2005 MINNESOTA BIENNIAL TRANSMISSION PROJECTS REPORT

NOVEMBER 1, 2005

American Transmission Company, LLC
Dairyland Power Cooperative
East River Electric Power Cooperative
Great River Energy
Hutchinson Utilities Commission
Interstate Power and Light Company
L&O Power Cooperative
Marshall Municipal Utilities
Minnesota Power
Minnkota Power Cooperative
Missouri River Energy Services
Northern States Power Company d/b/a Xcel Energy
Otter Tail Power Company
Rochester Public Utilities
Southern Minnesota Municipal Power Agency
Willmar Municipal Utilities

TABLE OF CONTENTS

1. Executive Summary

This document constitutes the 2005 Minnesota Biennial Transmission Projects Report.

The 2005 Minnesota Biennial Transmission Projects Report has been prepared pursuant to Minnesota Statutes § 216B.2425, which requires utilities that own or operate electric transmission facilities in the state to report by November 1 of each odd numbered year on the status of the transmission system, including present and foreseeable inadequacies and proposed solutions. Similar reports were prepared in 2001 and 2003. All three reports are available on the Internet on a webpage maintained by the utilities specifically intended to provide information to the public about these planning activities: www.minnelectrans.com/

This Report is a joint effort of the Minnesota Transmission Owners – the utilities that own or operate high voltage transmission lines in the state of Minnesota. These utilities include the following:

- American Transmission Company, LLC
- Dairyland Power Cooperative
- East River Electric Power Cooperative
- Great River Energy
- Hutchinson Utilities Commission
- Interstate Power and Light Company
- L&O Power Cooperative
- Marshall Municipal Utilities
- Minnesota Power
- Minnkota Power Cooperative
- Missouri River Energy Services
- Northern States Power Company, d/b/a Xcel Energy
- Otter Tail Power Company
- Rochester Public Utilities
- Southern Minnesota Municipal Power Agency
- Willmar Municipal Utilities

A major purpose of the Report is to address all present and reasonably foreseeable transmission inadequacies in the transmission system and possible alternative solutions that the state's utilities have identified. An "inadequacy" is essentially a need for additional transmission infrastructure, perhaps a new transmission line, but in many instances an additional transformer, or a new substation, a capacitor bank, or some other system enhancement may be sufficient.

Minnesota's electric utilities conduct planning studies constantly and work closely with regional transmission organizations such as the Midwest Independent Transmission System Operator (MISO) to determine what additional transmission facilities might be required to maintain a secure and adequate system at reasonable cost and to provide electricity at all times, under all conditions, for all customers.

The focus of these planning studies varies, depending on the issue involved. Often utilities conduct studies aimed at addressing local issues, such as when a population center is experiencing growth, and an increasing demand for power requires a local solution. In other cases, when a new generation station is planned that requires an interconnection to the transmission grid, studies must be performed to determine the impact the new facility will have on the system. Other times, however, transmission engineers and planners investigate what transmission facilities might be necessary to address a growing demand over a large area, such as the entire state or region. Over the past two years a number of Minnesota utilities have undertaken an extensive effort to determine what transmission infrastructure might be required to transport an additional several thousand megawatts of power over the Minnesota region to meet projected increased demand. This effort, labeled CapX 2020 to reflect the need for additional capital expenditures for new transmission infrastructure by the year 2020, built on other regional studies prepared by MISO and others to develop a Vision Plan that identifies the need for several new large high voltage transmission lines around the state. The need for these lines is pressing, and the utilities are embarking on a program to begin the process to seek regulatory approval for several new high voltage transmission lines.

The state's utilities also conduct studies to determine what transmission facilities might be required to comply with Minnesota's Renewable Energy Objective to increase the amount of power that comes from renewable sources, such as wind, hydropower, and biomass. The utilities have made a concerted effort to identify new transmission lines to provide an outlet for renewable energy from southwestern Minnesota in particular, the home of the state's best wind resources.

The Minnesota Transmission Owners have identified more than 75 "inadequacies" in this Report. Most of these were identified in the 2003 Report; some are new. A brief discussion is included for each of the inadequacies identified. In most cases a number of alternative options for addressing the inadequacy is also identified. Each matter has a tracking number that will be used in other documents and in subsequent reports to monitor the status of the matter. Tables are included in the Report that summarize each of the matters needing attention. Maps of the transmission system and the needs identified are also included in the Report.

The state of Minnesota is divided into six transmission planning zones: the Northeast Zone, the Northwest Zone, the West Central Zone, the Twin Cities Zone, the Southeast Zone, and the Southwest Zone. The Minnesota Transmission Owners held public meetings around the state in all the Transmission Planning Zones in October 2004 and May 2005. Summaries of these meetings are included in the Report.

Once a particular project has been selected as the solution to a particular need, the utility will seek necessary approvals. That approval may be a certificate of need and a route permit from the Minnesota Public Utilities Commission, depending on the size and type of the project. In other cases, local governments will have jurisdiction to approve a project. Any person interested in a particular matter should alert the utility and the Commission of an interest in being advised of developments with regard to that matter.

Minnesota Power and Great River Energy have already identified two transmission line projects for which they are seeking certification from the Commission. These two projects are described in the separate certification applications that are being submitted along with this Report. The Commission will be conducting public hearings on those two matters in the upcoming months.

The Commission will also be soliciting comments on the 2005 Report. Any person interested in commenting on the Report should contact the Public Utilities Commission to learn how to submit comments and remain advised of Commission action.

