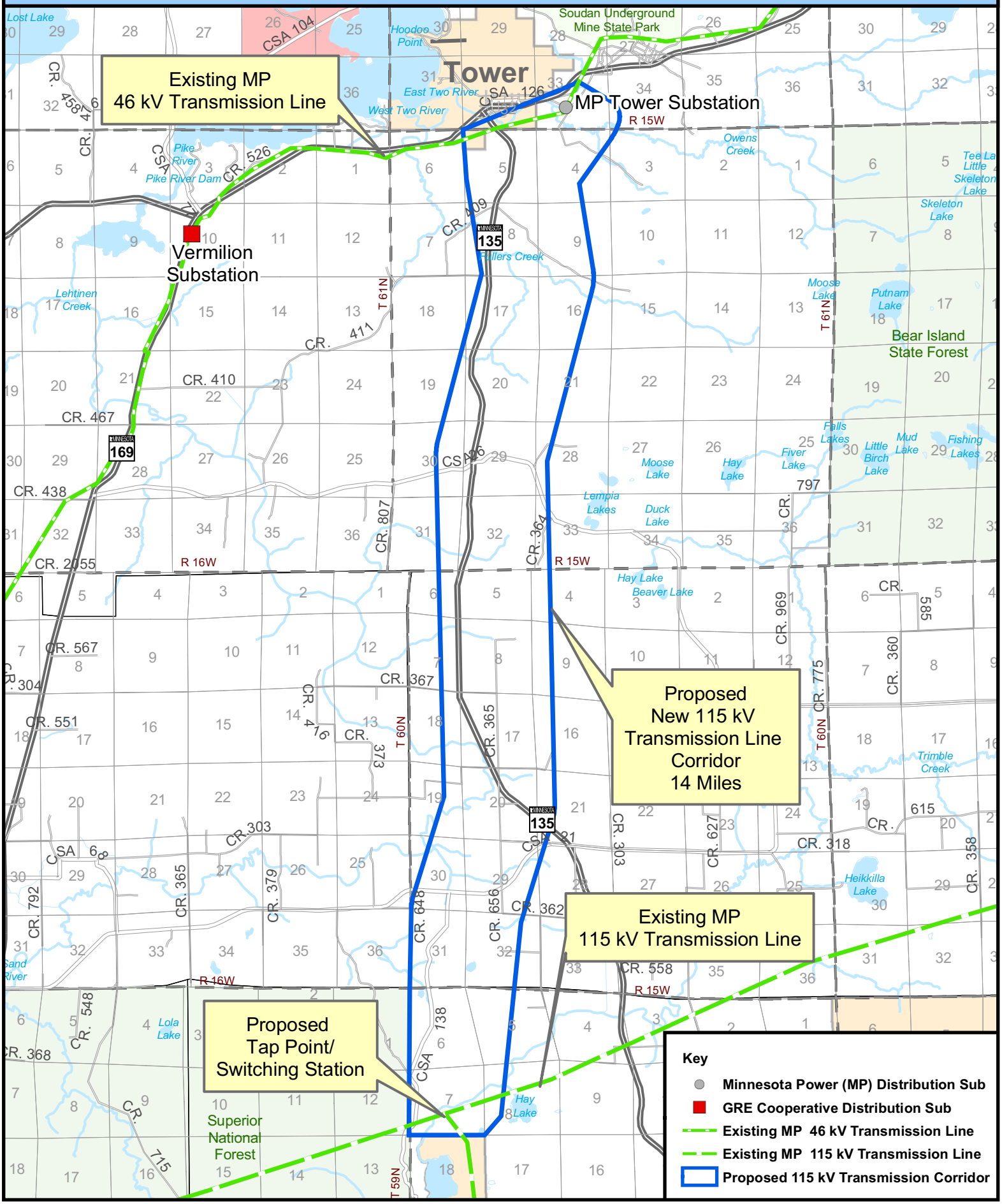
The predominant developed land use throughout the Project area is lightly developed, semi-rural residential parcels with single-family homes. Residential development reaches its highest density within Tower and the Township of Embarrass and surrounding area. There are several small commercial, retail or public buildings/parcels as well as a small Township park and ballfield in the township. Churches and other low-density developments or buildings are also present. Impervious surfaces are primarily restricted to the existing highways and roads. There are no large impervious surfaces within the Project area.

There are several other types of land uses within the Project area including highway, electric distribution line and trail rights-of-way, active and abandoned small gravel or borrow pits, and a grassed private airplane landing strip.

It is anticipated that land uses will remain relatively unchanged during the next 30 years. Increases in growth are expected, but the overall rural character of the Project area

PROJECT MAP

Figure 3-1



should remain unchanged. Timber practices will likely result in changes over time to the forest community dynamics, especially on a small, parcel by parcel basis

3.1.3 Right-of-Way Requirements/Procedures

The right-of-way (ROW) width requirement for a 115 kV transmission project would be 100 feet for all three structure design types, understanding that the ROW width for the single pole designs could be reduced in certain higher density, developed areas. The required right-of-way width may also be less in areas where the new transmission line follows an existing linear corridor such as a road or trail. The applicants would seek a permanent easement, providing the right to construct, operate and maintain the transmission line, for the full width and length of the right-of-way.

Once approvals from various state, federal and local agencies and governmental units are secured, land rights acquisition would commence for new right-of-way or where existing easements are not large enough. Land rights include easement acquisition in the case of a transmission line, or acquisition of a fee interest in the case of a substation. As a general practice, landowners would be contacted to review project details and to discuss the initial phase of the transmission project, including survey and soil investigation. Upon completion of the survey and preliminary design, landowners would be contacted and easement/fee acquisition negotiations would commence.

During the acquisition phase of the project, landowners would be given a copy of the conveyance documents, generally including easements, deeds, structure design or photos, offer sheets and a plan showing the proposed or rebuilt transmission line or facility relative to the landowner's property. Additional information may also be given to each landowner explaining power line safety, easement acquisition procedures, and damage settlement. In addition to permanent easements necessary for the construction of the line, temporary easements may be obtained from certain landowners for temporary construction, access or staging areas for temporary storage of poles, vehicles or other related items. Landowners would be notified in the event site access for soil boring is required to determine soil suitability in areas where certain soil characteristics may require special transmission design.

After land rights have been secured, landowners would be contacted to discuss the initial construction phase of the project including schedules, ingress and egress to and from the planned facility, tree and vegetation removal, damage mitigation and other related construction activities.

The first phase of construction activities would involve surveying the centerline of the new transmission line, followed by removal of trees and other vegetation from the ROW. As a general practice, low-growing brush or tree species are allowable at the outer limits of the easement area. Taller tree species that endanger the safe and reliable operation of the transmission facility would be removed. In developed areas and to the extent

practical, existing low growing vegetation that would not pose a threat to the transmission facility or impede construction would remain in the easement area.

The second phase of construction would involve staking the location of structures, followed by structure installation and stringing of conductor wire.

Upon completion of construction activities, landowners would be contacted to determine whether or not construction damages have occurred. Areas that sustain construction damage would be restored to the pre-construction condition to the extent possible. Landowners would be notified of the completion of the project and asked to report any outstanding construction damage that hasn't been remedied or any other issue related to the construction of the transmission line. Once construction cleanup is complete and construction damages have been successfully mitigated, landowners would be sent a final contact letter signaling the close of the project and requesting notification of any outstanding issues related to the project.

3.1.4 Corridor Considerations

The Project was reviewed during the electrical planning process by a team of siting, right-of-way, environmental and engineering personnel. The team reviewed the general study area for significant siting issues that may arise. The team analyzed the study area and identified the primary corridor based on opportunities to:

- share rights-of-way with existing transmission lines by double circuiting or paralleling an existing line;
- minimize impacts to reliability (i.e., consider if existing lines can be taken out of service for construction);
- parallel roads and trails to help decrease the amount of right-of-way required;
- parallel field lines, property lines or railroads, where access is adequate and the transmission line would cause minimal conflicts; and
- minimize the length of the transmission line to reduce the impact area and costs for the Project.

3.1.5 Future Routing Considerations

Once a corridor is selected as part of the certification process, routes will be identified within the corridor that avoid, to the extent possible, areas where a high-voltage transmission line (HVTL) could create significant impacts. These areas include:

- high density residential areas;
- areas where clearances are limited because of trees or nearby structures; and
- environmentally sensitive sites, such as wetlands, archaeologically significant sites, areas with threatened, endangered and species of special concern, areas of significant biological or cultural significance, and state and federal lands.

Proposed route segments will then be provided to several agencies (Minnesota Department of Natural Resources (DNR), State Historic Preservation Office (SHPO), United States Army Corps of Engineers (USACE), United States Fish and Wildlife Service (USFWS), Minnesota Department of Transportation (Mn/DOT), Tribal groups, and others), the public, and other utilities for review. The routes will be reviewed by these groups through a variety of methods: letters written with a general description of the proposal and maps of the proposed route, meetings with the DNR and the Mn/DOT, and public meetings held in the area of the proposal.

3.2 Transmission Line Description

3.2.1 Line Length, Types of Conductors

Line Length

A 115 kV transmission line constructed within the proposed corridor would be approximately 15 miles in length. There are no existing transmission lines in the project corridor. The entire project would be located in St. Louis County, Minnesota.

Conductors

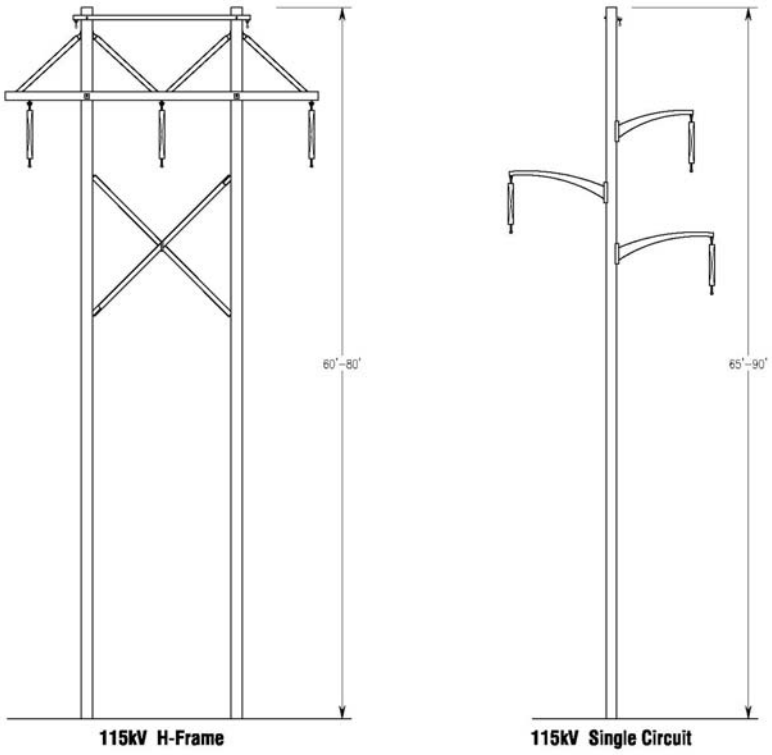
The proposed 115 kV transmission line would use 636 aluminum conductor-steel reinforced (ACSR) conductors. There would be three single conductors for the 115 kV circuit. Depending on structure type, there would also be one or two shield wires (3/8" high strength 7-strand steel) to protect the conductors from lightning. It is likely that this shield wire would consist of an optical shield wire (64mm2/258 OPGW 24 fiber) so it could be used for communications.

3.2.2 Structure Types, Structure Height and Span Length

Two structure types are being considered for the Project: wood H-frame and wood single pole. Dependent upon land use type, topography, right-of-way constraints and other design-dependent features, each of these transmission line structure designs would be appropriate in certain areas within the proposed corridor.

Figure 3-2 shows cross section views of typical 115 kV transmission line structures being considered for this project.

Figure 3-2 Typical 115 kV Transmission Structures



Wood H-frame

The two pole structure design is suited for areas with rugged topography and for areas requiring longer spans to avoid or minimize placement of structures in wetlands or waterways. The average span would be 600–900 feet, with 1,000-foot spans achievable with certain topography. The structure height would average 60–80 feet with taller structures required for the exceptionally long spans and in circumstances requiring additional vertical clearance (i.e., railroad tracks) exceeding the National Electric Safety Code (NESC) requirements.

Single Pole (no under build)

The single pole design is suited for areas where available ROW is limited, such as where corridors are shared along roads in developed areas. Average structure height would be 65–90 feet to achieve average span lengths of 400–600 feet. Specific structure heights and span lengths may exceed the average due to land use requirements and topography.

In addition to the two main structures under consideration for the Project, there may be limited use of a single pole structure with low voltage single phase or three phase distribution under build that directly supplies area electric customers. This single pole design is used in areas where existing land use development restricts the placement of two separate power line circuits, a high voltage circuit and a lower voltage (distribution line) circuit. The advantage of this design is less ROW requirement; however, there are significant operating, maintenance, and cost factors to consider. The higher voltage circuit is “stacked” on top of the lower voltage distribution circuit, resulting in a taller pole (averaging 75-90 feet in height) and shorter spans (250 - 350 feet). Another alternative would be to underground the distribution in specific areas.

3.2.3 Maximum Power-Carrying Capacity

The 115 kV transmission line would use 636 ACSR Rook conductors, which have an ampacity of 914 amps at 100 degrees C. This will limit maximum continuous electric power capacity of the line to 182 megavolt amperes (MVA), provided there is not a more restrictive limit associated with the substation terminal equipment or transformation capacity.

Initially, a 35 MVA 115/46 kV transformer would be installed in the proposed Tower Substation. As explained in Section 2.4.3, it is anticipated that if this Project is approved, a 60 MVA 115/69 kV transformer would be installed in the proposed Tower Substation in the future. This would limit the proposed line to a capacity of 95 MVA. However, the substation would be designed for additional transformer capacity when/if future load growth, reliability, or security issues dictate its need. Therefore, it is conceivable the conductor and operating voltage could become the most restrictive

element and limit maximum continuous power transfer to 182 MVA at some point in the future.

The expected initial maximum power flow on the proposed line in 2009 would be 30 MVA (assumes GRE proceeds with the 69 kV additions), well below the 95 MVA limit imposed by the transformers to be installed as part of this project and anticipated 69 kV additions.

3.2.4 Projected Load During Peak Load Conditions

Load flow analysis indicates that initially the proposed 115 kV line will carry 30 MVA at projected 2009 peak load during normal operating conditions. Based on the forecast load growth rates, the peak flow on the proposed 115 kV line would increase to approximately 45 MVA by 2025. These peak load flows assume that GRE would proceed with their proposed 69 kV Tower-Frazer Bay-Potlatch transmission line project. The flows on this 69 kV line are projected to be 16 MVA in 2009 and increase to 21 MVA by 2025.

3.2.5 Projected Line Losses – Peak Load and Average Conditions

Transmission line losses are directly related to the distance of the transmission line and the current flow through the transmission line. A longer transmission line would have increased losses due to the impedance of the longer conductor. Losses also increase with the square of current flow through the electric system. This means that losses will change over time, increasing as demand increases and falling as demand decreases.

The Project consists of a relatively short radial 115 kV line serving local area load; therefore, losses associated with this project would be small compared to losses associated with regional long distance transmission lines. Because of this, the accuracy of this analysis will be impacted by the tolerances associated with the power flow solutions. The transmission line loss analysis using the 2009 peak load model and PSS/E power flow software indicate the Project would result in a 1.5 MW reduction of on peak transmission losses on the combined MP and GRE systems (0.75% reduction). If flows on only the lines serving the local Project area are considered, (the Shannon-Virginia 69 kV loop and Virginia-Babbitt 46 kV loop and the new 115 kV line) the power flow analysis indicates peak loss savings associated with the project would be 1.1 MW.

Because line losses equal the square of the current times the resistance of the transmission system (I^2R), and because current flow varies with respect to time as electric demand changes, there is no precise method to calculate average annual loss

reductions. One method to estimate average annual loss savings is based on the following formulas;[1]

Loss Factor = (0.3 x Load Factor) + (0.7 x Load Factor^2)

Annual Loss savings = (Loss Factor x Peak Loss Savings) x 8760 hours/year

The average load factor for the loads served by the Project from 2001 to 2004 is 62% (based on MP Energy Management System (EMS) data). Using the method described above and loss savings for the Project area, this project is estimated to reduce transmission line losses by approximately 4385 megawatt hours (MWH) annually (1.1 MW x [(0.3 x 0.62) + (0.7 x 0.62^2)] x 8760 hours/year.

3.2.6 Voltages During Operation

The line would be designed to operate at a nominal voltage of 115,000 volts. During normal operations, voltage would deviate somewhat from nominal levels. Typical system intact voltage would be in the range of 95% to 105% of nominal and post contingency voltage would range between 90% and 105% of nominal.

3.2.7 Electrical Characteristics

The line would be a 3-phase, 60 hertz (Hz) alternating current (AC) transmission line insulated to operate at a nominal voltage of 115,000 volts. The line would use 636 ACSR Rook conductors that have typical 60 Hz impedance of approximately 0.149 +J0.732 ohms per mile (the reactive component will vary slightly with structure and conductor configuration). The thermal limit of conductors would be 182 MVA at 100 degrees Centigrade.

3.3 Construction Practices

The proposed 115 kV transmission line would be constructed at existing grade elevations. Therefore, no pole locations would require grading, unless it is necessary to provide a level area for construction access and activities.

MP and GRE design and construct transmission lines using the most cost-effective methods based on past experiences and practices and in compliance with the latest industry standards. MP and GRE typically utilize outside contractors for construction activities on large transmission line projects. The construction specifications used are developed by MP's and GRE's Engineering Services Departments.

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[1] Turan Gonan, Electric Power Distribution System Engineering, McGraw Hill, 1986, 55, 58-59

Typical tangent structures will be wood, laminated wood, or steel direct-embedded poles. Each structure will require a 10 to 15 feet deep hole that is 3 to 4 feet in diameter. Any excess soil will be removed from the site unless requested by landowners or others. The poles may be backfilled with native soils, crushed rock or concrete depending on design conditions. In lowland areas, a galvanized steel culvert may be also inserted for pole stability due to poor soil capacity. Large angle structures will typically be self-supporting steel poles that will require a drilled pier foundation. The piers will typically have diameters of 4 to 8 feet. The hole may require a typical depth of 15 to 30 feet depending on design requirements. The piers will be filled with concrete delivered to the site via trucks from a local batch plant.

Poles may be delivered to the staked location or to a designated marshalling yard depending on delivery and contractor availability. If the poles are delivered to a staked site, they are placed on the ROW out of the clear zone of any adjacent highways or designed pathways. The poles are typically framed with insulators and hardware on the ground and then lifted and placed in the hole via a bucket truck or a crane, depending on the weight of the structure.

Once the structures have been erected, conductors are installed by establishing stringing setup areas within the right-of-way. These stringing setup areas are typically located every two miles along the project route. The conductors are pulled with a rope lead that connects to every structure through a dolly attached at the insulator location. Temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

In lowland areas, construction activities may occur during the winter season to mitigate any damage to wetland areas or to comply with required crossing permits. A pre-construction conference will outline any special requirements for the contractor prior to the start of any construction activities.

During construction when temporary removal or relocation of fences may occur, installation of temporary or permanent gates may be required. The Applicants land rights agents would coordinate with affected landowners regarding replacement of fences and gates. The contractor would work around cultivated areas until harvest has occurred.

3.4 Operation and Maintenance

MP and GRE would periodically use the right-of-way of the transmission line to perform inspections, maintenance, and repair of any damage. Regular maintenance and inspections would be performed over the life of the facility to ensure a reliable system. Annual inspections would be done by foot, snowmobile, all-terrain vehicles, pickup

truck, or aerial means. These inspections would be limited to the acquired ROW and areas where obstructions or terrain require access off the easement. The Applicants would conduct an annual aerial inspection of the transmission line to ensure reliable operation.

The Applicants would conduct a vegetation survey and remove undesired vegetation that would interfere with the operation of the transmission line. Frequency of vegetation maintenance is on an approximate two-to-five year cycle. Right-of-way clearing practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

3.5 Required Permits/Approvals

Several agencies were contacted for their input on the Project including the DNR, SHPO, Mn/DOT, USFWS, USACE and Tribal groups. Responses are provided in Appendix A. Table 3-1 shows the permits potentially required for the Project.

Table 3-1 Permits/Approvals That May Be Required

Permit	Jurisdiction
LOCAL APPROVALS	
Road Crossing Permits	County, Township, City
Lands Permits	County, Township, City
Building Permits	County, Township, City
Over-width Loads Permits	County, Township, City
Driveway/Access Permits	County, Township, City
Conditional Use Permit/Project Approval	County, Township, City
STATE OF MINNESOTA APPROVALS	
Route Permit Application (Alternative Process)	Commission
Utility Permit (highway crossings)	Mn/DOT
License to Cross Public Waters	DNR Division of Lands and Minerals
License to Cross State Lands	DNR Division of Lands and Minerals
National Pollutant Discharge Elimination System (NPDES) Permit	Minnesota Pollution Control Agency (MPCA)

Permit	Jurisdiction
Section 401 Water Quality Certification	MPCA
FEDERAL APPROVALS	
Section 404 Approval	USACE
Environmental Approval	RUS

3.5.1 Local Approvals

Road Crossing Permits

These permits may be required to cross or occupy county, township and city road right-of-way.

Lands Permits

These permits may be required to occupy county, township and city lands, such as park lands, watershed districts and other properties owned by these entities.

Building Permits

These permits may be required by the local jurisdictions for substation modifications and construction.

Over-width Loads Permits

These permits may be required to move over-width loads on county, township or city roads.

Driveway/Access Permits

These permits may be required to construct access roads or driveways from county, township or city roadways.

Conditional Use Permit

The Applicants have the option of obtaining approval of the Project through a local governmental unit rather than the Commission. This is typically accomplished through the Conditional Use Permit process.

3.5.2 State of Minnesota Approvals

Route Permit (Alternative Process)

If the Applicants do not seek approval for the Project through a LGU, then a Route Permit from the Commission would be required. A Route Permit under the Alternative Process requires the Applicants to be eligible as outlined in Minnesota Rules 4400.2000.

Utility Permit

A permit from the Mn/DOT is required for construction, placement or maintenance of utility lines to be placed adjacent or across the highway right-of-way. These permits would be acquired once the line design is completed.

License to Cross Public Waters/State Lands

The DNR Division of Lands and Minerals regulates utility crossings over, under or across any state land or Public Waters identified on the Public Waters and Wetlands maps. A license to cross Public Waters is required under Minnesota Statute, § 84.415 and Minnesota Rules, Chapter 6135. The Applicants work closely with the DNR on these permits and would file for them once the line design is complete.

NPDES Permit

An NPDES permit is required for storm water discharges associated with construction activities disturbing soil and equal to or greater than one acre in an area. A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan, which includes Best Management Practices (BMPs) to minimize discharge of pollutants from the site. The Applicants would review the need for an NPDES permit for work at the Tower and Embarrass substation sites.

3.5.3 Federal Approvals

Section 404 Approval

The Applicants require Section 404 approval from the USACE when filling of a wetland or water of the United States is required. Section 404 approvals are not expected to be required for this project.

Section 401 Certification

The Applicants require a Section 401 Water Quality Certification when federal approval for the project is obtained (i.e. Federal Energy Regulatory Commission (FERC) permits or a USACE Individual Permit).

Environmental Approval

The RUS requires environmental approval of a project before construction can begin.

4.0 COST AND EFFICIENCY ANALYSIS OF THE PROJECT

4.1 Construction Costs/Cost Analysis Assumptions

4.1.1 Transmission Line Costs

The cost for the two proposed transmission line designs is divided into preconstruction and construction costs. Preconstruction costs include permitting and right-of-way acquisition costs. Construction costs include right-of-way clearing, transmission line construction, and right-of-way restoration costs.

Preconstruction Costs

The internal staff and external consultant costs resulting from preparation and approvals of Certificate of Need and Route Permit applications, public information meetings and public hearings, and acquiring easements for approximately 15 miles of right-of-way is estimated to be **$1,133,000.**

Construction Costs

The transmission line costs for the two proposed design types vary due to the number of structures per mile (span length), the height and diameter of the wood poles, labor, and hardware costs. The H-frame design would range from $300,000 to $400,000 per mile, inclusive of right-of-way clearing.

The single pole (without under build) design would also range from $300,000 to $400,000 per mile, including the right-of-way clearing.

The more expensive transmission design would be the single pole (with under build) design; a double circuit design. Average cost for the double-circuit design would range from $400,000 to $500,000 per mile. The cost would be dependent upon removal cost and salvage value of the existing circuit.

The estimated cost for the approximate 15 miles of transmission line would be **$5,670,000**.

4.1.2 Substation Costs

The project includes the construction of a new 115/46kV substation near Tower and the construction of a “115 kV switching substation” on Line #34 in Embarrass Township. The cost for the land is included in the following construction cost estimates:

- Tower Substation $ 1,790,000
- Embarrass Switching Substation $ 3,600,000

Total **$ 5,390,000**

The estimated total cost for the permitting, right-of-way acquisition, and construction of the two substations and the transmission line is approximately **$12,193,000**.

4.2 Annual Operational and Maintenance Costs

The annual cost of right-of-way maintenance currently averages approximately $350 per mile.

In addition to these right-of-way maintenance costs, annual operating and maintenance costs associated with 115 kV transmission voltages in Minnesota average approximately $600 per mile. Storm restoration, annual inspections, and ordinary replacement costs are included in these operating and maintenance costs.

4.3 Service Life and Depreciation

On March 31, 2003, Minnesota Power filed a Request for Approval of the Transmission and Distribution Average Service Life Depreciation Study for 2003 with the Commission that was subsequently approved by the Commission. Docket No. E015/D-03-500, Order Certifying Depreciation Rates and Methods dated June 30, 2003. For this filing, Minnesota Power completed analytical and judgmental review of all plant accounts that comprise the average service life grouping. MP used a simulated plant balance method for analytical results. These results were reviewed with engineering management from the transmission and distribution lines of business, and their expertise and knowledge was the deciding factor in areas of discussion.

Using the depreciation rates approved in the study by the Commission, the Project would result in an annual depreciation expense of approximately $289,000. Table 4-1 lists the alternatives (discussed in Section 9.0) and their estimated impact on annual depreciation.

Table 4-1 Impact on Annual Depreciation

	Tower Project	Reconductor Alternative (Section 9.3)	Voltage Upgrade Alternative (Section 9.4)	Double Circuiting Alternative (Section 9.5)	Generation/ Delayed Project Alternative (Section 9.7)
Impact on Annual Depreciation Expense	$289,000	$495,000	$575,000	$403,000	$252,000

4.4 Effects on Rates

MP and GRE have determined that MP would finance the construction of the Project. MP would bill GRE for transmission services through the established Network Integration Transmission Services Agreement (NITS Agreement).

Table 4-2 shows the Annual Revenue Requirements for the Project and Alternatives.

Table 4-2 Annual Revenue Requirements for the Project and Alternatives

TOWER PROJECT	RECONDUCTOR ALTERNATIVE (SECTION 9.3)	VOLTAGE UPGRADE ALTERNATIVE (SECTION 9.4)	DOUBLE-CIRCUITING ALTERNATIVE (SECTION 9.5)	GENERATION/DELAYED PROJECT ALTERNATIVE (SECTION 9.7)
$1,899,250	$3,503,845	$3,918,366	$2,778,050	$2,369,677

4.5 Effect of Project on Service Reliability (Service Areas and Throughout State)

At present, the MP Virginia-Ely-Babbitt 46 kV lines are supplied by 115 kV sources at Virginia and Babbitt and hydrogeneration at Winton. During faults on MP 46 kV Virginia - Winton line # 32, Winton Generation is vulnerable to tripping due to the time required to recognize and clear faults. If Winton Generation were to trip at peak load conditions and 32 line could not be reclosed at Virginia, voltage on the 46 kV loop could collapse. Although this is an unlikely event, Winton has tripped as a result of line faults in the past.

The Project will reduce the time to recognize and clear a fault on line # 32, which would greatly reduce the likelihood that Winton would trip as a result of a remote line fault. In addition, the project will divide line # 32 into two line sections, a Virginia-Tower Section and a Tower-Winton Section. The significantly reduced line exposure (reduced by 50%), combined with a third 115 kV source into Tower, would eliminate the possibility that a single contingency would result in voltage collapse on the 46 kV loop, if Winton Generation were to trip.

Studies conducted by MP indicate that as the load served by the 46 kV loop reaches approximately 28 MW, voltage is at risk of falling below acceptable levels (less than 92%), if one of the two 115 kV sources that supply the area is out of service. The existing system is capable of supporting approximately 1 MVA of additional load, provided both generator units are available at Winton. However, because the load peaks during winter, water is not always at levels where both hydrogeneration units are available. The new 115 kV source into Tower would remove the dependence on Winton Generation and eliminate voltage concerns if one of the two existing 115 kV sources is

out of service. The new Tower 115 kV source would improve security and reliability to the area electric loads and remove restrictions for conducting required maintenance on the transformers and lines supplying the area.

GRE operates a 69 kV line between the Virginia and Shannon 115/69 kV substations. The load served by this line has been growing and is expected to reach levels where the load tap changer located at Shannon will no longer be able to maintain post contingency voltage at acceptable levels. The proposed 115 kV substation facilities at Tower would be an additional source to provide support to this 69 kV loop. If the Project is approved and constructed, GRE proposes to add a 115/69 kV transformer and associated equipment at the new Tower Substation and construct a new 69 kV line to connect the Tower 115 kV source to the Shannon-Virginia loop at a point near Cook that would be in service by 2011. This project would provide the voltage support required to serve the growing loads served by the Shannon-Virginia 69 kV loop. The project would include development of a new Frazer Bay 69/12 kV Substation to serve the growing loads in the western Lake Vermilion area.

4.5.1 Regional Impacts

The Project would improve the reliability of the regional transmission system. The MP 115 kV Line # 34 runs between the MP's Laskin Steam Generation plant and the Virginia Substation with a tap to the Babbitt Substation. This line serves as one of the outlets for the Laskin Generation and the Taconite Harbor Generation (via a double-circuit 138kV transmission line tie between the two generation plants). The proposed Embarrass 115 kV switching station would split 115 kV Line #34 into three sections; Laskin-Embarrass, Virginia-Embarrass, and Babbitt-Embarrass. Construction of the Embarrass 115 kV switching station and sectionalizing the present 115 kV transmission lines would greatly reduce the exposure on Line #34 and improve its reliability. Because loss of Line #34 has a direct effect on the capacity of the Taconite Harbor generation outlets, the Project would improve the reliability and security of the Taconite Harbor generation outlets and generator runback protection schemes associated with loss of these generator outlets.

In addition to the benefits to the regional transmission system, the Project also provides a 115 kV source located near growing LCP loads in the Cook and Lake Vermilion area. As outlined in section 2.4.3, the Project can be used to provide a much needed third source into the center of the GRE Shannon-Virginia 69 kV loop.

5.0 ANALYSIS/MITIGATION OF ECONOMIC, ENVIRONMENTAL, AND SOCIAL CONSEQUENCES OF THE PROJECT

5.1 Summary of Public, Tribal and Governmental Input on Project

A summary of public input on the Project from the various zonal meetings was provided in Section 2.3.

Several agencies were contacted for their input on the Project, including the DNR, SHPO, USFWS, USACE and Tribal groups. All agency responses are provided in Appendix A. The DNR provided a short letter outlining necessary licenses as listed in Section 3.5. The SHPO sent a list of archaeological and historic sites in the Project area. The Leech Lake Band of Ojibwe, Bois Forte Reservation Tribal Council, Lac Vieux Desert Band of Lake Superior Chippewa Indians, Flandreau Santee Sioux Tribe, Sisseton-Wahpeton Oyate Reservation, the Mille Lacs Band of Ojibwe Indians and the Keweenaw Bay Indian Community responded that they reviewed the corridor area and do not have any concerns regarding sites of religious or cultural importance.

The Applicants conducted an open house, prior to submission of this application, on July 21, 2005 in Tower. Comment cards were provided at the meetings. Meeting notice ads were placed in local papers and invitations were sent to local agencies and public authorities in and near the corridor. A total of 25 people registered at the meeting. Follow up also occurred with several contacts requesting further information on the Project. The materials provided at the meeting include materials describing the Project, corridor maps and the certification process.

As required by Minn. Rules 7848.1900, subp. 6, and approved by the Commission (see Docket No. ET-2, E-015/TL-05-867, Order Approving Notice Plans, as Revised dated August 25, 2005) the Applicants implemented the Notice Plan for this Project on September 1, 2005. By this process, notice of the Project was provided to all persons reasonably likely to be affected by the Project, by direct mail and newspaper notice. The Notice Plan was mailed to approximately 230 landowners and 40 agencies.

About 35 people attended the Second “State Plan Certification Public Meeting” held September 29, 2005 at the Embarrass Town Hall. MP and GRE representatives discussed the project, which would include developing a new switching station near Embarrass and a new substation near Tower to serve the transmission system at 115, 69 and 46 kV levels, and 15 miles of new 115 kV transmission line to connect the substations.

Attendees were told about how economic growth in the region from Babbitt to Virginia to Hibbing/Chisholm is taxing the existing power delivery system, which is approaching its physical limit. In addition to the new 115 kV line, new 46 kV lines would be built from the new Tower Substation to the area’s existing 46 kV system. In the future, a new 25-

mile, 69 kV line will be needed between the Tower Substation and a new 115/69 kV substation near Frazer Bay on Lake Vermilion, then extending to the Ainsworth Board Plant near Cook.

Most people attending wanted to know whether the transmission line route had been determined yet, though there did not seem to be any major objections to the Project. MP and GRE explained that although a general transmission line corridor has been identified, no specific routes have been identified. The Applicants also explained that Project permitting and regulatory approvals will take about two years, and that many routing factors need to be evaluated and balanced in the route development process. Ultimately the pros and cons of each route alternative need to be weighed by the Commission in the decision-making process. One landowner asked why the existing Virginia to Tower 46kV transmission corridor is not the preferred option. It was explained that this system option would not improve electric security because two lines serving the same purpose would be on same right-of-way and would cost more to construct due to line length and construction issues.

More public hearings and public information meetings will be held over the next 18-24 months during the certification and routing processes.

5.2 Description of Project Corridor

The Project corridor is approximately 6,000 feet wide and extends on a north-south axis from the City of Tower to the Giants Ridge Recreation Area (Figure 5-1). Existing rights-of-way in the corridor include:

- Junction Road
- Iron Trail (snowmobile trail)
- Cross-country ski trails (public recreation area)
- Trunk Highway (TH) 135
- East Taylor Road
- County Highway (CH) 21

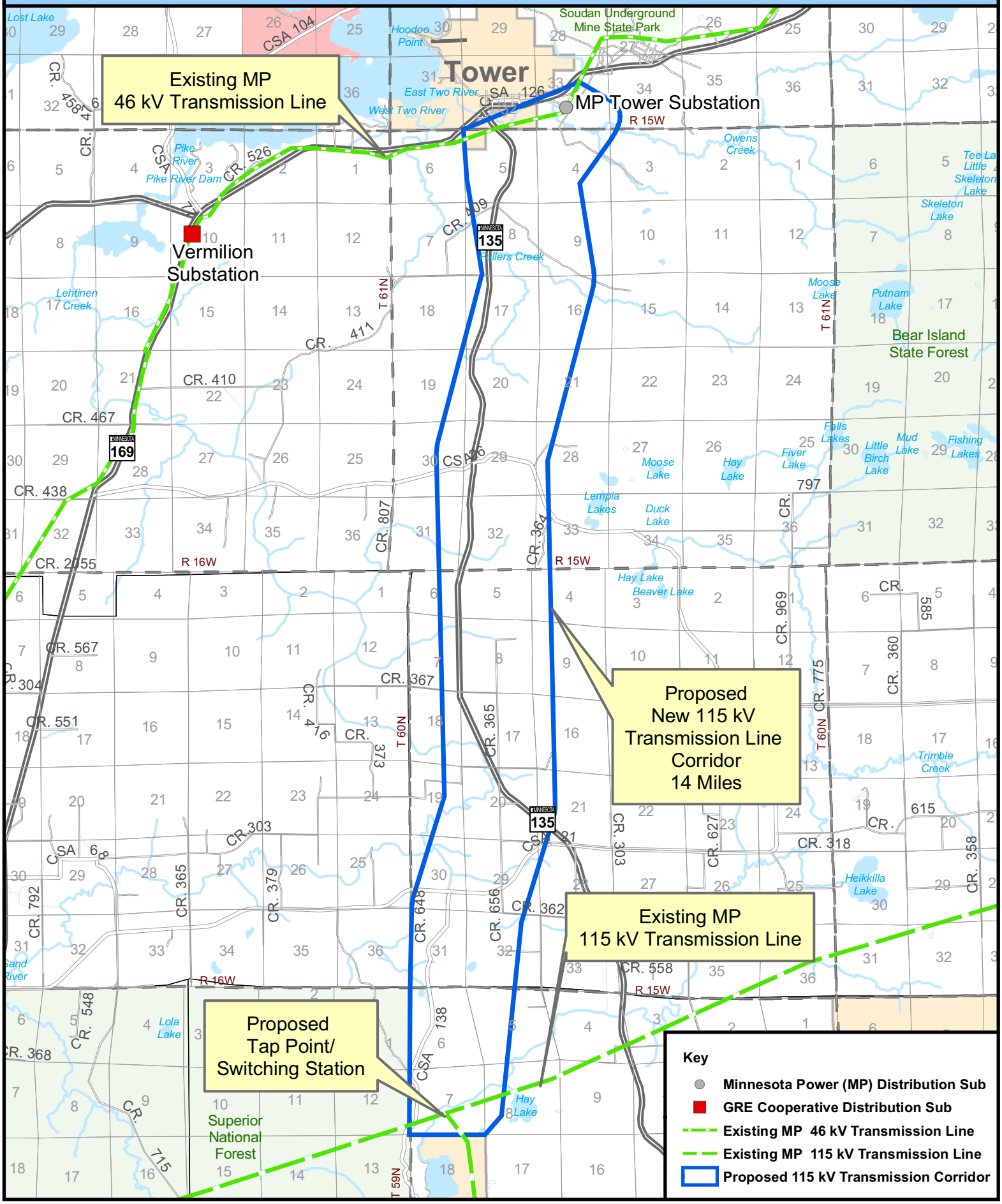
MP and GRE are evaluating transmission alternatives within the study corridor, and plan to use existing rights-of-way to the extent practical.

5.3 Physiographic Setting

The Quaternary glacial geology of the region has influenced the physiography of the project area. A relatively thin layer (<40 feet) of glacial till is overlain on Precambrian bedrock, portions of which are exposed at the surface. The Vermilion Range formation dominates the northern end of the project area near the City of Tower and provides more elevational relief in the immediate area. South of Tower, the topography is lower with small gently rolling hills and flat large wetland basins (peat deposits).

PROJECT MAP

Figure 5-1



Soils are comprised of peat, muck, and clay-based hydric soils in the wetlands and a relatively thin layer of glacial till over bedrock in the uplands. The Soil Survey of St. Louis County is still in draft form and has not been published to date.

Lakes are absent within the linear shaped Project study area. Lake Vermilion, a large lake, is located outside of the Project area to the north. Additional lakes are found several miles east and north of the Project study area. Fullers Creek, the Pike River, and the Embarrass River transect the Project study area on an east-west axis as shown in Figure 5-1.

5.4 Human Settlement

Human settlement patterns, in particular European settlement, were historically influenced by the natural resources in the region. Timber resources and the fur trade were the initial attractions for the earliest settlers to the region in the early and mid 1800s. In the early 1900s, an attempt was made by settlers to develop a farm-based economy on clear cut timber lands that eventually failed due to poor soils and climate.

During the early 1900s, some of the first ore pit operations evolved and expanded as technologies advanced. Eventually, mining surpassed timber as the primary employer in the Project area by the mid-20th Century. Timber production regained a dominant economic and settlement influence as the mine operations declined during the latter half of the 20th Century.

The City of Tower has historically been a mining town and has more recently become a municipality that supports tourism and development related to Lake Vermilion. The density of residential developments is highest within the City of Tower and around Lake Vermilion to the north and west. The Township of Embarrass has the next highest density of settlement within the project study area. Settlement throughout the Project area is concentrated near roads and likely influenced by land uses including timber production. The absence of lake shore property and industry in the Project corridor is evident, as there are no settlement concentrations influenced by these attractions.

5.5 Socioeconomic Setting

5.5.1 Demographics

The population of the City of Tower in 2000 was 479 with a 5.71% decrease in population from 1990 to 2000. St. Louis County had a population of 200,528 in 2000 with a 1.17% increase in population from 1990 to 2000. There has been no measurable increase in housing density within Tower or the Project study area during this period. The housing occupancy rate in 2000 included 48.64% owner-occupied in Tower, and 41.20% owner-occupied in St. Louis County.

The minority population of St. Louis County includes individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (Presidential Executive Order 12898).

In the 2000 data, the City of Tower had 95.74% in the White population group, 1.49% in the American Indian group, 1.92% in the Hispanic group, and 0.85% classified as other race. In 2000, 48.43% of the population was male and 51.57% was female. The age group composition in 2000 was 78.5% for the 19 and over age group and 21.5% for the under 19 age group.

In the 2000 data, the St. Louis County population had 94.86% in the White population group, 0.85% in the Black (not of Hispanic origin) group, 2.03% in the American Indian Group, 0.69% in the Asian group, 0.80% in the Hispanic group, 0.22% percent categorized as other race, and 1.35% in more than one race group. Males comprised 49.18% and females 50.82% of the County population in 2000. The age group composition was 73.73% for the 19 and over group and 26.27% for the under 19 age group.

5.5.2 Economy

Historically, timber production and mining were the economic mainstays of the Project area. While timber production remains, mining has declined as a primary employer. Many residents commute, sometimes great distances, to employment opportunities located outside of the Project area. Some local industries and employment are available, and the expanding recreational home industry, gaming facilities, and other tourism-based economies have increased and provided opportunities for Project area residents. Seasonal residents are relatively few within the Project area compared to neighboring areas where lake shore parcels are present. In summary, the socioeconomics of Project area is rural and primarily residential. Commercial and retail operations are uncommon within the Project area.

Business patterns for the City of Tower and St. Louis County are based upon the most recent information available (U.S. Bureau of the Census, 2000). In the 2000 data, the City of Tower had a work force of approximately 242 employees with a median household income of $26,429. No specific industries were identified in the data. St. Louis County had a work force of approximately 100,974 employees with an average median household income of $36,306. Again, no specific industries or employers were identified in the data.

5.6 Noise, Radio and Television Interference

5.6.1 General

Corona discharges from the conductors of an overhead transmission line result in the formation of audible noise and radio frequency noise. Corona occurs when the electric

field intensity at the transmission line's conductors exceed the breakdown strength of air resulting in ionizing the air near the conductors. If the discharges are excessive, the audible noise can reach annoyance levels and the radio frequency discharges can cause interference with radio and TV reception.

Corona formation is a function of the conductor radius, surface condition, line geometry, weather condition and most importantly the lines operating voltage. Corona produced audible noise, radio and television interference is typically not a concern for power lines with operating voltages below 161 kV, because the electric field intensity is low.

The Applicants are unaware of any complaints related to audible noise, radio or TV interference resulting form the operation of existing 115 kV transmission lines located near the Project area (Virginia, Hoyt Lakes and Babbitt for example) and do not expect that audible noise and radio TV interference will be an issue along the corridor.

5.6.2 Audible Noise

Noise levels are measured on a logarithmic scale in units of decibels. In addition, human hearing is not equally sensitive to all frequencies of sound, therefore it is customary to apply a weighting factor so the overall measured sound pressure level will relate as closely as possible to the ear's perception of the sound. The A-weighting network is typically used and the measured sound level is expressed in units of decibels A-weighted (dBA). In general terms, a noise level change of 3-dBA is imperceptible to human hearing. A 5-dBA change in noise level is clearly noticeable and a 10-dBA change in noise levels is perceived as a doubling of noise loudness. Table 5-1 provides estimates of the noise levels of some common noise sources expressed in dBA.

Table 5-1 Common Noise Sources and Levels

Sound Pressure Level (dBA)	Typical Sources
140	Jet engine (at 25 meters)
130	Jet aircraft at 100 meters
120	Rock and roll concert
110	Pneumatic chipper
100	Jointer/planer
90	Chainsaw
80	Heavy truck traffic
70	Business office
60	Conversational speech
50	Library
40	Bedroom
30	Secluded woods
20	Whisper

Source: MPCA, 1999. A Guide to Noise Control in Minnesota

As mentioned, transmission lines can create an audible crackling sound due to corona discharges from the conductors. Transmission line audible noise levels depend significantly on prevailing weather conditions for a given line geometry and operating voltage. Fair weather audible noise is very low and seldom noticed even if standing under a power line. Audible noise is the highest during periods when the conductor is wet, such as during periods of rain or fog. During heavy rain, the general background noise level is usually greater than the noise from the transmission line. As a result, people do not normally notice audible noise from a transmission line during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air and low background noise, transmission lines will produce audible noise that can be heard when standing under the line or within or at times slightly beyond the edge of the line's right-of-way.

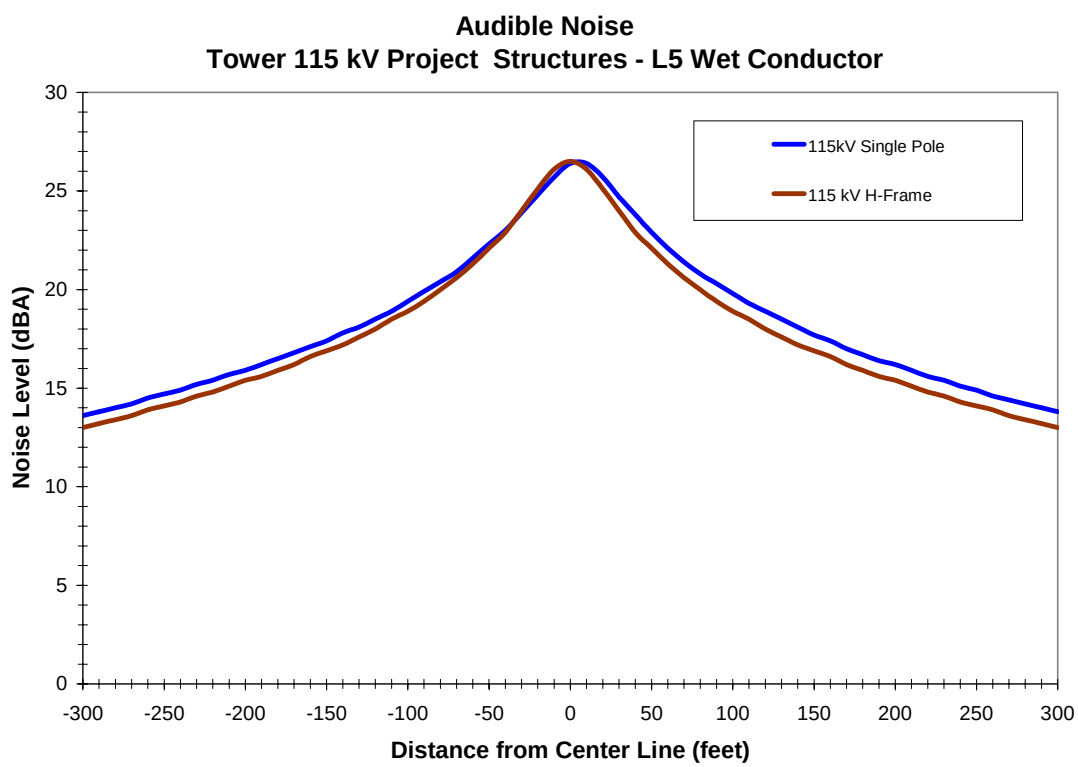
Minnesota Rule 7030.0040 establishes standards to regulate noise levels by land use types. The terms L50 and L10 designate noise levels expressed in dBA that are not to be exceeded more than 50% or 10% of the time, respectfully. The most restrictive MPCA standards require noise levels be less than an L50 level of 50 dBA and L10 level of 55 dBA at night. Table 5-2 identifies the established Minnesota noise standards for daytime and nighttime grouped by noise area classification.

Table 5-2 Noise Standards by Noise Area Classification

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The most restrictive MPCA standard (Classification area 1) require noise levels be less than an L50 level of 50 dBA and L10 level of 55 dBA at night. Graphs of the noise levels for the various line geometries considered for this project are shown in Figure 5-2 and indicate that noise levels will be well below these limits at the edge of the right-of-way even during foul weather periods when the conductors are wet and the transmission line noise will be at its highest level (note graphs show the more restrictive L5 noise level rather than the L50 or L10 levels, the L5 level is a level that is not exceeded more that 5% of the time). During fair weather conditions, the transmission line noise will seldom be noticed even if standing directly under the transmission line.

Figure 5-2



5.6.3 Radio Noise

"Radio Noise" is a term used to refer to any unwanted interference of an electromagnetic nature with any signal or communication channels throughout the radio frequency band of operation, 3 kilohertz (kHz) to 30,000 kHz. Corona-generated radio noise could cause interference with virtually any type of radio reception. However, in practice it has been found that the bands principally affected are the amplitude-modulated (AM) broadcast band, 535 to 1,605 kHz and in particular those stations broadcasting below approximately 1,000 kHz. Frequency-modulated (FM) stations are seldom impacted by electric transmission facilities. Cellular phones are unlikely to be affected due to the high frequencies used; in fact, utility personnel often use cellular phones within substations and transmission line rights-of-way.

The radio noise generated from transmission lines is a function of conductor size and geometry, conductor height above ground, phase spacing, and ground resistance. Because radio noise is due to corona discharges, it also depends on the line's operating voltage and weather conditions.

The Federal Communications Commission (FCC) considers transmission lines inadvertent emitters and therefore they are not covered directly by FCC regulations. However, in the past, the FCC and the State of Minnesota have suggested that transmission line radio noise should not result in interference within a licensed broadcast station's primary coverage area for non-mobile receivers. Based on the Applicants experience with operating other 115 kV transmission lines, the Project should not impact reception of commercial AM radio stations with non-mobile receivers within a stations primary coverage area.

5.6.4 Television Interference

Corona generated noise could cause interference with TV picture reception similarly as in the case with AM radio interference since the picture is broadcast as an AM signal. The level of interference depends on the TV signal strength for a particular channel (TV audio is an FM signal that is typically not impacted by transmission line radio frequency noise).

Due to the higher frequencies of the TV broadcast signal (54 megahertz (MHz) and above), 115 kV transmission lines seldom result in reception problems within a station's primary coverage area. In the rare situation that the proposed transmission line would cause TV interference, MP and GRE would work with the affected party to correct the problem. Usually any reception problem can be corrected with the addition of an outside antenna.

TV picture reception interference can also be the result of a transmission structure blocking the signal to homes in close proximity to a structure. Because the structures proposed for this Project would be wood, this is unlikely to occur. However,

measurements can be made to verify whether a structure is the cause of reception problems. Reception problems can usually be corrected with the addition of an outside antenna, an amplifier or both.

5.7 Electric/Magnetic Fields (EMF)

5.7.1 General

The term EMF refers to electric and magnetic fields that are present around any electrical device and can occur indoors and outdoors. Electric fields are the result of voltage or electrical charges, and the intensity of the electric fields is related to the operating voltage of the line or the device. Magnetic fields are the result of the flow of electricity or current that travels along transmission lines, distribution (feeder) lines, substation transformers, house wiring and electrical appliances. The intensity of a magnetic field is related to the current flow through the conductors (wire).

Considerable research has been conducted throughout the past three decades to determine whether exposure to power-frequency (60 Hz) electric and magnetic fields cause biological responses and health effects. Epidemiological and toxicological studies have shown no statistically significant association or weak associations between EMF exposure and health risks.

In 1999, the National Institute of Environmental Health Sciences (NIEHS) issued its final report on “Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields” in response to the Energy Policy Act of 1992. NIEHS concluded that the scientific evidence linking EMF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between EMF and health effects and the common exposure to electricity in the United States, passive regulatory action, such as providing public education on reducing exposures, is warranted.

Minnesota, California and Wisconsin all have recently conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL EMF effects. The Working Group consisted of staff from various state agencies. The Working Group published its findings in a White Paper on EMF Policy and Mitigation Options (White Paper 1) in September 2002.

The findings of the Working Group are summarized below:

> Research on the health effects of EMF has been carried out since the 1970’s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show

such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe (White Paper 1).

5.7.2 Environmental Consequences and Mitigation

The EQB has addressed the matter of EMF with respect to new transmission lines in a number of separate dockets over the past few years [Docket Nos. 03-64-TR-Xcel (161 kV Lakefield line); 03-73-TR-Xcel (345 kV Buffalo Ridge line); 04-84-TR-Xcel (115 kV Buffalo to White line) and 04-81-TR-Air Lake-Empire (115 kV line in Dakota County)]. The findings of the EQB and the discussion in the Environmental Assessments prepared on each of those projects are pertinent to this issue with respect to the transmission lines proposed here. Documents from those matters are available on the EQB webpage: www.eqb.state.mn.us.

In June 2005, in Docket No. 03-73-TR-Xcel for the 345 kV Buffalo Ridge line, the EQB made the following findings with regard to EMF:

118. No significant impacts on human health and safety are anticipated from the project. There is at present insufficient evidence to demonstrate a cause and effect relationship between EMF exposure and any adverse health effects. The EQB has not established limits on magnetic field exposure and there are no federal or Minnesota health-based exposure standards for magnetic fields. There is uncertainty, however, concerning long-term health impacts and the Minnesota Department of Health and the EQB all recommend a “prudent avoidance” policy in which exposure is minimized.

119. In previous routing proceedings, the EQB has imposed a permit condition on high voltage transmission line permits limiting electric field exposure to 8 kilovolts per meter (kV/m) at one meter above ground. This permit condition was designed to prevent serious hazard from shocks when touching large objects such as semi trailers or large farm equipment under extra HVTLs of 500 kV or greater. Predicted electric field densities are less than half of the 8 kV/m permit condition for both the 34.5 kV line and the 115 kV line.

The electric field from a transmission line can induce an electric charge on other conducting objects in the vicinity of the line, such as vehicles and fences. If these objects are insulated or semi-insulated from the ground, and a person touched them, a small current would pass through the person’s body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what can occur when a

person walks across a carpet and touches a grounded object or another person. Due to the relatively low operating voltage of the proposed line (115 kV), these discharges are unlikely to reach an annoyance level. To insure that any discharge does not reach unsafe levels, the NESC requires that any discharge be less than 5 milliamperes (ma). The line would be designed such that the discharge from any large object such as a bus or truck parked under or adjacent to the line would be significantly less than 5 ma. The Applicants would assure that any fence or other large permanent conductive object in close proximity to or parallel to the line would be grounded such that excessive discharges would not occur.

High intensity electric fields can have adverse impacts on the operation of pacemakers and implantable cardioverter/defibrillator (ICD). Interference to implanted cardiac devices can occur if the electric field intensity is high enough to induce sufficient body currents to cause interaction.

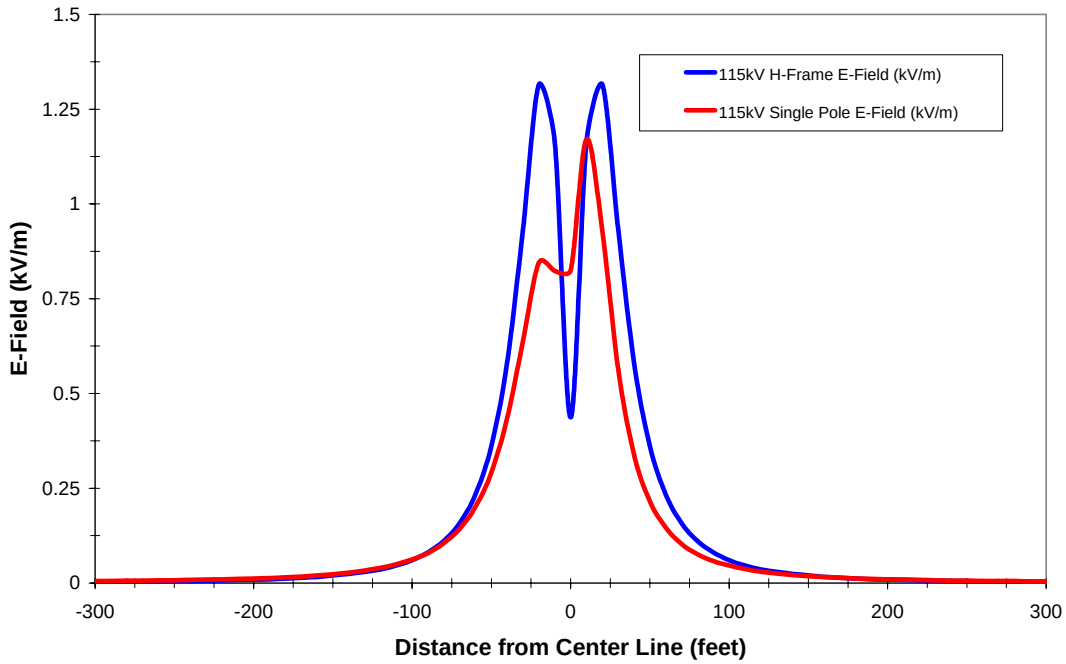
Modern bipolar devices are much less susceptible to interactions with electric fields. Medtronic and Guidant, manufacturers of pacemakers and ICDs, have indicated that electric fields below 6 kV/meter are unlikely to cause interactions affecting operation of most of their devices.

Older unipolar designs are more susceptible to interference from electric fields. Research completed by Toivoen et. al (Toivoen et. al 1991) indicated that the earliest evidence of interference was in electric fields ranging from 1.2 to 1.7 kV/meter. Figure 5-3 shows that the e-field for all structure and right-of-way alternatives are well below levels that modern bipolar devices are susceptible to interactions with electric fields. For older style unipolar designs the e-field just exceed levels that Toivoen et al has indicated may produce interference. However, a recent paper concludes that the risk of interference inhibition of unipolar cardiac pacemakers from high voltage power lines in everyday life is small[2]. In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker would return to its normal operation when the person moves away from the source of the interference.

[2] Scholten A, Joosten S, Silny J, Unipolar cardiac pacemakers in electromagnetic fields of high voltage overhead lines, Journal of Medical Engineering and Technology, 2005, 29(4):170-5

Figure 5-3

Electric Field - Proposed 115kV Structures



The magnetic field profiles around the proposed lines for the structure and conductor configurations being considered for the Project are shown in Appendix B. Because the magnetic field is dependent on current flow, the expected magnetic field was calculated for two conditions: current flow at the conductor's thermal capacity and current flow at the 95 MVA limit imposed by the substation transformer capacity. The 95 MVA limit is based on the 35 MVA 115/46 kV transformer to be added as part of this Project and the 60 MVA 115/69 kV transformer to be added in the future by GRE if this Project is approved.

Several conclusions can be drawn from the magnetic field profile data:

- Magnetic field levels decrease rapidly (inverse square of the distance from source) from the centerline.

- Because magnetic fields decrease as current flow decreases, the fields expected during normal operation would be significantly less than those represented in the graphs, because the graphs depict the fields associated with current flow at the conductor thermal limit and at the substation transformer capacity after the 69 kV additions proposed by GRE are in place.

5.8 Land Use

Land uses in the corridor are predominantly forest, rural residential, and wetlands.

The northern portion of the corridor is relatively rural with scattered houses and extensive timber production tracts. Wetlands are widespread in this area and bog habitat is common within many wetlands. The scattered agricultural parcels present are mostly pastures and hay production fields. Timber production tracts and wetlands are the most abundant land use.

The portion of the corridor that encompasses the Town of Embarrass has the highest residential development density in the entire corridor, but still retains some semi-rural character.

South from the Town of Embarrass and the CH 21 alignment, the corridor's low-density residential and forested character resumes and continues to the south terminus.

The Project is expected to have minimal effects on or changes to land uses, especially in portions of the Project that will be co-located with existing roads, utility rights-of-way, or similar linear corridors. New Project right-of-way would result in permanent conversion of forested land uses (including forested and shrub- dominated wetlands) to a linear cleared and maintained right-of-way. New Project right-of-way construction would cause temporary impacts with no land use conversions to herbaceous wetlands, pastures and hay fields, unforested fields, and other land that does not require tree or shrub removal. There is little farmland in the Project area.

5.9 Cultural Resources

5.9.1 Existing Environment

The SHPO provided database search results of all known or reported archaeological sites and historic architectural structures within one mile of the townships and sections crossed by the corridor (Appendix A). Within the Project corridor, the database lists five archaeological sites and 46 historic architectural structures. Of these known resources, there is one architectural structure site listed on the National Register of Historic Places (NRHP) and none that are considered eligible for listing in the NRHP. Nearly all of the historic structures are near the Town of Embarrass.

It is important to note that most of the listed sites have not been evaluated as to their historical significance and that there may be other resources within the alternative corridors that have not yet been identified. Historic structures must be at least 50 years old to be significant.

The database search results of nearby historic and archaeological sites (by township) are presented below.

Breitung Township

One archaeological site (Old Indian Cemetery)

Embarrass Township

41 architectural structures (one listed on the NRHP)

Kugler Township

Two recorded archaeological sites (trails)
Five architectural structures

White Township

Two recorded archaeological sites

5.9.2 Environmental Consequences and Mitigation

Construction of new transmission line structures in the proposed corridor could impact previously identified and currently unknown cultural resources.

Archaeological sites may be disturbed during construction of transmission structures, staging areas or access roads. Historic buildings or other sites may be impacted as construction of modern transmission structures may compromise the integrity of a historic view shed from or to above ground cultural resources. Potential impacts would be determined once routes are selected within the corridor.

Prior to construction, areas that are deemed high potential for cultural resources would be surveyed. The surveys would be coordinated with the appropriate landowners or land management agency. A product of the survey would be a cultural resources report recording findings and suggesting mitigation measures. The findings would be reviewed with the SHPO and specific mitigation measures necessary for each site or resource would be determined.

Mitigation may include careful relocation of access routes, structure sites and other disturbed areas to avoid cultural sites.

5.10 Hydrologic Features

5.10.1 Lakes, Rivers, Streams and Floodplains

There are no large lakes (>60 acres) within the Project area. The north end of the Project area near the City of Tower is within the watershed of a small creek system comprised of West Two Rivers Creek and Fullers Creek, which merge and flow north to

outlet in Lake Vermilion. The middle section of the study area encompasses the upper reaches and watershed of the Pike River, which flows towards the west. The main channel and two branches of the Embarrass River are located within the south end of the Project area. The Embarrass River flows in a southwesterly direction within the study area. These linear water bodies and their watershed boundaries within the study area are shown in Figure 5-4.

According to the designated floodplain maps of the Federal Emergency Management Agency (FEMA), 100-year floodplains are present along the channels of all three of the above-mentioned rivers including the Fullers Creek and West Two Rivers Creek system, Pike River and its upper tributaries, and the Embarrass River.

If the Project would result in permanent encroachments to the cross section of a designated floodplain, a floodplain assessment would be completed. The assessment quantifies the scale of the impact so that a design solution to mitigate the impacts (through minimization and facilitation of continued floodplain function) can be developed. Given the nature of the project, little floodplain fill or disturbance is anticipated and the effects of the installment of any poles within the floodplain are expected to be negligible.

5.10.2 Wetlands

The wetlands within the Project study area are mapped on the National Wetland Inventory (NWI) (USFWS 1979, 1983) and were confirmed in a 2005 field reconnaissance as shown in Figures 5-5 to 5-7. Wetlands are common and widespread throughout northern Minnesota and the study area is no exception.

Wetlands within the Project study area are typically large, influenced and defined by topography, and often are interconnected. The Project area's larger wetlands trend on an east-west axis but are also highly configured shaped polygons. Small, isolated depressions are also present but less common. These small isolated basins typically occur within forest settings or former forest that has been converted.

Wetlands are summarized in the descriptions below by Wetland Type (*Wetlands of the United States*, USFWS Circular 39) and observational data collected during the reconnaissance. Locations of each wetland are shown in Figures 5-5 to 5-7.

<u>Type 1 Wetlands, Seasonally Flooded Basins</u>

Type 1 wetlands are rare in any setting, and this is true in the Project area. One Type 1 wetland was observed in the Project area that was dominated with Canada blue-joint (*Calamagrostis canadensis* – USFWS Status Obligate (OBL)) and was disturbed by timber clear cutting operations.

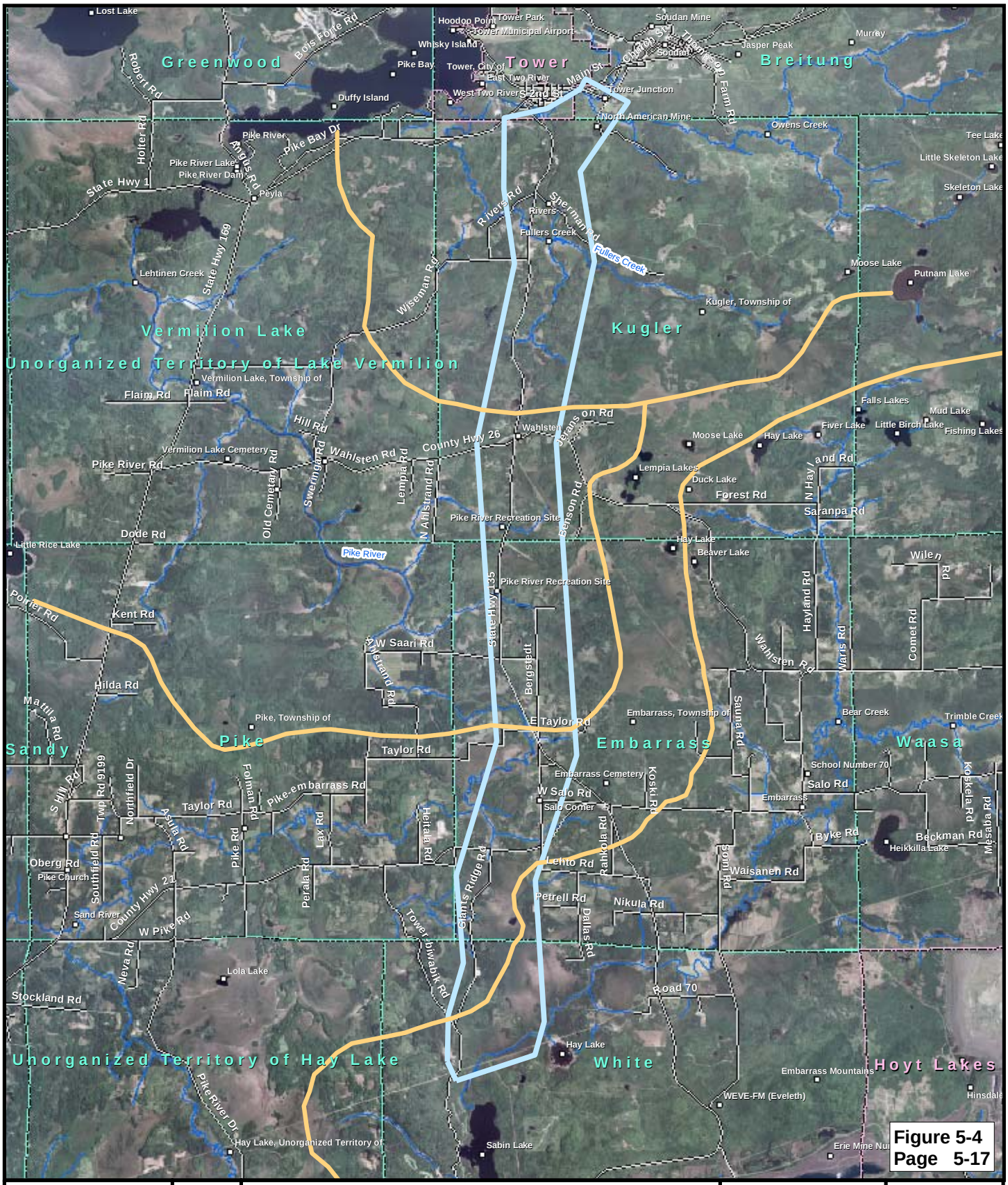


Figure 5-4
Page 5-17

SEH

3535 VADNAIS CENTER DR.
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WATTS: 800-325-2055
www.sehinc.com

Project Number
AMNPOW0507.00

July 2005

Legend

- Geographic Names
- Roads
- Municipal Boundaries
- Civil Township Boundaries
- Hydrography
- Project Corridor
- Approximate Watershed Boundaries

Projection:
UTM, Zone 15, Meters
NAD83

N
W E
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0 10,000 Feet

Map Document: (V:\KO\Mnpow\050700\GIS\AMNPOW050700\Figure xx - Watershed Bounds.mxd)
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Source: LMIC, EQB, USDA, USGS, MNDNR, USFWS, Mn/DOT, and SEH.

Minnesota Power

Approximate Watershed Boundaries

Tower to Giants Ridge Along 135

St. Louis County, MN

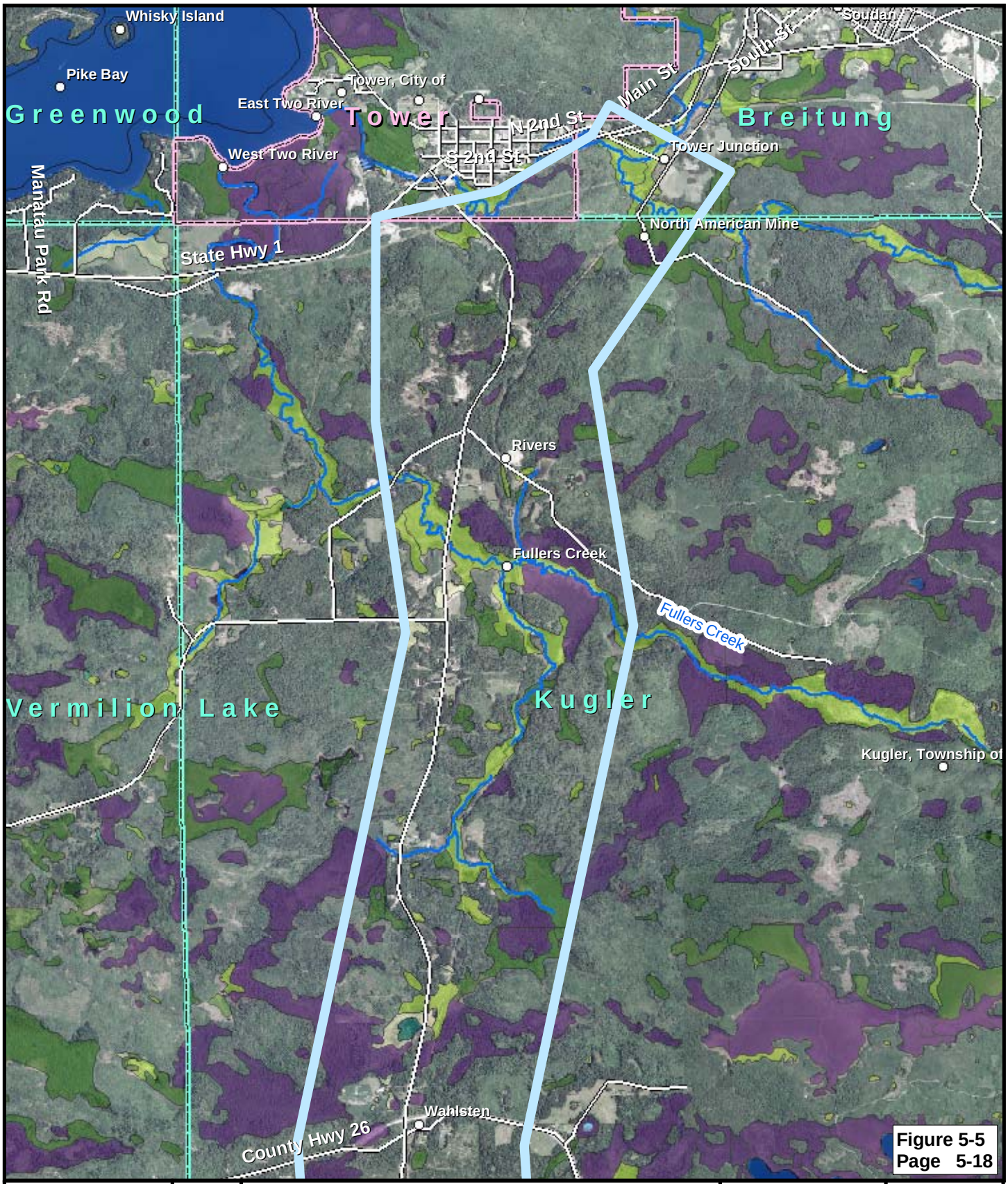

Figure 5-5
Page 5-18

SEH
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Project Number
AMNPOW0507.00

July 2005

Legend

- Geographic Names
- Roads
- Municipal Boundaries
- Civil Township Boundaries
- Hydrography
- Project Corridor

NWI (CIRC39)

- 1 - Seasonally flooded basin or flat
- 2 - Wet meadow
- 3 - Shallow marsh
- 4 - Deep marsh
- 5 - Shallow open water
- 6 - Shrub swamp
- 7 - Wooded swamps
- 8 - Bogs
- 80 - Municipal and industrial activities
- 90 - Riverine systems

Source: LMIC, EQB, USDA, USGS, MNDNR, USFWS, Mn/DOT, and SEH.

Map Document: (V:\KO\Mnpow\050700\GIS\AMNPOW050700\Figure 5-6 - National Wetland Inventory_85x11.mxd)
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Projection:
UTM, Zone 15, Meters
NAD83

N W E S

0 3,500 Feet

Minnesota Power

NWI Map - North

Tower to Giants Ridge
Along 135

St. Louis County, MN

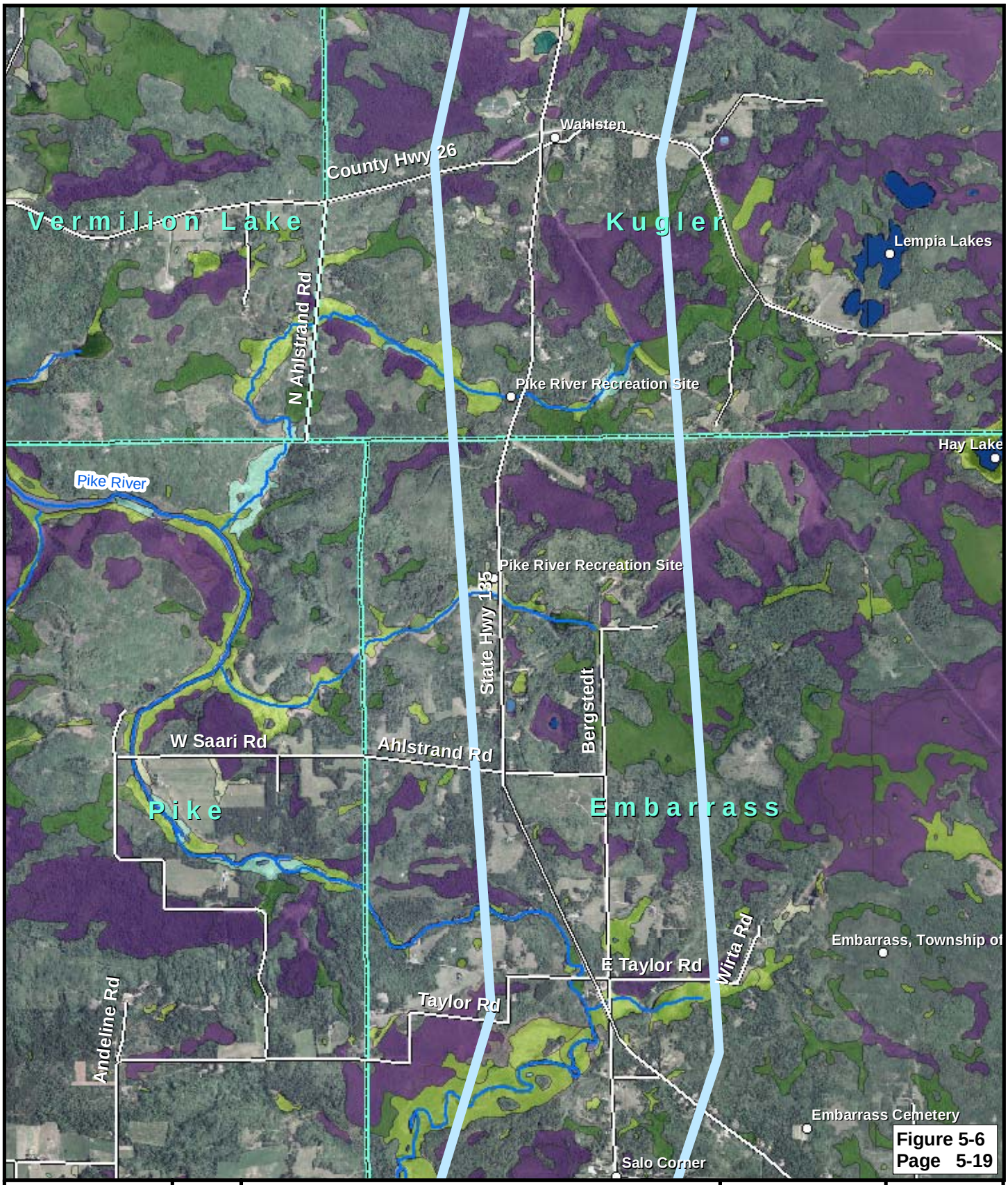

Figure 5-6
Page 5-19

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July 2005

Legend

- Geographic Names
- Roads
- Municipal Boundaries
- Civil Township Boundaries
- Hydrography
- Project Corridor

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- 7 - Wooded swamps
- 8 - Bogs
- 80 - Municipal and industrial activities
- 90 - Riverine systems

Source: LMIC, EQB, USDA, USGS, MNDNR, USFWS, Mn/DOT, and SEH.

Map Document: (V:\KO\Mnpow\050700\GIS\AMNPOW050700\Figure 5-6 - National Wetland Inventory_85x11.mxd)
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NAD83

N W E S

0 3,500 Feet

Minnesota Power

NWI Map - Central

Tower to Giants Ridge
Along 135

St. Louis County, MN

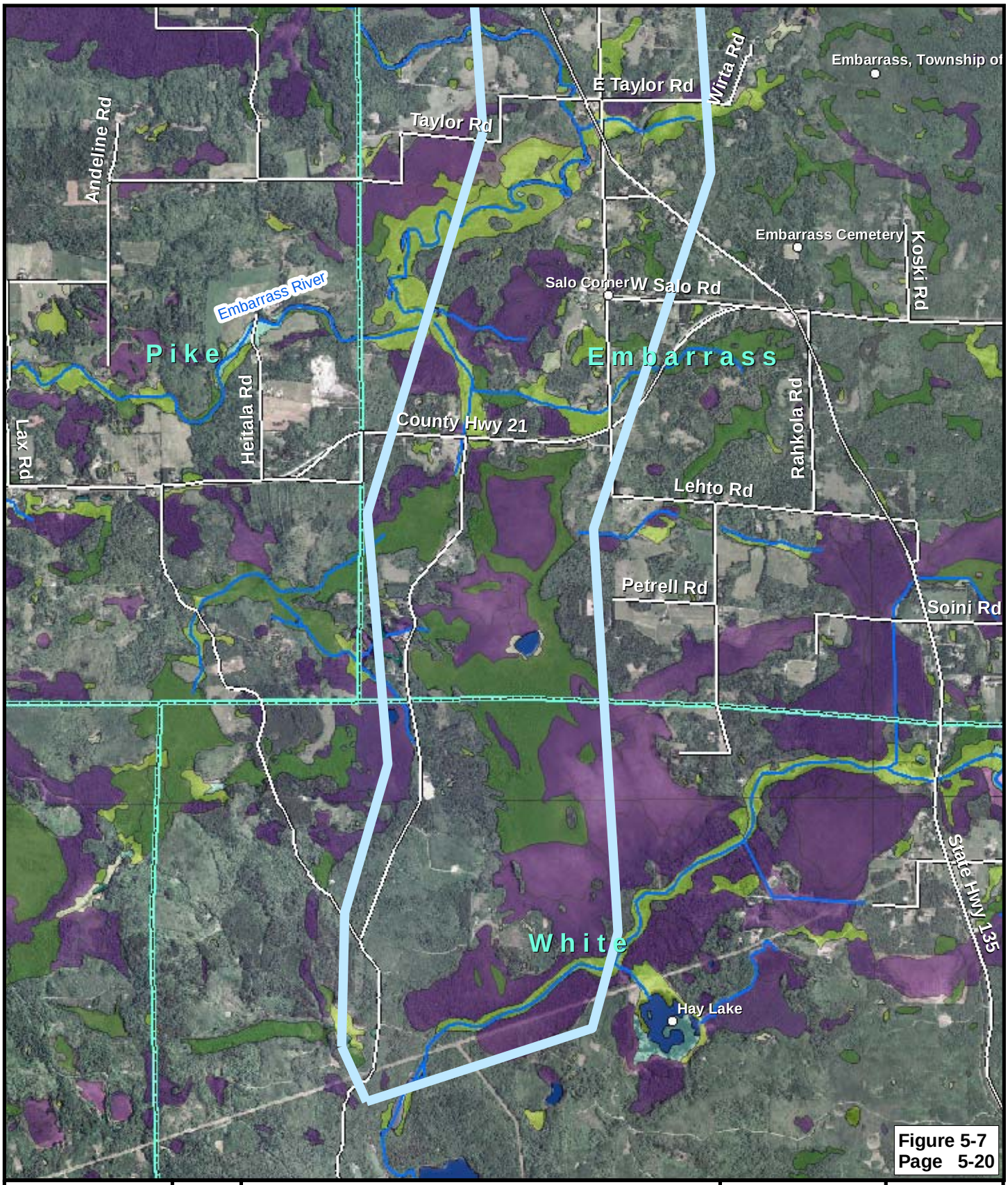

Figure 5-7
Page 5-20

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Project Number
AMNPOW0507.00

July 2005

Legend

- Geographic Names
- Roads
- Municipal Boundaries
- Civil Township Boundaries
- Hydrography
- Project Corridor

NWI (CIRC39)

- 1 - Seasonally flooded basin or flat
- 2 - Wet meadow
- 3 - Shallow marsh
- 4 - Deep marsh
- 5 - Shallow open water
- 6 - Shrub swamp
- 7 - Wooded swamps
- 8 - Bogs
- 80 - Municipal and industrial activities
- 90 - Riverine systems

Source: LMIC, EQB, USDA, USGS, MNDNR, LSRWD, Mn/DOT, and SEH.

Map Document: (V:\KO\Mnpow\050700\GIS\AMNPOW050700\Figure 5-7 - National Wetland Inventory_85x11.mxd)
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Projection:
UTM, Zone 15, Meters
NAD83

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Feet

Minnesota Power

NWI Map - South

Tower to Giants Ridge
Along 135

St. Louis County, MN

Type 2 Wetlands, Wet Meadows

Type 2 wetlands are also uncommon within the Project area. Similar wetlands are more typically Type 3. Several Type 2 wetlands are present and often associated within larger wetlands with other types. Canada blue-joint and sedges (*Carex* spp.) are the dominant vegetative species present. Wiregrass sedge (*Carex lasiocarpa* – OBL) in particular often grew extensively and monotypically within many of these Type 2 wetlands. Type 2 wetlands are seasonally flooded and are sensitive to invasive species from disturbances.

Type 3 Wetlands, Shallow Marsh

Type 3 wetlands within the Project area are also relatively uncommon and often are part of a larger wetland complex with other types. Type 3 wetlands more often are flooded for longer periods than Types 1 and 2 wetlands and may contain vegetation that reflects this extended hydro period. Cattail species (*Typha* sp.) were observed as the dominant vegetation along with sedges and Canada blue-joint. Pickerelweeds (*Pontederia* sp.) and arrowhead (*Sagittaria* sp.), two species common to deeper water marshes, were also observed.

Type 4 Wetlands, Deep Marsh

Type 4 deep marshes are not common to the Project study area. Nearly all of the Type 4 habitat occurs in association with other wetland complexes and/or deep open water along rivers or creeks. Cattail, pickerelweed and arrowhead are common vegetative species within the Type 4 wetlands in the study area.

Type 5 Wetlands, Shallow Open Water

The absence of lakes and open water habitats results in little to no Type 5 habitats within the study area.

Type 6 Wetlands, Shrub Swamp

Type 6 shrub swamp is one of the two most common wetland types within the project study area. As shown on Figure 5-5, Type 6 wetlands are common in large, connected wetland complexes and within small isolated basins. Type 6 wetlands are dominated by a shrub canopy comprised of speckled alder (*Alnus incana* – OBL). Red-osier dogwood (*Cornus sericea* – Facultative Wet (FACW)) and occasionally one or more of several species of willow (*Salix* spp.) found in the region are also present within the shrub canopy of the Type 6 wetlands. Sedges, Canada blue-joint, common marsh marigold (*Caltha palustris* OBL), marsh fern (*Thelypteris palustris* – OBL), sensitive fern (*Onoclea sensibilis* – FACW), and spotted joe-pye-weed (*Eupatorium maculatum* – OBL) are common in the herbaceous ground cover vegetation of the Type 6 wetlands. Type 6

wetlands are seasonally flooded and provide excellent wildlife habitat in the project study area.

Type 7 Wetlands, Wooded Swamp

Type 7 wooded swamps are present within the study area and often are associated with or are part of a larger wetland complex. Two distinct vegetative communities are found within Type 7 wetlands in the study area. The most common of the two is mixed forest swamp with a mixture of deciduous and conifers including black ash (*Fraxinus nigra* OBL), balsam poplar (*Populus balsamea* – FACW), black spruce (*Picea mariana* – FACW), tamarack (*Larix laricina* – FACW), and balsam fir (*Abies balsamea* – FACW). Canada blue-joint and ferns are often present in the herbaceous ground layer.

Pure stands of black ash comprise the other Type 7 vegetative community within the study area. Here, the tree canopy consists of a monotypic stand of black ash. The shrub and ground cover layers within these black ash swamps are similar in composition to the mixed forest swamp type.

Type 8 Wetlands, Bogs

Type 8 wetlands are the second-most abundant wetland type found within the project study area. The tree canopies, when present, are dominated by black spruce and tamarack. Willow and alders are present within any shrub communities found in the bogs. The most distinctive and unique feature of the bogs, a floating mat comprised of sphagnum moss (*Sphagnum* spp. – NI), forms the ground cover layer. Many different species of sedges, grasses and herbs are also present within the sphagnum mat. Bog birch (*Betula pumila* – OBL), leatherleaf (*Chamaedaphne calyculata* – OBL), Labrador tea (*Ledum groenlandicum* - OBL), and cotton-grass (*Eriophorum vaginatum* - OBL) are common to the Type 8 wetlands in the project study area.

5.10.3 Wetland Impacts and Mitigation

Impacts to hydrologic resources could occur by directly filling wetlands or DNR Public Waters due to construction of the project, or by otherwise negatively altering their functions and values. The Applicants would perform a wetland delineation of the selected route, concentrating on areas of disturbance near proposed transmission structures. Depending upon the results of the delineation, project components may be moved to avoid affecting wetlands along the route.

The Applicants anticipate that the Project would avoid many wetland areas and surface water features, such as rivers and streams, by spanning the transmission line over the water bodies.

To further protect hydrologic features, BMPs for sediment and erosion control would be implemented. To minimize contamination of water due to accidental spilling of fuels or

other hazardous substances, all construction equipment would be equipped with spill cleanup kits.

If impacts to hydrologic features are unavoidable, the Applicants would work with the jurisdictional agencies (USACE, DNR and/or Minnesota Board of Water and Soil Resources (BWSR)) to determine the best ways to minimize the impacts and create appropriate mitigation measures.

5.11 Flora and Fauna

The analysis of flora, fauna, and their habitats included a review request (see Appendix A) from the DNR for sensitive features identified in the Natural Heritage Information System (NHIS) database (DNR, 2005). Several NHIS database occurrences are present within the project study area and are discussed below. A field reconnaissance of the study area to ground truth and verify the quality of the Project area habitats was completed in the early summer of 2005. The results for the Project are discussed below.

The NHIS data were reviewed to implement avoidance of potential effects on Rare, Threatened or Endangered species or sensitive natural resources. Generally speaking, species protected under the federal Endangered Species Act require complete avoidance, no project effects, or extensive consultation with the USFWS if there is a potential for impacts. Potential effects on NHIS occurrences, including flora and fauna protected under the Minnesota Endangered Species Act require additional coordination with the DNR, a possible requirement for a takings permit, and/or may require mitigation. Mitigation could vary and include salvage and relocation for plants, the purchase and management of habitat, or some other measure unique to the species impacted that would satisfactorily compensate for the impact. The extent to which mitigation is required for NHIS occurrences depends on the nature of and protection status of the affected occurrences. State-listed Species of Special Concern have no or different mitigation requirements than species that are designated as Threatened or Endangered.

5.11.1 Project Corridor

All of the wetlands are of relatively high quality within the north portion of the corridor. Nuisance vegetation is absent and disturbance is minimal. Bog conditions and habitats are present within portions of or all wetlands. No listed species were observed.

A mature upland conifer forest with mixed pine and spruce is located on a hillside on the south side of the Iron Trail as the trail approaches Sherman Road from the north. This area could be potential habitat for the listed fern species identified by the DNR NHIS and is also suitable for goshawk nesting. A goshawk vocalization was heard approximately 0.5 miles towards the southwest within this forest parcel. This forest is mature, contiguous and shows no evidence of recent timber activities. The area is also

traversed by the City of Tower Cross Country Ski Trails. Avoidance of this habitat is possible by co-locating on or adjacent to the Iron Trail or through alignment shifts northwards away from the habitat area.

A DNR NHIS occurrence #14832 is present within the first wetland complex located south of Sherman Road. The occurrence is a plant species and is located approximately 600 feet east of the Iron Trail snowmobile right-of-way. Habitat for this species is present in close proximity to the trail.

Most of the upland habitats in this area have been recently subjected to forest harvesting activities. Some smaller patches of mature mixed pine-spruce forest are present on the upland islands imbedded within the wetlands, but there are also indications of disturbances within these areas as well. The probability for suitable goshawk nesting habitats is low and suitable habitats for the listed fern species are lacking or in poor quality.

South of Wahlsten Road, the wetland habitats are in a good to excellent qualitative state. Large amounts of bog habitats are present and could potentially harbor listed plant species.

The upland habitats located in the central area of the corridor are mostly comprised of young second growth mixed conifer-hardwood forest and evidence of recent timber activities. Goshawk nesting habitat is poor quality as is the potential habitats for the listed fern species.

Two vocalizing American bitterns (*Botaurus lentiginosus*) were documented in a wetland located on the east side of Bergstedt Road at the north terminus for the road. The vocalizations and time of year are indications that breeding activity may be occurring. The American bittern is a secretive and uncommon bird in Minnesota, although it is not state or federally listed. Like all native birds, the American bittern and its nests are protected under the federal Migratory Bird Treaty Act.

From the north end of Bergstedt Road to East Taylor Road the wetlands are in excellent quality and undisturbed. A mature pine-spruce forest that has been selectively cut and managed is present south of the first wetland. This area is large, contiguous and could be potential nesting habitat for goshawks and habitat for the listed fern species. Co-location along TH 135 is a possible option if avoidance of this area becomes necessary, as this habitat extends to the east for four or more miles.

From East Taylor Road to CH 21 most of the wetland habitats have been disturbed and lack the habitat for the listed species. Most of the upland habitats have been converted to land uses associated with the houses and development in the Town of Embarrass and are not suitable for the threatened and endangered species of interest.

From CH 21 to the southern edge of the corridor the wetland habitats are in good condition and undisturbed. Two NHIS occurrences (#22985, #22997) are present within the wetland habitats in this area.

The upland habitats are mostly comprised of mixed mature conifer-pine-hardwood forests. These are contiguous, extensive and sporadically subjected to timber activities. The habitat also extends into the Superior National Forest boundary. Lastly, northern goshawk vocalizations were documented during the surveys, mostly within the southern half of the segment and east of the road.

6.0 SYSTEM CAPACITY

6.1 Introduction

Continuing economic growth in this part of Minnesota from Babbitt to Virginia to Hibbing/Chisholm has caused a considerable increase in electrical use in the region. The addition of new electrical services and the increase in demand from existing services are causing electricity delivery concerns in the area. The existing electrical system, consisting of transmission lines and substations, is approaching its physical limit. Loss of a facility may result in potential long-term outages. This situation has become a concern for winter peak periods, but with continued growth, the number of critical hours during the year will continue to increase.

6.2 Transmission Planning Programs – Standards and Criteria

6.2.1 North American Electric Reliability Council

Reliability standards for electric transmission planning are currently established by NERC. Since its formation in 1968, NERC has operated primarily as a voluntary organization based on reciprocity and mutual self-interest. Its main purpose is to maintain electric system reliability in North America. As currently constituted, NERC is a not-for-profit corporation made up of ten Regional Councils throughout the country. Regional Council members come from all segments of the industry and account for virtually all the electricity supplied in the United States and Canada. The recently formed Midwest Reliability Organization[3] (MRO) serves as one of the NERC's Regional Councils. Minnesota Power and Great River Energy are members of the Midwest Reliability Organization.

On April 1, 2005 NERC adopted a new version (Version 0) of the reliability standards that were rewritten to be measurable and enforceable. The industry is currently operating under this version of the standards.

The Electricity Modernization Act of 2005 (the Act) was recently passed by Congress and enacted into law by President Bush on August 8, 2005. A provision of this legislation provides for a system of mandatory, enforceable reliability standards to be developed by a new organization referred to as the ERO (Electric Reliability Organization). Reliability standards are to be developed by the ERO (subject to review by FERC), and once approved, standards may be enforced by the ERO subject to commission review. The Act directs FERC to issue a final rule to implement the ERO on or before February 5, 2006. The Applicants are anticipating that the Version 0 standards will be initially adopted by the ERO.

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[3] Formation of the Midwest Reliability Organization (MRO) was approved by the Mid-Continent Area Power Pool (MAPP) Executive Committee in November 2002. In 2005, this organization became operational and replaced the MAPP Regional Reliability Council of the North American Electric Reliability Council (NERC).