2. Regulatory Process

2.1 The Statute

Minnesota Statutes § 216B.2425 requires any utility that owns or operates electric transmission lines in Minnesota to submit a transmission projects report to the Minnesota Public Utilities Commission (PUC or Commission) by November 1 of each odd numbered year. The Minnesota Legislature enacted the statute in 2001 as part of the Energy Security and Reliability Act. The law became effective on August 1, 2001.

The major purposes of the statute are to inform the public of transmission issues in the region, solicit feedback, enable regulators and the public to track development of proposed solutions to these transmission issues, and expedite approval of projects that do not raise significant environmental issues.

Minnesota Statutes § 216B.2425, subd. 1 provides that the transmission projects report must contain the following information:

(1) Specific present and reasonably foreseeable future inadequacies in the transmission system in Minnesota;
(2) alternative means of addressing each inadequacy listed;
(3) general economic, environmental, and social issues associated with each alternative; and
(4) a summary of public input the utilities have gathered related to the list of inadequacies and the role of local government officials and other interested persons in assisting to develop the list and analyze alternatives.

In addition, subdivision 7 of the statute requires each utility to determine necessary transmission upgrades to support development of renewable energy resources to meet the state Renewable Energy Objective under Minnesota Statutes § 216B.1691.

This Report contains information on all these categories.

2.2 Certification of Projects

Minnesota Statutes § 216B.2425, subd. 2, provides that a utility may elect to seek certification of a particular project identified in the transmission projects report. According to subdivision 3, if the Commission certifies the project, a separate Certificate of Need (CON) under section 216B.243 is not required.

No utility requested certification of a particular transmission project as part of a past Transmission Projects Report. As part of the 2005 Report, Minnesota Power and Great River Energy are seeking certification of two projects in the Northeast Zone – a new 115 kV line in the Tower-Ely Babbitt area (Tracking No. 2003-NE-N1) and a new 115 kV line between Pequot Lakes and Badoura and Long Lake (Tracking No. 2003-NE-N3). Those projects are discussed in Sections 8.3.1 and 8.3.3 and in separate documents prepared by the utilities.

2.3 The PUC Rules

In June 2003 the Public Utilities Commission adopted rules that govern the content of the transmission projects report and establish procedures for reviewing the report. Those rules are codified in Minnesota Rules chapter 7848.

Minnesota Rules part 7848.1300 sets forth a list of categories of information that must be included in a transmission projects report. That rule provides:

> Each biennial transmission projects report, whether or not it seeks certification of a high-voltage transmission line, must contain at least the following information:
>
> A. contact person for each utility.
> B. copy of most recent regional load and capability report of MAPP or other regional reliability council.
> C. copy of most recent regional transmission plan produced by the appropriate regional transmission organization.
> D. list of inadequacies currently affecting reliability and list of reasonably foreseeable future inadequacies over next ten years.
> E. list of all alternative means of addressing each inadequacy, including nontransmission alternatives.
> F. list of studies that have been completed, are in progress, or are planned that are relevant to each of the inadequacies identified.
> G. general description of the economic, environmental, and social issues raised by each alternative.
> H. an account of the measures taken to gather public input and to involve local government officials, tribal government officials, and other interested persons.
> I. report on the number of members of the public who provided input.
> J. report on the number of local and tribal government officials who provided input.
> K. list and description of every transmission project the utility considers necessary now or in the next ten years to remedy any transmission inadequacies identified in the report.
> L. a list and description of every nontransmission project the utility considers necessary now or in the next ten years to remedy any transmission inadequacies identified in the report.
> M. statement as to whether the utility seeks certification of any transmission project or the time frame within which it plans to file a certificate of need application.
> N. approximate time frame for filing a certificate of need application for any nontransmission project identified as necessary.

As with the statutory requirements, this Report addresses each of these categories of information.

As part of the adoption of chapter 7848, the Commission divided the State into six transmission planning zones – the Northwest Zone, the Northeast Zone, the West Central Zone, the Twin Cities Zone, the Southwest Zone, and the Southeast Zone. These zones are described in more detail in Section 7 of this Report.

2.4 The 2001 and 2003 Biennial Reports

The Minnesota Transmission Owners ("MTO") filed the first Biennial Transmission Projects Report on November 1, 2001 in PUC Docket No. E-999/TL-01-961, and the second on November 3, 2003, in PUC Docket No. E-999/TL-03-1752. These reports are both available on the Internet at:

http://www.minnelectrans.com/

MTO has attempted to avoid duplicating information that is included in the 2001 and 2003 Reports.

2.5 The PUC Orders Regarding the 2003 Report

The Minnesota Transmission Owners submitted the 2003 Biennial Transmission Projects Report on November 3, 2003. The Public Utilities Commission afforded interested persons an opportunity to submit comments regarding the completeness of the Report. After considering all comments filed, the Commission issued its Order Accepting Biennial Transmission Projects Report and Requiring Further Filings on June 24, 2004.

As part of its June 24 Order, in Ordering paragraphs 4 – 9, the Commission directed the MTO to provide certain information in future reports. Generally, the Commission directed the MTO to include more information in the 2005 Report about the transmission inadequacies identified in the 2003 Report and about the various alternatives for addressing each inadequacy. Also, the Commission asked for more information about the transmission planning process and about the transmission system in Minnesota.

The Commission also required a compliance filing by the end of 2004 regarding the status of the inadequacies identified in the 2003 Report and establishing a system for tracking the inadequacies through subsequent reporting cycles. MTO submitted that compliance filing by the end of the year, providing the requested information and establishing a tracking system that is continued in this Report.

On April 18, 2005, the PUC issued its Order Accepting Compliance Filing and Requiring Future Updates. In the April 18 Order, the Commission directed the MTO to report on the status of two ongoing exploratory studies – the Northwest Exploratory Study and the Iowa/Southern Minnesota Exploratory Study. The MTO submitted its compliance filing on June 28, 2005, stating that the Northwest Exploratory Study work had been completed and that the written report would be available by the end of October. The Northwest Exploratory Study Report is discussed in Section 4.5.1.