Version 0 of the NERC planning standards applies primarily to the "bulk" electric system, the electric generation resources, transmission lines, and interconnections generally operated above 100 kV. These systems must be capable of performing under a wide variety of expected system conditions, and must be planned to withstand probable forced maintenance outages and other service interruptions known as "contingencies." The standards are designed to keep the interconnected system planned, designed, and operating to withstand a number of contingencies caused by the loss of a generation unit, transmission line, or other system failures. The standards require companies to continually keep the system in a secure state (able to withstand the next contingency, even after one or more contingencies have already occurred). NERC's reliability standards can be found on its website, http://www.nerc.com/standards.

6.2.2 National Electric Safety Code

The NESC provides a second set of planning criteria. The NESC governs the design, construction and operation of electric utility transmission facilities to ensure public and employee safety.

The NESC was initially defined in the 1920s and is currently revised every five years following extensive research and review. A complete discussion of NESC standards can be found at http://standards.ieee.org/nesc/newssites.html.

The NESC specifies the physical clearances and the mechanical strength of structures and equipment required to ensure safe operation of high-voltage electrical facilities such as transmission lines and substations. Consideration of the Code's line-ground and line-line clearances, coupled with the Code's mechanical strength requirements, determines whether existing transmission lines can be reconductored or converted to higher voltages. The Code's provisions also establish the minimum clearances required from adjacent structures, such as buildings.

The applicants would design, construct and operate the proposed transmission line to meet or exceed NESC requirements or any Minnesota state electric codes that apply.

6.3 Regional Planning Under MISO

MISO’s Appendix B of the Transmission Owner's Agreement (Agreement of Transmission Facilities Owners to Organize the Midwest Independent Transmission System Operator) describes the process to be used by MISO in planning the transmission system. MISO is responsible for operating and planning all MISO members’ transmission facilities above 100 kV. The process for carrying out the planning of the MISO shall be collaborative with Owners, Users, and other interested parties. The Owners continue to have planning responsibilities for meeting their respective transmission needs in collaboration with MISO subject to the requirements of

applicable state law or regulatory authority. Nothing in the Transmission Owner's Agreement is intended to restrict or expand existing state laws or regulatory authorities.

The Owners identify and develop expansion plans to provide a reliable power supply to their connected load customers. MISO integrates the Owners' plans, transmission needs identified from transmission service and generator interconnection requests, facility studies, and expansions to support trading opportunities into the overall Plan. Any plans that call for modifications to the transmission system that would significantly affect available transmission capacity (ATC) must be approved by MISO before being implemented. MISO seeks out opportunities to coordinate or consolidate, where possible, individually defined transmission projects into a more comprehensive cost-effective plan that will meet reliability needs, better integrate the grid, and support competition while giving consideration to the inputs from all stakeholders.

The Project is planned and designed to serve local area loads and provide voltage support to these loads. Because the Project does not result in a significant increase in ATC, the Project would not require MISO approval. However, the Project plans have been forwarded to MISO. For this Project, MISO's role will be a facilitator, coordinator, and provider of support to move the Project forward.

6.4 MP's and GRE's Independent Applications of Programs, Criteria and Modeling

6.4.1 Programs

Power System Simulator Rev 29 (PSS/E) computer software was used to simulate the response of the electric system under the various outage conditions. Equipment current carrying capability and system voltages were all analyzed in these simulations. The output from the computer programs was compared against the appropriate criteria (NERC, Mid-Continent Area Power Pool (MAPP), MP and GRE) in order to identify system inadequacies. Alternatives were then developed that address the inadequacies identified. The alternatives were then placed into the models and the computer analysis rerun to determine the effectiveness of each of the alternatives. Review of these simulations and consideration of other factors (electric performance, cost, environmental impact etc.) were used to identify the recommended transmission alternative.

In addition to the PSS/E software, PowerWorld Simulator software, an interactive power systems simulation package, was used. This software provides a means to explain power system basics to non-technical people. It was demonstrated in the public meetings to illustrate the inadequacy of the present electric system serving the Project area, the need to address this inadequacy and that the Project provides the best solution to the inadequacy.

6.4.2 Modeling

Currently, the primary responsibility for building and maintaining the models used to analyze the reliability of the electrical system in Minnesota and throughout the region falls with MRO's[4] Modeling Building Subcommittee (MBS). The MBS maintains what is essentially a power flow, base case transmission model library. The library includes a series of power system models that simulate the behavior of the bulk electric system. The models are designed to accurately represent all major generation, load, and transmission facilities in the region. In general, these models include the 69 kV and higher voltage system.

MP and GRE used the 2004 Series Winter Peak Models to analyze the electric system serving the Project area. Because loading of the existing 46 kV lines is the root cause of the voltage support concerns in the Project area and the area is clearly winter peaking, only winter models were used in the analysis. As mentioned above, the base models include only the 69 kV and higher voltage system, therefore detailed modeling of the MP and GRE 46 kV systems was added to the model. This allowed simulation of the lower voltage electric system that supplies the electric energy to the distribution substations located in the Project area. This was necessary because the inadequacy being addressed with the Project is low voltage on the existing 46 kV loop that supply the distribution substations serving the project area's electric loads.

In the base model, the Project area loads were modeled based on historic data from the MP EMS system and GRE metered delivery point data. The process determined the ten days where the coincident load served by the 46 kV loop peaked. The days and associated loads were derived from MP EMS data from January, 2001 through May, 2005. These peak loads were then averaged and the flows for the historic hour that most closely matched the average were used in the base model, which represented existing system winter 2005 Peak Load conditions. These loads were then scaled by the growth rates supplied by the load forecast to determine the critical year, ability of the system to meet present demand and to determine the increase in capacity of the Project and its alternatives.

6.4.3 Criteria

As noted above, MISO member transmission owners continue to have planning responsibilities for meeting their respective transmission needs in collaboration with MISO. As explained above, MISO is not required to approve the transmission additions proposed in the Project. However, MP and GRE have submitted the Project for MISO for review and inclusion in the MISO Regional Expansion Plan. In addition, the Project

[4] Formation of the Midwest Reliability Organization (MRO) was approved by the MAPP Executive Committee in November 2002 and it became operational in 2005. The MRO took over many functions formally performed by the MAPP Regional Reliability Council including model building.

has been a topic of discussion at the Northern MAPP Sub-Regional Planning Group meetings.

MP's and GRE's internal analysis of the existing system serving the Project area and alternatives to eliminate the expected inadequacy was conducted using the Power Technology Inc. PSS/E (Rev. 29) load flow program, applying the standards of NERC and if more restrictive than NERC, the MP and GRE criteria. The main issues identified were near term low voltage and longer term line overloads concerns. The deficiencies identified, and when they would occur, are based on simulations with modeled load increased at forecast levels of growth. Alternative transmission and generation remedies were identified and their electric performance evaluated. Further review including integrating MP's and GRE system needs, cost, reliability, environmental and other issues, resulted in MP and GRE's conclusion that the 115 kV line is the best alternative to ensure continued reliable electric service to the Project area and at the same time provide transmission infrastructure that can be used to address expected future inadequacies in the nearby adjacent area served by the GRE Shannon-Virginia 69 kV loop.

The MP and GRE Transmission Planning Criteria used for the study of this area apply sound engineering judgment ensuring that reliable electric service will continue to be provided to the area in the future. The criteria, as shown below in Tables 6-1 to 6-3, include acceptable thermal loadings and voltage limits. These planning criteria are consistent with NERC, MISO and MAPP and are approved by MAPP.

Table 6-1 Steady-State Loadings for Maximum Thermal Loading

Facility	< 100 kV	> 100 kV	
		System Intact	Single Contingency
Transmission Line	100%	100%	100% GRE 110% MP
Transformer	100%	100%[5]	125%[6]

[5] MP will load transformers based on IEEE C57 standard with thermal loading not to exceed 110 degrees Centigrade where appropriate.
[6] MP will load transformers based on IEEE C57 standard allowing post contingency thermal loading up to 135 degrees Centigrade.

Table 6-2 Steady-State Load Serving Substation Voltage Limits

Criteria	Allowable Voltage Tolerance (% of nominal)	
	System Intact	Single Contingency
Maximum Voltage	105%	105%
Minimum Voltage	95%	92% GRE, 90% MP

Table 6-3 Maximum Voltage Change for Switched Capacitor Banks

Allowable Voltage Change for Switched Shunts (%)[7]	
System Intact	Single Contingency
3%	5%

6.5 Ability of Present Systems to Meet Demand

The electric system serving the 46 kV loop between Virginia-Ely and Babbitt is supplied by 115 kV connections to the regional transmission system at Virginia and Babbitt. In addition, there are two - 2 MW hydrogeneration units at Winton that also supply electric energy to the area. Due to water levels during the winter months and summer months, typically only one generator (2 MW) is on-line and supplying electric energy to the areas loads.

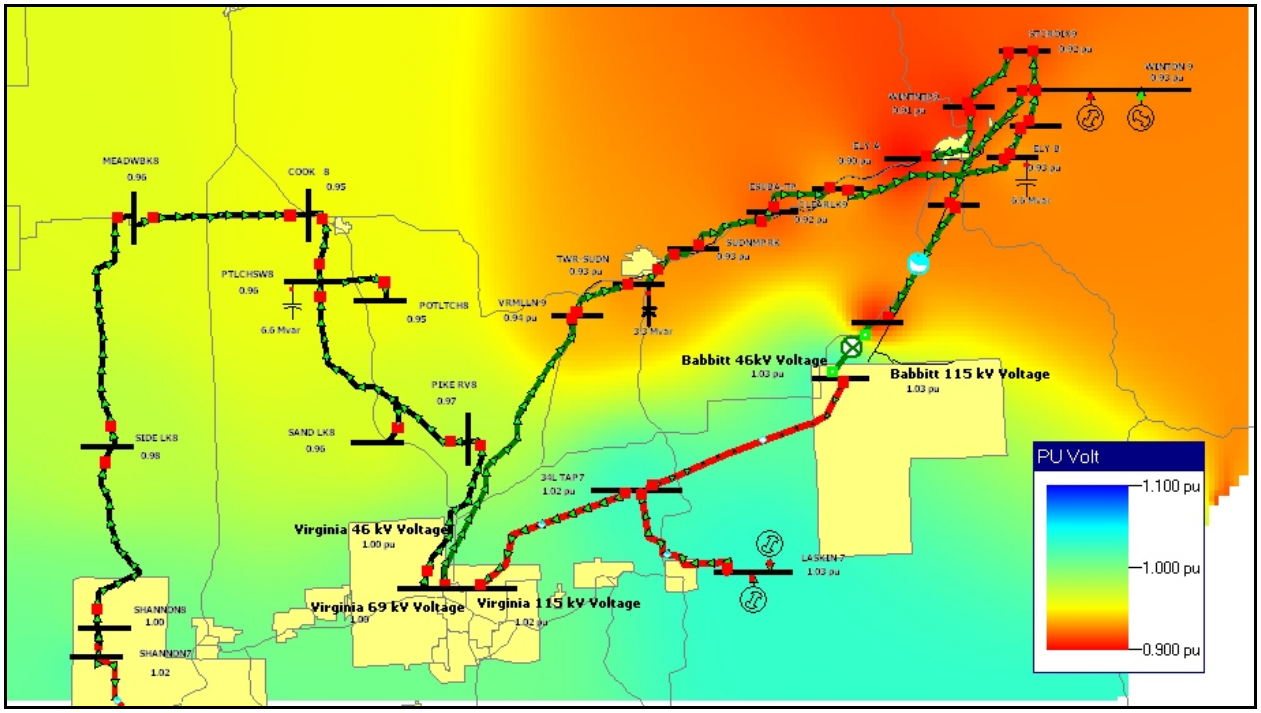
MP has plans to add a 3.8 to 4.2 MVAR capacitor bank to the existing Tower 46 kV Substation in early 2006. MP will also be adding additional transformer capacity at the existing Babbitt 115/46 kV Substation in 2006. These projects will provide additional voltage support and increase the nameplate transformation at Babbitt to 30 MVA.

Once these projects are complete, load flow analysis indicates that the critical contingency is loss of the 115 kV Babbitt source to the area. If this contingency were to occur, the area loads must be supplied by the Winton Generation and the Virginia 115 kV source. The results of the load flow analysis indicate that with loss of the Babbitt source and one Winton unit on-line, the existing system can support approximately 28 MW of load before voltage drops to unacceptable levels as shown in Figure 6-1, a

[7] MP will allow higher voltage change than shown in chart based on flicker charts if determined to be appropriate.

PowerWorld voltage profile of the Project Area with Babbitt 115 kV source out of service and area load at 28 MW.

Figure 6-1 Post Contingency Tower Area Voltage with Tower Area Load at Critical Load of 28 MW



With load at 28 MW, the 115/46 kV transformer at Virginia would also exceed its nameplate rating if the Babbitt source is lost, however, this overload is not a critical limiter at this time since it can be managed by either shifting load served by the 46 kV Line #30 (which runs between Virginia and Laskin) to Laskin or by loading the transformer based on thermal limitations[8] rather than nameplate rating.

Historic MP EMS load data indicates that the Virginia-Ely-Babbitt 46 kV loop load exceeded 28 MW at least once last winter (based on top of the hour readings). This is above the level that can be supported by the existing system. At this time, this deficiency could be managed by placing the second unit at Winton on-line for a short time period. However, this is not a long term solution because water restrictions prevent the running of two units at Winton on a continuous basis. In addition, load growth is expected to result in a significant increase in the number of hours the load in the area would exceed the critical level of 28 MW.

[8] Loading above nameplate based on the ANSI/IEEE C57 guideline for loading of mineral oil immersed power transformers.

6.6 Relationship Between the Project and Overall State Energy Needs

The need for this Project was discussed in the 2003, 2004 and 2005 Northeast Zone State Transmission Planning Public Meetings and was included in the *2003 Biennial Report.* In addition, the applicants held voluntary public meetings in the Project area and met with local officials to discuss the need for the project, proposed plans and alternatives solutions in 2005. The public and agency meetings provided an opportunity for the public, local governments and state agencies to become involved in the transmission planning process consistent with the Minnesota Energy Security and Reliability Act.

The Project is a local load serving project that will insure secure and reliable electric energy can continue to be supplied to electric consumers in and adjacent to the Project area. This is consistent with the goals of the Minnesota Energy Security and Reliability Act, which addressed a wide range of energy issues, including building the infrastructure necessary to deliver electric energy in a timely, efficient, secure, and reliable manner while at the same time minimizing cost and impact on the environment.

If the Project or one of its alternatives is not constructed, studies indicate that as load continues to grow, the Project area's electric security will decrease, which will lead to reduced reliability throughout the Project area. An insecure, unreliable electric supply is not in the best interest of the area's or the State's residents; doing nothing would not be consistent with the energy policies of the State.

In addition, coordinated planning between MP and GRE has resulted in a Project that is capable of addressing both utilities' current and anticipated future needs in the area. This coordination will eliminate construction of duplicate facilities, which is in the best interest of the local areas customers and all residents of the state of Minnesota.

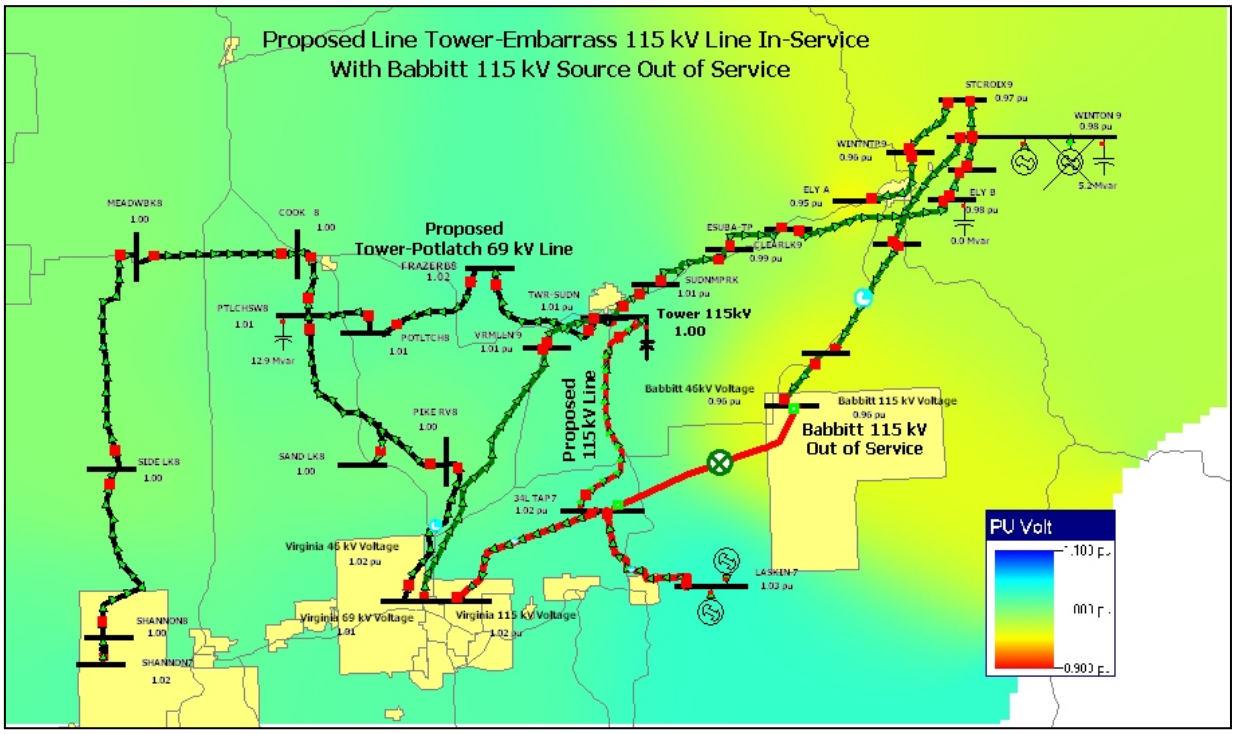
6.7 System Capacity with the 115 kV Transmission Project

The Project would add a third 115 kV source into the 46 kV loop serving the Project area. This represents at minimum a doubling the existing firm transmission capacity (firm transmission capacity is the capacity with one transmission element out of service) and would improve both the reliability and security of the power system that supplies the electric energy to the Project area. This additional source would reduce dependence on the two existing 115 kV sources serving the area eliminating the possibility that a single contingency could result in area low voltage that may require load shedding to prevent operating conditions that could lead to complete local area voltage collapse. The project would also eliminate single contingency overloading of the existing 46 kV lines and substations.

As discussed previously, the peak load served by the 46 kV loop has exceeded levels that can be supported during certain single contingencies for at least one hour during the 2004-2005 winter. As load continues to grow, the number of hours the existing

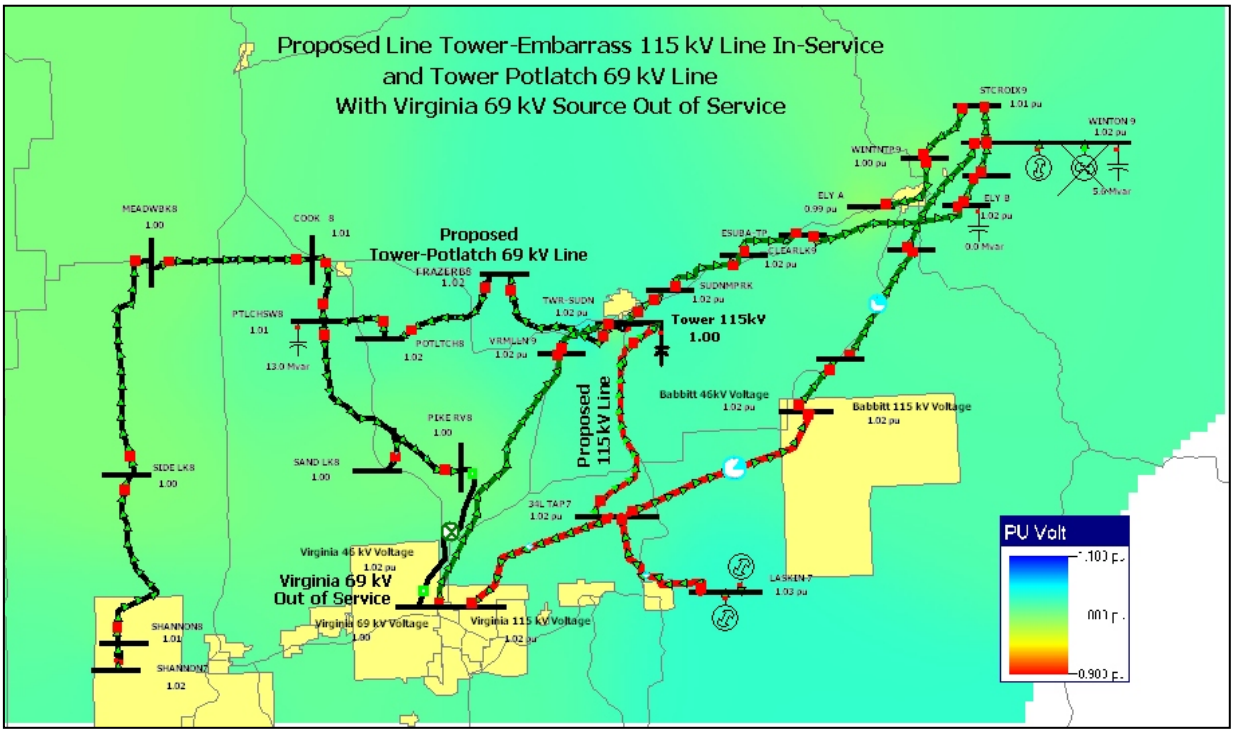
facilities will be inadequate to support all area load during a single contingency will increase. Figure 6-2 shows a PowerWorld simulation of the expected voltage profile of the Project area with Babbitt 115 kV source out of service and the proposed 115 kV line in service. As can be seen, voltages are no longer at or below adequate levels for what was the critical contingency for the existing system (see section 6.5 for discussion of the existing system critical issues). In addition, the transformers at Babbitt and Virginia are no longer loaded above nameplate rating and no operating procedures will be required to insure they do not exceed their thermal capability.

Figure 6-2 PowerWorld Simulation of Post Contingency Tower Area Voltage



In addition to providing a solution to inadequacies on the Virginia-Ely-Babbitt 46 kV loop, the Project could be used to eliminate inadequacies on the nearby GRE 69 kV Virginia-Shannon loop. Provided the Project is approved, GRE plans to add 115/69 kV transformation at the proposed Tower 115/46 kV Substation and construct a 69 kV line from Tower to the existing 69 kV GRE Potlatch Substation located near Cook MN. In addition, due to load growth along Lake Vermilion, Lake Country Power has plans to add a distribution substation near Frazer Bay. This new 69 kV line would also supply this new substation. As shown in Figure 6-3, the proposed 115 kV line combined with the planned GRE 69 kV line, would eliminate the low voltage issues on the GRE 69 kV Virginia-Shannon loop.

Figure 6-3 PowerWorld Simulation of Post Contingency Shannon-Virginia Area Voltage



Load flow analysis was used to estimate the length of time the Project will provide adequate support to the Project area. Loads in the Project were scaled to represent winter peak conditions in the year 2025 and all critical contingencies were simulated. Results indicate that with loads as modeled, the Project will be capable of meeting the Project areas needs through 2025, provided an existing capacitor bank is moved to another substation, the Virginia 115/46 kV transformer capacity is increased and a 69 kV CT limit is removed at the Virginia substation. Based on this analysis, the Project combined with the above future terminal upgrades, all transmission facilities serving the area will be loaded below their thermal rating and voltages will be at or above the minimum acceptable level of 0.92% post contingency through at least 2025, the last year simulated (based upon forecasted load growth rate).

In addition to providing solutions to local load serving issues in the project area, the Project would also increase reliability of the regional transmission system. As discussed previously, the proposed 115 kV Embarrass switching station would split MP Line # 34 into three separate lines. This would reduce exposure of these lines and improve their reliability, which would have a direct impact on the security of area generator outlets and the north shore power delivery loop (see Section 4.5 for additional details).

PUBLIC DOCUMENT - TRADE SECRET DATA HAVE BEEN EXCISED

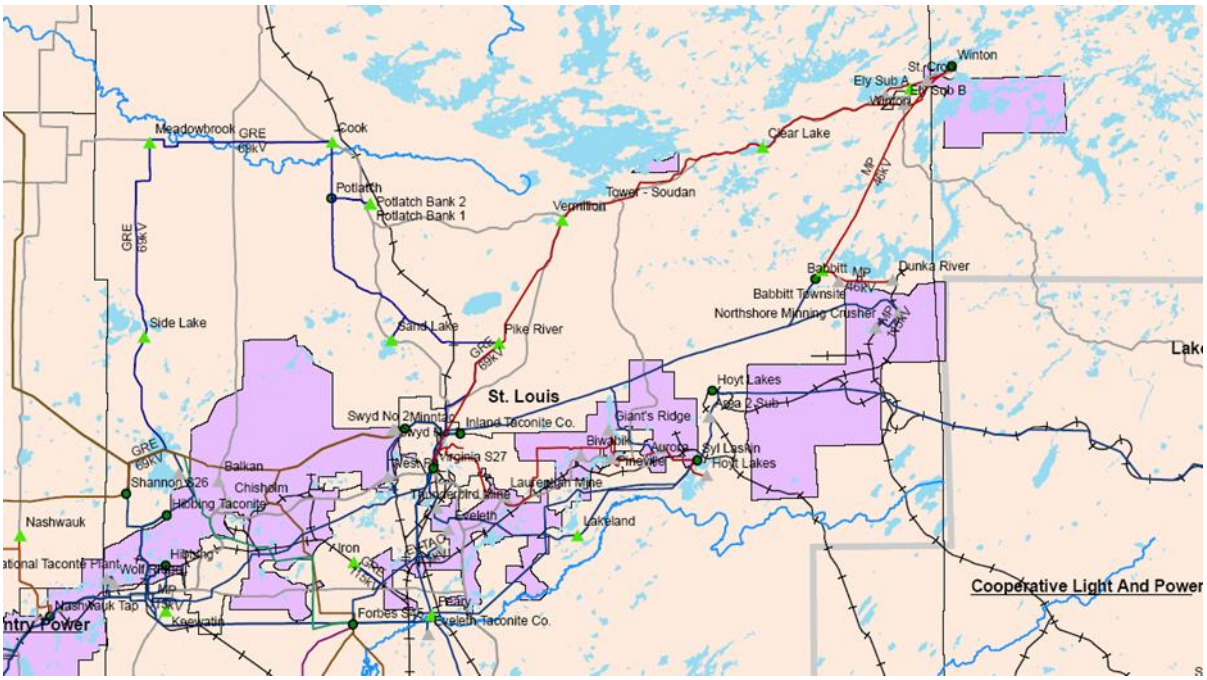
7.0 PEAK DEMAND/ANNUAL ENERGY CONSUMPTION FORECASTS

The load forecast for this joint filing is unique in that it requires a forecast for both GRE and MP service territories. Load growth within each of these two areas is driving the need for the Project, and the Applicants were faced with the question as to how to create a defendable area load forecast. GRE and MP discussed various approaches to create the load forecasts, and decided that each should create its own area load forecast.

There are unique factors driving load growth, and these are discussed in each load forecast. Coincident seasonal historic loads at each substation were used to develop the existing system model. Growth rates from the GRE and MP area forecasts were used to project the future loading at the substation level with consideration on higher growth substations within each area forecast.

Substations in the Lake Country Power and MP service territories comprise the load in the Project area. The GRE and MP loads in the Tower area are shown in Figure 7-1. The lavender regions are served by MP, and the other areas are served by Lake Country Power.

Figure 7-1 Tower Area Loads



7.1 Minnesota Power

7.1.1 Introduction

Load forecasting is a key factor in electric utility planning. Commitments to capacity and fuel resources are based on forecasts of customer counts, energy sales, and seasonal peak loads. Cost and revenue projections as well as forward looking plans and budgets also depend on load forecasts. Reliable forecasting and planning requires suitable models and persons knowledgeable in their use. MP has a history of accurate load forecasting, despite dealing with a primarily industrial sales market containing a high degree of future uncertainty and ongoing change volatility. This forecast accuracy stems from MP's detailed knowledge of its customers and their industries and the constant monitoring of the latest forecasting methods, data, and technique developments.

7.1.2 Forecast Methodology

MP's Tower area basic load forecast methodology uses an econometric forecast modeling approach by customer class. This method begins with forecasts of customer count numbers by eleven major customer classes (residential, residential space heating, residential dual fuel, small commercial, large commercial, commercial and industrial dual fuel, industrial, street lighting, other public authorities, sales for resale, and Company use) and energy sales by the same eleven customer classes.

Historical economic and demographic data includes the incorporation of detailed NAICS (North American Industry Classification System) data from the Minnesota Department of Employment and Economic Development (DEED), the U.S. Department of Labor Bureau of Labor Statistics (BLS), National Planning Associates (NPA), Regional Economic Models, Inc. (REMI), and the IMPLAN Group (IMPLAN). NAICS employment data from Implan, REMI, and DEED were incorporated in the recent history and early forecast periods. MP continues to use the Large Power and other customer class knowledge internally as key inputs to the econometric forecast process. More accurate historical peak demand data and the exclusion of the DSM/CIP data adjustment of past load forecast versions was eliminated due its contribution to forecast model instability, overstatement of MP growth rates, and heteroskedasticity statistical problems. MP assumes that the impact of conservation and DSM/CIP programs are incorporated into the price and income coefficients of the econometric model specifications more accurately than the previous arithmetic adjustment.

The Tower area, as St. Louis County of Minnesota, is growing slowly and is forecast to continue to grow slightly and at a much slower rate than the overall MP system in the next few years. Tower area economic and demographic growth rates increase somewhat in the further out years of the forecast and become closer to overall MP system growth after 2015. Historically, economic and demographic growth in the Tower area has been very stable and flat. Employment data shown in Table 7-1 and in

Figures 7-2 and 7-3 demonstrate the slow increase and growth over the last three years, after the 2001 recession.

Table 7-1 Employment Data, 2000-2005

MONTH YEAR	EMPLOYMENT LEVEL	JOB INCREASE/DECREASE	PERCENTAGE GROWTH
August 2005	100,804	+89	+0.1
August 2004	100,715	+1,779	+1.8
August 2003	98,936	-1,253	-1.3
August 2002	100,189	+2,149	+2.2
August 2001	98,040	-4,171	-4.1
August 2000	102,211		

Figure 7-2 Tower Area Employment, 1990-2005

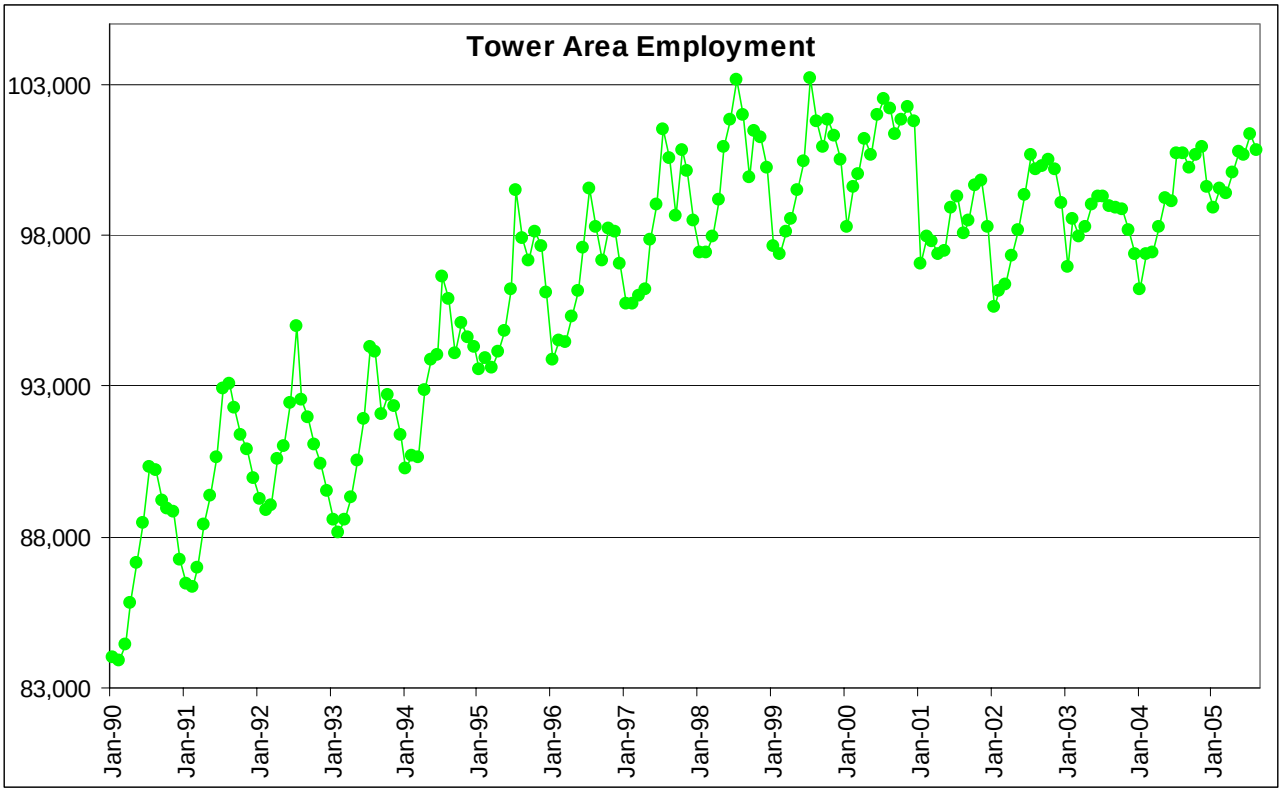
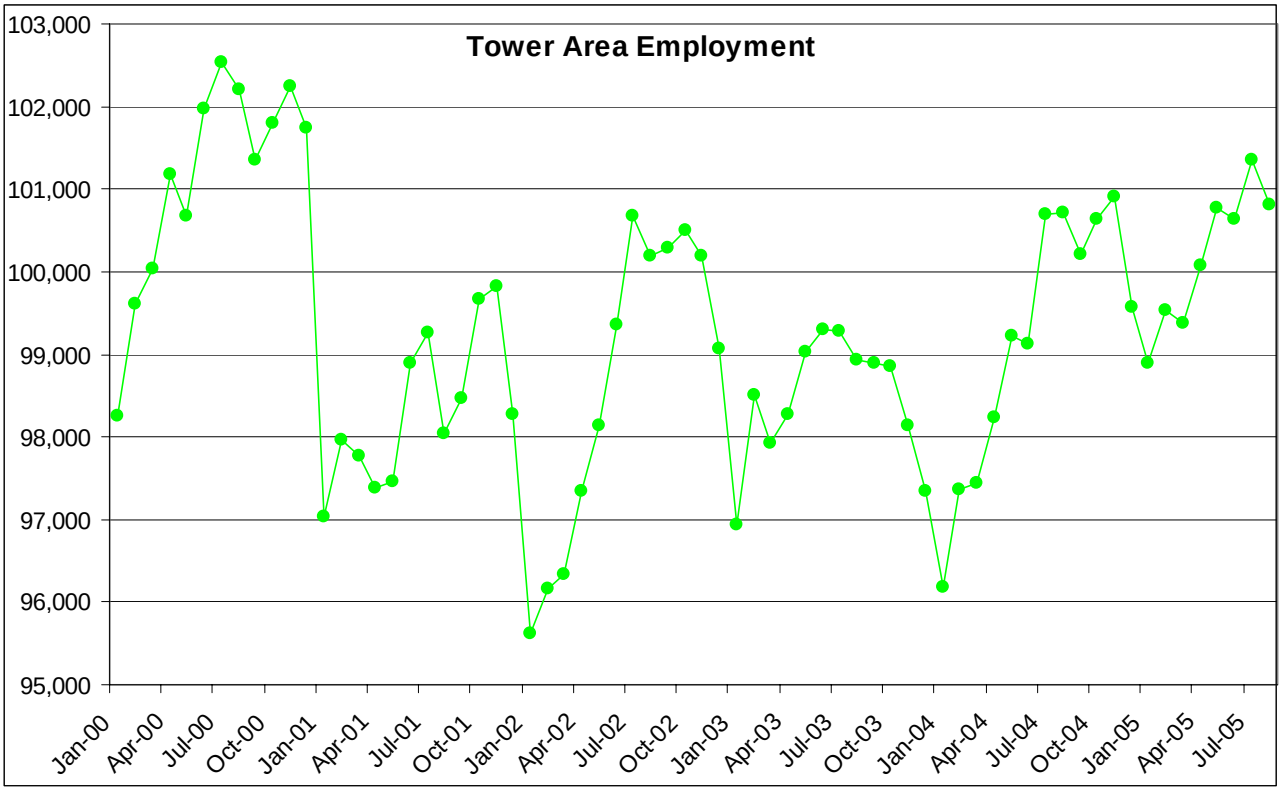


Figure 7-3 Tower Area Employment, 2000-2005



Unemployment appears to be easing from the most recent regional recession in 2003 (Figures 7-4 and Figure 7-5). The declining unemployment appears to be continuing with the January to August 2005 monthly data from MN DEED LAUS (Local Area Unemployment Statistics series).

Figure 7-4 Tower Area Unemployment, 1990-2004

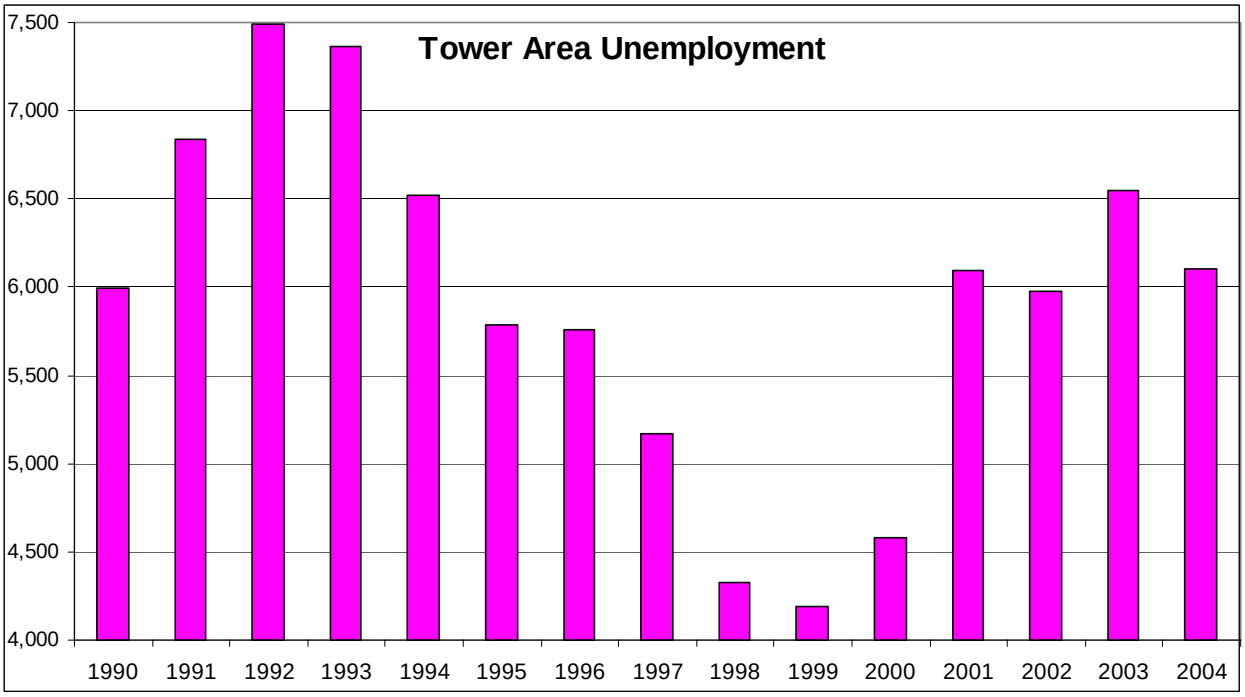
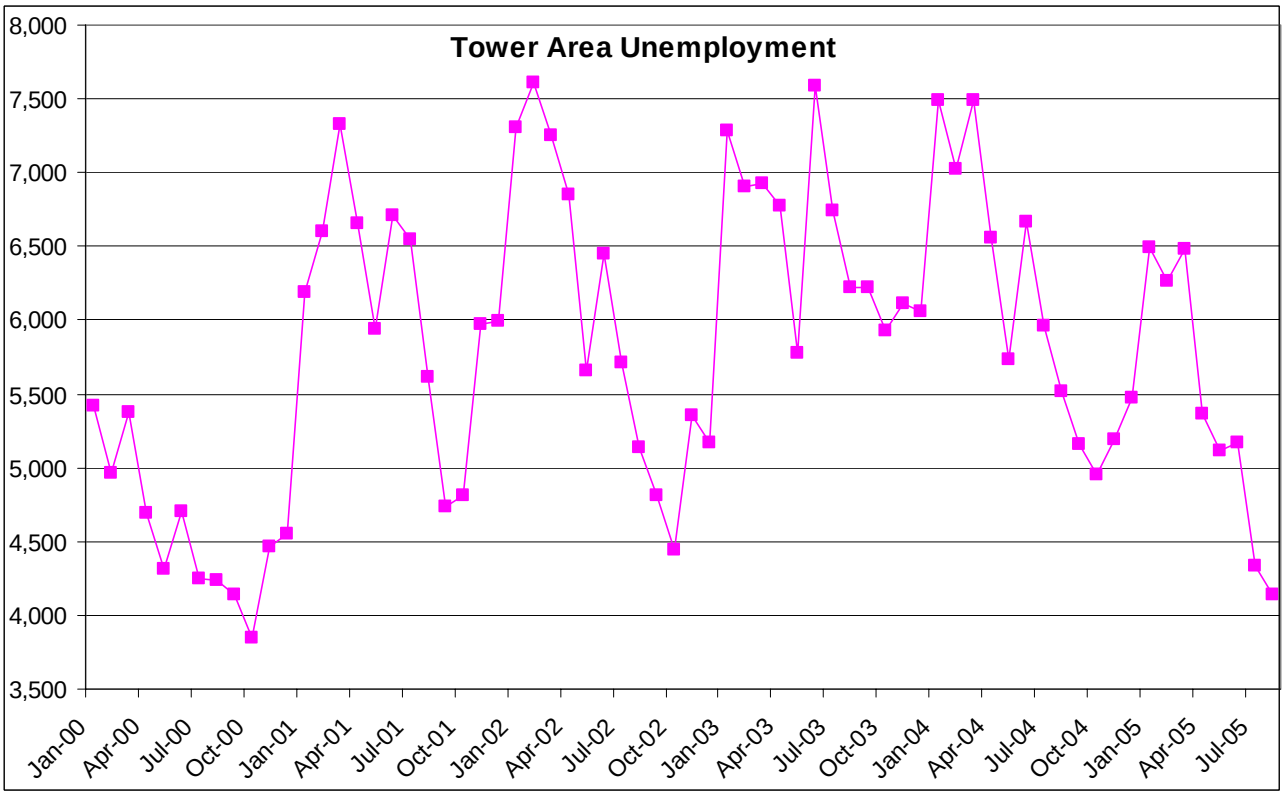


Figure 7-5 Tower Area Unemployment, 2000-2005



The load forecast approach is much stronger on an economic theory basis allowing the inclusion of important independent variables and an improvement of forecast model statistical quality measures. MP's chosen forecasting method is econometric. The MP econometric forecast method uses linear regression with ARMA (auto-regressive moving average) error correction terms. The MP Tower area econometric models with cross-model linkages provide an excellent forecast output performance for the long-term. The number of econometric forecast models estimated is twenty-one models. The database allows customer count model specifications to utilize twelve observations (1994 to 2005) and the energy sales models by class are estimated from 1995 to 2004, or ten observations. The number of independent variables used in the Tower area load forecast development is 169 terms.

In the Tower area load forecast models, there are 65 direct variables and 104 indirect or contributory (calculating) variables in the models providing considerable economic, demographic, price, and weather information detail and forecast model specification alternatives. Economic and demographic forecast drivers were adjusted to reflect the best future estimate at this time. The forward economic and demographic view includes input from the Marketing and other MP groups, as well as external experts such as REMI, Blue Chip Economic Indicators, NPA, IMPLAN, DEED, and BLS. Energy price forecasts are used by class (residential, commercial, and industrial) and total by energy source from the Annual Energy Outlook (AEO) from the U.S. Department of Energy/Energy Information Administration (DOE/EIA) for Minnesota or the West North Central region.

Section 7.1.3 details the development of the customer count and energy sales by class models including which variables were tested and either accepted or rejected. The expected forecast scenario in Section 7.1.8 is the base or most likely forecast future. Low and High forecast scenarios have been developed to indicate a range of reasonable peak demand and energy requirement possibilities in Sections 7.1.9 and 7.1.10.

Tools used in the forecast process (Section 7.1.5 Model Documentation) included re-estimation of the MP area REMI model version 6.0 to account for the most current employment data, recent business slowdowns, anticipated load impact in 2008 of a major industrial customer expansion, overall economic growth, and to adjust employment growth using NPA growth rates in the forecast time period. Statistical econometric forecast models are estimated using the Itron metrixND software platform. Forecasts are inherently based on assumptions and judgments grounded in external sources such as REMI, DOE/EIA, NPA, DEED, IMPLAN, Blue Chip Economic Indicators, large customer input, and the National Oceanic and Atmospheric Administration (NOAA) weather averages or normal.

Key modeling data sources include:

1. The REMI input/output simulation program is exceptionally well suited for identifying the direct, indirect, and induced impacts of recent economic events in

the MP area and incorporating those impacts into the economic outlook for the area economy. REMI is especially adept at measuring the total economic impact of a major expansion project or loss situation.

2. NPA provides county-level economic and demographic history and forecasts for the Tower area.
3. Blue Chip Economic Indicators are input into the REMI model and provide key national economic growth measurements for gross domestic product, inflation, and disposable personal income.
4. DOE/EIA AEO has regional and state level energy prices by class and fuel type for history and forecast periods.
5. NOAA Local Climatological Data (LCD) for Tower, Minnesota (MN) weather data is a key modeling input for seasonal energy sales for residential, residential space heating, residential dual fuel, small commercial, large commercial, sales for resale, and company use.
6. National economic and demographic data is obtained from the U.S. Department of Commerce Bureau of Economic Analysis (BEA), BLS, and Bureau of the Census (Census).
7. Regional economic and demographic data is obtained from DEED, BLS, Census, BEA, MN State Demographer, and IMPLAN.

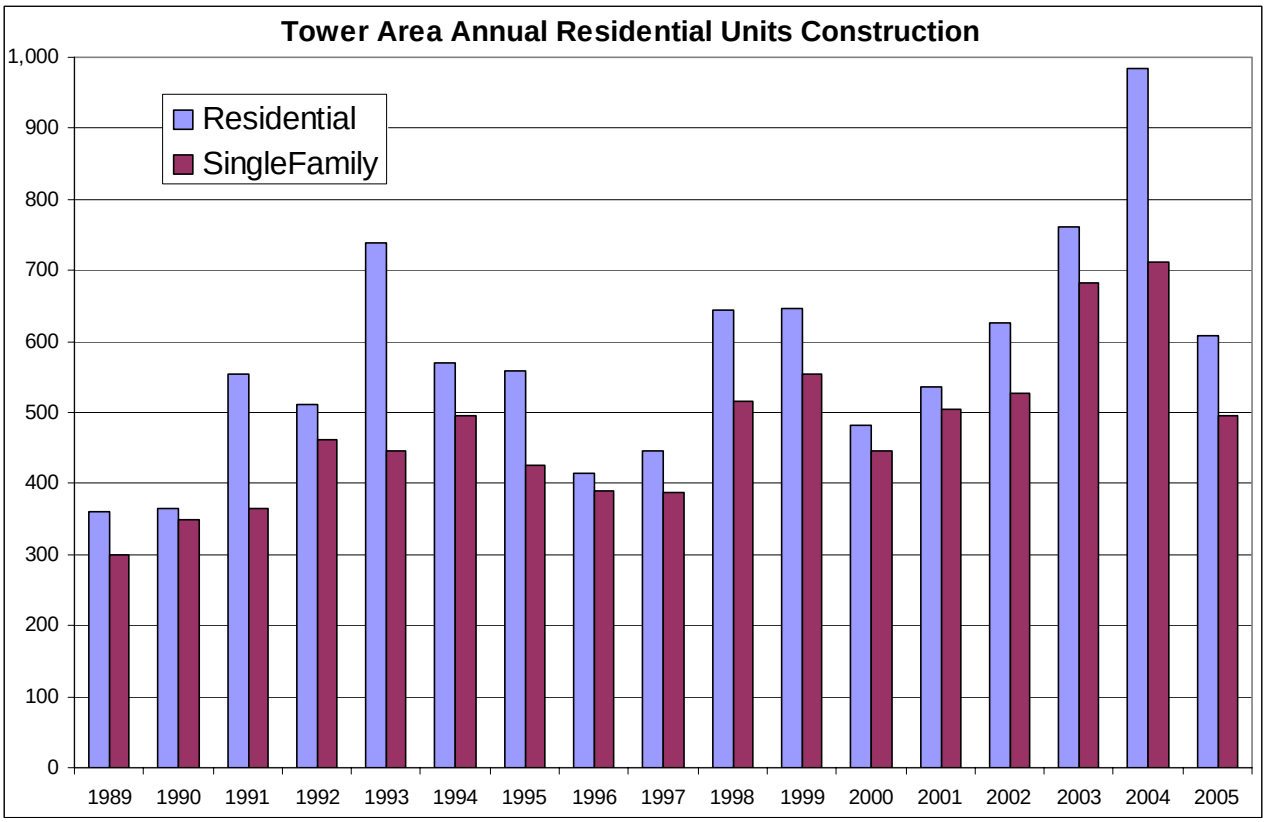
MP works closely with its Large Power customers to understand their plans and to better meet both the short- and long-term needs of those customers. The industrial class of the Tower area includes some large customers who can have a significant impact on MP's demand and energy requirements in this area. And incorporating more of these real-world events by using more data and better quality data in a statistical modeling forecast framework provides a more accurate and reliable forecast product.

The forecast group seeks input from the Strategic Accounts Marketing, Customer Service, and Economic Development areas in developing a tracking list of businesses that have closed or reduced employees or economic output since January 2002 for use in this year's forecast process. Due to the economic influence of large industry leaders in the Tower area, the local area economy exhibits a high degree of volatile business cycle characteristics. This cyclical volatility necessitates closely monitoring Tower area economic conditions.

The Tower area economic view shows a slowing and flattening of the area economy in 2003, with a return of economic growth and recovery beginning in late 2003 and strengthening in the 2004 experience and the first part of the 2005 employment level. McGraw-Hill Dodge Local Construction Bulletins also demonstrate the historical levels and types of growth activity in the Tower area. Dodge construction data is new activity for each year or annually. Adding the new construction to a base housing or business building stock would demonstrate the continuing nature of this area's steady growth. Residential units constructed has increased in recent years and that most of the new residential construction is for single-family housing units. The Tower area averaged an annual addition of 502 residential units from 1989 to 1997. The residential additions

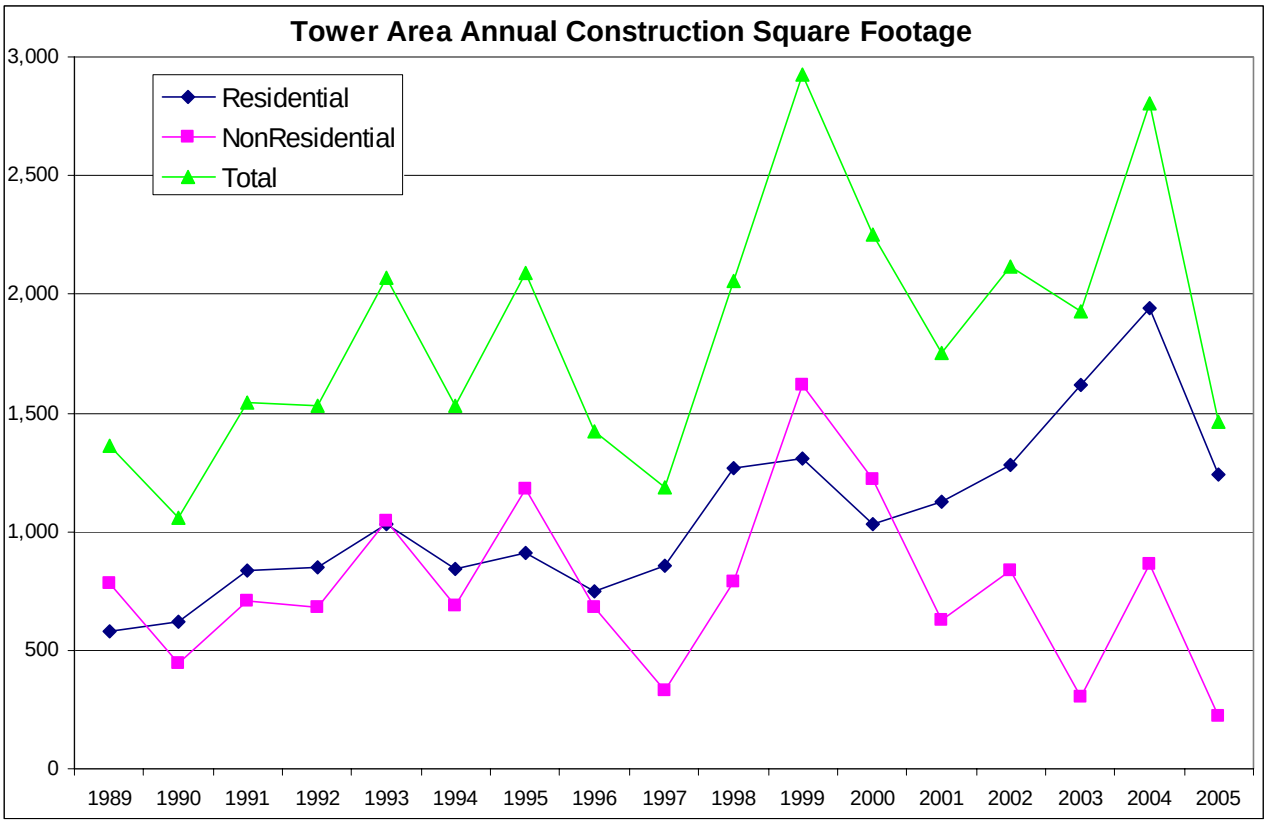
have increased by almost fifty percent to 745 residential units from 2002 to 2005 and 2005 data is only a part year from January to August of 2005, or eight months (Figure 7-6).

Figure 7-6 Tower Area Annual Residential Units Construction



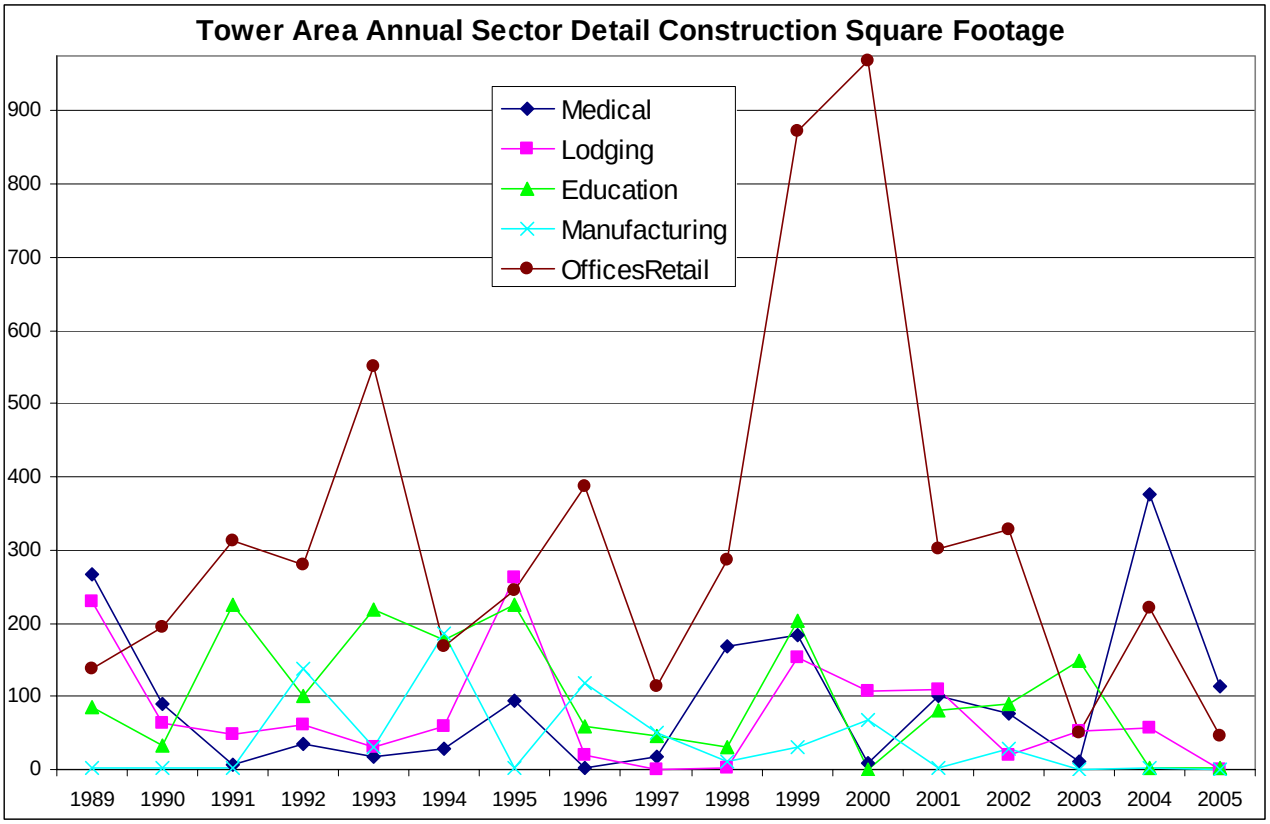
The addition of square footage shows the rapid increase in new construction housing size as the driver of most of the square footage growth since 1989 (Figure 7-7). The non-residential square footage also appears to have decreased significantly from 1999 to 2005 in comparison to 1989 to 1998, but the overall trend is flat and the graph scale is somewhat influenced by the larger residential sector.

Figure 7-7 Tower Area Annual Construction Square Footage



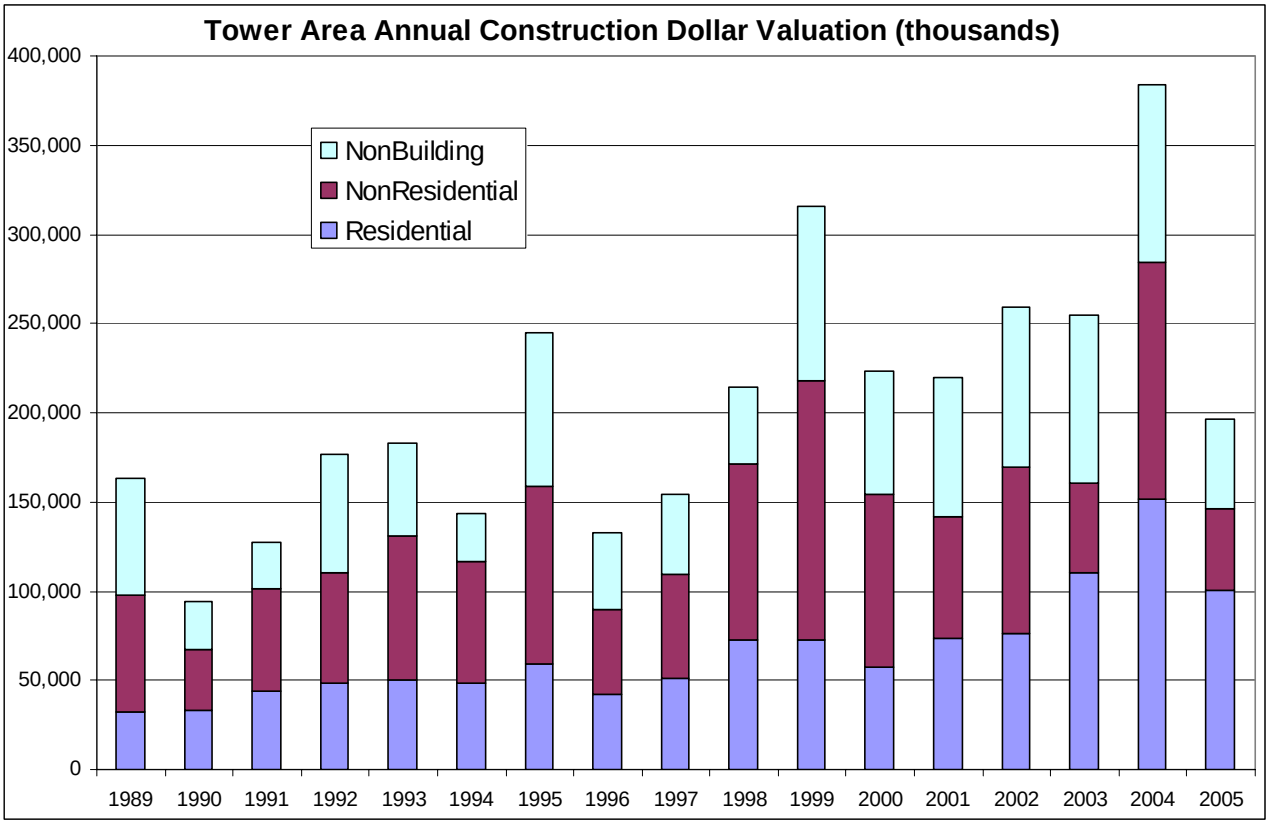
Tower area square footage in thousands by major construction sectors indicates that the growth has been broad based across the area economy. For various years, most of the sectors have seen construction increases in the hundreds of thousands square footage increase. Offices and retail building has been very strong in 1993, 1999, and 2000. Education building was high in 1991, 1993, 1995, and 1999. Medical construction grew rapidly in 1989, 1998, 1999, and 2004 (Figure 7-8).

Figure 7-8 Tower Area Annual Sector Detail Construction Square Footage



The Tower area has changed from a slightly below 150 million dollars valuation construction growth area prior to 1998 to a 225 million dollars valuation from 1999 to 2004 (Figure 7-9).

Figure 7-9 Tower Area Annual Construction Dollar Valuation



7.1.3 Model Development

MetrixND, an advanced statistics program for analysis and forecasting of time series data that is stored in Microsoft Excel or Microsoft Access databases, was used to develop MP's load forecasting models for the Tower area. This software, developed by Itron (formerly Regional Economic Research, Inc. or RER) has estimation algorithms for:

- Exponential smoothing
- Linear regression models
- Artificial neural networks (ANNs)
- ARIMA and seasonal ARIMA models
- Linear regression with ARMA and seasonal ARMA errors
- ANNs with seasonal ARMA errors (ANNARMA)

Key statistical measures examined and used in the determination of the best forecast model design included the theoretical correct sign of the variables, statistical significance of the variable measured by the t statistic, Durbin-Watson test, adjusted R-

squared, MAPE (mean absolute percentage error), residual error plot, independent variable elasticity values, F statistic, and other common statistical measures.

Customer class forecasting models, as summarized below, were developed using linear regression estimation with appropriate ARMA error algorithms.

[TRADE SECRET DATA EXCISED]

Theoretically, the forecast models should be structurally similar to the MP system models, and generally, such was the case here. The forecast models include a price of electricity variable, the ratio of the electric and natural gas price variable by customer class, or the customer class price of electricity and customer class price of natural gas, a demographic variable like area population, households, or aggregate or sector employment, an economic variable such as gross regional product, sector earnings, per capita income, or total economic output as forecast by NPA or REMI. Also, the energy sales forecast models include a weather affected variable of cumulative heating degree days and cumulative cooling degree days for the Tower weather station.

7.1.4 Database Listing

The following variables are included in the load forecast database (mnemonic, descriptor, sources):

- SUMMWPK - Minnesota Power (MP) Summer Peak Demand
- WINMWPK - MP Winter Peak Demand
- RESCUST - Tower Area Residential Customer Count
- RESSHCUS - Tower Area Residential Space Heating Customer Count
- RESDFCUS - Tower Area Residential Dual Fuel Customer Count
- SCOMCUST - Tower Area Small Commercial Customer Count
- LCOMCUST - Tower Area Large Commercial Customer Count
- CIDFCUST - Tower Area Commercial and Industrial Dual Fuel Customer Count
- INDCUST - Tower Area Industrial Customer Count
- SLCUST - Tower Area Street Lighting Customer Count
- PUBLCUST - Tower Area Other Public Authorities Customer Count
- RSALCUST - Tower Area Sales for Resale Customer Count
- COMPCUST - Tower Area Company Use Customer Count
- RESENER - Tower Area Residential Energy Sales
- RESSHEN - Tower Area Residential Space Heating Energy Sales
- RESDFEN - Tower Area Residential Dual Fuel Energy Sales
- SCOMEN - Tower Area Small Commercial Energy Sales
- LCOMEN - Tower Area Large Commercial Energy Sales
- CIDFENER - Tower Area Commercial and Industrial Dual Fuel Energy Sales
- INDENER - Tower Area Industrial Energy Sales

- SLENER - Tower Area Street Lighting Energy Sales
- PUBLENER - Tower Area Other Public Authorities Energy Sales
- RSALENER - Tower Area Sales for Resale Energy Sales
- COMPENER - Tower Area Company Use Energy Sales
- BASESUM - MP Summer Peak Demand Base
- BASEWIN - MP Winter Peak Demand Base
- UNADJSUM - MP Summer Peak Demand Unadjusted for DSM/CIP
- UNADJWIN - MP Winter Peak Demand Unadjusted for DSM/CIP
- GDP - U.S. Gross Domestic Product in Chained 2000 Dollars - Bureau of Economic Analysis (BEA) / Blue Chip Economic Indicators
- GRP - MP Area Gross Regional Product in Chained 1996 Dollars - REMI
- OUTPUT - MP Area Total Industry 1996 Dollars Economic Output - REMI
- TAC - MP Area Taconite Industry 1996 Dollars Economic Output - REMI
- PAPERWOOD - MP Area Paper and Wood Industry 1996 Dollars Economic Output - REMI
- CONSTR - MP Area Construction Industry 1996 Dollars Economic Output - REMI
- TWIU - MP Area Transportation, Warehousing, Communication, Information, and Utilities Industries 1996 Dollars Economic Output - REMI
- TRADW - MP Area Wholesale Trade Industry 1996 Dollars Economic Output – REMI
- TRADR - MP Area Retail Trade Industry 1996 Dollars Economic Output - REMI
- FIRE - MP Area Finance, Insurance, and Real Estate Industries 1996 Dollars Economic Output - REMI
- SERV - MP Area Services Industry 1996 Dollars Economic Output - REMI
- OTHMFG - MP Area Other Manufacturing Industries 1996 Dollars Economic Output - REMI
- RDI - U.S. Disposable Personal Income in Chained 2000 Dollars - BEA / Blue Chip Economic Indicators
- DSM - Demand Side Management Coincident to MP Peak Demand Date and Time
- DSMRES - MP Residential Sector Demand Side Management
- DSMCOM - MP Commercial Sector Demand Side Management
- DSMIND - MP Industrial Sector Demand Side Management
- ACSAT - MP Area Air Conditioning Saturation Level - Bureau of Census (BC) / surveys / model
- EHSAT - MP Area Electric Heating Saturation Level - BC / surveys / model
- SDDI - Summer Peak Degree Day Index (Duluth) - National Oceanic and Atmospheric Administration (NOAA) / average normal
- WDDI - Winter Peak Degree Day Index (Duluth) - NOAA / average normal
- SPD - Summer Peak Degree Day Term (Duluth) - NOAA / average normal
- SDDepart - Summer Peak Degree Day Index Departure (Duluth) from NOAA normal
- WPD - Winter Peak Degree Day Term (Duluth) - NOAA / average normal

- HDD - Heating Degree Days Index (Tower) - NOAA / average normal
- CDD - Cooling Degree Days Index (Tower) - NOAA / average normal
- HH - Tower Area Households - National Planning Associates (NPA)
- POP - Tower Area Population - NPA
- EMPL - Tower Area Total Employment - NPA
- FARMEM - Tower Area Farm Sector Employment - NPA
- PNFEM - Tower Area Nonfarm Private Employment - NPA
- MINEM - Tower Area Mining Sector Employment - NPA
- CONEM - Tower Area Construction Sector Employment - NPA
- MFGEM - Tower Area Manufacturing Sector Employment - NPA
- TWIUEM - Tower Area Transportation, Warehousing, Communication, Information, and Utilities Sector Employment - NPA
- TRADWEM - Tower Area Wholesale Trade Sector Employment - NPA
- TRADREM - Tower Area Retail Trade Sector Employment - NPA
- FIREEM - Tower Area Finance, Insurance, and Real Estate Sector Employment - NPA
- SERVEM - Tower Area Services Sector Employment - NPA
- GOVEM - Tower Area Government Sector Employment - NPA
- WSINC - Tower Area Wage and Salary 2000 Dollars Income - NPA
- FARMINC - Tower Area Farm Sector 2000 Dollars Income and Earnings - NPA
- PRVNFERNG - Tower Area Private Nonfarm Sector 2000 Dollars Earnings - NPA
- MNGERNG - Tower Area Mining Sector 2000 Dollars Earnings - NPA
- CONERNG - Tower Area Construction Sector 2000 Dollars Earnings - NPA
- MFGERNG - Tower Area Manufacturing Sector 2000 Dollars Earnings - NPA
- TIUERNG - Tower Area Transportation, Warehousing, Communication, Information, and Utilities Sectors 2000 Dollars Earnings - NPA
- WTRDERNG - Tower Area Wholesale Trade Sector 2000 Dollars Earnings - NPA
- RTRDERNG - Tower Area Retail Trade Sector 2000 Dollars Earnings - NPA
- FIREERNG - Tower Area Finance, Insurance, and Real Estate Sectors 2000 Dollars Earnings - NPA
- SRVERNG - Tower Area Services Sector 2000 Dollars Earnings - NPA
- GOVTERNG - Tower Area Government Sector 2000 Dollars Earnings - NPA
- TPINC - Tower Area 2000 Dollars Total Personal Income - NPA
- RPGAS - Average Price per million Btu of Natural Gas in Chained 2000 Dollars - Department of Energy (DOE)
- RPOIL - Average Price per million Btu of Distillate Oil #2 in Chained 2000 Dollars - DOE
- RPELEC - Tower Area Average Price per KWh of Electricity in Chained 2000 Dollars - DOE
- RRESPGAS - Residential Sector Average Price per million Btu of Natural Gas in Chained 2000 Dollars - DOE

- RCOMPGAS - Commercial Sector Average Price per million Btu of Natural Gas in Chained 2000 Dollars - DOE
- RINDPGAS - Industrial Sector Average Price per million Btu of Natural Gas in Chained 2000 Dollars - DOE
- RRESPOIL - Residential Sector Average Price per million Btu of Distillate Oil #2 in Chained 2000 Dollars - DOE
- RCOMPOIL - Commercial Sector Average Price per million Btu of Distillate Oil #2 in Chained 2000 Dollars - DOE
- RINDPOIL - Industrial Sector Average Price per million Btu of Distillate Oil #2 in Chained 2000 Dollars - DOE
- RRESPELEC - Tower Area Residential Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RRESSHPEL - Tower Area Residential Space Heating Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RRESDFPEL - Tower Area Residential Dual Fuel Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RSMCOMPEL - Tower Area Small Commercial Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RLGCOMPEL - Tower Area Large Commercial Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RCIDFPELEL - Tower Area Commercial and Industrial Dual Fuel Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RINDPELEC - Tower Area Industrial Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RSLPELEC - Tower Area Street Lighting Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RPAPELEC - Tower Area Other Public Authorities Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RMUNPELEC - Tower Area Sales for Resale Sector Average Price per kWh of Electricity in Chained 2000 Dollars - DOE
- RESPRRATIO - RRESPELEC / RRESPGAS
- RESSHPRRATIO - RRESSHPEL / RRESPGAS
- RESDFPRRATIO - RRESDFPEL / RRESPGAS
- COMEMPL - TRADWEM + TRADREM + FIREEM + SERVEM
- COMOUT - TRADW + TRADR + FIRE + SERV
- SMCOMPRRATIO - RSMCOMPEL / RCOMPGAS
- LGCOMPRRATIO - RLGCOMPEL / RCOMPGAS
- CIDFPRRATIO - RCIDFPELEL / RCOMPGAS
- INDEMPL - MINEM + MFGEM
- INDOUT - TAC + OTHMFG + PAPERWOOD
- INDPRRATIO - RINDPELEC / RINDPGAS
- ADD - CDD + HDD
- PAUEM - TWIUEM + GOVEM

- PAUPRRATIO - RPAPELEC / RCOMPGAS
- RSALPRRATIO - RMUNPELEC / RPGAS
- DEMPRATIO - RPELEC / RPGAS
- TLCUST - RESCUST+COMCUST+INDCUST+SLCUST+PUBLCUST+RSALCUST
- PCI - TPINC / POP

7.1.5 Model Documentation

Data was collected from a wide variety of sources in different delivery formats. The load forecast databases aggregate this data into an informational framework that is suitable for the development of an econometric forecast and analysis models for planning use within MP for the Tower area.

Weather data for Tower, MN was updated and collected for earlier historical periods from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC). The historical average (1965-2005) is assumed as the weather normal for the forecast period within the modeling process. Energy models by class incorporate cooling and heating degree days on a 65 degree base difference for mean daily temperature aggregated for each month and utilized when statistically acceptable.

National, Minnesota, and county-level area economic and demographic data was downloaded from the internet from the Department of Commerce Bureau of Economic Analysis (BEA), Bureau of the Census, Minnesota Department of Employment and Economic Development (DEED), and Department of Labor Bureau of Labor Statistics (BLS). National Planning Associates (NPA) provide a disk with history and forecast data series at the county level for employment and earnings by sector, population by age cohorts, households, and detailed components of personal income. IMPLAN Group supplied estimates of employment for NAICS level detail for 2001, 2002, and 2003. The Tower area is defined as one county in Minnesota (St. Louis). NPA's forecasts are econometrically derived and consistent with national growth levels disaggregated to the regional, state, MSA, and county level. NPA's sector employment and sector earnings growth rates are used for the forecast of the specific economic sectors. Blue Chip Economic Indicators issues a long-term national economic forecast twice per year. MP uses the March 10th issue (long-term) for the forecasts of inflation (Gross Domestic Product (GDP) chain type price deflator index in 2000 dollars), economic growth (real GDP), and real disposable personal income. Blue Chip Economic Indicators also provide sensitivity high and low cases represented by the top 10 and the bottom 10 survey respondents which are used as primary sensitivity scenario drivers.

Tower area towns, cities, and villages and their zip codes are as follows: Tower 55790, Ely 55731, Babbitt 55706, Soudan 55782, Winton 55796, Embarrass 55732, Cook 55723, Biwabik 55708, Virginia 55792/55777, Britt 55710, Angora 55703, Gilbert(McKinley) 55741, Hoyt Lakes 55750, Aurora 55705, and Orr 55771.

Energy prices, history and forecast, are from the Department of Energy (DOE) and Energy Information Agency (EIA). The four main fuel types are electricity, natural gas, oil, and propane. End-use class energy price data is categorized by DOE/EIA into residential, commercial, and industrial. DOE's Annual Energy Outlook (AEO) is used for the forecast period. DOE provides historical energy price data for Minnesota, forecast energy price data for the West North Central (WNC) region, and the national total. The Tower area historical average electric price data is from the Company's CIS information and FERC Form 1, and represents annual class revenue divided by annual class energy. Tower area classes available as reported are residential, residential space heating, residential dual fuel, small commercial, large commercial, commercial and industrial dual fuel, industrial, street lighting, other public authorities, sales for resale, and Company use. All energy prices are deflated by the 2000 base GDP implicit price deflator (IPD).

The REMI model is particularly well-suited for modeling the economic impact of these type of regional occurrences. The MP area has been severely impacted by the recent national economic recession and slowdown of overall economic growth. This year and last year, there was considerably more positive economic growth news for the next few years. There is evidence of an economic growth turnaround or expansion for the MP area in recent months. And the level of growth in the MP area appears consistent with long-run historical growth levels. The REMI model, as an input-output regional economic forecast model, works especially well in capturing the indirect economic positive and negative effects from expansions, layoffs, and closures. Flexibility of use allowed the forecast staff to test alternative modeling approaches within REMI. REMI model history and forecast results are used for employment by sector, demographics, economic output by sector, and gross regional product. Adjustments to REMI were accomplished through the Employment Update feature and the Firm Sales Policy Update feature. Simulation scenarios were also examined within REMI. Post-2013 employment growth rates within some manufacturing sectors were adjusted to better reflect consistency with historical and early forecast MP area experience within REMI. Demographic forecasts were consistent with the employment outlook. The REMI economic and demographic forecast variables reflected the time-delay from the initial shock event to the measurable action of economic growth, migration, and economic response.

MP load research analysis data was used in this forecast. Load research statistical samples collect hourly profile data for general residential by geographic areas, residential space heating, residential farm, commercial and industrial non-demand, and commercial and industrial demand categories.

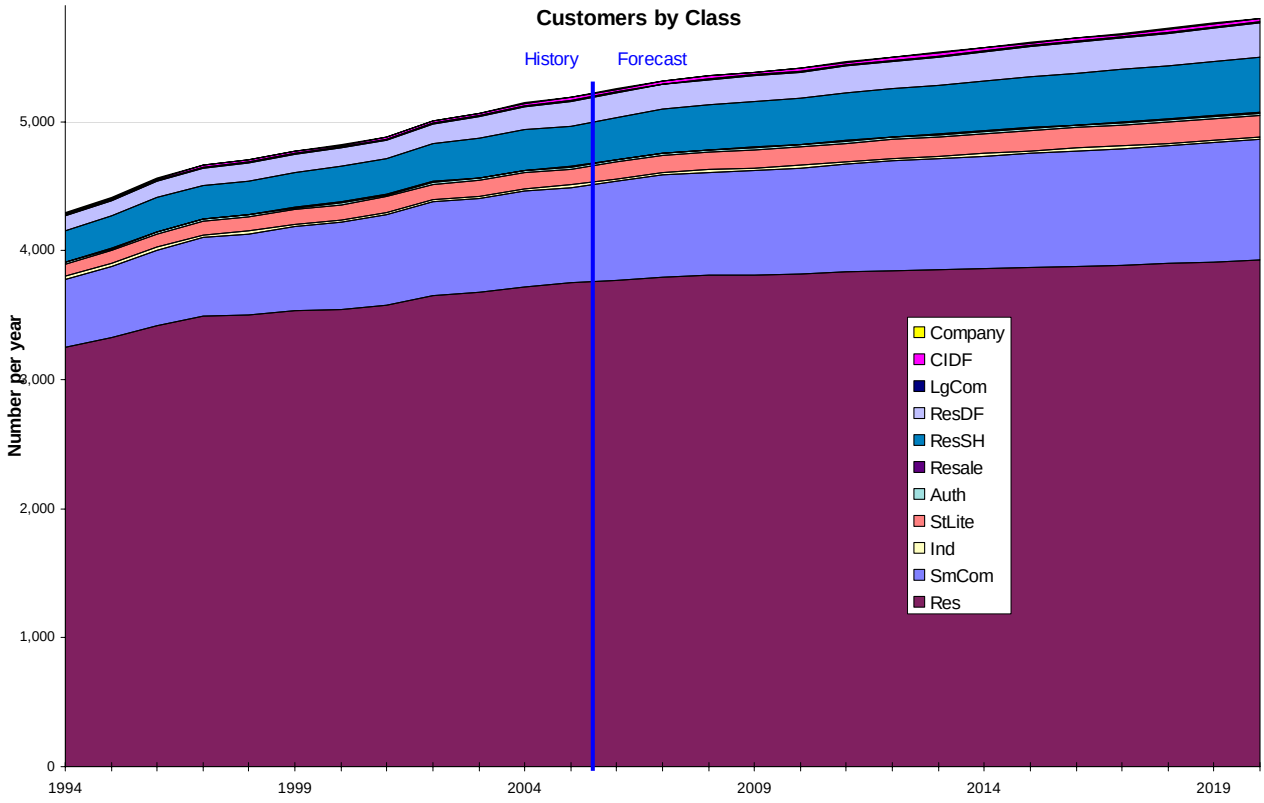
Economic growth and recovery begins by late 2003, 2004, and early 2005. Area economic growth is expected to follow long-run historical rates for many years into the future. In the later forecast years, economic growth accelerates to rates at the high end of historical experience reflecting large gains in labor and capital productivity and benefits of technology penetration. With the shift of the Baby Boom demographic into

retirement and a decline in the average workforce age, productivity change is the most likely medium for preserving and growing the economic quality of life.

The following model summary and graphs (Figures 7-10 to 7-37) are an overview of the Tower area forecast framework.

Customer models

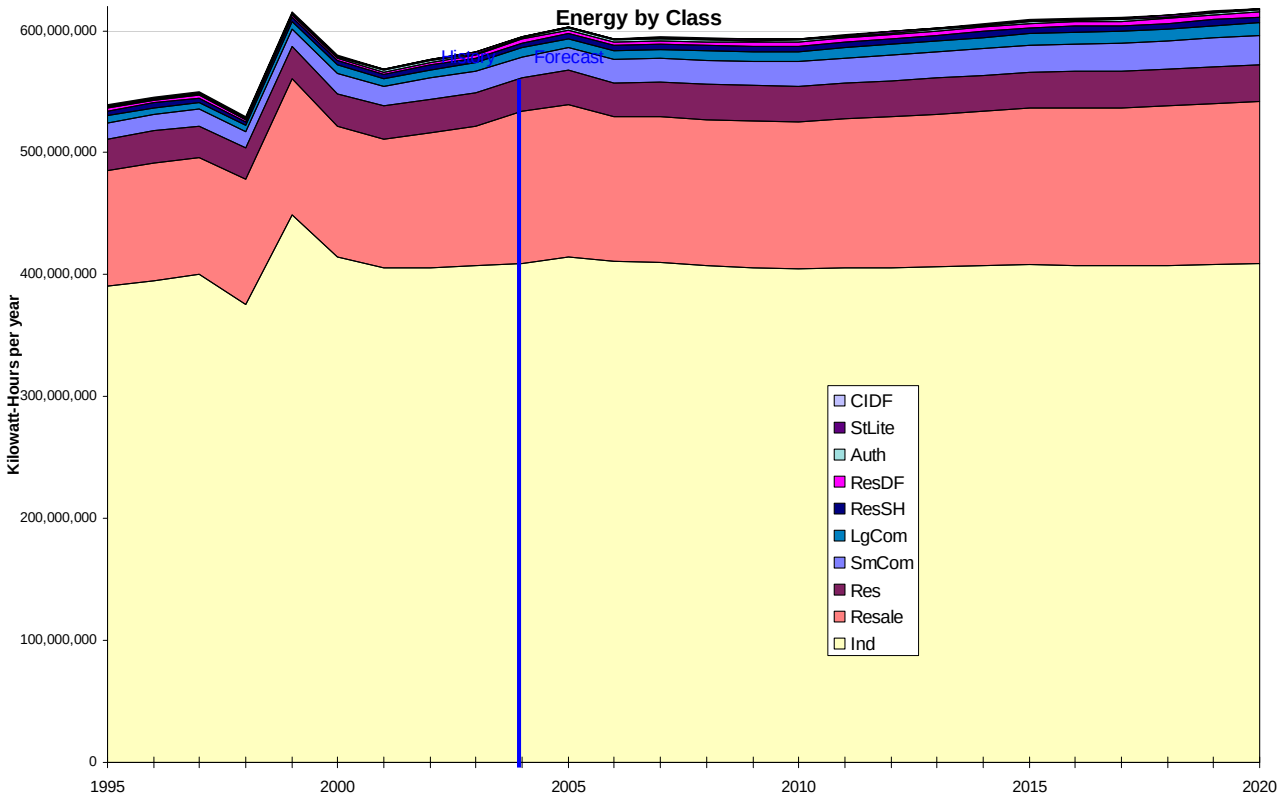
Figure 7-10 Customers by Class



[TRADE SECRET DATA EXCISED]

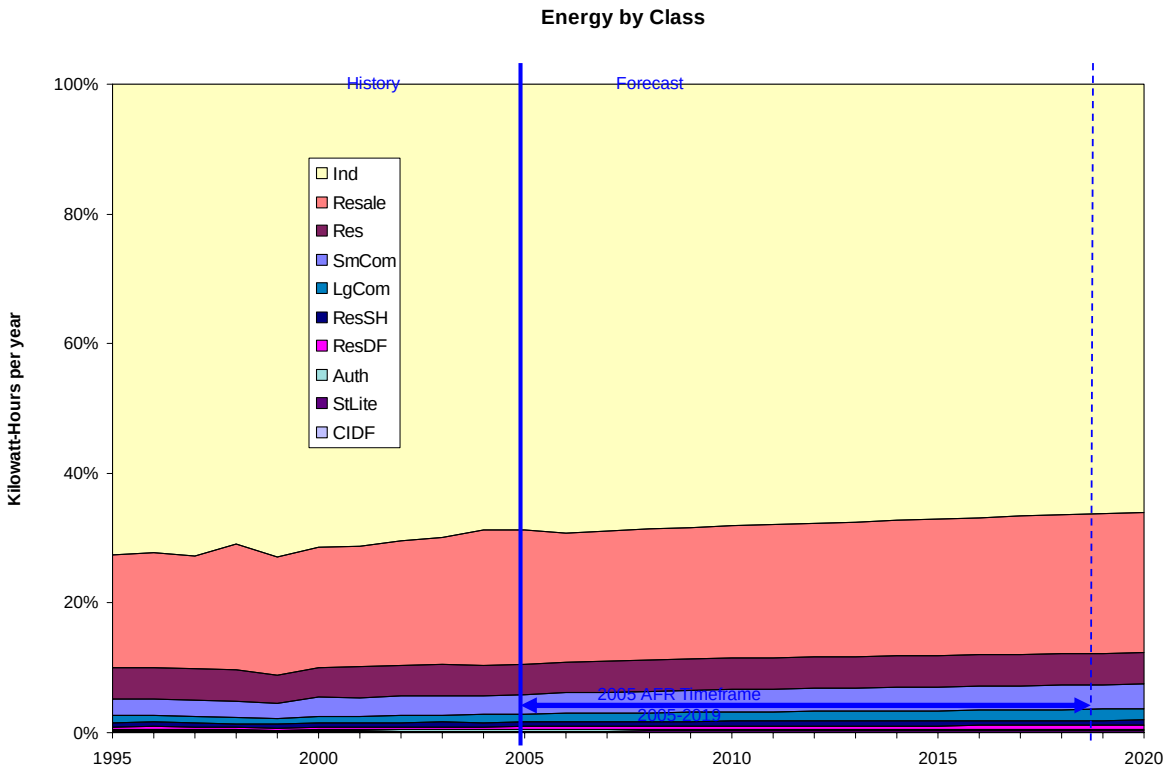
Energy models

Figure 7-22 Energy by Class



[TRADE SECRET DATA EXCISED]

Figure 7-35 Energy by Class



Peak Demand Models

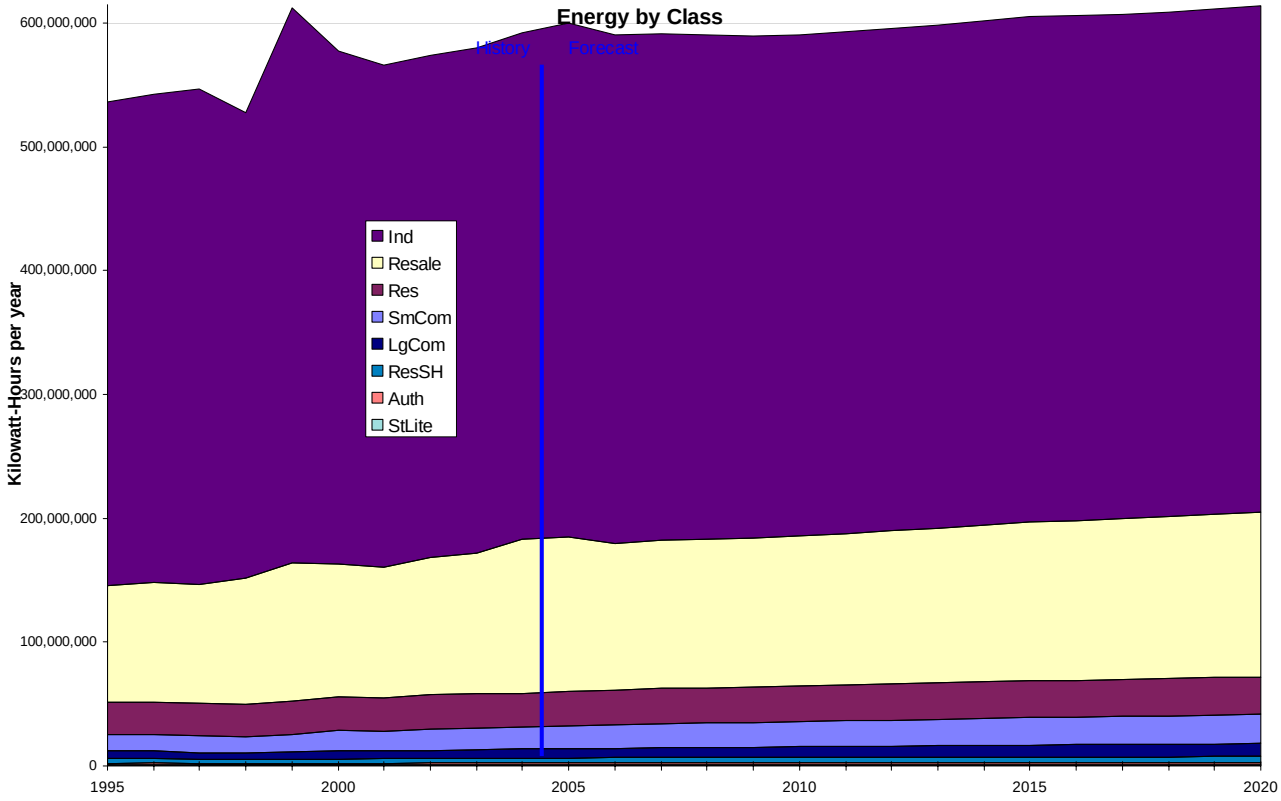
Peak demand is calculated using the annual percentage growth rate of energy sales without the residential, commercial, and industrial dual fuel classes. A constant annual load factor is assumed for the forecast period.

Tower annual percentage growth rates (peak demand growth escalator)

1996	1.2
1997	0.7
1998	-3.5
1999	16.1
2000	-5.7
2001	-1.9
2002	1.4
2003	1

2004	2.2
2005	1.3
2006	-1.6
2007	0.2
2008	-0.2
2009	-0.1
2010	0.01
2011	0.5
2012	0.5
2013	0.5
2014	0.5
2015	0.5
2016	0.2
2017	0.1
2018	0.3
2019	0.5
2020	0.4

Figure 7-36 Energy by Class



7.1.6 Forecast Scenarios

Tower area customer count and energy by class forecasts were prepared for three scenarios; expected, low, and high cases. The expected forecast is based on levels of economic activity that should occur according to a consensus opinion of national economists as shown in Aspen Publisher's (Robert Eggert) Blue Chip Economic Indicators, March 10, 2005. Industrial economic activity specifically related to taconite mining and pulp and paper production was obtained from industry experts and from MP's REMI economic model. Predicted demographic and economic information was provided by National Planning Association (NPA) data for St. Louis County of Minnesota and from MP's REMI model. The expected scenario indicates a flat growth pattern between 2004 and 2010. Due to the recent recession and economic downturn, growth declined in 2001 and 2003 in many economic measures. Economic recovery begins in 2004 and continues positive growth in virtually all sectors, partially offset by a continued slow decline in the mining industry. More moderate economic growth occurs after 2010 to the end of the current forecast, 2020.