The Iowa/Southern Minnesota Exploratory Study is still underway. The report will be available in June 2006. This study is discussed more fully in Section 4.5.2.

2.6 Joint Filing

The PUC rules allow utilities to file jointly. Minnesota Rules part 7848.0400 provides that the utilities required to file a transmission projects report shall "jointly or individually" file the necessary report. The utilities to which the requirement applies have elected for all three reporting years to file a joint report. The 2005 Transmission Projects Report is being filed jointly by the following utilities:

American Transmission Company, LLC
Dairyland Power Cooperative
East River Electric Power Cooperative
Great River Energy
Hutchinson Utilities Commission
Interstate Power and Light Company
L&O Power Cooperative
Marshall Municipal Utilities
Minnesota Power
Minnkota Power Cooperative
Missouri River Energy Services
Northern States Power Company d/b/a Xcel Energy
Otter Tail Power Company
Rochester Public Utilities
Southern Minnesota Municipal Power Agency
Willmar Municipal Utilities

The name and address of a contact person for each of the utilities is contained in Attachment 1.

3. The Transmission System

3.1 An Electricity Primer

Turn on the light switch in a room, and a circuit is completed that connects the light bulb with the wires that serve the building, which are connected to the wires, called distribution lines, that serve the neighborhood, which are connected to the larger wires, called high voltage transmission lines, that carry electricity long distances from an electric generating plant to the area where the power is needed.

Electricity is simply the movement of electrons within a conductor (the wire). The rate at which electricity moves through a wire is called current and is measured in amperes (or amps). The force that moves the electricity through the wire is called voltage. Voltage is measured in terms of volts or kilovolts (kV). One kilovolt equals 1,000 volts.

The wire conducting the current offers resistance to its movement. This resistance is measured in a unit called ohms. As expected, the higher the resistance in the conductor, the slower the rate of flow (the lower the current). Some materials are better conductors than others, i.e., they offer less resistance. The wires used by utilities to conduct electricity are usually made of aluminum, which conducts electricity with relatively little resistance.

The relationship between current, voltage, and resistance is expressed by Ohm's law – the current is equal to the voltage divided by the resistance.

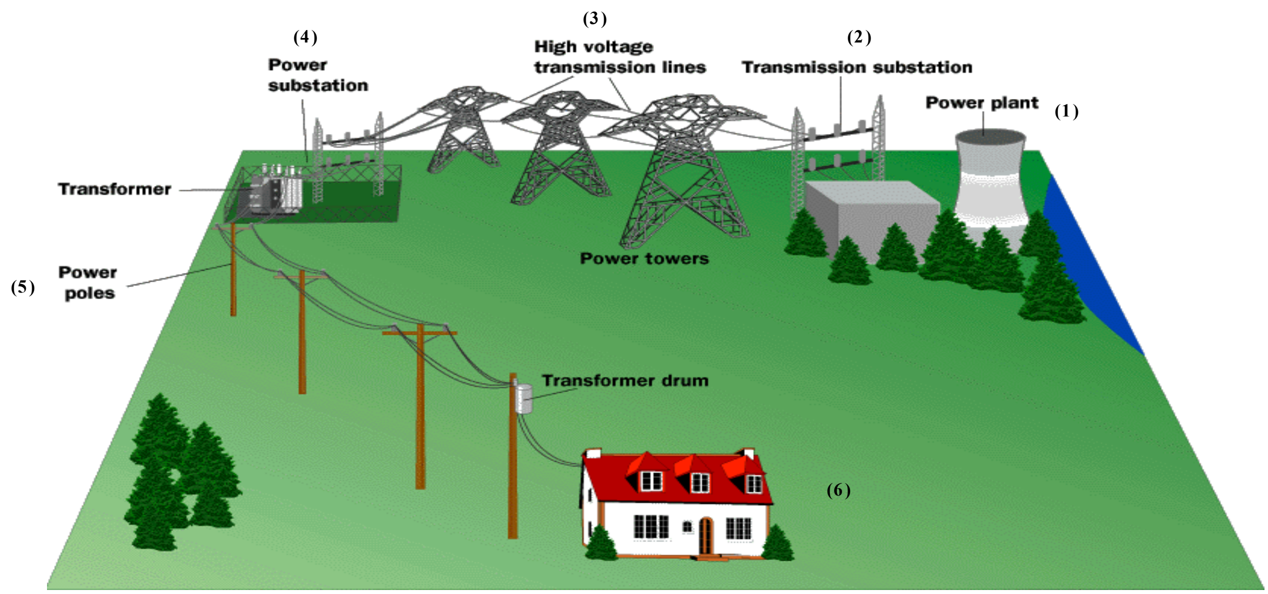
$$\text{Current (amps)} = \frac{\text{Voltage (volts)}}{\text{Resistance (ohms)}}$$

The basic unit of measurement of electricity is the "watt." A "watt" is the power produced by one ampere of current under an electromotive force of one volt. A kilowatt (kw) is 1000 thousand watts and a megawatt (MW) is one million watts. Watts and kilowatts are measurements of the instantaneous amount of power used or available. Energy consumption, however, is a measurement of how much power is used over a period of time. The most common units of measurement are the kilowatt hour, or KWh, or megawatt hour, MWh. If a 100 watt light bulb is left on for ten hours, 1000 watt hours or 1 KWh of electricity is consumed. Residential electric bills are normally expressed in terms of KWh of consumption.

While transmission equipment is usually measured in terms of the voltage rating, another significant measurement is the MVA rating, the amount of volt-amps that can be transferred. Since one volt-amp is the same as one watt, the MVA rating closely tracks the ability of the line to transfer electricity. In certain cases, a utility may address an increasing demand for electricity in a service area by increasing the MVA rating of the line, which results in making more watts of electricity available to the consumers. This can be accomplished by increasing the operating voltage of the line or by replacing the conductors with conductors capable of carrying more current (amps).

Electricity is usually produced at the generating plant in the several thousand volt range. This voltage is increased (stepped-up) by transformers installed close to the generating plant. The electricity is then transported long distances over transmission lines at voltages in excess of a hundred thousand volts. The reason for stepping up the voltage is that it is much more efficient to move electricity longer distances at higher voltages. Once the electricity reaches an area where it will be consumed, the voltage is reduced (stepped-down) to a more useable voltage at a distribution substation facility. The electricity is then distributed at these much lower voltages (34.5 kV or 12.5 kV) to the businesses and homeowners and other consumers by distribution lines, and then transformed again to the necessary service voltage (usually 240 volts or 120 volts for homeowners).

A schematic showing the transfer of electricity from generation to consumer is shown below:



Electricity is generated at a power plant (1) and its voltage is "stepped-up" at a substation adjacent to the plant (2). The electric energy travels along the high voltage transmission grid (3), which is interconnected with other high voltage transmission systems. The high voltage electricity is decreased, or "stepped down" at an electrical substation (4), and then is carried by distribution lines (5), is transformed to an even lower voltage at a transformer, where it is then consumed in your home or business (6).

3.2 The Transmission Grid

The electric transmission system in the United States is comprised of an interconnected network of generating plants, high voltage transmission lines, and distribution facilities. Since electricity follows the laws of physics as it flows through a conductor, it will seek the path of least resistance. It is impossible to know where the electric power came from that lights the room in your house.

Today, there are more than 150,000 miles of high voltage transmission lines in the United States transmitting electricity at voltages in excess of 200 kilovolts (200,000 volts). There are also many thousands of miles of transmission lines between 100 and 200 kilovolts. The following table provides a perspective of the miles of transmission lines in the country.

Table 1. Miles of High-Voltage Transmission Lines in the United States

Voltage	Miles of Transmission Line
AC (Alternating Current)	
230 kV	76,762
345 kV	49,250
500 kV	26,038
765 kV	2,456
Total AC	154,503
DC (Direct Current)	
250-300 kV	930
400 kV	852
450 kV	192
500 kV	1,333
Total DC	3,307
TOTAL AC/DC	157,810
Source: National Transmission Grid Study, U.S. DOE, May 2002.	

The North American electric transmission grid is divided into three major subsystems, called interconnections. These interconnections are called the Eastern Interconnection, the Western Interconnection, and the Electric Reliability Council of Texas (ERCOT) Interconnection. While very little power is exchanged between the Interconnections, power is readily transferred within the Interconnection. Minnesota is a part of the largest subsystem – the Eastern Interconnection.

There are thousands of miles of transmission lines in Minnesota alone. The transmission system in Minnesota connects more than 175 electric generating plants, sized from a few megawatts to more than 1100 MW, including fossil fuel-fired (coal, natural gas, and oil), nuclear, wind, hydro, and biomass plants, located both within and without the state, to serve the state's more than five million residents. The system is also connected to utilities in other states and in Canada in all directions, including over 6500 miles of 69 kV lines, nearly 3500 miles of 115 kV lines, 820 miles of 161 kV lines, approximately 1500 miles of 230 kV line, 870 miles of 345 kV lines, and

340 miles of 500 kV line. In addition, there are almost 300 miles of direct current (DC) lines in Minnesota.

Maps of the transmission lines in Minnesota above 69 kilovolts can be found in Section 7. Also, a map of transmission lines in Minnesota 69 kV and larger can be found on the Commission's webpage at:

http://server.admin.state.mn.us/maps/ElecTran03.pdf

3.3 Regional Transmission Operation and Planning

Day-to-day operation of the transmission system is conducted by the individual utilities that own and operate the lines. However, overall operation of the transmission grid and responsibility for continuing reliability of the system are the obligation of regional reliability organizations (RRO) and regional transmission organizations (RTO). Because of regulatory mandates by the Federal Energy Regulatory Commission (FERC), operation and planning for the Minnesota transmission system has continued to evolve since the filing of the 2003 Biennial Transmission Projects Report.

The following discussion describes the various RROs and RTOs that have responsibilities regarding operation of the transmission system and planning for continued reliability, beginning at the national level and moving to the regional level.

North American Electric Reliability Council (NERC). The North American Electric Reliability Council (NERC) has historically operated as a voluntary organization. First organized in 1968 after the 1965 Northeast blackout, NERC's mission is to ensure that the bulk electric system in North America is reliable, adequate, and secure.

There are ten Regional Reliability Councils across North America, including the Midwest Reliability Organization (MRO), which is discussed below. All ten are members of NERC. Eight of the RRCs, including the MRO, are located in the transmission subsystem called the Eastern Interconnection. A map of the Regional Councils that make up NERC can be found on NERC's webpage at:

http://www.nerc.com/regional/

NERC works with all segments of the electric industry, including electricity customers, to develop standards for the reliable planning and operation of bulk electric systems. The NERC standards cover all elements of operating and planning the transmission system, from facility design, to personnel training, to operational parameters. The standards set forth both technical and performance standards that utilities must meet.

The NERC standards are intended to ensure that the transmission system is designed, operated, and planned to be capable of performing under a wide-variety of possible conditions, including situations called contingencies, where an interruption of service from a storm or other event has taken a transmission line (or other facility or several facilities) out of service. A tornado downing a transmission line is an example of a contingency. The transmission system must be able to continue to operate satisfactorily to provide power to customers even in situations where one or more contingencies have occurred.