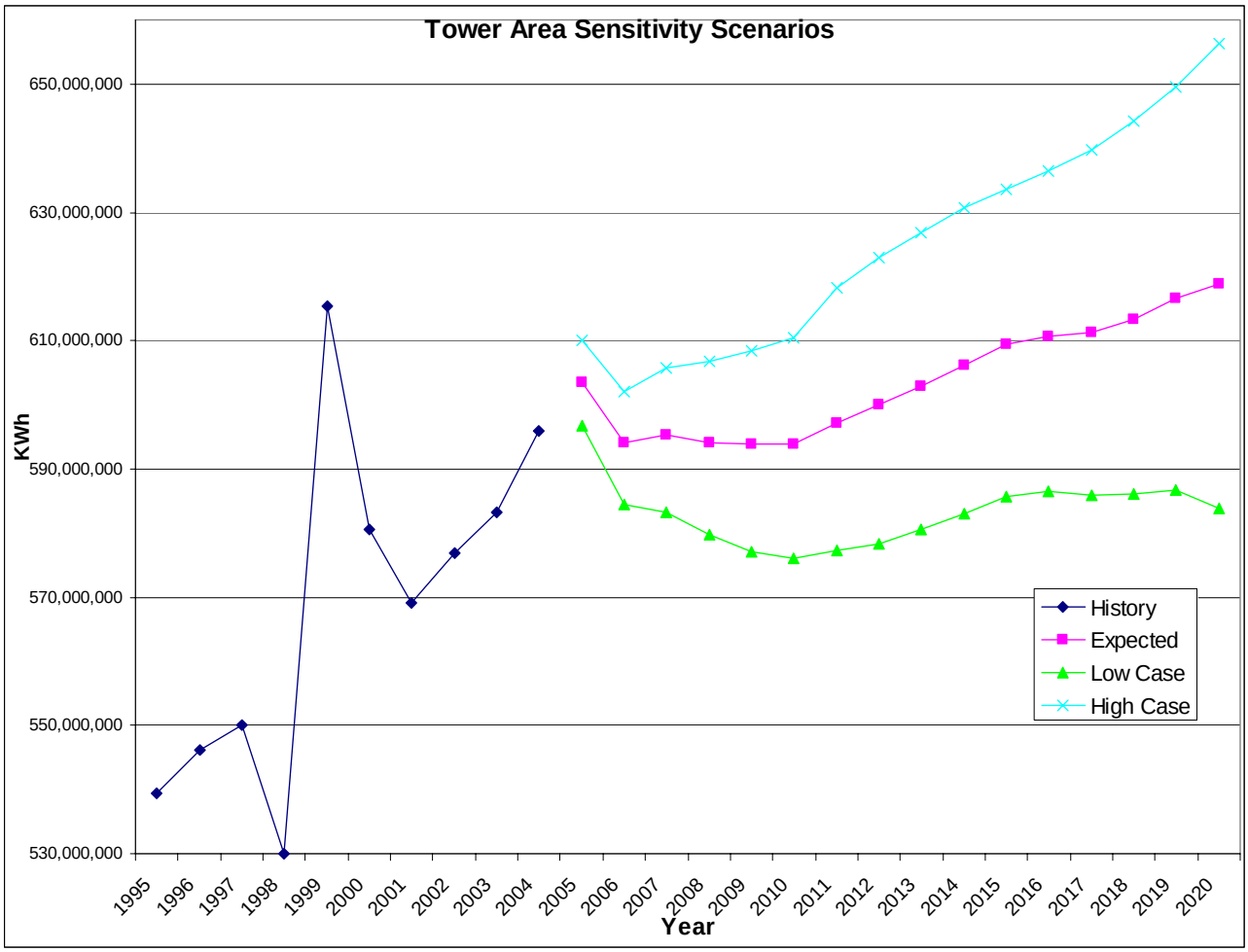
The load forecast formula could be placed in a spreadsheet and then calculated for a given set of independent variable values. It then produces a single value dependent variable class customer count or class energy sales forecast. However, the independent variable values that actually will occur are not known with precise certainty. In the high-low scenario analysis, economic, demographic, energy price, and weather assumptions are increased and/or decreased to create an optimistic or high forecast with rapid economic and demographic growth, low electric energy prices, high natural gas and oil prices, and colder than normal winter weather and hotter than normal summer weather. The opposite growth elements apply to the pessimistic or low scenario forecast. The low scenario forecast would be characterized by slow, flat, or declining economic and demographic growth, high electric energy prices, low natural gas and oil prices, and warmer than normal winter weather and cooler than normal summer weather. The uncertainty ranges are initially based on historical data and then increased over time to allow for the increasing uncertainty going into the future.

A resulting low to high range is statistically provided for each year as an indication of uncertainty or "risk" in the forecast and to give planners a reasonable span for which to plan. In the year 2006, for example, there is a statistical probability that the actual annual energy sales will probabilistically turn out to be between 584 GWh (-1.7 percent less than expected) and 602 GWh (+1.3 percent greater than expected), with a point estimate for the expected case of 594 GWh. By 2015, the low to high range is from 586 GWh (-3.8 percent less than expected) and 634 GWh (+4.1 percent greater than expected), with a point estimate for the expected case of 609 GWh for annual Tower area energy sales. Statistical probability ranges were also calculated. Uncertainty bandwidths were derived to assess the lower and upper limits of a 95 percent confidence level range. The Marketing Department high and low cases were also analyzed.

The LTV closing is an example of the significant impact the taconite industry and relative competitiveness of Iron Range facilities can have on MP, even though LTV used its own generation to produce the majority of its electric requirements. Indirect regional economic impacts from the LTV shutdown may have substantial future impacts on MP's electric sales, but these as well as others were quantified within the historical updates and survey inputs to the REMI model. Projected annual energy sales for the three forecast scenarios are shown in the chart below, along with historical annual energy sales.

Users of this Tower Area 2005 Load Forecast Report are cautioned to bear in mind the high degree of uncertainty inherent in this forecast and its individual components and to consider preparing contingency plans for the alternate futures shown.

Figure 7-37 Tower Area Sensitivity Scenarios



7.1.7 Expected Scenario Assumptions, Variables used in Forecast

TOWER AREA HOUSEHOLDS USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	0.12	0.33	0.34	0.39	0.4	0.35	0.37	0.4
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.42	0.44	0.48	0.53	0.54	0.54	0.57	0.62

TOWER AREA TOTAL EMPLOYMENT USING NPA , (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	1.87	1.46	1.21	1.2	1.01	0.81	0.85	0.72
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.63	0.61	0.72	0.72	0.6	0.47	0.38	0.53

TOWER AREA COMMERCIAL SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	1.34	1.6	1.31	1.31	1.12	0.9	0.96	0.82
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.72	0.71	0.83	0.82	0.71	0.57	0.48	0.66

TOWER AREA INDUSTRIAL SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	-4.43	1.14	0.88	0.84	0.56	0.43	0.4	0.32
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.18	0.1	0.19	0.23	0.03	-0.18	-0.21	-0.14

TOWER AREA CONSTRUCTION SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	-3.74	0.53	0.28	0.45	0.35	0.13	0.13	0.11
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.09	0.07	0.09	0.09	0.24	-0.09	0.04	-0.07

TOWER AREA RETAIL TRADE SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	1.32	1.69	1.4	1.4	1.13	1.01	1.03	0.89
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.75	0.74	0.89	0.83	0.7	0.63	0.46	0.66

TOWER AREA TRANSPORTATION, WAREHOUSING, INFORMATION, and UTILITIES SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	0.55	1.31	1.25	0.94	0.88	0.64	0.76	0.46
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.73	0.46	0.61	0.62	0.48	0.34	0.32	0.5

TOWER AREA GOVERNMENT SECTOR EMPLOYMENT USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	3.46	1.46	1.19	1.18	1.01	0.85	0.87	0.73
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.59	0.59	0.62	0.75	0.58	0.45	0.33	0.48

TOWER AREA PRIVATE NON-FARM SECTOR EARNINGS USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	1.32	3.2	2.82	2.76	2.46	2.16	2.09	1.88
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	1.76	1.79	1.86	1.89	1.78	1.66	1.54	1.74

TOWER AREA POPULATION USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	1.92	0.1	0.15	0.19	0.19	0.16	0.16	0.2
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.23	0.22	0.3	0.3	0.33	0.36	0.36	0.42

TOWER AREA PER CAPITA INCOME USING NPA, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	3.87	2.98	2.75	2.67	2.36	2.09	2.03	1.76
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	1.6	1.65	1.63	1.64	1.49	1.34	1.21	1.34

PRICE OF ELECTRICITY USING TOWER DOE, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	5.7	-3.16	-2.03	-2.65	-0.04	0.79	0.43	-1.64
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	-0.6	0.65	0.74	0.26	0.82	0.94	0.23	0.5

PRICE OF NATURAL GAS USING DOE, (% annual growth)								
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EXPECTED	9.43	3.08	-7.35	-5.95	-6.13	-3.53	-2.94	-0.66
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
	0.98	1.97	2.61	1.94	-0.21	-0.47	1.58	2.83

Weather

HEATING DEGREE DAYS USING NOAA TOWER								
EXPECTED	**2005-2019**		**MAX**			**MIN**		
	10645.2		11784	1996		8863	1987	

COOLING DEGREE DAYS USING NOAA TOWER								
EXPECTED	**2005-2019**		**MAX**			**MIN**		
	150.825		326	1988		38	1985	

In this world of uncertainty, forecasting future energy prices is a particularly difficult task. The underlying assumption is that no significant oil and gas supply interruptions will occur during the fifteen-year forecast period. The electric price changes shown above are based on averages for many different customers, many different end-uses, and changing consumption patterns. They are intended to be used for statistical forecast purposes only and are certainly not indicative of any intention or anticipation of changes in MP's rate pricing structure. The general expectation is that the real price of electricity will remain relatively stable or decline slowly over the early forecast period and increase slightly in the latter forecast years. Future energy prices are based on data from the U.S. Department of Energy (DOE), Energy Information Administration (EIA), National Energy Information Center (NEIC), Annual Energy Outlook (AEO). Economic growth is assumed to resume at healthy growth rates with low inflationary pressures. Other standard demographic and economic assumptions are used in the demand forecast development from NPA, Blue Chip, BLS, IMPLAN, MN DEED, and REMI. The econometric customer count class models are estimated from 1994 to 2005 and energy sales class models are estimated over the 1995 to 2004 time period.

7.1.8 Expected Forecast Scenario

[TRADE SECRET DATA EXCISED]

7.1.9 Low Forecast Scenario

[TRADE SECRET DATA EXCISED]

7.1.10 High Forecast Scenario

[TRADE SECRET DATA EXCISED]

7.1.11 Confidence in Forecast

MetrixND, like most statistical programs, bases its forecast model estimations on the past history of the data. Forecasts are calculated from the historically-derived model by applying projections and assumptions for the future of the independent variables. These quantitative forecasts are used as a starting point with insight and knowledge of future events used to improve the forecasts. The Expected Case Tower area forecast projects energy sales and customer counts by class on a long-term, weather-normalized basis and does not predict general business cycles after 2005, nor any abnormal conditions such as strikes, oil supply interruptions, natural catastrophes, or extreme weather.

The wide ranges of energy requirements, customer counts, and peak demand growth rates reflected in Table 7-2 are due largely to weather and economic conditions in the Tower area. Because the northeastern Minnesota economy is, to a large extent, driven by conditions in the specific industries in the Tower area, a large area of uncertainty makes for a wide span of possible futures.

Table 7-2 Total System Requirements

TOTAL SYSTEM REQUIREMENTS									
LP CONTRACT EXPIRATION, LOW, ACTUAL & EXPECTED, AND HIGH SCENARIOS									
	ENERGIES – GWh			PEAK DEMAND – %			CUSTOMER COUNT		
	LOW	**EXPECT**	**HIGH**	**LOW**	**EXPECT**	**HIGH**	**LOW**	**EXPECT**	**HIGH**
1998		530			-3.53			4,708	
1999		615			16.13			4,772	
2000		581			-5.73			4,820	
2001		569			-1.94			4,884	
2002		577			1.37			5,007	
2003		583			1.04			5,066	
2004		596			2.16			5,144	
2005	597	604	610	0.21	1.26	2.28		5,193	
2006	584	594	602	-1.89	-1.59	-1.28	5,152	5,255	5,301
2007	583	595	606	-0.21	0.21	0.6	5,167	5,319	5,390
2008	580	594	607	-0.58	-0.2	0.16	5,166	5,357	5,461
2009	577	594	600	-0.46	-0.06	0.28	5,153	5,386	5,522
2010	576	594	611	-0.18	0.01	0.33	5,147	5,418	5,587
2011	577	597	618	0.23	0.54	1.24	5,156	5,464	5,669
2012	578	600	623	0.16	0.45	0.72	5,158	5,503	5,750
2013	581	603	627	0.4	0.46	0.62	5,158	5,537	5,821
2014	583	606	631	0.42	0.53	0.6	5,167	5,575	5,898
2015	586	609	634	0.45	0.54	0.43	5,180	5,616	5,974
2016	587	611	636	0.14	0.18	0.42	5,177	5,652	6,043

The user of this forecast is cautioned to bear in mind this degree of uncertainty and to consider preparing alternate forecast contingency plans based on the uncertainty ranges presented.

7.1.12 Coordination of Forecasts with Other Systems

MP is a member of MAPP, MISO, Minnesota/Wisconsin Power Suppliers Group (M/W PSG), Upper Midwest Utility Forecasters (UMUF), and other trade associations. While each member of these groups independently determine its power requirements, periodic meetings are held to share information and discuss forecasting techniques and methodologies. MP forecast staff also regularly participates in other forecast meetings offered from the following entities: Itron, REMI, IBF, EEI, IPE, SME, AEIC, UBC, and EPRI.

7.2 Great River Energy

7.2.1 Introduction

This section provides a summary of load forecast, the forecast methodology, and the databases used to construct GRE's base scenario forecast. GRE works with the member cooperatives to prepare the peak demand and annual consumption forecast and has summarized the Lake Country Power 2004 Long-Range Load Forecast dated September 2005, which is the primary data source for the forecast.

The 2004 LRLF included five demand scenarios, including the base scenario (most probable economic assumptions, with normal weather). Details of the base scenario are presented in this section, but the forecast primarily used to evaluate loading for the Project in the transmission analysis due to summer loading levels was Demand Scenario 2, which assumed the most probable optimistic economic assumptions and extreme weather conditions.

The 2004 LRLF, along with the historic peak load data, was used to build the transmission models that were used to determine the need for the Project. Area loads were evaluated using a model showing temperature dependence and other load variations.

7.2.2 Definition of Service Area and System

LCP is the only GRE cooperative serving load in the Tower area. It is a member-owned electric cooperative providing electric service to consumers in St. Louis County. LCP has a unique subset of substations primarily serving customers in this region. These substations represent a share of the total cooperative load in the area. Table 7-3 shows the historic percentage of December 2004 member cooperative peak load that is serving the GRE share of the Tower area load.

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7.2.3 Forecast Methodology

<u>Overall Methodological Framework</u>

The member cooperative forecast is prepared as a separate work product and is part of the total GRE forecast. GRE staff assists in the preparation of the member system forecasts. The forecast is the fundamental information from which the area forecast is derived.

Energy forecasts were prepared for each cooperative by projecting the number of consumers and the average energy usage per consumer for each RUS classification of

consumers. Separate forecasts of the number of consumers and the energy usage per consumer were prepared for the following classes:

- residential
- seasonal
- small commercial
- large commercial
- irrigation
- street and highway lighting
- public authorities
- own use categories by member system

The cooperative residential class for LCP is shown for 2003 in Table 7-4 as a percentage of the cooperative.

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This class is a significant share of the totals and was analyzed extensively. Previous end-use long-range load forecasts were studied and previous results were compared to the present forecast.

Non-residential categories were forecast using trend-judgment using a variety of methodologies. Line-loss percentages were estimated and demand was forecast using a load-factor methodology.

To use the cooperative forecast to derive an area forecast, the relationship of area usage to the total cooperative usage must be established. Changes over time must also be evaluated in this exercise. Historic comparisons of the seasonal energy and demand values were used to evaluate this relationship. Once the historic relationship was evaluated, and the trend over time was included, distribution cooperative staff was consulted on the viability of historic values applying in the future.

Linear relationships appeared to be adequate in modeling the area to cooperative totals and were charted with correlation statistics for evaluation. Figure 7-38 shows the energy relationship for LCP of the area to total cooperative usage correlation.

Figure 7-38 Lake Country Power Area Historic Energy Correlation

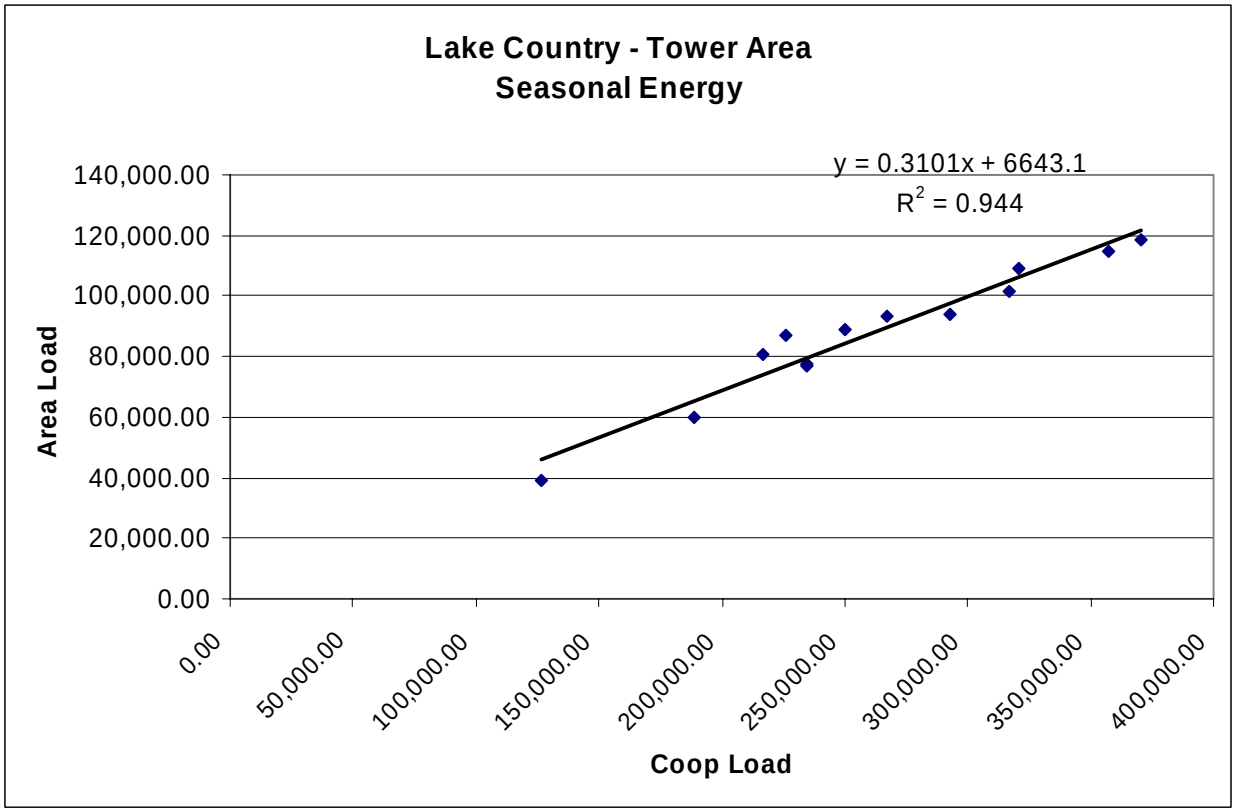
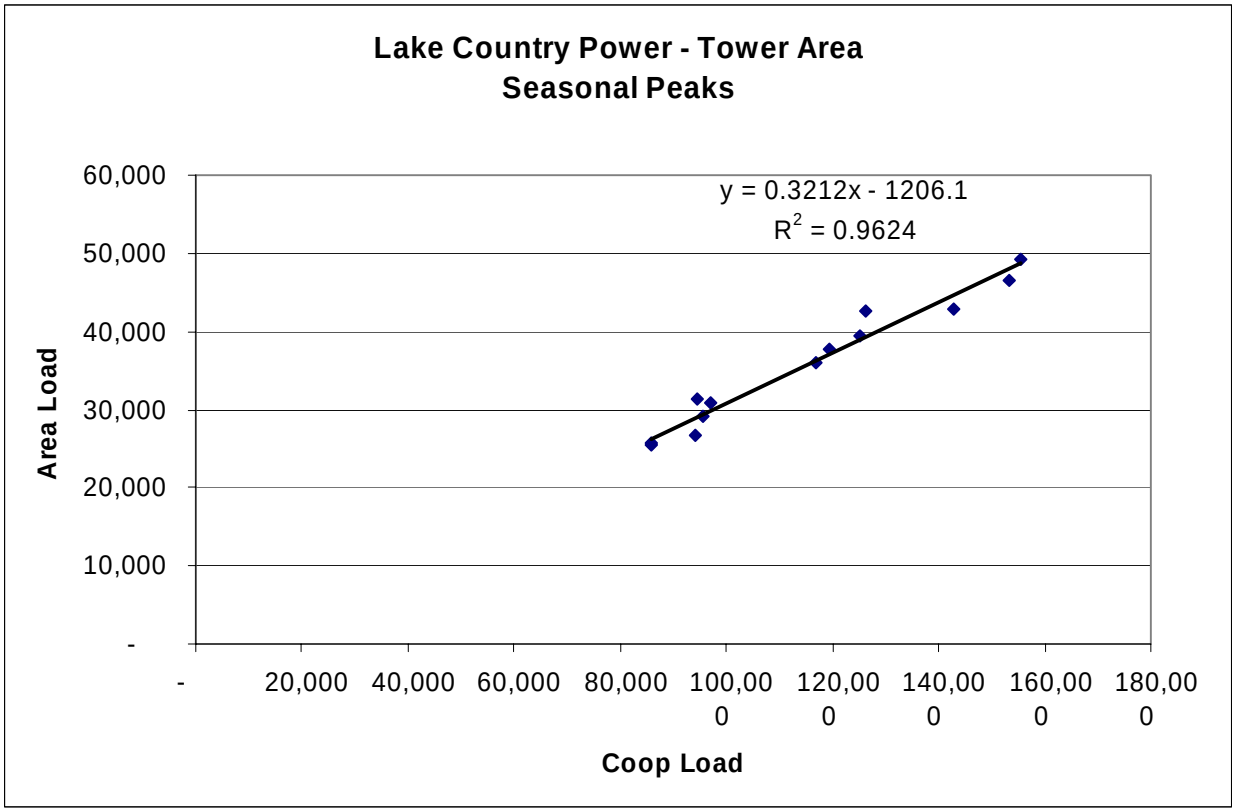


Figure 7-39 shows the correlation of the seasonal demand values over the 1999-2004 period.

Figure 7-39 Lake Country Power Area 1999-2004 Demand Correlation



Six years of cooperative level seasonal demand and energy values were evaluated for the study area and the total cooperative. Values for 1999 through 2004 were evaluated to determine the relationship of the area usage to the total cooperative. Area growth rates were also compared to the cooperative growth rates to determine if the contribution was increasing. Concerns had been raised that the area load growth was higher than the cooperative growth, but the correlation does not show divergence at higher load levels. The correlations developed a linear relationship of the area load to the cooperative load.

Both demand and energy correlations were developed for LCP. Results of the energy correlations are shown in Table 7-5.

Table 7- 5 Lake Country Power Energy Correlations

Member Cooperative	Scaling Factor (slope)	Adder (Intercept- MWh)	Curve Fit (R-Squared)
Lake Country Power	0.3101	6,643	94.4%

Table 7-5 indicates that LCP area energy usage is 31% of the total cooperative usage plus 6,643 MWh. Figure 7-38 does not show significant divergence in the correlation with higher energy usage (indication of later years). From this information, the correlation, the correlation was applied to the total cooperative forecast to derive the area forecast. Results of the area to cooperative demand correlations are shown in Table 7-6.

Table 7-6 Lake Country Power Demand Correlations

Member Cooperative	Scaling Factor (slope)	Adder (Intercept – MW)	Curve Fit (R-Squared)
Lake Country Power	0.3212	1.2	96.24%

Table 7-6 shows LCP demand scaling factor as 32.12% of the total cooperative demand plus 1.2 MW. Figure 7-41 shows the historic and forecasted energy usage for the load in the Tower Area. Figure 7-40 shows the historic and forecasted energy usage for the load in the Tower Area.

Figure 7-40 Tower Area Energy Usage

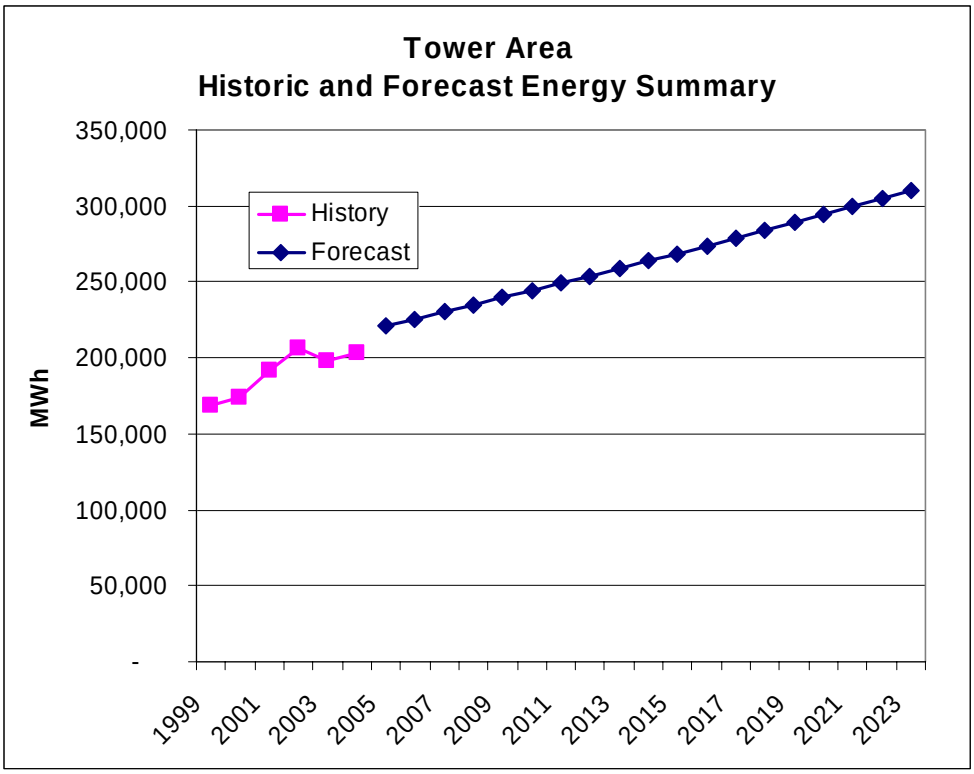
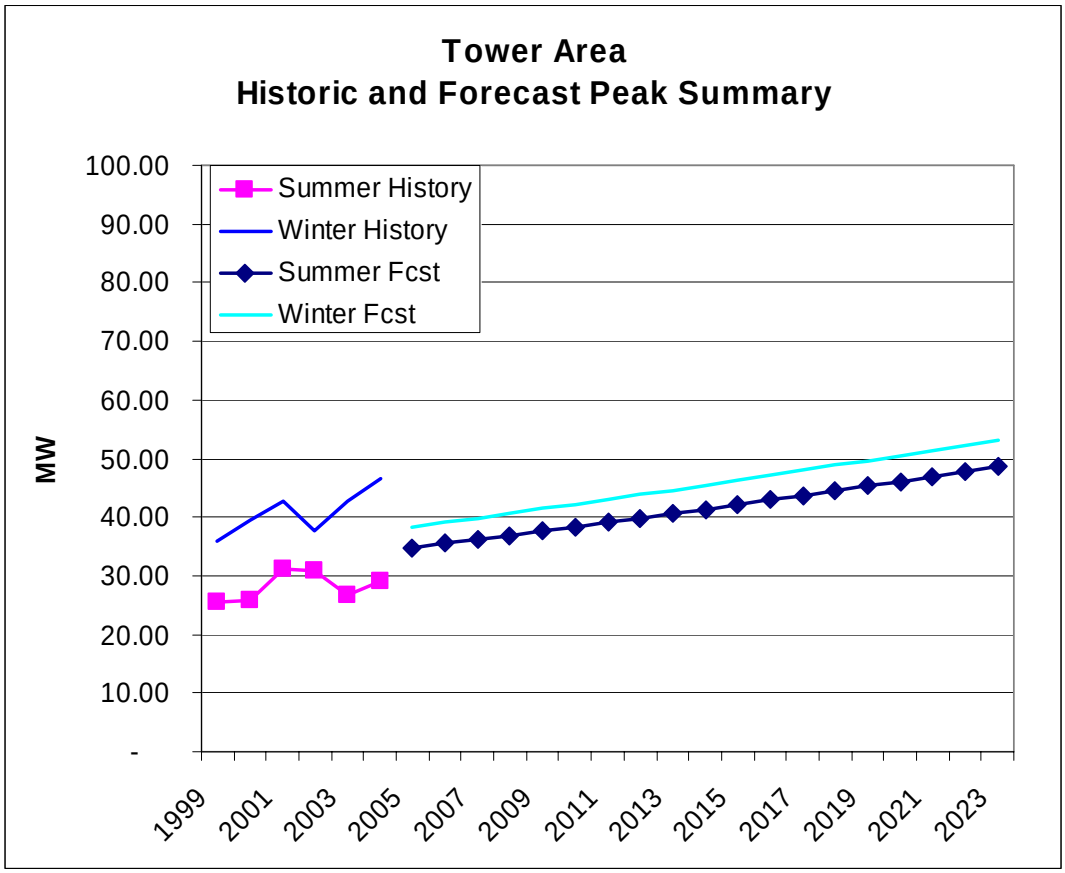


Figure 7-41 Tower Area Demand Summary



The energy and demand correlations of the area forecast to the cooperative forecast are assumed to cover a number of factors including the class breakdown of load, and peak diversity. Cooperative load forecast data was not available by class for the Tower Area, but was only available for the entire cooperative. The Tower Area forecast assumes that the class contribution to the total load in the 1999-2004 period will remain the same over the forecast period.

GRE and MP established a historic delivery system peak, taking into account conditions of the system such as weather and switching configuration. The most recent peaks were given highest consideration because they reflect the impact of growth. The historic demand was escalated in the transmission models by the projected area growth rate.

Specific Analytical Techniques – Cooperative Forecasts

GRE prepared the energy and demand forecasts with input from the cooperatives. Woods & Poole econometric databases (Woods & Poole Economics, Inc., 2004) and other key data were used.

Energy Forecast

The energy forecast is performed first since it is the basis for our demand forecast. As discussed in more detail in the appropriate sections, GRE staff prepares numerous models for both the number of members and usage per member for each member class. We then work with GRE to identify the model that most accurately represents future growth given historical information and known and measurable future load additions or subtractions.

Demand Forecast

Seasonal demand forecasts were developed using the total of the energy forecast of each class and a projected seasonal load factor. The seasonal load factor was developed as follows: seasonal historic load factor trends were analyzed by reviewing a seven and 11-year trend and judgment to create the 20-year projection. More specifically, tables and graphs of the load factor forecasts were examined to determine if it was reasonable to extend the trend twenty years into the future. Judgment is necessary because demand side programs and varying weather conditions affect the historic seasonal load factor.

The previous forecast was also evaluated for findings and lessons learned from previous end-use forecasts. Special attention was paid to the influence of changing air conditioning saturation and changes in the saturation of electric space heat. Initial load factors were then selected and tables and graphs of the demand forecast were studied. Changes in the trend of demand were studied to see if they were reasonable and if they could be explained. GRE staff then examined these forecasts of demand and load factors. Comparisons were made with the forecasts in other member systems. Differences were noted and the forecasts were re-examined to determine the reason for these differences. Staff members evaluated the demand forecasts to make sure they were reasonable. The resulting forecasts of load factors are reported in this section with the demand forecasts.

Application of Specific Analytical Techniques

Residential Energy Forecast

This classification includes farm and non-farm residential consumers as well as small public buildings. Farm and hobby farm energy consumption includes use for both farms and residences. Residential consumers include single-rural residences, small rural housing developments, and large suburban single-family dwellings and multi-family units.

Residential consumers make up the largest classification in the cooperatives system. City utility and street improvement projects have enabled the continued residential growth in the service area. The remainder of residential growth in the service area has

primarily been the result of rural residential developments, scattered throughout the Cooperative's service territory.

Number of Consumers

Because of the size of the residential class and its potential for large changes, special attention was given to the consumer forecast of the residential class of consumers. Both seven and 11-year linear trend forecasts were prepared. Tables and graphs of this data were then studied to detect changes in trend growth.

GRE staff prepared up to five forecasts with supplemental tables and graphs of the number of residential members. The basis for the five forecasts provided by GRE was 1) the Minnesota State Demographer, 2) Woods & Poole, and 3) the Metropolitan Council. GRE staff explained the strengths and weaknesses of each of the demographic forecasts and the resultant five models. Based on the information we constructed a forecast of the number of residential members. Senior staff reviewed the resulting forecast. GRE staff then reviewed the forecast.

These demographic forecasts are documented in the 2004 GRE Forecast Database. This methodology has been used for the last 20 years by the GRE member systems and has been extensively reviewed.

Energy Usage Per Consumer

Staff from the State Demographers Office and the Metropolitan Council met with staff of GRE and the member systems to review the forecasts on June 22, 2004. The Minnesota Department of Commerce was also represented. At this meeting the forecast demographic methodologies were reviewed and compared. This information is contained in the 2004 GRE Forecast Database and was used in developing the 2004 forecast.

An aggregate GRE econometric model was prepared quantifying the relationship between inflation-adjusted wholesale rates and residential energy usage per consumer. This model demonstrated the elasticity of demand and how the higher inflation-adjusted rates of the 1980s reduced energy usage per consumer. Since peaking in the early 1980s, the inflation-adjusted rates have steadily declined, thus resulting, all else being equal, to increased usage. Rates are currently in the range associated with increasing energy usage. Future projections of inflation-adjusted wholesale rates indicate they will remain in the range associated with increasing residential energy usage. This model is documented in the 2004 GRE Forecast Database.

After all factors were reviewed and discussed, comparisons were made among the member systems. A significant difference in growth rates existed between the urban and rural member systems. Urban member systems were experiencing rapid growth in energy usage per consumer. This is likely due to a number of factors, including larger new homes being added to the system, increased number of customers using electric water heating due to new building codes, and increased usage of electronic devices such as computers.

Energy usage per consumer forecasts were selected and reviewed by GRE and member system staff. GRE senior management reviewed the forecasts. Final forecasts were approved after review with GRE staff.

Creation of Forecast

Energy per consumer and residential customer number forecasts were combined to create the residential energy forecast.

As planned in the Long-Range Load Forecast Work Plan, GRE hosted a series of meetings with its members to review the residential forecast models and factors affecting growth. A group discussion ensued with comparisons of the member system growth rates.

Draft forecasts were selected and reviewed by member system staff. GRE staff also reviewed the forecast. This process was followed to ensure that all relevant information was reflected in the forecast.

Non-Residential Forecasts

The non-residential categories were forecast using a variety of methods.

Small Commercial

Small Commercial includes businesses and establishments whose service requires a transformer of 1,000 kilovolt-amperes (kVA) or less.

The methodology used to forecast the small commercial category is primarily a trending analysis supplemented by econometric modeling.

After studying prepared tables and graphs of the historical number of small commercial consumers, trend forecasts were prepared and studied. These forecasts are documented in the GRE 2004 Forecast Database.

The forecast growth rate of the residential class was examined when preparing the small commercial forecast because small commercial establishments will be developed as needed to serve a growing, residential population. An econometric

model relating small commercial consumer growth to residential consumer growth was prepared. This model reflected the close relationship between residential and small commercial consumer growth.

After reviewing these models, the initial forecast of small commercial consumers was selected by member system staff. Member system senior staff and GRE staff then reviewed this initial forecast.

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Tables and graphs of the historical usage per small commercial consumer were prepared and studied for trends. Comparisons with the residential class of consumers were completed. The econometric model showed the relationship among real income, real electricity price and total employment, heating degrees, and average usage per small commercial consumer. Forecasts were then selected and reviewed by senior staff and GRE staff.

Large Commercial

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Seasonal

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Seasonal consumers have summer homes or seasonal cabins located around area lakes. They generally occupy these residences for less than six months of the year, permanently residing elsewhere. These accounts are billed on an annual basis. Some other accounts fall under this classification, such as a member request for annual billing.

The seasonal residential accounts have continued to decline over the past eight years. A large percentage of accounts in this category are located on recreational lakes. Vacant lakeshore in the service territory has grown increasingly scarce, which limits seasonal growth. This and the continued residential growth throughout the service area have led to the conversion of seasonal accounts to year-round residential accounts and have contributed to this steady decline.

The seasonal class growth is most influenced by the availability of lakeshore for development. As some member systems are serving fully developed areas, seasonal consumers were transferred to the residential class. Other member systems serve areas with significant lakeshore that could be developed. These member systems are forecasting continued growth in seasonal consumers.

Energy Usage per Consumer

Due to a relatively stable base of consumers classified as seasonal, along with the shifting from higher usage seasonal accounts to year-around residential classification, the energy use per seasonal consumer is projected to increase at about 1 % through the forecast period.

Irrigation

The methodology used to forecast this category is trend-judgment. Lake Country Power does not have any irrigation consumers and does not warrant a more intensive effort to forecast this class.

Street and Highway Lighting

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7.2.4 Content of Forecasts

The primary elements of the forecast are:

- Number of customers by class
- Total energy usage by class
- Energy use per customer
- Peak demand for the Lake Country Power system

Customer class energy forecasts are summed to obtain results for the cooperative systems. Data concerning ultimate consumers and annual electrical consumption within the systems are reported in the following subsections. Note that none of the systems serve mining loads or electric transportation, therefore discussion of these categories is not included.

<u>Customer Categories and Annual Consumption</u>

This subsection presents the annual energy forecast and the forecast of the number of customers for Lake Country Power.

Figure 7-42 depicts the forecast of total customers and residential customers for the period from 2004 to 2023, together with historical data from 1991.

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Figure 7- 43 compares the historic rates of growth of the customer classes to the growth rates in the forecast period. The historic and forecast data from which the growth rates were computed are shown in Table 7-7.

While all customer classes are growing in size, their forecast rates of growth are all slower than in the historic period. The historic rates of growth in the commercial or industrial sectors are not expected to be maintained in the future.

The primary drivers of changes in customer growth rates are due to demographic trends in housing stocks, and economic trends for the commercial and industrial sectors.

[TRADE SECRET DATA EXCISED]

Figure 7-44 shows the forecast of total energy and residential energy for the period from 2004 to 2023, together with historical data from 1991.

[TRADE SECRET DATA EXCISED]

Figure 7-45 shows the historic and projected percentage of residential energy of total energy requirements.

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Figure 7-46 compares the historic rates of growth of annual energy by customer class to the growth rates in the forecast period from 2004 to 2023. The historic and forecast data from which the growth rates were computed are shown in Table 7-8.

[TRADE SECRET DATA EXCISED]

Use per customer data as shown in Figure 7-47 was obtained by computing the ratio of energy per customer, using 2004 as the base year. The index normalizes all results to the same relative scale. The index permits results for all three classes to be shown on the same scale. The slopes of the lines indicate relative rates of change. Industrial use per customer is nearly flat. Therefore, virtually all industrial energy and demand growth is due to an increase in the number of consumers.

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7.2.5 Databases for Forecasts

RUS Data

The RUS Form 7 (*Rural Utilities Service Form 7, Financial and Statistical Report)* is the source of historical member system data on the number of consumers by each RUS class, their kWh usage, the revenue collected, and monthly peak demand. The RUS classes are:

- residential
- residential seasonal
- irrigation
- small commercial (1000 kVA or less)
- large commercial (greater than 1000 kVA)
- public street and highway lighting
- public authorities
- sales for resale

GRE Surveys

Periodically, GRE conducts residential surveys to determine consumers per county, type of residential consumers, size of residence, people per residence, age of house, appliance ownership and age, and consumer demographics. These surveys are used as the source for historical appliance data, as documented in power requirements studies.

Proprietary Economic Databases

Woods & Poole is the source of historical and forecast data for county households, county employment, and income.

7.2.6 Assumptions and Special Information

Lake Country Power and GRE staff determined the following assumptions and special information:

- Alternate forms of energy will be available and competitively priced.
- Data for electrified transportation and mining classes were not available due to the lack of electrical usage in these classes.
- Inflation-adjusted prices of electricity will continue to decline. This will increase system demand.

The forecast for GRE was not coordinated with any other system's forecast.

8.0 ENERGY CONSERVATION AND LOAD MANAGEMENT PROGRAMS

The Applicants have been actively involved in energy conservation and load management programs across all customer classes—residential, commercial-industrial, agriculture, and large power—for over 20 years. Through the biennial Conservation Improvement Program (CIP) and a variety of load management programs, MP and GRE have successfully helped their customers get the most out of their energy dollar in terms of economic, quality of life, and environmental benefits.

With customers' growing need for electric energy, these programs have been effective in reducing the rate of this growth but not eliminating it. CIP and load management activities have helped delay the need for transmission line upgrades for several years; however, a critical point has now been reached in this area so that a transmission upgrade is crucial to ensure MP's and GRE's ability to meet our customers' growing electric energy needs.

Regarding this Certification Application and the success of current and future DSM programs, MP and GRE have explored the feasibility of increasing DSM activities in the Project area to eliminate the need for a transmission line upgrade. MP and GRE concluded, based on technological feasibility and market acceptance criteria, that DSM activities should continue as planned and that the transmission line upgrade is essential to meeting growing customer need for electric energy. Specifically, MP and GRE believe that the transmission line upgrade is more cost-effective and predictable than increasing DSM activities.

The remainder of this section focuses on the regulatory, economic, technological, and market acceptance criteria that affects use of DSM, as reflected in MP's current and proposed CIP plans. As stated in the most recently filed IRPs, MP and GRE are committed to using DSM resources in conjunction with supply side options, which includes transmission upgrades, to meet the growing need for electrical energy in its service area

8.1 Minnesota Power

MP has optimized the use of its CIP and load management programs based on regulatory, economic, technological, and market acceptance criteria. As detailed in the recently filed Integrated Resource Plan (IRP) and Deputy Commissioner Garvey's Decision on Minnesota Power's 2004 CIP Status Report (dated July 13, 2005, Docket No. E015/CIP-03-819.06), a plan has been developed to effectively use demand side management (DSM) to help meet growing customer electric needs. Additionally, MP has an established history of delivering successful CIP programs to all customer classes.

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8.1.1 Background

As required in Minnesota Statute 216B.241 and in compliance with Minnesota Rules 7690.0500 through 7690.0800, investor-owned utilities (IOUs) in Minnesota are required to file a Biennial CIP Plan that details specific programs designed to save energy through conservation and energy efficiency activities. It also requires IOUs to determine the cost-effectiveness of these programs and to spend at least 1.5% of its annual gross revenue on approved CIP programs. In conjunction with this biennial filing, MP is required to ensure that DSM activities achieve savings levels at or above those proposed in the IRP.

MP's 2004 CIP Status Report (Docket No. E015/CIP-03-819.06) indicates that the company has both exceeded the above spending requirement of 1.5% and Projected DSM savings levels determined in the IRP. Also, MP's proposed 2006–2007 Biennial Plan (Docket No. E015/CIP-05-797) again exceeds CIP required spending levels and IRP determined energy savings levels.

In preparing the 2006–2007 Biennial CIP Filing, MP personnel talked with customers and their trusted providers, community groups, energy experts, channel partners, and third-party contractors to determine their Projections for CIP activity over the next two years. Input was sought on the effectiveness of existing programs and the potential for new products and processes. The company reviewed the success of current CIP programs and the results of R&D Projects to identify opportunities for new and innovative products and programs and to determine the need to improve or eliminate existing programs. MP then reviewed these potential improvements and innovations against the following criteria: economic justification, technological feasibility, market acceptance, and the Department of Commerce evaluation process. This included both cost-benefit analysis and market player feedback. This is a realistic look at what the "market will bear," based on customer willingness to invest in energy-efficient products and processes, proposed legislation on product efficiency levels, and existing product availability.

8.1.2 Conservation Goals and Objectives

MP's conservation goals and objectives are detailed in its current 2004–2005 Biennial CIP Plan (Docket No. E015/CIP-03-819) and in its proposed 2006–2007 Biennial Plan (Docket No. E015-CIP-05-797). In 2004–2005 and in 2006–2007, MP proposed to spend more than the required spending levels and to exceed IRP determined savings levels.

8.1.3 Existing Load Management and Energy Conservation Programs and Accomplishments

As documented in Exhibit 4 and Appendix A of MP's 2004 Status Report, MP and its provider network, community groups, and customers have successfully exceeded filed energy and spending goals. MP has achieved 36,593,095 kWh in annual savings, which is 120% of the filed CIP goal and 4,237 kW or 106% of our goal. In addition, MP's ratepayers spent over $3.1 million on these programs. The average cost per kW achieved was $733/kW at the busbar in 2004.

Through the help and support of the people and organizations identified in item 8.1, MP has developed a dynamic yet structured business model (detailed in the Introduction to the 2006–2007 Biennial CIP filing, Docket No. E015/CIP-05-797) and a community-focused market strategy that has created a vibrant CIP environment dedicated to continuous improvement and innovation. Some of our recent program improvements and innovations include the following:

1. The first comprehensive, residential-based ENERGY STAR® program in the State of Minnesota. This program exceeded MP's goal and was recognized nationally by the Department of Energy (DOE) and the Environmental Protection Agency (EPA).

2. A site-based, event marketing approach to delivering energy conservation materials and education to the low-income market based on customer preferences. This resulted in a day-long event at the Salvation Army that was co-sponsored by the Duluth water and gas department, a Community Action Program (CAP) agency, and the State Energy Office. MP has held site-based events at multi-family and Housing and Redevelopment Authority (HRA) facilities that have attracted qualified low-income customers who have not participated in traditional low-income programs. New lighting products-torchieres and compact fluorescent lights (CFLs)-were also introduced to these customers. This was a strategy later recommended by Xcel Energy and the American Council for an Energy Efficient Economy (ACEEE) in their Low-income Work Plan, dated June 30, 2005.

3. Introduction of one of the first functioning microturbine installations in a waste treatment facility that runs on methane from a digestion process.

4. Presentation of the first H. E. gas furnace with an Electronically Commutated Motor (ECM) rebate program in the state, which was developed in conjunction with heating, ventilation, and air conditioning (HVAC) distributors. It incorporated rebate programs offered by gas utilities and loan programs from local communities. This was an effort to provide one-stop shopping for MP customers and introduce MP's Central Air Conditioning (CAC) Proper Installation and Rehabilitation Program in the new and retrofit market.

5. Conducted successful community-based recycling and ENERGY STAR® rebate programs for residential air conditioners (RACs) and dehumidifiers through local retailers, Cities for Climate Protection, public entities and recycling organizations, and other utilities.

6. Completed the research on and installation of new lighting technologies applicable to offices and warehouse facilities. This technology was then incorporated into a PowerGrant program.

7. Utilized the synergy between the PowerGrant and ENERGY STAR® programs and emphasis on education to complete energy-efficient installations at school facilities; and also to offer a school-based fundraiser and energy education program at these same schools. This provided students and the community the opportunity to learn about energy conservation in their school and at home. It saved energy and dollars and also rewarded students for each CFL purchased at a local retailer. The funds were used for school activities.

These are some examples of what MP did in 2004 to engage businesses, communities, and the people who live and work in them to learn about the value of energy conservation and efficiency. These programs demonstrate how MP integrates the core principles of its business model—collaborating; leveraging information, dollars and infrastructure; and managing the customer experience—and the Five "I" Marketing Approach (incentives, information, innovation, integration, and impact) across all our CIP programs. This shows that MP has established an aggressive DSM strategy and that it is being used to maximize energy and demand savings throughout its service area and across all market sectors.

8.1.4 Other Demand Side Management Programs Considered

MP uses its CIP Research and Development (R&D) program to identify potential new products and programs. The R&D initiatives provide technological and market-based information that enhances current CIP programs and helps identify new products. Appendix B details the results from our 2004 R&D Projects. An updated list of planned 2005 R&D Projects are included in Appendix C of the 2004 CIP Status Report.

MP's Dual Fuel, Controlled Access and interruptible programs continue to control system peaks and minimize the need for future growth in transmission and generation. Over 200 MW of interruptible or controlled load are served by these DSM-driven rates.