Although NERC standards were historically enforced on a voluntary basis, the utility industry has recognized that these standards are necessary for the continuing reliability of the North American bulk electric systems. In February, 2005, NERC issued its "Version 0" standards, updating all prior NERC standards. FERC simultaneously issued an order finding the NERC Version 0 standards to be "good utility practice" under FERC Order 888, thus making the standards effectively mandatory for all FERC jurisdictional electric utilities, including certain MTO members.

On August 8, 2005, the President signed into law P.L. 109-58, the Energy Policy Act of 2005. One provision of that law provides that FERC may certify one electric reliability organization (ERO) to develop and enforce reliability standards. Section 211(c); 16 U.S.C. §824o(c). Once an ERO is approved by FERC, it must develop "reliability standards" that are filed and approved by FERC. The Act defines a "reliability standard" as

> a requirement, approved by the Commission [FERC] under this section, to provide for reliable operation of the bulk-power system. The term includes requirements for the operation of existing bulk-power system facilities, including cybersecurity protection, and the design of planned additions or modifications to such facilities to the extent necessary to provide for reliable operation of the bulk-power system, but the term does not include any requirement to enlarge such facilities or to construct new transmission capacity or generation capacity.

Section 211(a)(3); 16 U.S.C. §824o(a)(3).

NERC is expected to file an application and be certified as the ERO, and file Version 0 standards to be the initial mandatory standards. Future ERO transmission planning operations and other standards will be mandatory and enforceable by both the ERO and FERC.

Mid-Continent Area Power Pool (MAPP). In 1963 Minnesota utilities formed the Mid-Continent Area Power Pool (MAPP) as a planning group. Nine years later, in 1972, it transformed into a full-fledged power pool, meaning members were able to reliably back-up other members when needed in the case of damaged power lines, repairs to power plants, etc.

The goal of MAPP was to ensure that the regional interconnected electric system was operated securely and efficiently and that the economic benefits of power pooling were equitably shared through coordination, consistent standards, and enforcement. MAPP had approximately 107 members, including investor-owned utilities, electric cooperatives, municipal utilities and public power districts, a federal power marketing agency, private power marketers, regulatory agencies, and independent power producers. Additional information about MAPP can be found on its webpage: http://www.mapp.org/

A map of the historic MAPP region is shown below:

MAPP has evolved since submission of the 2001 and 2003 Biennial Transmission Project Reports. In December 2001, the Midwest Independent Transmission System Operator (MISO) became the NERC regional reliability coordinator for the MISO region and in early 2005, the remaining reliability functions of MAPP transferred to the Midwest Reliability Organization (MRO). MISO and MRO are discussed below. MAPP did maintain certain of its functions, including transmission planning, regional tariff administration, and reserve capacity requirements.

Midwest Reliability Organization (MRO). In November 2002, the MAPP Executive Committee approved the formation of the Midwest Reliability Organization. MRO became operational in 2005. MRO replaced MAPP as a Regional Reliability Council member of the North American Electric Reliability Council. The MRO maintains a webpage at:

http://www.midwestreliability.org/

The MRO will administer and enforce reliability standards across a broader geographic region than did MAPP. MAPP will remain responsible for certain transmission planning activities in the MAPP area and will continue to operate a reserve sharing pool. A map showing MAPP and MRO is available in an MRO White Paper at:

http://www.midwestreliability.org/documents/MROWhitePaper.pdf

MRO has a Standards Committee that has the assignment to ensure that MRO standards are consistent with NERC standards. Information about the committee is available at:

http://www.midwestreliability.org/Standards.html

Midwest Independent Transmission System Operator, Inc. (MISO or Midwest ISO). Beginning in 1996, the Federal Energy Regulatory Commission (FERC), which has jurisdiction over certain aspects of the transmission grid under provisions of the Federal Power Act (16 U.S.C. § 824), began an effort to open up the transmission grid to all interested persons on an equal and nondiscriminatory basis. In April 1996 FERC issued its Order No. 888, which required each jurisdictional transmission utility to offer nondiscriminatory transmission service to all wholesale customers on the same basis as it provides service for its own generation. One effect of Order No. 888 was to require all public utilities to construct new transmission facilities if needed to fulfill a request for firm transmission service by an eligible wholesale customer. FERC also encouraged utilities to transfer operational control of their transmission facilities to an Independent System Operator (ISO).

The Midwest ISO was founded in 1998 as a voluntary association of electric transmission owners in the Midwest intending to form an ISO. In 1999, FERC issued a second order – Order No. 2000 – further encouraging competition in the wholesale power supply market by encouraging transmission-owning utilities to voluntarily join large Regional Transmission Organizations. On December 20, 2001, MISO became the first Regional Transmission Organization in the nation to be approved by FERC.

The MISO region spans a large area, encompassing fifteen 15 states from the Dakotas to Kentucky. MISO's headquarters are in Carmel, Indiana. The utilities that have joined MISO are located in various states in the Midwest, including Minnesota, Iowa, South Dakota, North Dakota, and Wisconsin, along with the Canadian provinces of Manitoba and Saskatchewan. A map of the MISO region is shown at the following webpage:

http://www.midwestiso.org/about_signatories.shtml

In its December 2004 Energy Conservation and Policy Report, the Minnesota Department of Commerce stated the following about MISO:

> MISO's primary function is to monitor the bulk power transmission system and to develop policies and procedures that ensure that every electric industry participant has access to the transmission system, and that transmission lines are used in a way that minimizes congestion and maintains system reliability. MISO has a much larger geographical footprint than MAPP, but not every MAPP member belongs to MISO. Today MISO controls more than 100,000 miles of transmission lines and more than 100,000 megawatts of electric generation over approximately 1.1 million square miles. MISO has the responsibility for Regional Transmission Planning and has direct responsibility and authority over the process to add or expand generation connected to the MISO transmission system.

Of the utilities submitting this Report, the following are members of MISO:

Interstate Power and Light Company
Great River Energy
Minnesota Power
Missouri River Energy Services
Otter Tail Power Company
Northern States Power Company, d/b/a Xcel Energy

Dairyland Power Cooperative and the Southern Minnesota Municipal Power Agency have both signed conditional MISO membership applications.

A complete list of the MISO members can be found on the MISO webpage:

http://www.midwestiso.org

3.4 System Performance Criteria Limits

The Public Utilities Commission, in its June 24, 2004, Order, directed the utilities to provide information on system performance criteria limits in the 2005 Report. Identifying such performance criteria limits is difficult because for the most part, the utilities' task is to provide a reliable transmission system that can meet demand at all times, under all conditions.

The following criteria are ones that utilities use in evaluating the performance of the system.

Voltage Stability. The bulk transmission System Intact Steady State bus voltage must be between 0.95 per unit (p.u.) and 1.05 p.u of the nominal voltage of the system. This means that the voltage of each unit (a line, transformer, other buses) on the system must remain in the range of 95% to 105% of the normal range for the unit.

Transmission Capacity. During normal operations, no facilities can be loaded above the normal rating.

Reactive Capacity. A power plant produces a mixture of "active" and "reactive" power. Active power is measured in watts and is the form of electricity that powers equipment. Reactive power is measured in volt-amperes reactive (VAR) and is the energy stored during part of a cycle by inductance and capacitance and then returned to the power source. Utilities are required to provide sufficient reactive power capacity and voltage control facilities to maintain or enhance the system's loading and transfer limits due to voltage level constraints and to maintain acceptable voltage levels.

Transfer Capability. The system must be adequate to complete all committed transfers.

Contingencies. A contingency is an unexpected failure or outage of a system component, such as a generator or a transmission line. The system must be able to perform reliably during contingencies. The utilities plan for the system to be able to continue to meet all customer demands with a "N-1" contingency (a single transmission element or generating unit out of service). Some areas are designed to continue to supply customer demands with two lines out of service (N-2). The underlying obligation is to maintain a system that can meet customers' demands as reliably and economically as possible.

Reserve Capacity. MAPP requires its members to maintain a generation reserve capacity of 15%.

National Electric Safety Code (NESC). The purpose of the National Electric Safety Code is to ensure the safety of persons during installation, operation, and maintenance of electric lines and associated equipment. Utilities must comply with all applicable NESC standards in planning and maintaining all transmission lines. The NESC standards can be found at

http://standards.ieee.org/faqs/NESCFAQ.html#q1

While the Midwest Reliability Organization has taken over promulgation and enforcement of reliability standards from MAPP for utilities in the MRO region, the standards that MAPP has established are indicative of the kind of standards that are followed. The standards are not some straightforward numerical numbers or calculations that utilities must meet, but are more directions to maintain the system at all times. MAPP adopted a Regional Reliability Handbook that utilities have followed. Section 6, p. 20, of the Handbook provides:

> During and following the conditions listed below [numerous contingencies], the MAPP system shall be continuously operated to prevent interruption of load due to instability, cascading, voltage instability, undamped oscillations, subsynchronous resonance or violation of transient voltage limits. This shall be done at all load levels and status conditions of equipment on the power supply system at 115 kV and above.

Similarly, in section 5, p. 1, of the Handbook, MAPP states:

> The MAPP Operating Standards as outlined in Section 8 of the MAPP Reliability Handbook are recognized by the MAPP Reliability Committee as essential to assure that continued operation of the MAPP system will be accomplished in a manner which will maintain a high degree of MAPP system reliability. Each entity responsible for the reliability of the interconnected system, herein after referred to Entity, shall endeavor to operate its system in a manner that shall enhance reliability of the MAPP system and minimize adverse effects on other Entity systems in accordance with these standards.

Section 8, p. 1, of the Handbook is entitled "MAPP System Design and Operating Standards:"

> The Standards of the Mid-Continent Area Power Pool (MAPP) described herein are recognized by the Management Committee as

> essential to assure that continued development of the MAPP System will be accomplished in a manner which will maintain a high degree of MAPP System Reliability. MAPP System additions shall be planned and constructed in such a manner that System contingencies can be sustained without Undue Burden on another member System.
>
> The MAPP System Design Standards serve primarily as a means of measuring the ability of the MAPP System to withstand a broad spectrum of contingencies affecting power System Reliability. The standards constitute an effective and practical means of stressing the MAPP System by simulation to predict its ability to function without uncontrolled, area-wide power interruptions, even under quite severe but credible conditions.

A copy of the complete MAPP Regional Reliability Handbook is available on the MAPP webpage.

In addition, the North American Electric Reliability Council is responsible for establishing uniform standards for the performance of the transmission grid that apply nationwide, and all transmission operators must comply with these standards. The NERC Version 0 standards are found in a document entitled "Reliability Standards for the Bulk Electric Systems of North America" dated February 2005. This document is available on the Internet at:

http://www.nerc.com/~oc/opman_status.html

As with the MAPP criteria, the NERC criteria are narrative directions designed to ensure that the transmission system performs reliably in all circumstances. An example is Standard TOP-004-0 entitled Transmission Operations, which contains the following statements:

> R2. Each Transmission Operator shall operate so that instability, uncontrolled separation, or cascading outages will not occur as a result of the most severe single contingency.
>
> R3. Each Transmission Operator shall, when practical, operate to protect against instability, uncontrolled separation, or cascading outages resulting from multiple outages, as specified by Regional Reliability Organization policy.