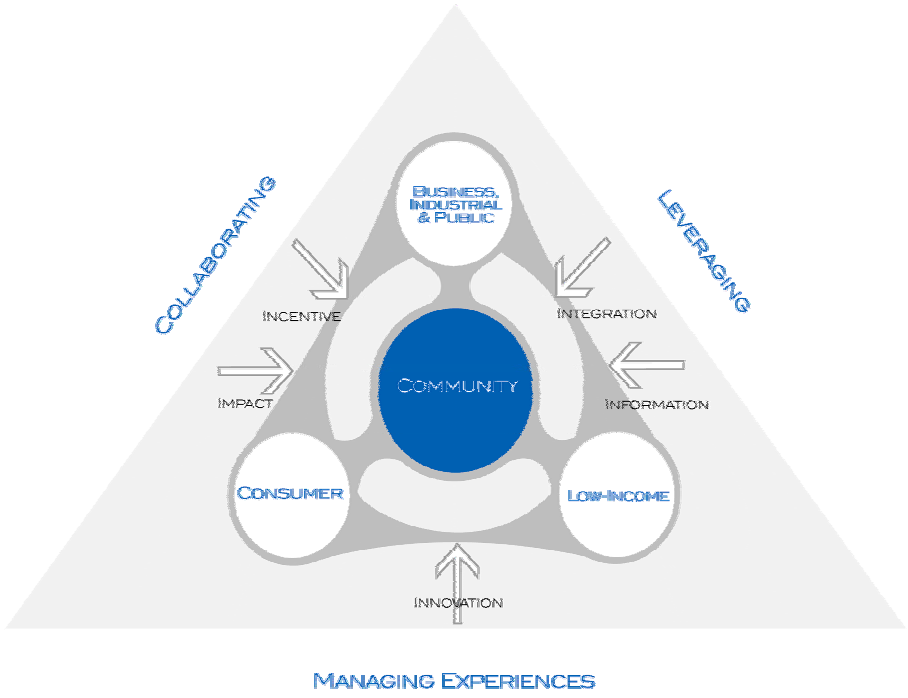
8.1.5 Future Load Management and Conservation Plans

Minnesota Power's 2006–2007 Biennial Conservation Improvement Plan is made up of five major components:

- Consumer Sector
- Low-income Sector
- Business, Industrial, and Public Sector
- Cross-Market Activity Sector
- Renewable Energy Sector

Each sector is part of a synergistic whole, based on a common platform, designed to deliver a comprehensive approach to creating true stakeholder value by helping each customer get the most out of their energy dollar. A graphic representation of this process is shown in Figure 8-1. MP's goal is to enable customers to participate seamlessly within and between sectors. For example, a homeowner may purchase CFLs at a community-wide event and then install high-efficiency lighting in their business. This enables Minnesota Power and its provider network to optimize each point of contact, to deliver the right product at the right time and place, and to leverage dollars and information. The result is long-term energy savings, maximum participation, reduced delivery costs, and market transformation.

Figure 8-1 Minnesota Power Marketing Approach



Consumer Sector

The Triple E Plus Program is the comprehensive platform MP uses to reach and serve its residential customers. It includes a package of products, services, and activities targeting this market.

Triple E Plus was introduced in MP's 2004–2005 Biennial Plan. It is designed to take advantage of the brand recognition inherent in Triple E and ENERGY STAR®, and MP's longstanding relationship with local communities. Successful brands are based on partner-affiliate relationships and a strong word-of-mouth campaign to educate and engage participants. It is referred to as community brand building, which is designed to increase participation in CIP and establish energy efficiency as a community-wide goal.

Triple E Plus provides a pipeline for new energy-saving products. It increases saturation of existing energy-efficient products, creates new markets, and leverages new and existing distribution channels. In 2006–2007, MP is proposing to expand the lighting and HVAC components of Triple E Plus. This will ensure a continued supply of new products to meet market needs and replace products that have achieved market saturation. CIP R&D is critical to identifying and testing new products and markets for the Triple E Plus pipeline. Based on an ACEEE study and MP's experience in working with mass market and niche market distribution channels, it has been found that packaging related technologies under a common brand can positively transform the market for energy-saving products and services, resulting in long-term energy savings.

Low-Income Sector

The Energy Partners Program is the comprehensive platform used to reach low-income customers with the right product or service when and how they want it. Energy Partners utilizes low-income community stakeholders (landlords and public housing agencies, the Salvation Army, utilities, the State Energy Office, CAP Agencies and community-organized low-income task forces) to provide low-income people the opportunity to participate in CIP. Through education and energy-efficient products, people learn to take control of their energy use. They view saving energy as essential to their quality of life. It helps create a community committed to finding ways to save energy for the long term.

The success of the Energy Partner's Program is based on its flexibility. It needs to reach the low-income participant via a multifaceted delivery system and inspire utilities to participate in a comprehensive, seamless program addressing all fuel sources. It seeks commitment from multifamily organizations to co-sponsor events and encourage energy efficiency at the building level, and even individual apartments.

Business, Industrial, and Public Sector

PowerGrant is the primary forum for reaching and serving business, industrial, and public sector customers. PowerGrant provides a comprehensive platform for meeting the needs of a full range of business and public customers from small businesses and farms to educational institutions and both large and small manufacturing facilities.

The Deputy Commissioner's Order in Docket No. E015/CIP-03-819.03 (dated August 11, 2004) requires MP to include the former ICP Program and its participants as a segment of MP's biennial commercial and industrial program. This establishes PowerGrant as the vehicle to serve these large customers. PowerGrant's energy and demand goals for 2006–2007 include anticipated participation from these customers.

PowerGrant's three-pronged marketing approach enables MP to customize a package of products and services that meets the unique needs of distinct business, industrial, and public communities from agriculture and education to healthcare and small and large businesses. MP is able to leverage a dynamic yet structured PowerGrant platform, utilizing a common go-to-market strategy to deliver a portfolio of products that meets the needs of these distinct market segments.

Cross-Market Activity Sector

This sector consists of five programs-Integrated Energy Education and Communications (IEE&C), Energy Analysis, Research and Development, Evaluation and Program Development, and Regulatory Charges. They contain common activities and functions (communications, research, analysis, and evaluation) that are the building blocks for a successful CIP initiative.

The Cross-Market Activity Sector is critical to meeting the needs of businesses, communities, and the people who live and work in them for now and in the future. Identifying new products and markets, evaluating the success of existing CIP programs, and providing effective communications lay the foundation for a vibrant, dynamic CIP plan that achieves energy-saving goals and delivers participant value.

Renewable Energy Sector

The basis for this sector is the continuation of the successful Community-focused Renewable Energy/Distributive Generation Pilot Program that was filed as part of Minnesota Power's 2004–2005 Biennial Plan. This program continues to focus on key infrastructure issues related to small scale renewable technology, from photovoltaics to wind turbines and biomass Projects. It provides easy access to information on technologies and incentives that impact decision making and transform the market for renewable energy applications in MP's service area.

Although each of the programs in these sectors is important to an overall successful CIP initiative, they are not viewed as isolated or stand-alone entities. As shown in Figure 8-1, these programs fit together as part of a synergistic whole, based on MP's core principles, designed to drive long-term energy savings. It depicts MP's holistic approach to creating and delivering stakeholder value through its Five "I" Marketing Approach (incentives, information, innovation, integration, and impact) within a community-focused market strategy. Through this strategy we continue to strive to meet the needs of communities and businesses—and the people who live and work in them.

8.1.6 Other DSM Activities

Customers served by the MP's Dual Fuel, Controlled Access and Interruptible rates continue to grow. By controlling its loads, MP has been able to avoid additional generation and minimize transmission growth. However, growth in these DSM activities is not expected to be sufficient to meet the needs in the future, therefore the Project is proposed.

8.1.7 Cost Comparison of Transmission Project to Conservation Programs

The comparative cost of conservation programs to the Project is:

	Conservation	Project
Cost/kW	$ 733	$128

8.1.8 Effect of Energy Conservation Programs

Section 8.1.3 provided information on the impact of MP's conservation programs in 2004. These data are detailed in the 2004 CIP Status Report.

MP has found, through extensive work with key market players and community stakeholders, that successful conservation programs are driven by the following:

1. Targeting a delivery system to make energy-saving and efficient products available to customers when and where they want them. Experience has shown that you don't differentiate yourself by your products, but rather by how those products are marketed and packaged.

2. Delivering customer-defined value drivers - increased productivity, reduced costs, and increased comfort - to encourage investment in energy-saving products and processes.

3. Focusing on communities and their stakeholders to achieve their economic, environmental, and quality of life goals through energy conservation and efficiency.

Although MP has proven that conservation can be an effective tool to help customers get the most out of their energy dollar, it is not the only tool. It must be combined with effective supply side options (in this case a transmission upgrade) to meet the growing energy needs of customers in northeastern Minnesota.

8.2 Great River Energy

8.2.1 Background

GRE and its 28 member cooperatives have pursued load management and energy conservation for over 22 years. GRE, the member cooperatives and Elk River Municipal Utilities, are pleased with the overall results of these load management, energy conservation and renewable energy programs. In 2001, following 2001 legislative changes, combined spending on load management and energy conservation by GRE and its member cooperatives totaled over $12.6 million. That spending level represents 1.98 percent of the retail revenue of the 29[9] member cooperatives. Since 2001, spending has increased each year.

Spending in 2002 was $14,558,439 which was over 2.27 percent of the retail revenue, and spending in 2003 was $14,929,776 which was 2.08 percent of the retail revenue. In 2004, CIP spending is budgeted to increase to almost $16.0 million, 2.09 percent of retail revenue. In 2005 spending is budgeted at more than $17.3 million, 2.16 percent of retail revenue. In 2006 spending is budgeted at more than $17.5 million, 2.12 percent of projected retail revenue.

These programs have resulted in significant operational benefits for GRE. During high demand periods during the summer of 2001, GRE estimates that it was able to reduce its summer peak demand by 250 megawatts or 10 percent of estimated uncontrolled peak levels. In 2002 and 2003 approximately 271 MW and 285 MW was reduced during key summer peaks due to CIP load management programs. DSM and LM reduced the 2004 GRE summer peak by over 300 MW. In 2005 and 2006, the peak is projected to be reduced by 318 MW and 336 MW, respectively. GRE Cooperatives provide a tabular Conservation Improvement Program Report in the filing, and this provides a forecast of the number of participants by program. This information is not available for the Project area, but only for the entire cooperative.

[9] Head of the Lakes Cooperative merged into East Central Energy on January 1, 2003.

GRE has a significant about of load management in place, with over 300 MW controlled in 2004. GRE has included a forecast of achievable levels of DSM and load management programs in its July 1, 2005 IRP that was filed with the Minnesota Department of Commerce (DOC). The IRP assumes an aggressive overall system demand reduction to increase from the 2004 level of 345 MW to over 400 MW by 2007. Program levels were not provided in the IRP by cooperative, but participant information was provided on a cooperative level in the most recently filed CIP.

GRE and its 28 member cooperatives have developed both direct impact and information programs targeted at major electrical end-uses for all customer classes.

GRE has developed energy conservation and load management programs to address all major residential uses of electricity. These programs include cycled air conditioning and ENERGY STAR® high-efficient air conditioner rebates. Air source and ground source heat pumps may also qualify for a rebate. Both of these programs provide capacity and energy savings during GRE's highest peak demand months. The cooperatives also encourage efficient use of electricity for both space heating and water heating. Many customers, especially in rural areas, find that electricity is a much-preferred fuel for both space heating and water heating. GRE encourages efficient use of electricity for these purposes and offers specific programs and rates to shift such loads to off-peak periods. These energy conservation programs are becoming especially important as more customers begin using electricity for these end-uses in response to new residential energy code requirements. GRE has also developed an ENERGY STAR® energy efficient lighting rebate program for residential customers and all 28 member cooperatives participated, and an ENERGY STAR® appliance rebate for refrigerators, dishwashers, and clothes washers.

As was mentioned in Section 7.0, commercial customers account for 39 percent of energy sales to retail customers. Accordingly, GRE has developed a number of programs to address the needs of these customers. Of these commercial programs, the Energy Grant program offers tremendous incentive for commercial customers to increase energy efficiency, which lowers both peak demands and overall energy use. In 2003, the Energy Grant program was expanded to include lighting and motor rebates. Finally, these customers may also participate in load management efforts such as cycled air conditioning and interruptible rates.

8.2.2 Conservation Goals and Objectives

GRE's conservation goals and objectives are fully outlined in its October 2004 CIP filing. The goals and expenditures are higher than required levels and are summarized in the Table 8-1.

Table 8-1 Summary of CIP Programs - GRE

SUMMARY OF CIP PROGRAMS				
Year	**Expenditures ($)**	**CIP % of Retail GOR**	**Energy Savings (kWh)**	**Peak Summer Demand Savings (kW)**
2001	12,638,000	1.98	53,056,713	250,000
2002	14,558,000	2.27	73,908,540	271,300
2003	14,930,000	2.08	113,424,783	284,700
2004*	15,985,000	2.09	159,840,694	300,000
2005*	17,300,000	2.16	211,000,000	317,800
2006*	17,500,000	2.12	264,000,000	336,000

* Projected values

8.2.3 Existing Load Management and Energy Conservation Programs and Accomplishments

GRE and its member cooperatives offer a wide variety of conservation and load management programs. A description of each of these programs is provided in Appendix C. A list of these programs, indicating which programs are energy conservation, load management, and miscellaneous other programs, is provided in Table 8-2. The “miscellaneous” group of programs includes efforts such as program evaluation, research and development, renewable generation and administrative/marketing. This categorization of programs is based in large part on DOC review and Commission approval of Dakota Electric Association’s 2004 Annual Conservation Report (Docket No. E-111/M-03-2042).

Table 8-2 GRE Conservation and Load Management Program List

Residential – Conservation

Air Conditioner Tune-Up Program
Air Source Heat Pump
CFL Program
Conservation Loan Program
Electrical Evaluation and Consultation
Energy Education
ENERGY STAR® Appliance Rebate Program
ENERGY STAR® Central Air Conditioner Rebate Program
ENERGY STAR® Room Air Conditioner Program
ENERGY WISE® Home Building Program
Ground Source Heat Pump (GSHP) Program
High-Efficiency Water Heater Rebate Program
Interruptible Air Conditioning
Off-Peak Space Heating – Dual Fuel Space Heating
Off-Peak Water Heating – Electric Thermal Storage (ETS) and Peak Shave Water Heating

Residential - Load Management

Off-Peak Pool Heating and Electric Vehicles
Off-Peak Space Heating – ETS
Voluntary Summer Load Reduction Program

Residential – Renewable

Wellspring Wind Energy Program

Residential – Other

Fluorescent Bulb Recycling Program
Tree Shading

Low-Income and Renter Programs – Conservation

Habitat for Humanity
Low-Income & Renter Energy Education
Low-Income Air Conditioner Tune-Up
Low-Income Air Conditioner with Cycling Program
Low-Income Energy Audit Program
Low-Income Program

Low-Income Refrigerator Replacement Program
Low-Income Water Heater Program
Renter Assistance Program
Renter Program – Lighting & Air Conditioner Tune-Ups
Renters – Grant Allocation

Commercial and Industrial – Conservation

Commercial GSHP
Commercial & Industrial – Agricultural (C&I-A) – Energy Grant Program
Commercial and Industrial Electrical Evaluation and Consultation
Commercial Lighting
Light Emitting Diode Traffic Light Project
Street and Security Lighting
Vending Miser

Commercial and Industrial Programs – Load Management

Commercial & Industrial Demand Controller Program
Interruptible Commercial and Industrial Loads
Interruptible Irrigation
Power Factor Correction Program

Commercial and Industrial Programs – Renewable

Biodiesel Project
Biomass Grant
Customer-Owned Wind Farms
Landfill Gas to Electric Project
Stirling Engine

Miscellaneous

Depreciation of DSM Plant
Distribution Automation
DSM Potential Assessment
Energy Management Database
Energy Management Maintenance
Load Management Master Controller
Phillips Community Energy Cooperative
Program Evaluation
Regulatory Commission – CIP Projects
Research and Development

8.2.4 Other Demand Side Management Programs Considered

In 2003, GRE contracted with expert DSM consultants, Global Energy Partners LLC (Global), an Electric Power Research Institute affiliate company, to conduct a full DSM potentials study. This study was reported in GRE's 2003 IRP and GRE's July 2005 IRP integrated those findings into its overall DSM programs. Some key results of this study include:

- Global did not identify any economic programs missing from GRE's portfolio.
- Global helped demonstrate to GRE the practical limits to achievable potential because of customer preference and saturation of programs.
- Global showed GRE that some of its existing programs could be modified (e.g. higher rebates or overall budgets) to increase savings and maximize their potential to reduce GRE's capacity and energy needs.

8.3 Ability to Meet Forecast Demands through Conservation and Load Management

While conservation and load management play a part in minimizing future generation and transmission needs, load growth continues despite more than 20 years of conservation efforts. However, because of MP's and GRE's conservation and load management programs, the current infrastructure has been able to meet the needs of its customers as long as it has. MP and GRE believe conservation and load management have deferred the need for filing to upgrade its transmission facilities until now.

The ultimate goal is to create value through energy conservation and load management activities and supply side options for the businesses, communities, and the people who live and work in them. The Applicants believe that balancing DSM activities with options like the proposed transmission line upgrade will help ensure this value for years to come.

9.0 ALTERNATIVES TO THE PROJECT

9.1 No-build Alternative

Currently the voltage support and line loading is a concern for a few hours a year when load on the 46 kV loop is at or above approximately 28 MW. As load continues to grow, the number of hours the area will be at risk will increase. If this inadequacy is not eliminated, a single outage could result in localized voltage collapse. If this were to occur, it could take several hours to restore electric service to the customers served by the Virginia-Ely-Babbitt loop. Once load is restored, rotating black-outs may be required to insure voltage would not collapse again until the equipment that caused the outage is repaired or replaced and put back in service. Electric load in this area peaks during the winter, so loss of electric service to the area could result in property damage and life threatening conditions if electric service cannot be restored in a reasonable time.

Under this alternative, the Commission would not approve the construction of the proposed high voltage transmission line and substation project. For reasons described above and in Section 7.0 Peak Demand/Annual Consumption Forecasts, regarding continuing population, economic, and electricity usage growth, doing nothing is not a viable alternative. Using only the existing transmission and substation system, as is, would not provide adequate power delivery capacity or reliable service by 2009. No action with respect to the improvement to the area's electric power delivery systems would place the area's residential and commercial customers and their businesses, safety, and welfare at risk of being without reliable electric service.

9.2 Conservation Alternatives

As thoroughly documented in Section 8.0 - Energy Conservation and Load Management Programs, effective conservation measures employed in the Project area have deferred but cannot eliminate the need to install a new transmission line and two substations in the Project area. Conservation programs will continue to be implemented in the area to maximize efficient use of electricity. Further conservation programs are not as cost effective or predictable as the proposed transmission project

9.3 Increasing Efficiency of Existing Lines

Reconductoring the existing 46 kV lines serving the area would reduce the voltage drop along the line slightly and eliminate line overload issues. However, the voltage improvement would not be significant, therefore reconductoring would only delay the need for a new source to serve the area by a few years, at most. This option would include removal and rebuilding of 46 kV Line #31 (Winton to Babbitt) and Line #32 (Virginia to Winton) because the present structures are not capable of supporting the heavier replacement conductor. Additional right-of-way for construction space would be required to complete the reconductoring because the present lines cannot be removed from service for an extended period of time. The total cost for permitting, right-of-way

acquisition and reconductoring construction would be approximately $22,660,000. The reconductoring alternative is not a reasonable or cost-effective solution.

9.4 Upgrading/Rebuilding Existing Facilities

Upgrading/rebuilding existing transmission lines would typically involve complete replacement of structures and conductors. Construction procedures would be similar to those discussed for the Project in Section 3.3. Increased voltage or current requirements would result in increased phase spacing or larger conductors. Transmission lines are typically rebuilt in the same right-of-way, provided the circuit being rebuilt can be removed from service for an extended period. However, if the voltage is increased, right-of-way widths need to be evaluated for proper clearances. Compact designs can sometimes mitigate the need for additional right-of-way for voltage upgrades

The option of upgrading the voltage of 46 kV # 31Line between Babbitt and Winton and 46 kV #32 Line between Virginia and Tower to115 kV was considered as an alternative. A voltage upgrade would reduce the current flow necessary to supply the area loads and thereby reduce voltage drop and increase the thermal limit of the existing lines.

Portions of #31 Line were constructed with 115 kV structures and phase spacing; however, the line would need to be reinsulated to 115 kV levels. In addition to the line upgrades, the 46 kV Winton Substation would need to be upgraded to 115 kV.

The existing #32 Line structures are not capable of being upgraded to 115 kV operation. This line would need to be dismantled and rebuilt as a 115 kV line. Because #32 Line would need to remain in service while it being rebuilt, the right-of-way would need to be widened. In addition, the GRE Vermilion and MP Tower substations would need to be converted to 115 kV. The total permitting, right-of-way acquisition, and transmission line and substation construction cost would be approximately $ 25,276,000.

Typically, 115 kV lines are more reliable than lower voltage circuits due to increased insulation levels. However, this alternative would not be as reliable as the proposed alternative because it does not add a third source into the area. In addition, it is significantly more costly than the proposed alternative.

9.5 Double Circuiting

The proposed line could be routed from Virginia to Tower and either share rights-of-way with the existing 46 kV # 32 Line or # 32 Line could be rebuilt as a 46/115 kV double circuit line. As mentioned above, # 32 Line would need to remain in service during construction, so for either option (parallel or double-circuit construction), the right-of-way would need to be widened. Due to the increased distance (approximately 27 miles vs. 15 miles for the proposed Embarrass-Tower line), this alternative would cost approximately $17,933,000, significantly more costly than the Project.

Also, this option would not provide a significant improvement in reliability or security to the area. This is because each circuit (46 kV and 115 kV) of the double circuit line would serve the same function, a local source to the Project area. Therefore, a common mode failure (loss of a double circuit structure, for example) would mean the area would need to be supplied by the only remaining source, the Babbitt source. This mode of operation would be no different and no improvement over the existing system, where the loss of the Virginia source results in all area load supplied by the Babbitt source.

There would be similar reliability and security concerns if the proposed 115 kV line shared right-of-way with # 32 line. There would be no geographic separation between two lines serving the same function (sources to the Project area). Because the lines would be located on the same right-of-way, a single storm could result in loss of both lines, such as can occur with straight line winds or a tornado. This is much less likely to occur if the two lines are geographically separated, as is the case with the Project.

9.6 Alternate Line Tap Locations or Different Voltages

The only nearby locations that could provide a connection between the Project area and the regional transmission grid are located at the Babbitt, Virginia or Laskin Substations or from MP 115 kV Line # 34 as proposed for this project. The Babbitt Substation site would not be an appropriate terminal because it is supplied by a radial 115 kV line (# 34 Line tap) and currently serves as a source to the Project area. Using the Virginia Substation as a terminal would result in a line at least 10 miles greater in length and depending on the line route, would not be as reliable, as discussed in Section 9.5. The Laskin Substation terminal option would also result in a longer line and not provide the benefits of splitting MP's 115 kV Line # 34 into separate, shorter, more reliable lines at the proposed Embarrass 115 kV Switching Station, as discussed in Section 4.5.

Other voltages were considered for this project. In particular a 46 kV line from the Embarrass area to Tower would be the preferred alternative if the objective was only to eliminate the 46 kV Virginia-Ely-Babbitt loop inadequacies. However, the Project is designed to solve the 46 kV loop issues, as well as, issues on the GRE Shannon-Virginia 69 kV loop. Load flow analysis indicated that a 46 kV line was not adequate to provide the electric energy needed to provide a long term solution and operational flexibility to meet local load serving needs for both the 46 kV loop and GRE's 69 kV loop.

9.7 Generation Alternatives

Distributed Generation was considered as an alternative to new transmission into the Tower area. The Institute of Electrical and Electronics Engineers (IEEE) defines distributed generation as a distributive resource as having an aggregate capacity of 10 MVA or less that is not directly connected to a bulk power transmission system. Based on load flow steady state analysis, initially 6 MW of generation would be required to be

located between Tower and Winton. This distributed local generation could be located at one location, which would be the most cost effective method due to the equipment required to connect the generators to the electric grid, or dispersed at several locations between Winton and Tower.

Because there are no natural gas lines in the area, the generators would be fueled by diesel, gasoline or propane. Typically generators such as this would be diesel fueled and 1.5 to 2 MW in size, so several units would be required. Because the units are diesel fueled, they may not meet the State of Minnesota's more restrictive definition[10] of a distributed resource. Lastly, due to the high cost of this type of fuel, it is unlikely that these generators would be on-line in anticipation of an outage.

Because the generation may not be on-line during a contingency, area load would likely be lost due to under voltage load shedding (depending on load levels). The generators would then need to be started, synchronized and load picked up. This would require 10 to 30 or more minutes, provided automatic switches are installed to allow load to be picked up in sections. Depending on the length of time required to get loads back on line, there is a possibility of loss of load diversity.[11] This could result in a significant increase in electric load immediately after restoration, and a possibility that more than 6 MW of generation would be required. Lastly, the use of diesel generation increases the risk of a long term outage because diesel generation is not as reliable as transmission and if a generator were not to start the system may not be capable of supporting all loads at peak.

If generation were used in place of the Project, generation would also need to be added along the 69 kV loop to address the Shannon-Virginia 69 kV inadequacy. The best location for this generation would be in the Cook area. GRE has estimated that 6 MW of generation would be required to eliminate post contingency voltage issues. Because these units would also have high operating costs, they would not be run in anticipation of a disturbance on the system leading to the same operating concerns described above.

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[10] Minn. Stat. §216B.169, subd. 1(c) defines distributed generation as high-efficiency, low-emissions, distributed generation of no more than 10 MW of interconnected capacity certified by the Commission. Recently enacted Minn. Stat. §216B.2426 requires that the Commission ensure that distributed generation is considered in this Biennial Transmission Plan Certification of Need proceeding.

[11] Loading significantly above typical peaks can occur when load is reconnected after an outage due to loss of load diversity. For example, typically only a small portion of electric heat would be on at any point in time, because some homes would be at the level set by the thermostat and their furnaces cycled off. This load diversity could be lost if a significant number of homes cool below the thermostat set point prior to electric service being restored. If this were to occur, on-line electric heat load may result in loads above typical peak due to loss of load diversity.

Generation would not eliminate the need for additional transmission; it would only delay its need. This is because of the high cost to operate this type of generation and once loads reached the levels that they are at risk of being shed post contingency for more than a few hours a year, it would be prudent to add transmission and remove the security risk.

To estimate how long generation would delay the need for a transmission improvement, hourly historic load data from April 1, 2004 – March 31, 2005 was used. The hourly load data were scaled up by the annual load growth rates provided by the load forecast. A load duration curve was then derived for future years and the number of hours the load was above the critical level of 28 MW was determined. Based on this, it was determined that it would be prudent to have a transmission solution to provide support to for the Virginia-Ely-Babbitt 46 kV loop by 2015, a delay of six years. For the GRE Shannon-Virginia 69 kV loop, the analysis indicated that by 2012, the number of hours the system would be above the critical load level would be approaching 100 hours. Based on this, it would be prudent to have a transmission solution in place by 2012, or a delay of approximately three years.

In addition to the historic load duration curves, load flow analysis was also used to estimate how far out into the future the generation addition would be able to support post contingency voltage. Generation additions were modeled at Winton on the 46 kV loop and at Potlatch on the GRE 69 kV. The critical contingency was then simulated with the generation on line and load was scaled up as directed by the load forecast until voltage could no longer be maintained within acceptable limits. This analysis indicated that the generation alternative failed in 2014 for the 46 kV loop and by 2012 for the 69 kV loop. This is similar to the results derived from the load duration curves.

MP and GRE discussed the generation option during the State Transmission Plan public meetings held in 2003 and 2004. The operating issues associated with generation were also explained during these meetings and comments from the public were sought. A generation solution was also put forward in the *2003 Biennial Report* and the Applicants requested comments from local area residents and regulatory agencies on the use of generation as a solution. The Minnesota Department of Commerce did provide a comment and stated: [12]

> All things being equal, the Department usually prefers the least-cost alternative among those that result in a reliable system. Because the generation alternative does not completely solve the reliability issues, it is not equal to the transmission alternative. Therefore, based on the information provided by MTO, the Department would tend to prefer the transmission alternative….

[12] Comments of the DOC at page 14, dated January 29, 2004, Docket No. E999/ET-03-1752.

In addition, the Applicants sought input from the areas electric distribution providers, Ely Utilities Commission and LCP. Both of these providers indicated a preference for the transmission alternative over the generation alternative based on the operating issues associated with the generation alternative and because it did not eliminate the need for transmission for a significant period of time.

Because generation was initially considered a viable option to solve the area's issues for some limited period of time, an economic analysis was conducted to determine if it was a reasonable solution. The results of this analysis indicate that the initial cost of installing generation would be approximately $4,378,000. Because the generation only delays the need for transmission, the cost associated with adding transmission in 2012 also needs to be factored in. Based on this analysis, the total cost for the generation alternative is approximately $14,993,000. The generation option was rejected because of the significantly higher costs and operating issues associated with getting the generation on-line and load restored. The Applicants do not believe the generation alternative is the best long-term solution to the area's reliability needs.

9.8 Transmission Line Requiring New Right-of-Way

The rebuilding of existing lines, as discussed in Sections 9.3 to 9.5, would require new right-of-way. The study corridor for the Project does not include any transmission line rights-of-way between the two endpoints. There are rights-of-way for lower voltage electric lines, secondary roads, trails, and abandoned railroads within the Project corridor. An approved route within the Project study corridor would include some new right-of-way.

9.9 Summary of Alternatives Considered

Table 9-1 compares the alternatives considered and the Project relative to solving the inadequacy in the electric system supplying the loads served by the Virginia-Ely-Babbitt 46 kV loop.

Table 9-1 Comparison of Alternatives and the Project

Alternative	Improve Security	Improve Reliability	Long –Term Solution	Ability to Support GRE 69 kV Loop	Cost
Reconductor existing 46 kV Lines (Section 9.3)	No	No	No	No	$22,660,000
Upgrade Voltage of Existing 46 kV Lines to 115 kV (Section 9.4)	Moderate	Moderate	Yes	Yes	$25,276,000
Virginia-Tower 115 kV Double Circuit 115/46 kV on existing 46 kV ROW (Section 9.5)	No	Somewhat	Yes	Yes	$17,933,000
Generation (Total Cost-Construct Project in 2012) (Section 9.7)	Outage Likely until Generation Started	No	No	With Generation on the GRE 69 kV loop	$4,378,000 (Total cost-$14,993,000)
Tower Project	Yes	Yes	Yes	Yes	$12,193,000

10.0 DESCRIPTION OF TRANSMISSION ALTERNATIVE

10.1 Description of the Alternative

10.1.1 Probable Location of Alternative

The transmission line study corridor for this project is 6000 feet wide and is sufficiently expansive to include options for development of alternative routes. Routes, the more specific location for alternative pathways between two transmission line endpoints, would be further explored in the Route Permit regulatory phase, provided the Project is certified by the Commission. Several transmission line design alternatives are fully developed in Section 9.0. These transmission line design alternatives do include various endpoints and therefore are "Transmission Alternatives." Beyond the "Transmission Alternatives" explored in Section 9.0 and the expansive Project corridor, there no other feasible transmission alternatives that merit investigation.

10.1.2 Summary of Public, Tribal and Governmental Input on Alternative

Input received from the public, tribal and government agencies regarding the Project corridor was discussed in Section 5.1.

10.2 Analysis/Mitigation of Economic, Environmental and Social Consequences

The Project corridor described in Section 5.0 includes any transmission alternatives that are under consideration. These alternatives would be located in similar settings and would have similar environmental consequences and mitigation measures as described previously n the following sections:

- Physiographic Setting – Section 5.3
- Human Settlement - Section 5.4
- Socioeconomic Setting – Section 5.5
- Noise, Radio and Television Interference – Section 5.6
- Electric/Magnetic Fields – Section 5.7
- Land Use – Section 5.8
- Cultural Resources – Section 5.9
- Hydrologic Features – Section 5.10
- Flora and Fauna – Section 5.11

10.3 Cost and Efficiency Analysis of Transmission Alternative

The costs for all Project alternatives are discussed generally in Section 9.0 and a specific cost comparison is provided in Table 9-1.

Other information regarding costs was discussed in previous sections as follows:

- Construction Costs/Cost Analysis Assumptions – Section 4.1
- Annual Operational and Maintenance Costs – Section 4.2
- Service Life and Depreciation – Section 4.3
- Effects on Rates – Section 4.4

10.3.1 Effect of Transmission Alternative on Service Reliability

See Section 9.0, Alternatives to the Project.

10.4 Required Permits/Approvals

Permits and other approvals required would be the same as discussed in Section 3.5.

11.0 SUMMARY

11.1 Satisfaction of Statutory Criteria

As discussed below, all Minn. Stat. 216B.243 factors are covered by the analysis provided in this Application. Minn. Rules pt. 7848.1400, subp. 2(v). Minn. Stat. Sec. 216B.243 specifies the procedures and content required for the issuance of a Certificate of Need for a large energy facility such as the 115 kV transmission Project proposed by MP and GRE. Subdivision 3 requires that the Applicants justify the need for the Project, generally, and show specifically that the demand giving rise to the need for the Project cannot be met more cost effectively through conservation and load-management measures.

The initial threshold (conservation/DSM measures cannot cost effectively satisfy demand) is discussed primarily in Sections 2.0, 7.0, and 8.0 of this Application. The Applicants have emphasized that population and development growth is fueling the increased demand, not increased usage by individual customers. MP and GRE have also established that the increase in demand is of such a magnitude that no reasonable application of conservation/DSM measures can offset the increase. Given these circumstances, the Applicants focused the rest of the Application on determining the best means of satisfying the projected increase in demand.

Once the above threshold of need is passed, Minn. Stat. Sec. 216.243 (Subd.3) requires that the Commission evaluate the following in assessing need:

The accuracy of the long-range energy demand forecasts on which the necessity for the facility is based.

The Applicant's forecasting processes are discussed in Section 7.0. The Applicants are aware of nothing that would cause the present forecasts to be less accurate than previous forecasts.

The effect of existing or possible energy conservation programs under sections 216C.05 to 216C.30 and this section or other federal or state legislation on long-term energy demand.

With the exception of the conservation and load reduction programs discussed primarily in Sections 7.0 and 8.0 of this Application, there are no existing or proposed state or federal programs that would require evaluation by the Commission in its determination of need for the Project.

The relationship of the proposed facility to overall state energy needs, as described in the most recent state energy policy and conservation report prepared under section 216C.18.

The most recent state energy policy and conservation report does not directly discuss the Project, as the report focuses primarily on statewide energy needs and policies. The goal of the report, however, is to help assure that through conservation, rate structures, and prudent construction, there is adequate generating and transmission capacity to meet the state's foreseeable needs for energy. The Project is fully consistent with that goal.

Promotional activities that may have given rise to the demand for this facility.

In Sections 2.4 to 2.6, the Applicants show that population and development growth in the Project is causing the increase in demand, not promotional activities.

Benefits of this facility, including its uses to protect or enhance environmental quality, and to increase reliability of energy supply in Minnesota and the region.

The advantages and disadvantages of the various options considered for satisfying the projected demand are discussed in Section 9.0. The Applicants believe the 115 kV Project can be constructed with minimal environmental impact. MP and GRE also submit that it is the most reliable option and the only option contributing to overall reliability of the regional electric system.

Possible alternatives for satisfying the energy demand or transmission needs including but not limited to potential for increased efficiency and upgrading of existing energy generation and transmission facilities, load-management programs, and distributed generation.

The Applicants reviewed various alternatives for satisfying the projected increase in demand (see Section 9.0), including transmission (upgrading/rebuilding existing facilities) and generation and distributed generation (in compliance with recently enacted Minn. Stat. Sec. 216B.2426) options. Energy efficiency and load management programs were discussed in Section 8.0, but it is apparent that these measures cannot sufficiently reduce demand to the point where new transmission or distributed generation is not required. As discussed in more detail in Sections 2.0, 4.0, and 9.0, the proposed 115 kV line is the most efficient and least-cost alternative for providing the needed capacity.

The policies, rules and regulations of other state and federal agencies and local governments.

Throughout this Application, MP and GRE have referred to various rules, regulations and policies affecting all or parts of the Project (for example, local government permits).

In all cases, the Project could comply with the applicable requirements and the Applicants have stated that they are not aware of any other regulatory requirements with which they would be unable to comply. In addition, as required under recently enacted Minn. Stat. Sec. 216B.253, subd. 7(b), MP and GRE will notify the Commissioner of Agriculture if the Project will impact cultivated agricultural land, as that term is defined in Minn. Stat. Sec. 116I.01, subd. 4.

Any feasible combination of energy conservation improvements required under section 216B.241, that can (i) replace all or part of the energy to be provided by the proposed facility, and (ii) compete with it economically.

Minn. Stat. Sec. 216B.241 sets out levels of investment that utilities such as MP and GRE must make for energy conservation improvements. Programs considered by the Applicants are reviewed in Section 8.0. Energy conservation improvements could satisfy some of the forecasted demand. However, the potential energy savings from these programs are far less than the forecasted increase in demand, and relying on conservation and load reduction programs would not prevent future line and transmission outages. Therefore additional transmission or distributed generation is required even under the best-case scenario of conservation and DSM measures

11.2 Satisfaction of 7848 Criteria

MP and GRE have responded in this Application to all of the criteria set forth in Minn. Rules Chapter 7848. The completeness checklist included in Section 1.0 (Table 1-1) provides references to those portions of the Application that address each of the requirements of Chapter 7848.

11.3 Closing Summary

MP and GRE have been evaluating and addressing voltage support and line capacity issues in the Project area over the last decade. The inadequacies in the region were discussed during the 2003, 2004, and 2005 State Transmission Plan meetings, and in the *2003 Biennial Report*.

Continuing economic growth in the Project area has caused a considerable increase in electrical use in the region. The addition of new electrical services and the increase in demand from existing services are causing electricity delivery concerns in this area. The existing electrical system, consisting of transmission lines and substations, is approaching its physical limit. Loss of a facility may result in potential long-term outages. This situation has become a concern for summer and winter peak periods, and with continued growth, the number of critical hours during the year will continue to increase.

The North American Electric Reliability Council, which develops standards for implementing secure and safe electrical delivery, mandates that certain levels of service be maintained to insure that the transmission grid operates efficiently and reliably. In severe cases the transmission grid could collapse, which could result in regional blackouts. Electric utilities must maintain power quality at a level that prevents damage to all customers' electrical loads. Based on these mandates, transmission improvements are necessary for this region.

MP and GRE are responsible for meeting these mandates by constructing, operating and maintaining a reliable transmission system in northeastern Minnesota.

MP and GRE have clearly established that the future electric demand in the Project area will greatly exceed the capacity of its existing facilities to deliver the necessary load. The Applicants have also established that, for this area, enhanced transmission facilities are the preferred method for meeting the anticipated increase in demand. Generation alternatives were rejected due to operating issues and high operating costs. Finally, among the transmission options, MP and GRE have established that the 115 kV Project is superior in all respects, including system capacity and reliability, economics, and minimization of losses and environmental impact.

12.0 REFERENCES

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Service. In cooperation with the National and Regional Interagency Review Panels. Washington, D.C.

U.S. Fish and Wildlife Service National Wetlands Inventory Map, Tower Minnesota Quadrangle, 1979. (From 1980 aerial photographs.) Scale: 1" = 2,000'.

U.S. Fish and Wildlife Service National Wetlands Inventory Map, Embarrass Minnesota Quadrangle, 1983. (From 1980 aerial photographs.) Scale: 1" = 2,000'
Wetland Bank List, 2005.
http://www.bwsr.state.mn.us/wetlands/wetlandbanking/index.html. Minnesota Board of Water and Soil Resources (BWSR).

APPENDIX A

AGENCY CORRESPONDENCE

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

Region II Headquarters
1201 East Highway 2
Grand Rapids, Minnesota 55744

June 24, 2005

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, MN 55330

Dear Ms. Schmidt:

Thank you for contacting the Minnesota Department of Natural Resources (DNR) on June 1, 2005 concerning the **Tower 115 kV Transmission Line Project** being considered in St. Louis County. Your letter indicated that Great River Energy & Minnesota Power will be seeking certification for this project and that you are currently gathering data to be used in preparation for several applications and approvals.

This is a reply to your inquiry about permits needed to cross state land. A "License for Utility to Cross State Land" is required for any state land administered by DNR anticipated to be crossed by this transmission line. A separate "License for Utility to Cross Public Waters" is required if public waters are crossed by this project. A separate water crossing license would probably be issued for all the water crossings related to the project. Both the land and water crossing licenses would be subject to Department review and approval. Utility licenses will be not issued until after environmental review is completed.

Future questions regarding land and water license applications can be directed me at 218-999-7894. Prior to submitting your license applications, please contact me to review the license application process.

Please note that your letter has been forwarded to Tom Balcom and Matt Langan of the Environmental Review section in the Department. Future questions about environmental concerns related to your proposal can be directed to Matt Langan at 651-297-3359.

Sincerely,

Joe Rokala
Northeast Lands & Minerals Regional Supervisor

Cc: Alan Jones, Forestry – St. Paul
Mike Magnuson, Forestry - Tower
Paul Peterson, Forestry – Grand Rapids
Greg Kvale, Forestry - Brainerd
Matt Langan, Ecological Services – St. Paul

Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Traditio	Context	Reports	NR	CEF	DOE
County:	**Saint Louis**													
21SL0007	Old Indian Cemetery	62	15	31	NW-SW	0	1	EW	W-1					
21SLal	Height of Land Portage	59	15	7	NE-SW-NW,SW,NE -SE	0	1	TR			SL-03-04			
	Height of Land Portage	59	15	7	C,NW-SE,NE	0	1	TR			SL-03-04			
21SLpo	Rivers	61	15	8	ON RR	0		HD						
21SLpp	West Two Rivers	61	15	8		0		HD						

History/Architecture

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY	**Saint Louis**										
CITY/TOWNSHIP:	**Embarrass Twp.**										
bridge	Co. Hwy. 303 over Lehtein River	60	15	17	SW-SE-SW	Biwabik NE	SL-88-2H				SL-EMB-001
August Nikunen Barn	off Co. Rd. 390	60	15	5	SW-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-043
August Nikunen Root Cellar		60	15	5	SW-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-044
August Nikunen Root Garage		60	15	5	SW-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-045
Charles Johnson Building	off Co. Rd. 364	60	15	8	SE-NE-NE	Biwabik NE	SL-88-1H				SL-EMB-046
Charles Johnson Building		60	15	8	SE-NE-NE	Biwabik NE	SL-88-1H				SL-EMB-047
Charles Johnson Building		60	15	8	SE-NE-NE	Embarrass	SL-88-1H				SL-EMB-048
Charles Johnson Building		60	15	8	SE-NE-NE	Embarrass	SL-88-1H				SL-EMB-049
Nels Johnson Log Building		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-085
Nels Johnson Log Shed		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-086
Nels Johnson House		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-087
Nels Johnson Barn		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-088
Nels Johnson Building		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-089
Nels Johnson Building		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-090
Nels Johnson Building		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-091
Nels Johnson Summer Kitchen		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-092
Nels Johnson Well		60	15	17	SE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-093
Jacob Pesola Farm Log Building	off Co. Rd. 303	60	15	19	SW-NW-NW	Biwabik NE	SL-88-1H				SL-EMB-094
G.A. Paivarinta House (moved)		60	15	19	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-095
sauna .		60	15	19	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-096
building		60	15	19	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-097
building		60	15	19	NW-NW-NE	Embarrass	SL-88-1H				SL-EMB-098

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY	**Saint Louis**										
CITY/TOWNSHIP:	**Embarrass Twp.**										
building	off Co. Rd. 303	60	15	19	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-099
building		60	15	19	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-100
log building		60	15	20	NW-NW-N	Biwabik NE	SL-88-1H				SL-EMB-101
building		60	15	20	NW-NW-N	Biwabik NE	SL-88-1H				SL-EMB-102
log sauna		60	15	21	SE-SE-NE	Embarrass	SL-88-1H				SL-EMB-103
house		60	15	21	SE-SE-NE	Embarrass	SL-88-1H				SL-EMB-104
Aili Parvianen Sauna	off Co. Rd. 362	60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-130
Aili Parvianen Farmhouse		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-131
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-132
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-133
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-134
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-135
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-136
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-137
Aili Parvianen Farm Building		60	15	32	NW-NW-NE	Biwabik NE	SL-88-1H				SL-EMB-138
Henry Petrell Barn	off Co. Rd. 558	60	15	32	NE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-139
Henry Petrell House		60	15	32	NE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-140
Henry Petrell Log Shed		60	15	32	NE-NW-SE	Biwabik NE	SL-88-1H				SL-EMB-141
Height of Land Portage	off Co. Rd. 138	60	15	31	SW	Biwabik		Y			SL-EMB-160
CITY/TOWNSHIP:	**Kugler Twp.**										
house	SW corner Co. Hwy. 135 & Co. Hwy. 411	61	15	17	NW	Tower	SL-88-2H				SL-KUG-001
shed		61	15	17	NW	Tower	SL-88-2H				SL-KUG-002
shed		61	15	17	NW	Tower	SL-88-2H				SL-KUG-003

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY	**Saint Louis**										
CITY/TOWNSHIP:	**Kugler Twp.**										
garage	SW corner Co. Hwy. 135 & Co. Hwy. 411	61	15	17	NW	Tower	SL-88-2H				SL-KUG-004
Kugler Town Hall	off Co. Hwy. 135	61	15	17	SW-NE-NW	Tower	SL-88-2H				SL-KUG-005

RECEIVED SEP 16 2005

Minnesota Power
30 West Superior Street
Duluth, Minnesota 55802
Utility Contact: Eric Olson
Email Address: eolson@allete.com
Phone: 218-723-3947
www.mnpower.com

Great River Energy
17845 East Highway 10
P.O. Box 800
Elk River, Minnesota 55330-0800
Utility Contact: Kandace Olsen
Email Address: kolsen@grenergy.com
Phone: 763-241-2293
www.greatriverenergy.com

The Lac Vieux Desert Band of Lake Superior Chippewa Indians have no interest in

Project #: St. Louis County

giiwegiizhigookway Martin/THPO/NAGPRA

9/12/2005

Date

BOIS FORTE
Reservation Tribal Council
5344 Lakeshore Dr. • Box 16 • Nett Lake, MN 55772 • 218-757-3261 • FAX 218-757-3312

September 15, 2005

RECEIVED SEP 19 2005

Carol L. Schmidt
Great River Energy
17845 E. Highway 10
P.O. Box 800
Elk River, MN 55330

RE: Tower 115 kV Transmission Projects

Dear Ms. Schmidt;

This letter is in response to notification of the proposed Tower 115kV Transmission Project in St. Louis County, Minnesota. The Bois Forte Band appreciates the opportunity to comment on this project.

The Bois Forte Band is unaware of any cultural resources within the proposed right-of-way. The area through which the proposed trail is routed was inhabited by members of the Bois Forte Band prior to Euro-American settlement. Band members continued to use the area for hunting, gathering plants, sugaring and fishing sporadically through the latter half of the 19th century. Therefore, the proposed Transmission project has the potential to impact cultural resources affiliated with the Bois Forte Band and an archaeological inventory is recommended within the right-of-way.

Again, thank you for the opportunity to comment on this project. Should you have any questions, please do not hesitate to contact me at 218-753-6017 or rozeberens@yahoo.com.