NERC also recognizes that the Regional Reliability Councils may set regional standards for their members. As described earlier in section 3.3, the Energy Policy Act of 2005 provides that one electric reliability organization, with authority to set mandatory standards, may be approved by FERC.

3.5 Assessment of Interruptions and Curtailments

In its June 24, 2004, Order, the Public Utilities Commission directed the utilities to address in the 2005 Report how service on the Minnesota transmission system is affected by interruptions or curtailments due to system constraints.

Transmission constraints are situations where the transmission facility or element is unable to handle the amount of electricity flowing over or through the facility or element without exceeding established reliability criteria. A "constrained facility" is defined by NERC as "a transmission facility (line, transformer, breaker, etc.) that is approaching, is at, or is beyond its System Operating Limit or Interconnection Reliability Operating Limit." Glossary of Terms Used in Reliability Standards, Adopted by NERC Board of Trustees: February 8, 2005, Effective Date: April 1, 2005. The Glossary of Terms can be found on the NERC webpage.

There are points on a transmission system that are referred to as "flowgates." Flowgates are the elements or facilities in the system that act as a proxy for an operating security limit. Each flowgate has an "available flowgate capacity" (AFC) – the amount of power that can flow through the transmission facility at a certain point. If the available flowgate capacity is reached, additional demands for power cannot be transmitted through that flowgate. If the available flowgate capacity is exceeded, the flows must be promptly reduced to prevent damage to or failure of the constrained facility or element. As a result, the transmission operator may have to curtail the amount of electricity through a particular flowgate. This cutback is called "Transmission Loading Relief" (TLR). TLR is a reliability standard established by NERC, mandated by FERC, and administered by the applicable region reliability coordinator, like MISO.

The best source for information about TLR incidents is found in MISO's 2005 Transmission Expansion Plan Report (MTEP-05) in Section 6 (Baseline Reliability Study Findings), subsection 6.3 (MAPP Region) and subsection 6.4. There MISO identifies 24 specific flowgates that were most frequently involved in TLR incidents over a 48 month period (2001-2004). These 24 flowgates accounted for 67% of all MISO TLR hours over that period, and of that amount, the top eleven flowgates accounted for half of all TLR hours in the MISO region. See MTEP-05 Report at pp. 120-121 and Figure 6.4-5 at p. 121. The MTEP-05 Report is discussed further in Section 4.5.9 of this document and the Report is on the MISO webpage at: http://www.midwestiso.org/plan_inter/expansion.shtml

Only one of the 24 flowgates identified is in Minnesota – the 161 kV transmission line between the Lakefield Junction Substation and the Fox Lake Substation in southwestern Minnesota. The Lakefield-Fox Lake flowgate is not one of the top 11 flowgates and accounted for only a small percentage of the total TLR hours during the four year period from 2001 to 2004. See Figure 6.4-5 at p. 121. This potential constraint is intended to be alleviated by the construction of a second 161 kV line between the two substations. See Figure 6.4-3 at p. 126 of the MTEP-05 Report. The Minnesota Environmental Quality Board issued a Route Permit for this line in September 2004. EQB Docket No. 03-64-TR-Xcel. The line is expected to be in-service in 2006.

TLR incidents have not affected the reliability of the transmission system in the MISO region. TLR incidents are primarily of economic significance. As MISO states in its MTEP-05 Report, at page 110:

> Midwest ISO Reliability Authority continues to monitor approximately 32 constrained flowgates within the MAPP region. These constraints can limit MAPP imports and exports under various conditions, and require continuous monitoring. Reliability problems are not expected as long as limits are identified in real time and respected.

At p. 113 of its Report, MISO continued:

> Transmission system constraints that limit the availability of service reservations or that limit the flow of scheduled transmission service reservations, generally represent limitations to the commercial use of the system, rather than limitations to the reliability of the system. This is because mechanisms exist for the curtailment of scheduled transactions when system conditions are other than planned and are designed to prevent system security violations. These commercial limitations give rise, however, to congestion costs that may or may not exceed the costs of relieving the constraints. Much of the congestion realized simply reflects proper management of the system within reliable bounds, and is not reflective of other eminent problems or expansion needs. Given adequate generation reserves, the transmission system becomes the "ultimate sentinel" for reliability. Any subsequently realized transmission congestion has two facets. When transmission limits are reached and there are adequate generation resources to shift supply the reliability risk is very low.

It is likely that incidences of TLR will be reduced in the future because MISO is replacing congestion management by TLR with management through regional security-constrained economic dispatch. MISO will be able to direct the dispatch of specific generators on either side of a constrained facility to reduce the overload condition when such situations arise. MISO stated in its MTEP-05 Report, at p. 113:

> Historically the transmission reservation process has attempted to measure the available flowgate capacity (AFC) and used that as a basis on which to grant or refuse additional service requests. Subsequent to the granting of transmission service, transmission loading relief (TLR) is a procedure to control flows and prevent system security violations. Beginning March 31, 2005 the Midwest ISO intends to implement a centrally controlled security constrained dispatch, and this dispatch will become the primary process for controlling security constraints on an operational basis.

> The central dispatch process is directed at economically dispatching the system while honoring constraints and avoiding security violations. MTEP reports after 2005 may contain a review of system limits based on central dispatch history. Such central dispatch history may provide information to better resolve if the cost of relieving constraints would warrant network expansion solutions. This is the situation for an extreme majority of the time. Alternatively, when a transmission limit is reached and generation resources are fully utilized, the situation is very critical.