Sincerely;

Rosemary Berens

Rosemary Berens
Tribal Historic Preservation Officer

cc Barbara Brodeen
Bill Latady

Leech Lake Band of Ojibwe

George Goggleye, Chairman
Arthur "Archie" LaRose, Secretary/Treasurer

District I Representative
Burton "Luke" Wilson

District II Representative
Lyman L. Losh

District III Representative
Donald "Mick" Finn

September 12, 2005

RECEIVED SEP 19 2005

Great River Energy
Attn: Carole Schmidt
17845 E. Highway 10
P. O. Box 800
Elk River, MN 55330

RE: **Proposed Tower 115 kV Transmission Project**
St. Louis County, Minnesota
LL-THPO Number: 05-199-NCRI

Dear Ms. Schmidt:

Thank you for the opportunity to comment on the above-referenced project. It has been reviewed pursuant to the responsibilities given the Tribal Historic Preservation Officer by the National Historic Preservation Act of 1966, as amended in 1992 and the Procedures of the Advisory Council on Historic Preservation (38CFR800).

I have reviewed the documentation; after careful consideration of our records, I have determined that the Leech Lake Band of Ojibwe does not have any concerns regarding sites of religious or cultural importance in this area.

Should any human remains or suspected human remains be encountered, all work shall cease and the following personnel should be notified immediately in this order: County Sheriff's Office and Office of the State Archaeologist.

You may contact me at (218) 335-2940 if you have questions regarding our review of this project. Please refer to the LL-THPO Number as stated above in all correspondence with this project.

Respectfully submitted,

Gina M. Papasodora
Tribal Historic Preservation Officer

Leech Lake Tribal Historic Preservation Office * *Established in 1996*
6530 U.S. 2 NW * Cass Lake, Minnesota 56633
(218) 335-2940 * FAX (218) 335-2974
llthpo@hotmail.com

KEWEENAW BAY INDIAN COMMUNITY

Keweenaw Bay Tribal Center
107 Beartown Road
Baraga, Michigan 49908
Phone (906) 353-6623
Fax (906) 353-7540

2005 TRIBAL COUNCIL

SUSAN J. LAFERNIER, President
WARREN C. SWARTZ, JR., Vice-President
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TONI J. MINTON
SHAWANUNG

September 6, 2005

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

Re: Tower 115kV Transmission Project

Dear Ms. Schmidt:

The Keweenaw Bay Indian Community (KBIC) received your requests for comments or interest on the above-mentioned projects. KBIC has no interests documented at this time in the proposed project areas. If the scope of work changes in any way or if artifacts or human remains are discovered, please notify KBIC immediately so we can assist in making an appropriate determination.

Please forward a copy of any request for future opportunities to review and comment to Summer Sky Cohen, Coordinator, Tribal Historic Preservation Office, at the address listed below. Please keep us informed of future projects as KBIC plans to increase our efforts to identify and document sites in the area.

Thank you for this opportunity to review and comment.

Respectfully,

Summer Cohen

Summer Sky Cohen, Officer
Tribal Historic Preservation Office
Keweenaw Bay Indian Community
107 Beartown Road
Baraga, Michigan 49908
906.353.6272
906.353.6869 fax

RECEIVED AUG 2 5 2005

Flandreau Santee Sioux Tribe

P.O. Box 283 Flandreau, SD 57028

Ph. 605-997-3891
Fax 605-997-3878

Date: August 23, 2005

To: Minnesota Power

From: Cultural Preservation Officers-Flandreau Santee Sioux Tribe

RE: Tower 115 kV Transmission Project

No objections, however, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify the appropriate persons from our Tribe. Sam Allen and Ray Redwing of our staff are our Cultural Preservation Officers, and NAGPRA Representatives. They can be contacted at the above address and phone number. Thank you.

Signature: Sam Allen Date: Aug 22, 2005

Sam Allen-Cultural Preservation Officer-Flandreau Santee Sioux Tribe

Sisseton-Wahpeton Oyate

LAKE TRAVERSE RESERVATION
P.O. Box 509
100 Veterans Memorial Drive
Agency Village, South Dakota 57262-0509
Phone: (605) 698-3911

September 16, 2005

Carole L. Schmidt
Great River Energy
Environmental Scientist

Dear Carole,

Thank you for the opportunity to comment on the proposed new transmission line in St. Louis County. At this time in the planning process the Sisseton Wahpeton Sioux Tribe has no objections or concerns as to the location of the proposed project.

However we would like to be involved in discussions pertaining to specific locations for the transmission facility and lines as such activities may have the potential to affect historical or cultural sites within the project area.

Thank you again and we look forward to working with you in the future.

Sincerely,

Franky Jackson

Franky Jackson
Tribal Historic Preservation Officer
Sisseton-Wahpeton Oyate
Agency Village, SD 57262
605-698-4972

giiwegiizhigookway Martin/THPO/NAGPRA
Lac Vieux Desert Band
P.O. Box 249
Watersmeet, MI 49969

RECEIVED AUG 3 0 2005

GREAT RIVER ENERGY®
A Touchstone Energy® Cooperative

minnesota power
AN ALLETE COMPANY

Date 8/25/05
giiwegiizhigookway Martin/THPO/NAGPRA
Project #: Tower 115kV-
The Lac Vieux Desert Band of Lake Superior Chippewa Indians have no interest in

17 August 2005

Mr. James Williams , Jr., Chairperson
Lac Vieux Desert Band of Lake Superior
Chippewa Indians
P.O. Box 249, Choate Road
Watersmeet, MI 49969

RE: Tower 115 kV Transmission Project

Dear Mr. Williams:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to assist in obtaining the necessary approvals and permits for the proposed Tower 115 kV Transmission Project in St. Louis County, Minnesota. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

The proposed project would consist of a new 115 kV transmission line that would connect a new 115/46 kV substation near Tower and a new 115 kV switching station near Embarrass (see attached map). At this point Minnesota Power and Great River Energy have not identified a route for the project, but are evaluating transmission alternatives within identified study corridors. Potentially affected sections within the proposed study corridors are provided below.

County	Township Name	Township	Range	Sections
St Louis	White (NE)	59N	15W	5-7
St Louis	Embarrass	60N	15W	5-8,16-21, 28-32
St. Louis	Kugler	61N	15W	4,5,8,9,16-18,19,20, 29-32
St. Louis	Breitung	62N	15W	31,33

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1 June 2005

Mr. Robert Whiting, Branch Chief
St. Paul District
190 Fifth Street East
St. Paul, MN 55101-1638

RE: Tower 115 kV Transmission Project

Dear Mr. Whiting:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to be used in preparation of several regulatory applications necessary to obtain approvals and permits for the construction of the proposed Tower 115 kV Transmission Project in St. Louis County. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

The proposed project would consist of a new 115 kV transmission line that would connect a new 115/46 kV substation near Tower and a new 115 kV switching station near Embarrass (see attached map). At this point Minnesota Power and Great River Energy have not identified a route for the project, but are evaluating transmission alternatives within identified study corridors. Potentially affected sections within the proposed study corridors are provided below.

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St. Louis	Kugler	61N	15W	4,5,8,9,16-18,19,20, 29-32
St. Louis	Breitung	62N	15W	31,33

MP and GRE request that the Corps comment on the possible effects of the proposed project on floodplains, wetlands, and other important natural resources that occur in the proposed study area. This request is made pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Your input on the project will assist MP, GRE, our environmental consultant (SEH) and the Commission in their review of the project.

We would appreciate a response to this request by Friday, July 1, 2005. Written responses may be directed to:

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

We will be seeking ongoing feedback from you and your agency as this project proceeds through review and permitting. If you require further information or have questions regarding this matter, please feel free to call us at the numbers provided below. Thank you for your attention to this important project.

Sincerely,

GREAT RIVER ENERGY

Carole L. Schmidt

Carole L. Schmidt
Environmental Scientist
763-241-2272

MINNESOTA POWER

Robert E. Lindholm

Robert E. Lindholm
Manager, Environmental Services
218-722-5642, ext. 3342

Attachment: Project Location Map

cc: Kelly Bettendorf, SEH
Larry Bubacz – Minnesota Power
Blake Francis – Minnesota Power

h:\cschmidt\Tower-Embarrass\TowerCOEltr

GREAT RIVER ENERGY®
A Touchstone Energy® Cooperative

minnesota power
AN ALLETE COMPANY

1 June 2005

Mr. Alan Jones
Minnesota Department of Natural Resources
State Forest Management
500 Lafayette Road
St. Paul, MN 55155-4044

RE: Tower 115 kV Transmission Project

Dear Mr. Jones:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to be used in preparation of several regulatory applications necessary to obtain approvals and permits for the construction of the proposed Tower 115 kV Transmission Project in St. Louis County. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

The proposed project would consist of a new 115 kV transmission line that would connect a new 115/46 kV substation near Tower and a new 115 kV switching station near Embarrass (see attached map). At this point Minnesota Power and Great River Energy have not identified a route for the project, but are evaluating transmission alternatives within identified study corridors. Potentially affected sections within the proposed study corridors are provided below.

County	Township Name	Township	Range	Sections
St Louis	White (NE)	59N	15W	5-7
St Louis	Embarrass	60N	15W	5-8,16-21, 28-32
St. Louis	Kugler	61N	15W	4,5,8,9,16-18,19,20, 29-32
St. Louis	Breitung	62N	15W	31,33

MP and GRE request that the Minnesota DNR provide information on any permits that the proposed 115 kV transmission project would require to cross a state forest and also identify potential impacts from the project that the DNR would consider when reviewing the proposed project. Your input on the project will assist MP, GRE, our environmental consultant (SEH) and the Commission in their review of the project

We would appreciate a response to this request by Friday, July 1, 2005. Written responses may be directed to:

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

We will be seeking ongoing feedback from you and your agency as this project proceeds through review and permitting. If you require further information or have questions regarding this matter, please feel free to call us at the numbers provided below. Thank you for your attention to this important project.

Sincerely,

GREAT RIVER ENERGY

Carole L. Schmidt

Carole L. Schmidt
Environmental Scientist
763-241-2272

MINNESOTA POWER

Robert E. Lindholm

Robert E. Lindholm
Manager, Environmental Services
218-722-5642, ext. 3342

Attachment: Project Location Map

cc: Kelly Bettendorf, SEH
Larry Bubacz – Minnesota Power
Blake Francis – Minnesota Power

h:\cschmidt\Tower-Embarrass\TowerDNRforltr

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1 June 2005

Ms. Sarah Hoffmann
Minnesota Department of Natural Resources
Natural Heritage and Nongame Research Program
500 Lafayette Road, Box 25
St. Paul, MN 55155

RE: Tower 115 kV Transmission Project

Dear Ms. Hoffmann:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to be used in preparation of several regulatory applications necessary to obtain approvals and permits for the construction of the proposed Tower 115 kV Transmission Project in St. Louis County. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

The proposed project would consist of a new 115 kV transmission line that would connect a new 115/46 kV substation near Tower and a new 115 kV switching station near Embarrass (see attached map). At this point Minnesota Power and Great River Energy have not identified a route for the project, but are evaluating transmission alternatives within identified study corridors. Potentially affected sections within the proposed study corridors are provided below.

County	Township Name	Township	Range	Sections
St Louis	White (NE)	59N	15W	5-7
St Louis	Embarrass	60N	15W	5-8,16-21, 28-32
St. Louis	Kugler	61N	15W	4,5,8,9,16-18,19,20, 29-32
St. Louis	Breitung	62N	15W	31,33

MP and GRE would like the Minnesota DNR to comment on potential effects of the proposed 115 kV transmission project and to identify federally- and state-listed threatened or endangered species and rare natural features. Your input on the project will assist MP, GRE, our environmental consultant (SEH) and the Commission in their review of the project

We would appreciate a response to this request by Friday, July 1, 2005. Written responses may be directed to:

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

We will be seeking ongoing feedback from you and your agency as this project proceeds through review and permitting. If you require further information or have questions regarding this matter, please feel free to call us at the numbers provided below. Thank you for your attention to this important project.

Sincerely,

GREAT RIVER ENERGY

Carole L. Schmidt

Carole L. Schmidt
Environmental Scientist
763-241-2272

MINNESOTA POWER

Robert E. Lindholm

Robert E. Lindholm
Manager, Environmental Services
218-722-5642, ext. 3342

Attachment: Project Location Map

cc: Kelly Bettendorf, SEH
Larry Bubacz – Minnesota Power
Blake Francis – Minnesota Power

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A Touchstone Energy® Cooperative

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1 June 2005

Mr. Dan Stinnett
MN Threatened and Endangered Species Review
U.S. Fish and Wildlife Service
4101 East 80th Street
Bloomington, MN 55425-1665

RE: Tower 115 kV Transmission Project

Dear Mr. Stinnett:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to be used in preparation of several regulatory applications necessary to obtain approvals and permits for the construction of the proposed Tower 115 kV Transmission Project in St. Louis County. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

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St. Louis	Breitung	62N	15W	31,33

MP and GRE request that the U.S. Fish and Wildlife Service comment on potential effects to known federally-listed threatened or endangered species in accordance with Section 7 of the Endangered Species Act of 1973, as amended, for the proposed 115 kV transmission project. Your input on the project will assist MP, GRE, our environmental consultant (SEH) and the Commission in their review of the project.

We would appreciate a response to this request by Friday, July 1, 2005. Written responses may be directed to:

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

We will be seeking ongoing feedback from you and your agency as this project proceeds through review and permitting. If you require further information or have questions regarding this matter, please feel free to call us at the numbers provided below. Thank you for your attention to this important project.

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Blake Francis – Minnesota Power

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GREAT RIVER ENERGY®
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minnesota power
AN ALLETE COMPANY

1 June 2005

Mr. Dennis Gimmestad
Minnesota State Historic Preservation Office
345 Kellogg Boulevard West
St. Paul, MN 55102-1906

RE: Tower 115 kV Transmission Project

Dear Mr. Gimmestad:

Minnesota Power (MP) and Great River Energy (GRE) are currently gathering data to be used in preparation of several regulatory applications necessary to obtain approvals and permits for the construction of the proposed Tower 115 kV Transmission Project in St. Louis County. The project is needed to meet the growing electrical needs of the area. MP and GRE intend to seek certification of the proposed project under the Minnesota Public Utilities Commission's (Commission) biennial transmission planning process outlined in Minnesota Rules, Chapter 7848.

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St. Louis	Kugler	61N	15W	4,5,8,9,16-18,19,20, 29-32
St. Louis	Breitung	62N	15W	31,33

MP and GRE request your review of this project to identify potential impacts to cultural and archaeological resources from the project and any permits that the project might require. At this point it is unknown whether the project will require federal permits or use federal funding. Your input on the project will assist MP, GRE, our environmental consultant (SEH) and the Commission in their review of the project.

We would appreciate a response to this request by Friday, July 1, 2005. Written responses may be directed to:

Carole Schmidt
Great River Energy
17845 E. Highway 10
PO Box 800
Elk River, Minnesota 55330

We will be seeking ongoing feedback from you and your agency as this project proceeds through review and permitting. If you require further information or have questions regarding this matter, please feel free to call us at the numbers provided below. Thank you for your attention to this important project.

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cc: Kelly Bettendorf, SEH
Larry Bubacz – Minnesota Power
Blake Francis – Minnesota Power

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APPENDIX B

EXPECTED MAGNETIC FIELD

APPENDIX B

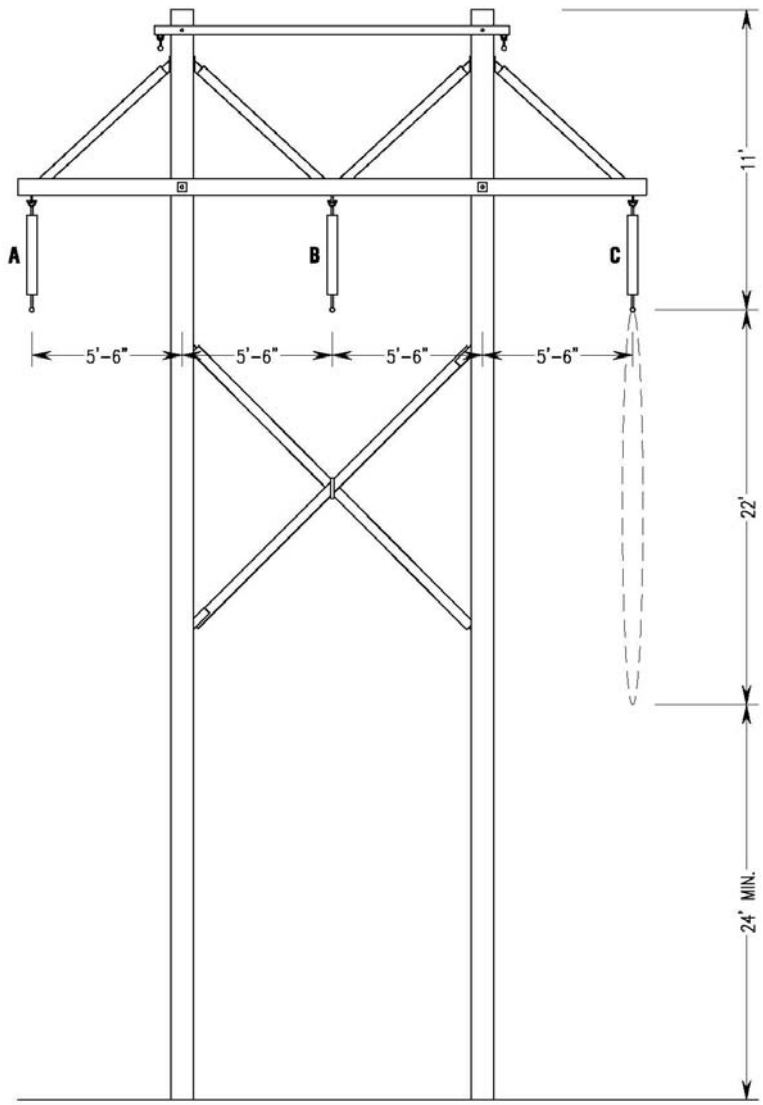
Expected Magnetic Field

The magnetic field was calculated for the two main structures being considered for the Project, a single pole with davit arms and an H-Frame. The structure drawings show the phase arrangements used in the modeling. The calculations were done at two different assumed current carrying capacities; the flow at the conductors' thermal limit and at the flow limited by the Project transformer capacity, including the proposed future addition of the GRE 115/69 kV transformer at the Tower Substation.

Load flow analysis indicates that actual current flows on the line will be significantly less than the modeled flows. Because the magnetic field produced by the transmission line is dependent on the current flowing on its conductors, the actual magnetic field will be less than shown in the graphs.

Load flow analysis indicated that when the Project is placed in service, expected system intact continuous peak flows on the proposed 115 kV line will be 151 amps (30 MVA) or approximately 32% of the 477 amp limit imposed by the transformer capacity. Likewise, load flow analysis indicates that in 2025, the expected transmission line flows would be 226 amps (45 MVA) or approximately 50% of the flow at the transformers capacity. Because the strength of the magnetic field is directly proportional to the current flow, the actual magnetic field will initially be approximately 32% of the magnetic field depicted in the graph with current flow at the 477 amp limit imposed by the transformer capacity and increase to approximately 50% of the level depicted by 2025.

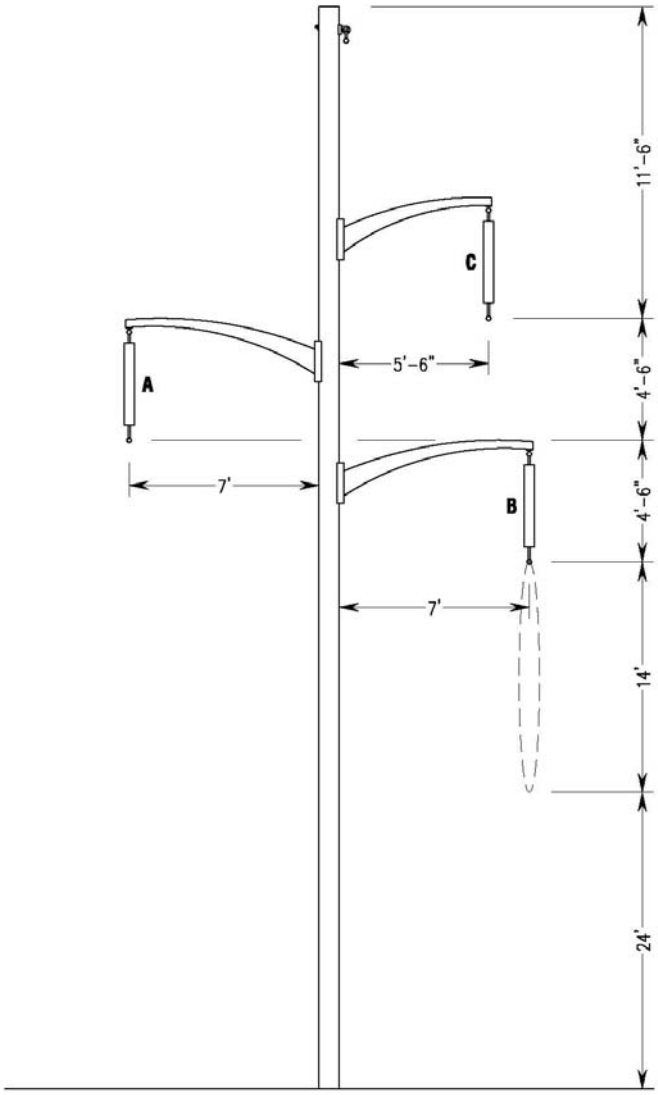
115kV Transmission H-Frame Structure



At Conductor Thermal Limit		At Substation Transformer Capacity*	
– Phase A –		– Phase A –	
Voltage (kV)	Voltage Phase Angle	Voltage (kV)	Voltage Phase Angle
115	0°	115	0°
Current (amps)	Current Angle	Current (amps)	Current Angle
914	0°	477	0°

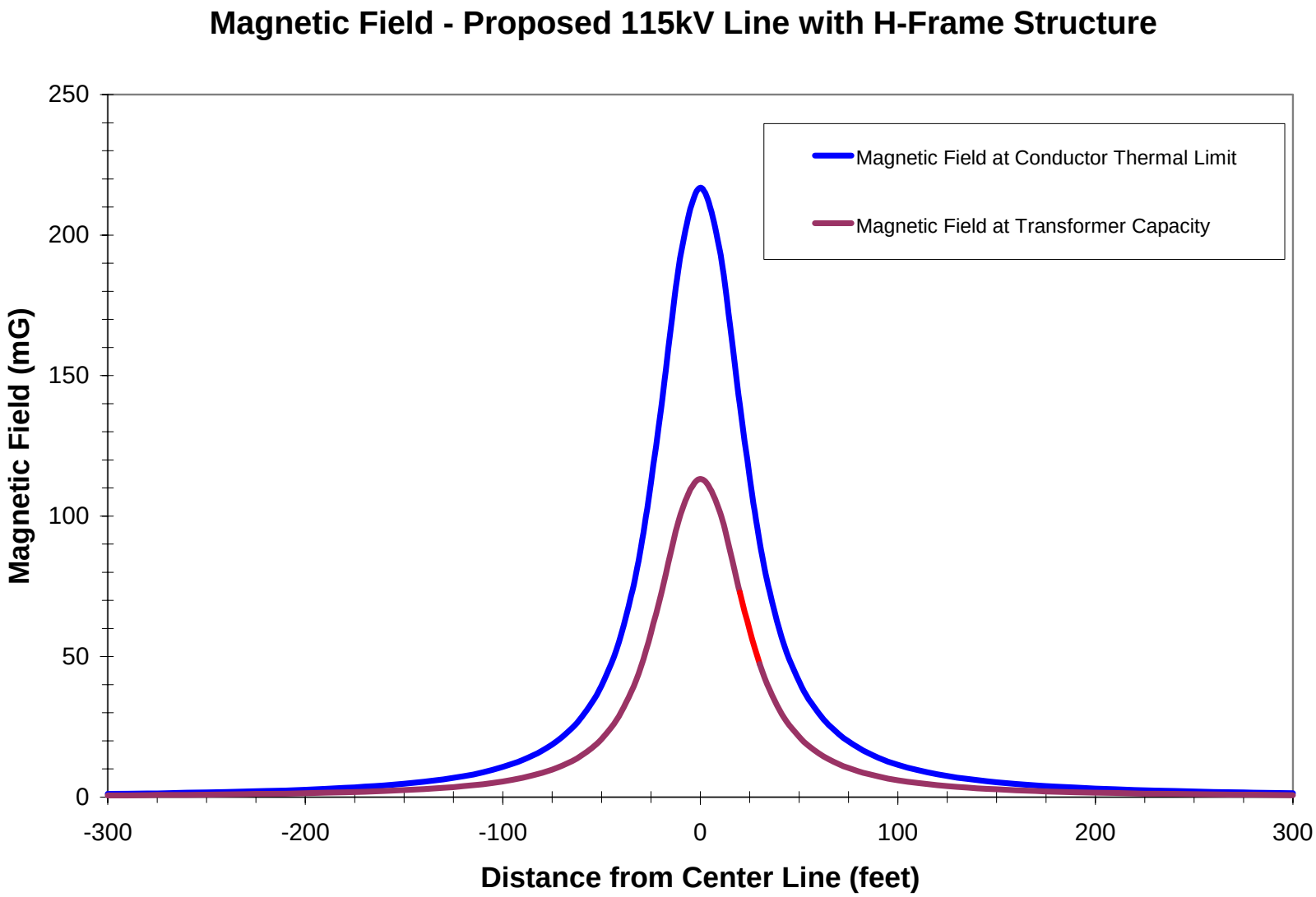
* Includes GRE proposed 115/69kv 60MVA tower transformer

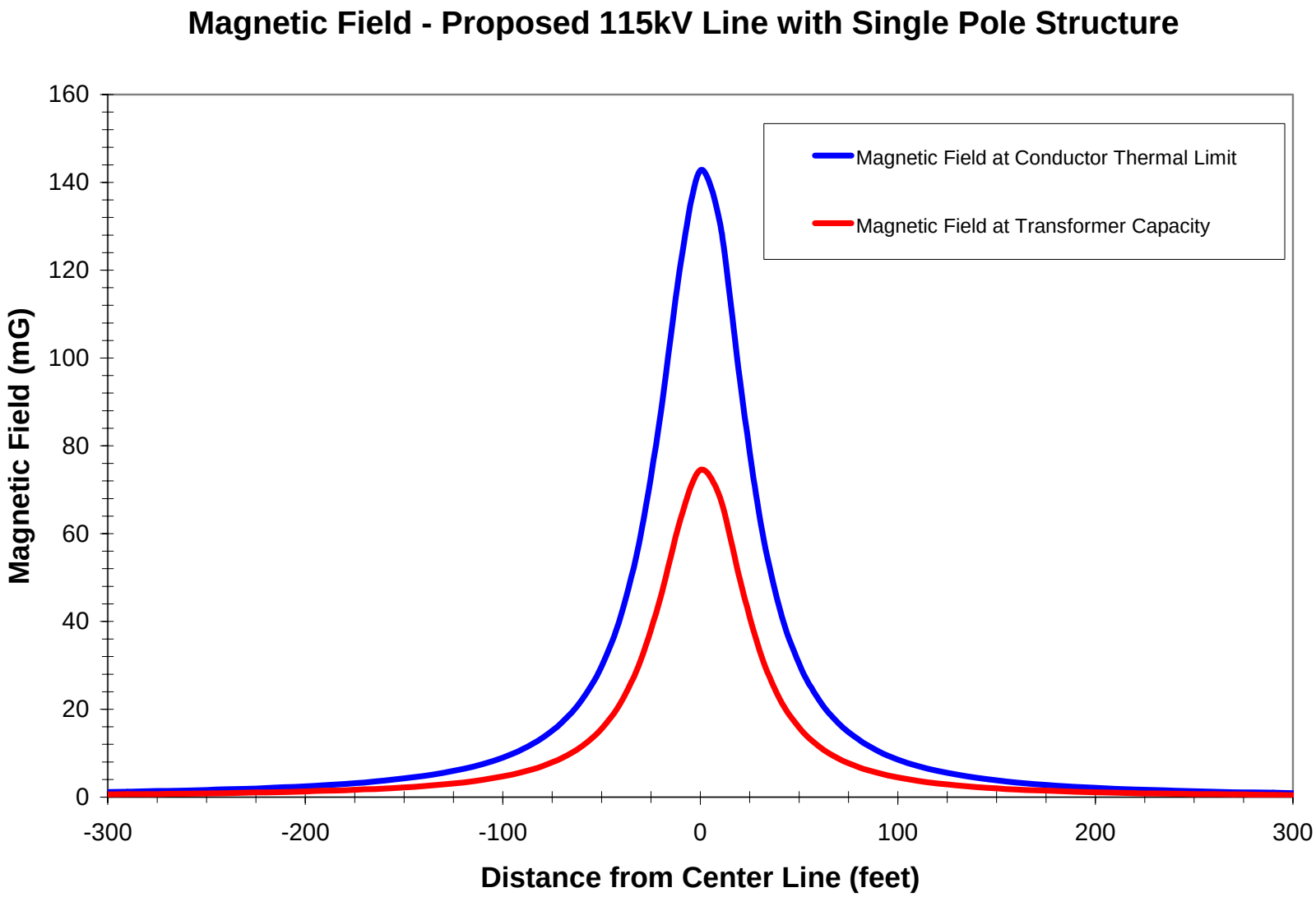
115kV Transmission SPT Structure



At Conductor Thermal Limit		At Substation Transformer Capacity*	
– Phase A –		– Phase A –	
Voltage (kV)	Voltage Phase Angle	Voltage (kV)	Voltage Phase Angle
115	0°	115	0°
Current (amps)	Current Angle	Current (amps)	Current Angle
914	0°	477	0°

* Includes GRE proposed 115/69kv 60MVA tower transformer


Magnetic Field - Proposed 115kV Line with H-Frame Structure
Magnetic Field at Conductor Thermal Limit
Magnetic Field at Transformer Capacity
Magnetic Field (mG)
250
200
150
100
50
0
-300
-200
-100
0
100
200
300
Distance from Center Line (feet)


Magnetic Field - Proposed 115kV Line with Single Pole Structure
Magnetic Field at Conductor Thermal Limit
Magnetic Field at Transformer Capacity
Magnetic Field (mG)
160
140
120
100
80
60
40
20
0
-300
-200
-100
0
100
200
300
Distance from Center Line (feet)

APPENDIX C

GRE 2004 CONSERVATION IMPROVEMENT PROGRAM

Appendix C – Program Descriptions

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RESIDENTIAL - CONSERVATION

AIR CONDITIONER TUNE-UP PROGRAM

Brown County Rural Electric

Description:

Members who tune up their central air conditioner unit are eligible for a $20 rebate on their electric bill. The tune up must be performed by a licensed contractor.

Support:

Brown County Rural Electric provides a $20 rebate to members.

Energy Savings: 180 kWh Demand Savings: 1.0 kW

Elk River Municipal Utilities

Description:

Air conditioners are oftentimes in need of a "tune up" to operate at peak efficiencies. Filters are not changed when necessary, condensing coils and cooling coils get dirty and operate less efficiently, and they may even be operating on low pressures which require longer run time to satisfy the thermostat. Beginning in 2002, ERMU launched an air conditioning tune-up program to encourage customers to keep their air conditioners operating at peak efficiency. Local HVAC contractors perform the following: clean the condenser coil, check Freon level and pressure, check filter, inspect cooling coil and clean if necessary, assure drain line is open, visually inspect the system, and inform/educate the homeowner about the importance of frequent maintenance. Once the tune-up is complete, the homeowner pays the contractor and submits equipment report and receipt to ERMU for up to $65 reimbursement. The goal is to concentrate on low income, but all residential systems at least three years old are eligible. Air conditioning is a critical load to ERMU and its wholesale power supplier's efforts to improve system load factor, reduce peak capacity requirements, improve system efficiencies, and help keep rates low. The goal of this program is to reduce energy consumption of the air conditioner by at least 15 percent.

Support:

ERMU will reimburse homeowner up to $65 to have a certified HVAC contractor provide the AC tune-up. Any expense associated with repair or replacement will be the responsibility of the homeowner. If the homeowner qualifies as low income, loan funds will be made available for repairs with payment included as part of the utility bill at no interest.

Energy Savings: 225 kWh Demand Savings: 0.5

Runestone Electric Association

Description:

Through the member newsletter and bill stuffers Runestone Electric Association (REA) members are encouraged to have an A/C tune-up on their existing and working central air conditioner for a cost that is determined in conjunction with Ellingson Plumbing & Heating (a subsidiary of REA). The member contacts REA and then Ellingson schedules the tune ups. The A/C tune-up includes: clean condenser coil; check Freon levels and pressure, check furnace filter, check furnace belt in lube motor, test all controls, blow out drain line, visual inspection of system and educate homeowner on efficient operation of unit.

Support:

The member has the option of putting the cost of the tune-up on their electrical account in one lump sum or over installments of three monthly payments.

Energy Savings: 100 kWh Demand Savings: 0.3

AIR SOURCE HEAT PUMP (ASHP)

Member Cooperatives

Description:

ASHPs provide summer cooling and spring/fall heating in residential or commercial installations. ASHPs are sized for cooling. In the cooling mode, the ASHP functions as a central air conditioner, and is load managed during the summer per the cycled air conditioning control strategy. The cycling provides approximately 1 kW of demand reduction per ASHP and approximately 75 kWh of energy savings per

summer season. In the heating mode, the ASHP combined with a fossil fuel furnace, provides very efficient space heating down to approximately 15 to 20 degrees Fahrenheit. At these temperatures and below, the ASHP automatically shuts off and the secondary heating system typically a natural gas or liquid propane furnace heats the home. If conditions should require load control, our wholesale electric provider also has the ability to shut off the ASHP during the heating season. ASHPs help the distribution cooperative and our wholesale electric provider improve load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

The potential for energy savings with an air source heat pump is significant in both the summer and winter. GRE and its member cooperative will continue to educate and promote the importance of energy efficiency when selecting an HVAC system. The distribution cooperative provides a rebate to the customer for installing a high-efficient ENERGY STAR® ASHP and provides a reduced energy rate to the customer during the heating season. Beginning in 2004, the SEER rating requirement increased from 12 to 13.

Energy Savings: 2,500 kWh Demand Savings: 1 kW

COMPACT FLUORESCENT LIGHT (CFL) PROGRAM

Member Cooperatives

Description:

Lighting makes up 10 percent of a typical home's electricity consumption; the home light program is an energy conservation program that provides a rebate to encourage the conversion from incandescent lighting to more energy efficient lighting – particularly compact fluorescent lighting. A single CFL can save more than 400 kWh and $60 in energy costs over the bulb's lifetime. Recent advancements in CFL technology provide for more installation opportunities.

Through September, the distribution cooperatives provided a $4 rebate to residential customers that purchase an ENERGY STAR® rated CFL. All 28 member cooperatives participated in the national ENERGY STAR *Change a Light, Change*

the World campaign, from October 1 through November 30, 2003. Cooperative members could purchase up to SIX CFLs for as little as $0.99 per bulb.

Support:

The distribution cooperative continues to educate its customers and builders on Energy Star and the value and benefits of high efficiency lighting through its various media and customer education opportunities.

Energy Savings: 66 kWh Demand Savings: 0.03 kW

Elk River Municipal Utilities

Description:

Compact fluorescent light bulbs save 75 percent on energy and last up to 10 times longer than incandescent bulbs. The problem remains their cost. CFLs cost 10 to 20 times more than an incandescent bulb, so the typical consumer is reluctant to purchase them. Several years ago, they had a high failure rate, so the typical consumer doesn't think CFLs are a good value. Beginning in 2002, ERMU launched an educational campaign to inform the public about improved reliability and to reinforce the value of switching to CFLs. Additionally, it provides incentives ($5 coupon) to entice customers to purchase compact fluorescent lamps to help offset the additional cost of switching to CFLs.

Support:

Three coupons with a value of $5 each are mailed to customers. They can be redeemed for the purchase of up to three compact fluorescent lamps at various Elk River stores. Support materials include featuring CFLs at the Elk River Business Expo, a special mailing including an informational brochure with three coupons, and newspaper ads.

Energy Savings: 66 Demand Savings: 0.03

CONSERVATION LOAN PROGRAM

Member Cooperatives

Description:

The Energy Resources and Conservation (ERC) loan program sponsored by the Rural Utilities Service (RUS) offers the distribution cooperative the ability to assist its customers in the financing of energy efficiency improvements in addition to projects such as high-efficiency air conditioners and off-peak space and water heating systems. The market-rate financing program allows customers to improve energy efficiency and reduce monthly electric energy bills and is available to both residential and commercial customers.

Support:

The ERC loan program provides a finance option to customers wanting to implement energy efficiency improvements. The distribution cooperative provides administrative support for loan processing and administration

Energy Savings: N/A

Demand Savings: N/A

Stearns Electric Association

Description:

Stearns Electric Association sponsors the Stearns zero percent Interest Loan Program, an interest-free loan program to assist its members in financing the purchase of 92 percent efficient Marathon water heaters. The interest-free loan allows members to easily finance the high efficiency water heater purchase with no interest charge and incorporate the payment on the current electric bill.

Support:

Members are offered the payments on current electric bills. Payments are spread over two years, and the member is not charged a set-up fee.

Energy Savings: N/A

Demand Savings: N/A

ELECTRICAL EVALUATION AND CONSULTATION

Member Cooperatives

Description:

The residential electrical evaluation and consultation program is targeted at customers who contact the distribution cooperative and express concern over their electrical usage. When a customer contacts a distribution cooperative representative, the representative reviews general appliance usage and costs with the customer. The review, which generally takes 15 minutes to complete, provides an overview of the customer's energy usage. The representative will also review a variety of means to conserve energy with the customer. If the representative determines that additional actions should be taken, the customer may be scheduled for an on-site audit. The audit will include:

- Energy bill analysis
- Customer education
- Building shell assessment
- Blower door test (in some cases)
- Mechanical and electrical equipment assessment
- Recommendations

Support:

The residential electrical evaluation and consultation program assists customers with energy usage concerns and provides the opportunity to instruct the customer on the benefits of energy conservation, energy efficient appliances, and energy saving new-home construction techniques. This program is also used to help educate builders, subcontractors, and electricians on energy efficient home construction and off-peak equipment installations.

Energy Savings: N/A

Demand Savings: N/A

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ENERGY EDUCATION

Member Cooperatives

Description:

The distribution cooperative assists residential, commercial and industrial customers in the areas of energy reduction methods and techniques, and in the selection of energy efficient technologies or products through a variety of mediums including brochures, bill inserts, radio, newsletters, workshops, fairs, tradeshows, and one-on-one consultation. This general program captures a variety of services that the distribution cooperative provides including:

- Explaining to customers the benefits of purchasing energy efficient appliances including lighting, heating systems, ventilating, and air conditioners.
- Providing answers to customers' electric energy usage questions.
- Educating customers on how appliances, lighting, heating, cooling, and general usage habits affect their energy bill.
- Recommending energy reduction measures.
- Providing simple energy usage calculation tools and energy cost guidelines.

Support:

The distribution cooperative provides a variety of support mechanisms for Energy Education including:

- Energy education brochures
- Appliance energy usage and cost guides
- Energy education workshops

Energy Savings: N/A Demand Savings: N/A

ENERGY STAR® CENTRAL AIR CONDITIONER REBATE PROGRAM

Member Cooperatives

Description:

Residential air conditioning is a critical load to GRE and its member cooperatives' effort to improve system load factor, reduce peak capacity requirements, and improve system efficiencies. The interruptible air conditioning program has greatly helped in these areas; however, not every customer wants their air conditioner to be cycled. The opportunity to improve system efficiencies and to also lower customer's

cooling operating costs is available through the residential high efficiency air conditioner rebate program.

The distribution cooperative provided a $200 customer rebate or installing contractor rebate for air conditioners that have a Seasonal Energy Efficiency Ratio (SEER) of 12 or greater through 2003. This increased efficiency results in energy and demand savings during the critical summer period. Beginning in 2002, GRE provides an additional $50 incentive to the distribution cooperative for each new high-efficiency air conditioner installed with cycling option. This additional rebate can be used by the distribution cooperative to offset the additional cost of installing a load management receiver. Starting in 2004, the distribution cooperatives may offer $300 for each ENERGY STAR qualified air conditioner with a SEER of 13 or greater.

Support:

Distribution cooperative representatives meet with area HVAC dealers to discuss the details and qualifications of the residential high-efficiency air conditioner rebate program. The distribution cooperatives also promote the program through their various media and customer education opportunities, and administrate the verification of installation and distribution of a rebate to the customer or installing contractor.

Energy Savings: 200 kWh

Demand Savings: 1 kW

ENERGY STAR® APPLIANCE REBATE

Member Cooperatives

Description:

In addition to water heating, residential appliances are the largest energy users in a typical home – particularly refrigerators, dishwashers and clothes washers. There is an opportunity to save energy by promoting the use of high efficiency ENERGY STAR appliances. ENERGY STAR has identified dishwashers, refrigerators, and clothes washers as the most promising appliances for electric energy and demand savings. For this reason, GRE and its member cooperatives started a rebate program for ENERGY STAR rated appliances in 2003. This program was closely

monitored and its success ensures that GRE's member cooperatives will continue the program during the next biennial.

Support:

GRE member cooperatives intend to continue educating customers and builders on ENERGY STAR and the value and benefits of high efficiency appliances through its various media and customer education opportunities. The cooperatives will also administrate the verification of installation and the distribution of a rebate to the customer.

Energy Savings:	Clothes Washer	550 kWh	Demand Savings: 0.06 kW
	Dishwashers	145 kWh	
	Refrigerators	56 kWh	

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ENERGY STAR® ROOM AIR CONDITIONER PROGRAM

Member Cooperatives

Description:

Residential air conditioning is a critical load to distribution cooperatives and GRE's effort to improve system load factor, reduce peak capacity requirements, and improve system efficiencies. The opportunity to achieve utility system benefits and lower customers' cooling operating costs is available through the ENERGY STAR Room Air Conditioning Program. Distribution cooperatives provide a rebate when a customer purchases an ENERGY STAR-rated room air conditioner. This increased efficiency results in energy and demand savings during the critical summer period.

Support:

Distribution cooperatives promote the program through various media and customer education opportunities. The room air conditioner must be ENERGY STAR rated to qualify for a rebate. The rebates are available to residential customers only. Requests by multi-unit residential building owners for entire building change out must be administered through the C&I-A Energy Grant program. Energy and demand savings are based on information from the ENERGY STAR website.

Energy Savings: 100 kWh Demand Savings: 0.15 kW

Elk River Municipal Utilities

Description:

Customers who purchase ENERGY STAR rated room air conditioners will receive a rebate from ERMU to help offset the additional cost of purchasing a more energy efficient model. According to EPA, ENERGY STAR rated room air conditioners exceed minimum federal standards for energy consumed by at least 10 percent. Based on customer visits, ERMU believes it to be higher!

Support:

ERMU will rebate $30 for the purchase of an ENERGY STAR rated room air conditioner upon receipt of the ENERGY STAR Form and proof of purchase from customers of ERMU.

Energy Savings: 100 kWh Demand Savings: 0.15kW

ENERGY WISE® HOME BUILDING PROGRAM

Cooperative Light & Power Association

Description:

New home construction program promotes energy-efficient design and construction through above-code performance standards. Homeowners qualify for rebates by meeting or exceeding thermal integrity, ventilation and heating and cooling performance.

Support:

By working with homeowners and builders to meet performance standards. Process includes plan review, two on-site inspections followed by a blower door test. Total rebate of up to $2,500 dependent upon performance.

Energy Savings: N/A Demand Savings: N/A

GROUND SOURCE HEAT PUMP (GSHP) PROGRAM

Member Cooperatives

Description:

GSHPs have proven to be one of the most efficient space conditioning options and the potential for energy savings is significant. Acceptance of this technology continues to grow nationwide. GSHPs use the latent heat in the ground as a heat sink and a heat source. By utilizing a series of vertically or horizontally buried heavy-duty plastic pipes filled with a food-grade antifreeze solution as the heat transfer medium, GSHPs achieve significantly high efficiencies in both the cooling and heating mode. This high efficiency results in reduced kWh usage in the cooling season and can also significantly reduce the total energy used to heat a building when compared to fossil fuel heating systems. To date, Great River Energy through its 28 distribution cooperatives serves hundreds of residential GSHP systems and also is a member of the International Ground Source Heat Pump Association.

Support:

The potential for energy savings with ground source heat pumps is significant in both the summer and winter. GRE and its distribution cooperatives will continue to educate and promote the importance of energy efficiency when selecting a HVAC system for residential homes. GRE will continue as a member of the International Ground Source Heat Pump Association. GSHPs currently qualify for a $300 rebate.

Energy Savings: 14,000 kWh Demand Savings: 10 kW

Elk River Municipal Utilities

Description:

Customers who purchase ground source heat pump systems will receive a rebate from ERMU to help offset the additional cost of space conditioning with the most efficient!

Support:

ERMU will rebate $800 towards the purchase of an ENERGY STAR rated ground source heat pump system in residential applications upon proof of purchase from

customers. Rebates for commercial installations will be considered on a case-by-case basis and will be calculated at $150 per ton if qualified.

Energy Savings: N/A

Demand Savings: N/A

HIGH-EFFICIENCY WATER HEATER REBATE

Member Cooperatives

Description:

A customer who replaces an old inefficient electric water heater with a new high efficiency electric water heater receives a $100 rebate. Minimum acceptable water heater has R16 or greater insulation. Several cooperatives offer rebates including:

- McLeod Cooperative Power Association
- Nobles Cooperative Electric
- Stearns Electric Association

Support:

Water heaters that were replaced had an average efficiency factor of 0.82 or less. Half of the replacement water heaters had energy efficiency factors of 0.94; the other half had energy efficiency factors of 0.91 or more. Average savings is determined using the difference in energy efficiency improvement from 0.82 to 0.92, which is equivalent to a 10.87 percent energy savings on a water heater using 4,800 kWh per year. This savings of 522 kWh is calculated by multiplying 4,800 kWh by 10.87 percent. The consumer receives a $100 rebate after installing the water heater and providing proof of purchase and verification of the water heater's energy rating. The water heater does not have to be on a load management program to receive a rebate.

Energy Savings: 522 kWh

Demand Savings: 0.03 kW

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INTERRUPTIBLE AIR CONDITIONING

Member Cooperatives and ERMU

Description:

The interruptible air conditioning program provides customers with an incentive to allow GRE to cycle (15 minute on, 15 minute off) or fully interrupt their central air conditioner, air source heat pumps and ground source heat pumps during periods of high peak demand during the summer season. The cycling provides approximately 1 kW of demand reduction per participant and approximately 100 kWh of energy savings per summer season. Air conditioning is a critical load to the GRE's and its member cooperatives efforts to improve system load factor, reduce peak capacity requirements and improve system efficiencies. The customer receives a reduced energy rate for air conditioning or a monthly credit on their energy bill during the summer months. Room air conditioners are not allowed unless they are hard-wired.

Support:

Air conditioning represents a very low load factor end use product. Interruptible air conditioning provides a tremendous potential to lower system peak demand and reduce customer energy consumption. The distribution cooperative provides a reduced electric rate or a monthly credit during the summer months. In addition, GRE will provides a $50 rebate to the distribution cooperative to help offset the cost of the load management receiver that must be installed with each interruptible air conditioner.

Energy Savings: 100 kWh Demand Savings: 1 kW

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OFF-PEAK SPACE HEATING - DUAL FUEL SPACE HEATING

Member Cooperatives

Description:

Dual fuel space heating systems are a combination of interruptible electric and non-electric space heating. Conventional electric (generally, baseboard or a plenum heater) is the primary heating system and fuel oil, natural gas, liquid propane, or in some cases wood is the secondary heating system. Both the primary and secondary heating system are sized for the entire heating load of the home. During periods of high electric demand, the interruptible electric heating system is shut off and the secondary heating system heats the home. Single thermostat control is encouraged for the highest level of customer comfort. Wood-fired furnaces and boilers as a

backup are allowed; however, it is highly discouraged because of their non-automatic nature. The dual fuel space-heating program helps the distribution cooperative and GRE improve load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

The distribution cooperative provides off-peak dual fuel sizing support for electrical contractors. The distribution cooperative also provides a reduced electric rate to customers using dual fuel space heating systems.

Energy Savings: 0 kWh Demand Savings: 7.5 kW

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OFF-PEAK WATER HEATING - ELECTRIC THERMAL STORAGE (ETS) AND PEAK SHAVE WATER HEATING (PSWH)

Member Cooperatives and ERMU

Description:

An electric thermal storage (ETS) water heating system has sufficient storage capacity to supply the user's hot water needs over an extended "on-peak" period while the electrical supply is interrupted – typically from 7:00 AM to 11:00 PM each day. The program is targeted at customers who may choose electric water heating and is therefore designed to conserve both energy and capacity. Customers who choose ETS water heating must install a high efficiency water heater.

GRE member cooperatives and ERMU promote the installation of high efficiency off-peak water heaters. The customer typically has an 85-gallon water heater that provides enough hot water to use throughout the day when the electric heating elements are turned off.

Another option available to customers is the Peak Shave Water-Heating (PSWH) program. PSWHs are load managed during peak days that typically occur on the hottest and coldest days of the year. The water heater is shut off during these peak times for up to eight hours a day in some cases.

Water heating is the second largest user of energy in the average home; off-peak water heating programs are an excellent way to manage this end-use appliance and provide GRE and its members a strategy to improve system load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

Many consumers use electricity for water heating. One of the primary reasons is the ease of installation. As the building code continues to require tighter envelopes, we expect to see the demand for electric water heating to increase because of the flexibility that electric water heating offers in new construction. The distribution cooperatives also provide a reduced electric rate to customers using off-peak water heating systems.

Energy Savings: 300 kWh Demand Savings: 1 kW

RESIDENTIAL – LOAD MANAGEMENT

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OFF-PEAK POOL HEATING AND ELECTRIC VEHICLES

Description:

Electrically heated swimming pools or electric vehicles such as fork lifts and golf carts that can be heated or charged during the nightly 8-hour Electric Thermal Storage charge time are eligible for a reduced electric rate from the distribution cooperative. The pool heater or electric vehicle must be metered as an ETS load and energized only during the nightly eight-hour ETS charge time. Both indoor and outdoor pools qualify with the recommendation that an insulated pool cover be used. Spas and hot tubs do not qualify. The electric vehicle must be able to operate "around-the-clock" from the nightly eight-hour ETS charge.

Support:

The distribution cooperative provides support for pool heater sizing and also helps electric contractors with feeder sizing for electric vehicle recharging systems.

Because both the pool heater and the electric vehicle use the ETS strategy, the distribution cooperative provides a reduced electric rate to customers.

Energy Savings: 0 kWh Demand Savings: Customer specific

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OFF-PEAK SPACE HEATING - ELECTRIC THERMAL STORAGE (ETS)

Member Cooperatives

Description:

An electric thermal storage (ETS) space heating system is capable of providing 100 percent of a home's heating requirement by storing heat produced from electricity during an eight hour off-peak period, which occurs from 11:00 PM to 7:00 AM each day from September through April. The program is targeted at customers who may choose electric space heating and therefore designed to conserve both energy and capacity. A number of storage mediums can be used to store heat during off-peak periods; the most common are water and ceramic. There are three commercially available storage-heating configurations: central, room or dispersed, and slab. Customers receive a low off-peak rate in return for allowing GRE to control their systems each day between 7:00 AM and 11:00 PM. The residential ETS space-heating program helps the distribution cooperative and GRE improved load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

The distribution cooperative provides off-peak ETS sizing support for electrical contractors. GRE also stocks and distributes residential ETS space heating equipment that is made available to HVAC contractors within the service territory. The distribution cooperative also provides a reduced electric rate to customers using ETS space heating systems.

Energy Savings: 0 kWh Demand Savings: 7.5 kW

VOLUNTARY SUMMER LOAD REDUCTION PROGRAM

Member Cooperatives

Description:

Wait 'till 8 is a voluntary program asking members to delay using electric appliances until 8:00 p.m. on peak summer days. This helps GRE's load profile by decreasing the amount of energy used until a time when the load is expected to decrease. Participating cooperatives include:

- Arrowhead Electric Cooperative
- Cooperative Light & Power
- East Central Energy
- Lake Country Power
- Mille Lacs Electric Cooperative

Support:

Cooperatives work with local radio stations to provide public service announcements. They also advertise the program in their newsletters and in mailings to their members.

Energy Savings: N/A Demand Savings: N/A

Elk River Municipal Utilities

Description:

Beginning in 2000, ERMU launched a campaign to encourage customers to reduce electric usage whenever the temperature reached 90 and dew point exceeded 70F. It was called Wait Till Eight. Another summer voluntary load reduction program targeting air conditioners and using the same parameters was called Dial Up Five At Five. Neither program was widely accepted because of the voluntary nature and lack of public awareness. However, public education will continue in an attempt to increase the participation rate.

Support:

A program brochure was mailed to all accounts in 2000, and ads are continually placed in the local newspaper to inform customers of the pressing need to reduce summer peak load. Results as to effectiveness are sketchy at best, but a survey taken in 2003 indicates 67 percent of ERMU's customers have heard of the program and 10 percent have initiated some sort of load reduction at peak times. Mailings will

continue, and ads will be placed in the local newspaper to increase public awareness of the extreme need to reduce use of electricity on peak summer days.

Energy Savings: N/A Demand Savings: N/A

RESIDENTIAL – RENEWABLE

WELLSPRING WIND ENERGY PROGRAM®

Member Cooperatives

GRE resources include 18 megawatts of wind energy, including 6 megawatts from the Chandler Hills Wind Farm along the Buffalo Ridge in southwestern Minnesota. In addition, GRE purchases another 6 megawatts of wind energy from a recently completed project located in Dodge Center, Minnesota, and another 6 megawatts from a wind project in Jackson County, Minnesota. GRE was one of the nation's pioneers in providing a green pricing program. Through the Wellspring Wind Energy® Program, cooperative customers can designate that part or all of their electricity use be generated by the wind.

Support:

Wellspring is sold in 100 kWh blocks. More than 3,600 customers now choose the number of blocks they want to buy, from one block per month up to 100 percent of their electricity usage.

Energy Savings: N/A Demand Savings: N/A

RESIDENTIAL - OTHER

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FLUORESCENT BULB RECYCLING PROGRAM

Member Cooperatives

Description:

GRE and its member cooperatives support the recycling of fluorescent bulbs. The residential fluorescent bulb recycling program is designed to encourage residential customers to recycle fluorescent bulbs safely and properly. Each year, the distribution cooperative mails a sheet of ten $0.50 coupons to its residential customers. Customers can redeem the coupons when recycling fluorescent bulbs at participating area hardware stores. In addition, the distribution cooperative periodically publishes lamp recycling and other environmentally related information in its newsletter. This effort keeps the importance of proper lamp disposal in front of our customers.

Support:

The fluorescent bulb recycling program is in direct response to the statutory goals of M.S. 216B.241, Subdivision 5, which requires distribution cooperatives to encourage the use of energy efficient lighting. The distribution cooperative will continue to educate its customers on the merits of proper fluorescent bulb disposal through its various media and customer education opportunities. The distribution cooperative will also continue to support and administrate the coupon redemption program related to the recycling program.

Energy Savings: N/A Demand Savings: N/A

Goodhue County Cooperative Electric Association

Description:

Goodhue County Cooperative is a drop off point for county wide recycling program. Goodhue County Cooperative houses the bulbs and ballasts until the county picks them up to bring to a qualified recycling center. Each person in the county is eligible for ten free recycled bulbs per year under this program and the county bills participants for extra bulbs.

Support:

Goodhue County Cooperative has an area in their warehouse set aside for the recycling program. The warehouse person is the contact for the county.

Energy Savings: N/A Demand Savings: N/A

TREE SHADING

Elk River Municipal Utilities

Description:

Strategically sited shade trees can reduce residential air conditioning energy use by up to 25 percent. In order to get this message out and encourage customers to consider planting trees to help reduce their cooling bills and utility air conditioning energy and demand, ERMU launched the AC Tree Program in 2003. This program includes the distribution of a limited number of free trees to the people who first respond to and qualify to the program. Because these are large (15 ft.) deciduous trees, they should begin to provide shading benefits in a few short years. The benefit through consumer education increases the value of this program by a factor of many times.

Support:

ERMU will provide a large baled and burlaped tree to 150 qualifying customers who agree to plant it in a location that will help decrease their air conditioning use. Each prospect is screened via a site visit and agrees in writing to plant the tree according to recommendations set forth by the Department of Commerce.

Energy Savings: N/A Demand Savings: N/A

LOW-INCOME AND RENTER PROGRAMS – CONSERVATION

HABITAT FOR HUMANITY

Elk River Municipal Utilities

Description:

Sherburne County Habitat for Humanity is building a home in Elk River in 2004. ERMU will furnish ENERGY STAR appliances, upgraded insulation levels and improved construction techniques which have been shown to increase energy efficiencies.

Support:

ERMU will furnish the following energy conserving devices and upgrades: Heat recovery ventilator, ENERGY STAR appliances, add-on heat pump, DC furnace blower motor upgrade for gas furnace, off-peak water heating, high efficiency windows and door upgrade, insulation upgrade, and CFLs throughout.

Energy Savings: 3,350 Demand Savings: 3.0

LOW-INCOME & RENTER ENERGY EDUCATION

Lake Country Power

Description:

The distribution cooperative assisted the Leech Lake Band of Ojibwa in Cass Lake, Minnesota on April 15, 2003 at their first Energy Assistance & Weatherization Energy Fair coordinated by Chris Bedeau and Sally Morrison of Leech Lake Energy. The energy fair was designed for and attended by low-income residential homeowners and renters that utilize their energy assistance and weatherization programs. Lake Country Power, along with five other energy vendors, spent the day speaking to over 100 individuals who attended the energy fair on "Low Cost/No Cost" ways to save energy, weatherization techniques, vendor billing options, appliance efficiencies, home heating and cooling, and lighting options. Other agencies represented during the day were the Minnesota Department of Commerce, Bi-CAP Agency, Cass County Energy Assistance and Leech Lake Weatherization Program. Lake Country Power donated an "Energy Star" small kitchen appliance for the final drawing and provided Department of Commerce brochures & CD's on energy savings along with specific conservation methods and programs offered by Lake Country Power.

Support:

The distribution cooperative provides a variety of support mechanisms for Energy Education including: energy education brochures; appliance energy usage and cost guides; energy education workshops; in-home energy audits and billing assistance.

Energy Savings: N/A

Demand Savings: N/A

LOW-INCOME AIR CONDITIONER TUNE-UP

Member Cooperatives

Description:

Beginning in 2003, the distribution cooperatives offered an air conditioning tune-up to low-income customers. Some distribution cooperatives operated the program through a local Community Action Program (CAP) agency, others administered the program in-house. The CAP agency can help identify customers who would benefit from this service and also instruct local HVAC service vendors authorized to provide the tune-up under this program. The tune-up service will include:

- Cleaning condenser coil
- Checking freon level and pressures
- Checking indoor filter
- Testing all controls
- Blowing out drain line
- Visual inspection of entire system
- Educating homeowner on operation

Residential air conditioning is a critical load to the distribution cooperative and our wholesale electric provider's effort to improve system load factor, reduce peak capacity requirements, and improve system efficiencies. The low-income air conditioner tune-up program improves the air conditioners efficiency, which in turn lowers the customer's energy bill - according to a local CAP agency; tune-ups will reduce average residential air conditioning energy usage by approximately 10 percentt.

Support:

This program specifically addresses Minnesota Statute 216B.241, Subdivision 2, Part 3, which requires that a portion of the money spent on residential conservation improvement programs is devoted to programs that directly address the needs of low income and renters.

Energy Savings: 100 kWh Demand Savings: 0.3 kW

LOW-INCOME AIR CONDITIONER WITH CYCLING PROGRAM

Stearns Electric Association

Description:

Beginning in 2003, Stearns Electric Association cooperative provides low-income customers in cooperation with local EDA programs, rebates for standard and high efficiency air conditioning. Stearns Electric also provides free equipment for cycling air conditioners during the cooling season and incentives for construction costs. This program helps improve system load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

Cycled central air conditioning provides a tremendous potential to lower system peak demand. Stearns Electric provides a monthly credit during the summer to customers participating in the program.

Energy Savings: 100 kWh Demand Savings: 1 kW

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LOW-INCOME ENERGY AUDIT PROGRAM

BENCO Electric Cooperative

Description:

Through the local Community Action Program (CAP) agency Minnesota Valley Action Council, BENCO Electric Cooperative provides funds for energy audits to help

total energy cost for low-income members. This includes the energy efficient Marathon Water heater program at little or no cost.

Support:

Provide funding to CAP agency.

Energy Savings: N/A

Demand Savings: N/A

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Dakota Electric Association

Description:

Dakota Electric Association started the Residential Electric Conservation Program in 2002 to provide electric conservation materials and services for low-income customers. Potential customers will be identified from CAP Agency programs and referrals from other agencies and Dakota Electric. The overall goal of the project will be to reduce electrical consumption of targeted households in Dakota Electric's service area. See Dakota Electric's 2001 Annual Conservation Report page 40-41 filed November 30, 2001 for more details (Docket No. E111/M-01-1769).

Support:

Minnesota Statute 216B.241, Subdivision 2, Part 3, requires that "a portion of the money spent on residential conservation improvement programs is devoted to programs that directly address the needs of renters and low-income persons..." In addition, the PUC's December 26, 1996 Order in Docket No. E111/M-96-1192 requires that Dakota Electric initiate a program to address the needs of low-income customers.

Energy Savings: N/A

Demand Savings: N/A

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South Central Electric Association

Description:

South Central Electric Association provides energy audits for low-income members through Minnesota Valley Action, its local CAP agency.

Support:

Administrative services and funding for the local CAP agency are provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

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LOW-INCOME PROGRAM

Agralite Electric Cooperative

Description:

Agralite Electric Cooperative helps Prairie Five and West Central Communities action agencies work with low-income families to improve housing and living conditions.

Support:

Twenty-one water heaters were donated to Prairie Five for installation in homes in the area where the water heater had failed. New energy-efficient water heaters were installed by licensed contractors.

Energy Savings: Customer specific Demand Savings: Customer specific

Connexus Energy

Description:

Connexus Energy provides cash incentives to low-income individuals to improve energy efficiency through lighting, heating and cooling.

Support:

The cooperative will provide either direct financing of equipment or reimburse the consumer for a portion of the cost in the form of a rebate.

Energy Savings: Customer specific Demand Savings: Customer specific

Cooperative Light & Power Association

Description:

Cooperative Light and Power is participating with local CAP agencies to assist with an energy conservation program. The local CAP agency is Arrowhead Economic Opportunity Agency.

Support:
This will be done through the CAP agencies.

Energy Savings: Customer specific Demand Savings: Customer specific

Elk River Municipal Utilities
Description:
Elk River Municipal Utilities will provide up to $5000 each to a limited number of low income families to upgrade their homes and older inefficient appliances. Equipment selection will be made and funding administered by Tri-County Action from a list of eligible low income customers of ERMU.

Support:
ERMU will make funds available to Tri-County Action of St. Cloud to be used to help low-income customers become more energy efficient. The total amount made available will depend on success of the other CIP Programs. A goal of 25 percent reduction in total energy consumption has been established for participants in the Program.

Energy Savings: Customer specific Demand Savings: Customer specific

Itasca-Mantrap Cooperative Electrical Association
Description:
Beginning in 2003, the distribution cooperative offered a low-income weatherization program. The program operated through a local CAP agency. The CAP agency can help identify customers who would benefit from weatherization under this program.

Support:

This program addresses requirements of Minnesota Statute 216B.241, Subdivision 2. Part 3, that a portion of the money spent on residential conservation improvement programs directly address the needs of the low income.

Energy Savings: Customer specific Demand Savings: Customer specific

Lake Region Electric Cooperative

Description:

Assist low-income members with energy conservation.

Support:

Direct grant to local CAP agencies.

Energy Savings: Customer specific Demand Savings: Customer specific

McLeod Cooperative Power Association

Description:

McLeod Cooperative Power Association donates funds to the local Community Action Program agency for weatherization audits, blower door test and weatherization/insulation improvements in low income family homes. The CAP agency pre-qualifies the homeowner as low income and evaluates the home for the energy efficiency improvements required. Recipients of the improvement projects are member owners of the electric cooperative. The CAP agency insulates the home which reduces energy loss by approximately 15 percent. A report of the project assessment and results are provided to McLeod. The CAP agency can also request from the co-op a new high- efficient water heater if the existing water heater is not operational. Funding is given to the CAP agency to do weatherization audits, client education, clean and tune of furnace, insulation of walls and attic, blower door testing, smoke detectors, ducts, etc. for low-income homeowners and renters in our service area.

Support:

Documentation from CAP agency on audits done for low income families did not quantify energy savings from weatherization measures. However, the CAP agency auditor did calculate the savings for their audit. The energy savings from furnace

cleaning and addition of wall and attic insulation should be significant BTU savings. Education of one renter included use of most efficient source to heat the home (as last year they used cooking oven to heat the home at high cost and low efficiency).

Energy Savings: Customer specific Demand Savings: Customer specific

Meeker Cooperative Light & Power Association

Description:

Meeker Cooperative's Low-Income Program will provide annually, one storage water heating system to a low-income family. Meeker Cooperative will work with the local CAP agency (Heartland) to provide this installation to a family who receives service from Meeker Cooperative.

Support:

This Storage Water Heating installation will not only increase the energy efficiency of the existing water heater, but will benefit the family with the resulting energy savings and reduction in the families monthly utility bill.

Energy Savings: Customer specific Demand Savings: Customer specific

Minnesota Valley Electric Cooperative

Description:

Provide financial assistance to low-income members for energy conservation measures.

Support:

MVEC wrote checks to the CAP Agencies in three counties where MVEC has their largest amount of members. The CAP Agencies were directed to spend the money as follows: 1) Member must be designated low-income by CAP Agency, 2) Money must be used for conservation electrical programs such as update appliances, insulation, window replacement, electric heat on off-peak programs or tune-ups for Central Air Conditioning. The CAP Agency will administer all funds and report back to MVEC how the money was spent.

Energy Savings: Customer specific Demand Savings: Customer specific

LOW-INCOME REFRIGERATOR REPLACEMENT PROGRAM

Dakota Electric Association

Description:

The Low-Income Refrigerator Replacement is a new program that was offered in 2003 and provided a mechanism to replace old, inefficient refrigerators with a new ENERGY STAR® rated model for Dakota Electric customers identified as low-income. Potential customers will be identified from CAP Agency programs, referrals from other agencies, and referrals from Dakota Electric. The goal of this project will be to reduce electrical consumption of targeted households in Dakota County. The CAP Agency will administer this program. Customers who are eligible for this program will pay 25 percent of the new refrigerator cost. The new ENERGY STAR refrigerator is delivered to the customer's home; the old refrigerator is removed and recycled by the appliance dealer.

Support:

Dakota Electric replaced 10 units in 2003. Dakota Electric is recommending to the CAP Agency that the refrigerators should be 10 years old or older to qualify unless other circumstances warrant as determined by the CAP Agency.

Energy Savings: Customer specific Demand Savings: Customer specific

LOW-INCOME WATER HEATER PROGRAM

Runestone Electric Association

Description:

Runestone Electric Association works with local CAP agencies to provide low-income members with high-efficient water heaters.

Support:

Runestone administers the program through the CAP agencies

Energy Savings: 300 kWh Demand Savings: 1 kW

Stearns Electric Association

Description:

Beginning in 2002, Stearns Electric Association in cooperation with the St. Cloud EDA will offer to low-income home owners in the Westwood Edition of St. Cloud and other possible EDA projects in the Stearns service area, free, high efficiency water heaters. These free water heaters are the Marathon brand and rated at 92 percent efficient. Included with this equipment is a free low flow shower head, designed to save 7 gallons of hot water every 5 minutes of showering.

Support:

These water heaters will be delivered to the job site free of charge and will include free equipment to keep this energy load off any system electrical peak, and will include a free mixing valve, used to insure the homeowner has enough hot water daily and that they are able to have a safe operating temperature at all faucets in their home.

Energy Savings: 300 kWh Demand Savings: 1 kW

RENTER ASSISTANCE PROGRAM

Meeker Cooperative Light & Power

Description:

Meeker Cooperative's Renter Assistance program will provide educational information and materials to help weatherize rental units.

Support:

Educational materials will consist of brochures that discuss conservation measures that can help reduce energy consumption. Meeker Cooperative employees will train and assist the renters in installing weatherization materials that will reduce their energy consumption and conservation measures that can help reduce their energy consumption. Renter Program – Lighting & AC Tune-Ups

Energy Savings: N/A Demand Savings: N/A

RENTER PROGRAM – LIGHTING & AC TUNE UPS

Connexus Energy

Description:

Beginning in 2003, Connexus Energy offered renters and property owners, rebates for lighting retrofits and AC tune ups. The tune-up service includes: cleaning condenser coil, checking Freon level and pressures, checking indoor filter, testing all controls, blowing out drain line, visual inspection of entire system, educating homeowner on operation. The program also applies towards lighting upgrades or replacements.

Support:

This program specifically addresses Minnesota Statute 216B.241, Subdivision 2, Part 3, which requires that a portion of the money spent on residential conservation improvement programs is devoted to programs that directly address the needs of low-income and renters.

Energy Savings: N/A Demand Savings: N/A

RENTERS – GRANT ALLOCATION

Connexus Energy

Description:

Provides renters or rental property owners the opportunities to upgrade lighting and space heating and cooling.

Support:

The renters grant allocation program provides resource exclusively for renters and rental property owners.

Energy Savings: N/A Demand Savings: N/A

COMMERCIAL AND INDUSTRIAL PROGRAMS – CONSERVATION

COMMERCIAL GROUND SOURCE HEAT PUMP (GSHP)

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Member Cooperatives

Description:

GSHPs have proven to be one of the most efficient space conditioning options and the potential for energy savings is significant. Acceptance of this technology continues to grow nationwide. GSHPs use the latent heat in the ground as a heat sink and a heat source. By utilizing a series of vertically buried heavy-duty plastic pipes filled with a food-grade antifreeze solution as the heat transfer medium, GSHPs achieve significantly high efficiencies in both the cooling and heating mode. This high efficiency results in reducing kWh usage in the cooling season and can also significantly reduce the total energy used to heat a building when compared to other heating systems. To date, GRE through its 28 distribution cooperatives and ERMU serve schools, churches, and other commercial and industrial buildings heated and cooled with GSHPs.

Support:

The potential for energy savings with ground source heat pumps is significant in both the summer and winter. The GRE and its member cooperatives will continue to educate and promote the importance of energy efficiency when selecting a HVAC system for commercial and industrial buildings. GRE is a member of the International Ground Source Heat Pump Association.

Energy Savings: Customer specific Demand Savings: Customer specific

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COMMERCIAL & INDUSTRIAL – AGRICULTURAL (C&I-A) – ENERGY GRANT PROGRAM

Member Cooperatives

Description:

The Commercial and Industrial – Agricultural (C&I-A) Energy Grant program provides cash incentives to qualified applicants for energy efficiency improvements to their business, farm, or industry. Interested customers must complete a grant application form, which describes the intended energy efficiency improvement measure and calculates the expected energy and demand savings. The individual member cooperative evaluates the proposal for viability, and cost effectiveness; those that

rank the highest are awarded grants to help offset the cost of the project. Grant funds are typically used for installing high efficient lighting, motors, and adjustable speed drives, refrigeration compressors, air conditioning, and other energy conserving equipment.

Beginning in 2002, the program also included a New Construction Rebate for Lighting and Motors and adjustable speed drives (ASDs). The grant program requires a demand and energy savings worksheet to be completed. The new construction lighting and motor rebate is a simple form that provides a rebate on a per fixture basis or on the horsepower rating of the motor for new construction only.

Beginning in 2004, the program includes rebates for C&I Cooling and lighting retrofit applications and vending miser. Although cooperative's members could previously complete a grant application to calculate a grant for these technologies, now members may utilize an easy-application rebate form.

Support:

The Commercial and Industrial – Agriculture Energy Grant program provides an incentive to customers contemplating energy efficiency improvements. The program assists customers in reaching their payback requirements while lowering energy and demand requirements. The distribution cooperative actively solicits grant opportunities and helps the customer in determining demand and energy savings potential.

Energy Savings: Customer specific Demand Savings: Customer specific

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COMMERCIAL AND INDUSTRIAL ELECTRICAL EVALUATION AND CONSULTATION

Member Cooperatives

Description:

The commercial and industrial electrical evaluation and consultation is targeted at the distribution cooperatives' larger commercial and industrial customers who have

high electric energy requirements. A distribution cooperative representative meets with the customer on-site to review general electric usage patterns of the business. The customer's electric usage patterns may be available through a web-based load profiling service that our wholesale electric provider has made available to the distribution cooperative. The review, which generally takes one hour, includes suggestions on ways to conserve energy and details of our energy efficiency grant program. If the representative determines that additional actions should be taken, the customer may be scheduled for an on-site audit. The audit will include:

- Energy bill analysis
- Lighting and motor load review
- Customer education
- Building shell assessment
- Mechanical and electrical equipment assessment
- Recommendations

If the distribution cooperative representative determines that a more detailed audit is required, an independent auditing firm may be hired. The costs for a more detailed audit are generally shared between the customer and the distribution cooperative.

Support:

The commercial and industrial electrical evaluation and consultation program provides the distribution cooperative the opportunity to assist large energy-use customers become more energy efficient in their business. By interviewing, reviewing equipment specifications, and on site observation, the distribution cooperative representative can assist the customer identify cost-effective energy saving opportunities. In many of these cases, the energy savings measures that have been identified qualify for the energy efficiency grant program that the distribution cooperative offers.

Energy Savings: N/A

Demand Savings: N/A

COMMERCIAL LIGHTING

Elk River Municipal Utilities

Description:

ERMU provides incentives to commercial accounts to retrofit or convert existing T12 fluorescent lighting to T8 or T5 technology with an incentive equivalent to $0.30 per watt reduced (an average of $16.00 per 4 lamp fixture). Even though the program was started in 1999 and is promoted through customer visits, participation continues to be very low. An increase from $0.10 per watt-reduced to $0.30 per watt reduced in 2002 helped increase customer interest, but it is still difficult to attract program participants because the payback is usually 2 or more years even with the incentive.

Support:

Beginning in 2002, ERMU tripled the existing incentive to $0.30 per watt reduced for retrofit or conversion from T12 to T8 or more efficient technology. The Program was also expanded to include replacing high intensity discharge lamps with clustered fluorescent, and LED signs using the same $0.30 per watt reduced. Occupancy sensors were also added at $10 each. More needs to be done to expand the program, so more emphasis will be placed on getting the message out to the right people in 2004.

Energy Savings: Customer specific Demand Savings: Customer Specific

LED TRAFFIC LIGHT PROJECT

Elk River Municipal Utilities

Description:

ERMU converted traffic lights at 18 intersections from incandescent to LED technology. The main objective in doing so is to conserve energy -- LEDs consume approximately one-tenth the energy compared to incandescent bulbs. A secondary objective in doing so is to reduce maintenance -- incandescent bulbs typically last six to 12 months while LEDs are projected to last 10 years. Experience to date supports at least five years.

Support:

Each intersection has 18 traffic lights and each traffic light has three traffic lamps. The incandescent bulbs used in the red and green lamps are 150 watt while the

yellow uses a 116 watt lamp. Red LEDs are rated at 15 watts, green LEDs are rated at 18 watts, and yellow LEDs are rated at 25 watts. Traffic arrows and walk/don't walk lamps were also changed out to LEDs. Currently, all 324 traffic lights consume about 50,000 kWhs per year while there incandescent counterparts would consume 450,000 kWh per year. That's a savings of 400,000 kWh per year.

Energy Savings: 1,235 kWh Demand Savings: 0.09 to 0.13 kW

STREET AND SECURITY LIGHTING

Member Cooperatives

Description:

The street and security lighting program ensures that only energy efficient high-pressure sodium (HPS) lighting equipment is installed. In new installations, HPS is the accepted standard. Conversion to HPS in older mercury vapor lighting systems occurs at the time of failure or at the customer's request.

Support:

The street and security lighting program responds in part to the statutory goals of M.S. 216B.241, Subdivision 5, which requires distribution cooperatives to encourage the use of energy efficient lighting.

Energy Savings: 292 kWh Demand Savings: 0.08 kW

VENDING MISER

Dakota Electric Association

Description:

The Vending Miser is an intelligent device that is an economical way to control vending machines, which significantly reduces energy consumption without compromising the vending product. Utilizing a passive infrared sensor, Vending Miser powers down a vending machine when the area around it is unoccupied and

automatically repowers the vending machine when the area is reoccupied. The unit also monitors the ambient temperature while the vending machine is powered down and automatically powers up at the appropriate intervals to ensure that the vending product stays cold.

Support:

The Vending Miser will reduce energy consumption up to 70% depending on the application. Research by Bayview Technologies based on 40 installations showed that the average savings was 49 percent. The vending miser is ideal for schools, office buildings and government buildings.

Energy Savings: 1,250 Demand Savings: 0.4 kW

COMMERCIAL AND INDUSTRIAL PROGRAMS – LOAD MANAGEMENT

COMMERCIAL & INDUSTRIAL DEMAND CONTROLLER PROGRAM

Dakota Electric Association

Description:

A digital demand controller (DDC) is a compact relay box with sophisticated programming and data acquisition capabilities. It can be installed in most commercial building electrical rooms. Wiring is usually low voltage. The demand controller is programmed and operates to reduce peak demand and energy consumption. A DDC will work for most commercial accounts, but is most applicable to mid-size and small commercial accounts that typically do not have energy management systems. Convenience stores are a prime application for the DDC. For commercial applications, the DDC can reduce a customer's billing demand 5 to 200 kW and reduce energy consumption by up to 5 percent. Convenience stores typically save 10 to 20 kW with energy savings up to 5 percent.

Support:

Dakota Electric will promote the DDCs to commercial customers. Dakota Electric will offer a $25 per kW rebate for qualifying installations. The maximum rebate is $500 per customer installation.

Energy Savings: N/A Demand Savings: N/A

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INTERRUPTIBLE COMMERCIAL AND INDUSTRIAL LOADS

Member Cooperatives

Description:

The interruptible commercial and industrial loads program provides a reduced electric rate to C&I customers that can reduce their demand by a minimum of 25 kW during high peak demand periods. Customers are billed for their maximum demand and total kWh similar to other general service C&I customers. In addition, coincidental demand charges are applied to the customer's load that occurs coincident to GRE monthly billing peaks. During these periods, the customer is automatically alerted and reduces their demand completely or to a predetermined demand level. This program provides a strategy to improve system load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

Promoting the interruptible commercial and industrial loads program provides a large opportunity to reduce peak capacity requirements that improve system load factor and system efficiencies. Due to the complexity of the program from both a customer and an electric provider's perspective, the distribution cooperatives spends considerable time with each interested customer explaining the program in detail and answering questions.

Energy Savings: 0 kWh Demand Savings: Customer specific

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INTERRUPTIBLE IRRIGATION

Member Cooperatives

Description:

Interruptible commercial irrigation systems – generally agricultural, turf growers or golf courses can be interrupted once per day for up to four hours. Since most irrigation systems must be restarted manually, GRE makes every effort to only

schedule irrigation control during extremely high peak demand periods and if possible at consistent times. This makes the manual restart of the systems easier for the irrigation operator. This program provides a strategy to improve system load factor, reduce peak capacity requirements, and improve system efficiencies.

Support:

The distribution cooperative's primary support is to review the benefits of interruptible irrigation with customers prior to system installation. By educating and recruiting customers to the program the distribution cooperative and our wholesale electric provider reduces peak capacity requirements and improves system load factor. Due to the complexity of the program from both a customer and an electric provider's perspective, the distribution cooperative spends considerable time with each interested customer explaining the program in detail.

Energy Savings: 0 kWh Demand Savings: Customer specific

POWER FACTOR CORRECTION PROGRAM

East Central Energy

East Central Energy will launch a program in 2002-03 that encourages its largest customers to improve their power factor. Currently, East Central Energy and most other Minnesota electric utilities require their large commercial and industrial customers to maintain a power factor of 90 percent or higher.

Support:

In 2002, ECE adopted revised retail rate schedules that imposed power factor penalties. Poor power factor means electric utilities need to generate excess capacity to compensate for the difference, which wastes energy. In 2002, East Central Energy began installing the first of 150 new interval meters on all accounts with summer peak demands in excess of 250 kW. In 2003, the program was expanded to include all commercial customers with summer peak demands in excess of 50 kW.

The new interval meters enable cooperative staff to gain a better understanding of

business customer load profiles and to troubleshoot problems with electrical equipment that may be contributing to poor power factor. Through revised rate schedules and a grant program, the cooperative expects to boost overall power factor to 90% or higher.

Following installation of these meters, cooperative staff will begin gathering data to analyze customer-specific power factor, identify customers who need power factor correction, develop proposals for capacitor banks and switchable capacitors, and through an affiliation with Energy Alternatives, Inc., provide a turnkey service to install capacitor banks at these customer locations, and finance the installations upon request.

Energy Savings: N/A Demand Savings: N/A

COMMERCIAL AND INDUSTRIAL PROGRAMS – RENEWABLE

BIODIESEL PROJECT

Dakota Electric Association

Description:

Building on existing research, the University of Minnesota's Center for Diesel Research will evaluate soy-based biodiesel fuels for reducing the impact of exhaust emissions from generators on air quality. After identifying the types and configurations of engines used for electric peak shaving in Minnesota, and selecting biodiesel blend levels and emissions controls for use with those engines, a laboratory evaluation will be conducted to determine the influence of using biodiesel on emissions. A demonstration site will be selected and the change in emissions will be measured under real-world conditions.

Support:

Dakota Electric is providing $25,000 in 2002 and $25,000 is 2003 for this project.

Energy Savings: N/A Demand Savings: N/A

BIOMASS GRANT

Great River Energy and BENCO Electric Cooperative

Description:

GRE developed a Biomass Grant Program to encourage the development of biomass distributed generation resources in its service territory specifically for farmer-owned anaerobic digesters. Anaerobic digesters are containers that hold manure at a given operating temperature for a period of time that is long enough to allow a steady-state growth of bacteria that produces methane. Anaerobic digesters reduce farm odor and produce gas that is used to fuel electric generators.

As a waste-to-energy power plant, GRE's Elk River Station diverts about 270,000 tons of municipal solid waste annually from community, producing enough electricity for approximately 30,000 homes. Elk River Station was classified as a renewable resource in 2003 legislative session. This moves GRE closer to making a "good faith effort" to generate 10 percent of our electricity from renewables by 2015, as urged by state energy legislation passed in 2001.

GRE implemented a special Biomass Grant Program to encourage the development of additional renewable energy technologies using biomass resources. Anaerobic digesters show much potential for mitigating the environmental hazards of dairy and swine feedlots while producing renewable energy.

Support:

GRE awarded the first $100,000 biomass grant to Northern Plains Dairy, a member of BENCO Electric. BENCO Electric Cooperative provided program delivery support to the dairy. Northern Plains Dairy is a 3,000-cow dairy located just south of St. Peter. The dairy supplies milk for the Davisco Foods cheese operation.

The grant will be used for an anaerobic digester system that uses methane gas from cow manure to fuel two electric generators. The dairy expects to consistently produce 280 kilowatts of electricity that will be used for its operations.

Energy Savings: N/A

Demand Savings: N/A

East Central Energy

Description:

East Central Energy was the first cooperative in Minnesota to successfully pioneer the use of biomass (cow manure) to generate electricity. The Haubenschild Farms anaerobic digester at Princeton, generates approximately 135 kW of electric energy around the clock with a 98.7 percent reliability. The project generates nearly 100,000 kilowatt-hours per month; 40 percent of the electricity is used on the farm, while East Central Energy purchases all excess energy for re-sale to other customers who wish to pay a premium for renewable energy. The project has received nationwide notoriety and is an award-winning example for other dairy and livestock producers.

Support:

East Central Energy has agreed to purchase all excess energy from these digester projects at the full retail rate the customers can qualify for; in this instance, 7.3 cents per kilowatt-hour. While ECE markets a portion of this energy to other customers at an incremental premium of 1.29 cents per kilowatt-hour, the difference is included in CIP participant incentives.

Energy Savings: N/A

Demand Savings: N/A

CUSTOMER-OWNED WIND FARMS

Member Cooperatives

Several GRE distribution cooperatives purchase energy and capacity from customer-owned wind generation systems less than 40 kW which qualify under Minnesota Statute 216b. These cooperatives include:

- BENCO Electric
- Federated Rural Electric Association
- Goodhue County Cooperative Electric Association
- Kandiyohi Power Cooperative
- Nobles Cooperative Electric
- Redwood Electric Cooperative
- South Central Electric Cooperative
- Stearns Electric Association

- Steele-Waseca Cooperative Electric

The consumer purchases energy for their own facility at the applicable retail rate per the rate schedule from the co-op. The co-op in turn purchases the excess output of the wind generator at the applicable retail rate for that consumer.

Support:
The co-ops offer information to the members about the program rates and guidance on where to find more information about installing their own wind systems.

Energy Savings: N/A Demand Savings: N/A

LANDFILL GAS TO ELECTRIC PROJECT

Elk River Municipal Utilities

Description:
Elk River Municipal Utilities installed 550 kW of engine driven generation at the Elk River landfill in 1999. This $550,000 facility was powered by an engine-generator which ran on landfill gas (methane). In 2002, that system was replaced by a larger facility to increase reliability and to utilize increased methane production. This new 2,400 kW plant which went on line in October 2002, also has an education wing for visitors.

Support:
Elk River Municipal Utilities has increased the capacity of the landfill gas generator to 2,400 kW at a cost of $2,860,000 beginning fourth quarter 2002. During 2003, this plant proved to be very reliable and produced 20 million kWh or 15 percent of Elk River's needs by utilizing a resource which would otherwise be wasted. ERMU believes that costs associated with building, maintaining and operating this new landfill gas to electric facility should qualify as CIP expense.

Energy Savings: N/A Demand Savings: N/A

STIRLING ENGINE

Description:

In 2004, an ENX 55, an external combustion engine utilizing Stirling Engine technology is scheduled for installation at the Haubenschild Farm in Princeton. The fuel-fired ENX 55 can operate on a number of fuel sources including low-pressure, low-BTU and poor quality fuels. At the Haubenschild Farm the ENX 55 will operate on biogas from an anaerobic digester.

The Stirling Engine technology requires fewer moving parts and therefore requires less downtime, lower maintenance and lower operating costs.

This is a collaborative effort between GRE, EPRI and Haubenschild Farm. The ENX 55 will be accompanied by a 2kW fuel cell and supported by the University of Minnesota Agriculture Extension Service Department in response to the Legislative Commission on Minnesota Resources project *Advancing Utilization of Manure Methane Digester Electrical Generation.*

Support:

Great River Energy will provide a grant.

Energy Savings: N/A

Demand Savings: N/A

MISCELLANEOUS

DEPRECIATION OF DSM PLANT

Dakota Electric Association

Description:

This program includes the annual depreciation expense for all of Dakota Electric's DSM plant and equipment.

Support:

Administrative Support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

Stearns Electric Association

Description:

This program includes the annual depreciation expense for all Stearns Electric's DSM plant and equipment. All dollars associated with this program are in program delivery and will affect participants in all DSM programs.

Support:

Administrative Support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

DISTRIBUTION AUTOMATION

Dakota Electric Association

Description:

The distribution automation program initiated by Dakota Electric is motivated by the need for more efficient utilization of existing plant and resources and building added customer value for the use of electricity. GRE's member cooperatives have united around a uniform load management policy that calls for GRE to direct a coordinated load management system for the benefit of all the member cooperatives. See Dakota Electric's 2001 Annual Conservation Report page 69 filed November 30, 2001 for more details (Docket No. E111/M-01-1769).

Support:

Administrative Support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

DSM POTENTIAL ASSESSMENT

Description:

In 2003 GRE retained EPRI and Global Energy Partners to conduct an Assessment of Energy Efficiency Potential for the service area covering its 28 member cooperatives. The purpose of the assessment was to provide a comprehensive and thorough study to be used in the development of GRE's Conservation Improvement Program (CIP) and the Integrated Resource Plan (IRP) per the regulatory requirements of the Minnesota Public Utilities Commission.

Support:

GRE supported this collaborative project with EPRI funds.

Energy Savings: N/A

Demand Savings: N/A

ENERGY MANAGEMENT DATABASE

Dakota Electric Association

Description:

Dakota Electric's energy management database includes all of the internal labor and maintenance costs associated with tracking information on the customers and installed equipment for CIP program participants.

Support:

Administrative support is provided by the cooperative.

Energy Savings: N/A

Demand Savings: N/A

ENERGY MANAGEMENT (EM) MAINTENANCE

Meeker Cooperative Light & Power Association

Description:

Meeker Cooperative must maintain its energy management (EM) system to ensure reliability for those cooperative members participating in the programs. Maintenance is also required to ensure the EM control equipment can provide the control necessary during peak times.

Support:

Maintenance audits have been preformed since the EM system was installed. These audits have proven the EM equipment to be reliable in the past, however the existing system is aging and recent audits have found failure rates that support the continued use of these audits and the EM maintenance program.

Energy Savings: N/A Demand Savings: N/A

LOAD MANAGEMENT MASTER CONTROLLER

Great River Energy

Description:

GRE will install a load management master controller in 2004. The new master controller will replace two separate systems allowing GRE more flexibility and consistency in controlling member system service territory. The updated controller and related transmitter equipment will also allow GRE member coops to utilize more modern load management receiver switch technology.

Support:

GRE is purchasing the new load management master controller and coordinates for all and performs load management operations for most member co-ops from the new central load management controller.

Energy Savings: N/A Demand Savings: N/A

PHILLIPS COMMUNITY ENERGY COOPERATIVE

Great River Energy

Description:

The Phillips Community Energy Cooperative delivers energy-related services and conservation to its members. Members from within the Phillips community may join the co-op for $1 and receive an "energy efficiency" kit. This kit includes: two compact fluorescent light bulbs, one low-flow shower head, and a 5-pack interior window insulation kit. Members outside the Phillips community may join for an

annual fee of $20 and will receive a quarterly newsletter and may receive assistance in organizing neighborhood awareness of energy conservation and buying groups to purchase energy efficient products.

Support:

GRE provided a grant to the Philips Community Energy Cooperative.

Energy Savings: N/A Demand Savings: N/A

PROGRAM EVALUATION

Dakota Electric Association

Description:

Dakota Electric has been tracking member attitudes with a perception research survey for a number of years. A random sample of approximately 500 members is contacted and asked to give its response to a number of issues. From this research, Dakota Electric Association is able to track acceptance of programs and service from year to year.

Support:

This annual survey is vitally important in tracking customer attitudes, program awareness, and assisting in the focus of informational efforts.

Energy Savings: N/A Demand Savings: N/A

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REGULATORY COMMISSION – CIP PROJECTS

Dakota Electric Association

Description:

This program includes the cost of preparing and supporting the annual Dakota Electric Association CIP reporting and GRE CIP reporting. All costs associated with performing required cost/benefit analyses on programs are also included here.

Support:

Administrative support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

RESEARCH AND DEVELOPMENT

Connexus Energy

Description:

Integrate a fuel cell into the distribution system where capacity levels are being reached or destination is remote making for poor power quality.

Support:

Work with a fuel cell manufacturer in a partnership relationship to maximize end results.

Energy Savings: N/A Demand Savings: N/A

East Central Energy

Description:

In 2002, the cooperative retained RKS Research & Consulting to conduct 20-minute telephone interviews involving the energy decision-makers at the cooperative's largest commercial and industrial customers who represent approximately 20 percent of the cooperatives electrical load. Project goals included: gauge the impact of the current economic climate on East Central Energy business customers and assess the outlook going forward, including prospects for growth and future electric energy usage, determine the participation level in energy conservation programs and evaluate their effectiveness, determine the level of interest in new energy-saving products and services.

Support:

On a comparative basis, East Central Energy business customers rate their utility higher than the national and Midwestern average and many consider the co-op to be very close to the ideal energy provider. East Central Energy will utilize this research in targeting its communication programs and business customer seminars to helping

customers understand the economics of energy conservation programs and thereby encourage further participation. While there seems to be a great deal of interest in energy conservation among commercial and industrial customers, more than half of those surveyed (56 percent) could not estimate the cost savings from these initiatives.

This project represents indirect costs exclusively with no direct kW or kWh savings; however, the research will play a key role in helping the cooperative to customize its energy conservation program offerings to business customers in the future.

Energy Savings: N/A Demand Savings: N/A

Lake Region Electric Cooperative

Description:

Energy Efficient Model Home Project and Methane Digester.

Support:

Lake Region Electric Cooperative is investigating and implementing a model home project to demonstrate state-of-the-art energy efficient technologies for new residential construction. The co-op is investigating the possibility of a methane digester at an agricultural site (large dairy) for possible renewable distributed generation.

Energy Savings: N/A Demand Savings: N/A

McLeod Cooperative Power Association

Description:

Cooperative staff served on the Carver County Methane Task Force to study the viability of a methane bio-digester for use on hog farm and studied the economic viability of a digester for one particular farm site. Committee changed to Odor Mitigation Task Force after it was determined that the methane bio-digester was not an economically feasible option. However, this was an excellent learning experience in renewable energy.

Support:

Training and education of staff on bio-digester technology and renewable fuels options for customers.

Energy Savings: N/A Demand Savings: N/A

Meeker Cooperative

Description:

Meeker Cooperative is testing a 5-ton commercial, two-stage compressor ASHP with a SEER of 15. The ASHP is manufactured by YORK, which describes its product as state-of-the-art regarding energy efficiency.

Support:

The York manufacturing representative is monitoring the installation and operation of the ASHP. Administrative support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

Minnesota Valley Electric Cooperative

Description:

Minnesota Valley Electric Cooperative is providing labor for research of new load management hardware and supporting a pilot project for a new load management program.

Support:

Administrative support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A

Stearns Electric Association

Description:

Stearns Electric Association will promote the use of new technologies to customers, the energy savings of new types of heating, lighting, motors and space cooling.

Support:

Administrative support is provided by the cooperative.

Energy Savings: N/A Demand Savings: N/A