As the administrator of TLR events, MISO will continue to be the best source of TLR data of interest to state agencies and others.

4. Transmission Planning

4.1 Planning Process

Transmission planning in Minnesota and throughout the country is done on a regional basis. In Minnesota, electrical engineers and others from the various utilities work with MAPP and MISO staff to develop plans to ensure the continued reliable operation of the transmission system. MAPP maintains various committees, like its Subregional Planning Groups (SPGs) and Transmission Planning Subcommittees, to focus on planning for additional transmission infrastructure in the region.

MISO participates with MAPP and the utilities in some of this planning and works in close coordination with the SPGs. MISO has the task to develop plans for maintaining the transmission system throughout the entire MISO region. MISO has created a Planning Support Group. MISO states on its webpage:

> The Planning Support Group (PSG) shall draw upon the collective knowledge of its Transmission Owner and Transmission Customer participants to advise, guide, and provide recommendations to MISO staff with the goal to better enable MISO to execute its planning responsibilities, in an efficient and timely manner, as set forth in the MISO Tariff, MISO/Transmission Owner Agreement, and other applicable documents.
>
> http://www.midwestiso.org/committees/planning/

Much of the planning is done in an open forum, with attendance by staff of the regulatory agencies like the Public Utilities Commission and the Department of Commerce and by interested members of the public and by independent organizations interested in obtaining transmission service.

For additional information about the planning process, consult the 2003 Biennial Transmission Projects Report at pp. 10-17 found at www.minnelectrans.com.

4.2 Planning Objectives

The overall goal of the planning process, of course, is to ensure the reliable operation of the transmission system to meet the demand for power by a utility's customers at the lowest reasonable cost. However, there are usually specific objectives involved with planning activities, and it is helpful to address the various objectives that planners to observe.

Load Growth. One of the objectives involved in planning is to ensure the continued supply of electricity to a utility's customers. Minnesota utilities are predicting a growth of approximately 2% in energy demand in the MAPP/MISO region through 2011. Not only does this increasing demand require an analysis of how that electricity is going to be generated, but it also requires a determination of what transmission infrastructure will be required to carry that power from the generation source to the ultimate consumer. The long-range planning undertaken by the utilities as part of the CapX 2020 efforts was designed to look at transmission infrastructure required to meet increasing demand for power. The CapX 2020 effort is discussed in detail in Section 6.

Interconnection Requests. Related to load growth, planners must be cognizant of all requests to interconnect to the existing transmission system. These interconnection requests can be both requests by the utility to interconnect its own new generation sources that are planned to meet increasing demand and requests by independent merchant generators who want to be able to inject their power onto the grid for delivery and sale to utilities and others.

By direction of FERC, MISO administers the interconnection request process for all MISO-member utilities. MISO maintains a queue, and prioritizes the interconnection requests in the order they are made. Once a request for interconnection service is made, MISO and the utilities must conduct studies to determine (a) what facilities are required to interconnect the proposed generator to the transmission grid, and (b) whether the present transmission system can handle the additional power, and if not, what new transmission infrastructure (called "network upgrades") should be constructed to address the expected impacts. Under FERC Orders 888 and 2003, a utility is obligated to construct the required interconnection and network upgrade facilities, although the generator may be required to fund certain construction costs. Once the required interconnection studies are completed, the generator, MISO, and the affected transmission-owning utility must enter into an interconnection agreement using the standard Large Generation Interconnection Agreement form, and the agreement is filed with FERC.

Certain of the projects described in the 2005 Transmission Projects Report involve facilities being constructed to satisfy approved interconnection requests. See the Big Stone project (Tracking No. 2005-WC-N1) and Blue Lake plant (Tracking No. 2005-TC-N4) and several Southeast Zone projects.

System Maintenance. One important aspect of planning, and one related to all other reasons for planning, is to determine whether existing facilities need to be upgraded or replaced to continue to perform as intended. Portions of the transmission system in Minnesota are older than 50 years. In some instances, the need to repair or replace an older transmission line or other facilities like transformers can offer opportunities to increase the capacity of the facilities and provide future benefits to the system.

Transmission Service Improvements. With the efforts by FERC to open the transmission grid to all users on a nondiscriminatory basis, and to seek ways to provide the most economical power around the country, virtually all utilities that own power plants or transmission lines or both seek to both buy and sell electricity with other entities. It is necessary to identify constraints to moving electricity around the grid and to possible solutions to relieving these constraints. MISO administers the transmission request and approval process on a regional basis. Under contract to MAPP, MISO also administers that transmission service request and approval process for MAPP utilities.

Renewable Energy Objective. Minnesota has established a Renewable Energy Objective, whereby each utility in the state is obligated to make a good faith effort to increase the amount of power generated by renewable energy sources like wind and hydropower and biomass by 1% per year until a total of 10% of power comes from renewable sources by the year 2015. Minn. Stat. § 216B.1691. One objective of planning is to determine what transmission facilities might be necessary to accommodate the required growth in generation from renewables. The REO is discussed further in Section 4.6 of this document.

Regional Goals. A change on one part of the interconnected system will likely have impacts on other parts of the grid, often at geographically distant locations. That is why planning activities are conducted and designed to address issues on a regional basis. That is also why MAPP and MISO are involved in all planning activities to provide regional coordination. The utilities that are part of MAPP and MISO are located in various states in the Midwest and in Canada.

Distributed Generation. When utilities conduct their planning activities to determine what additional generation facilities are necessary to meet future energy needs, one of the factors taken into account is the possibility of meeting increasing needs through construction of small generation sources in the area of increasing demand. The concept of constructing numerous small generation sources rather than larger central generating facilities is often referred to as distributed generation or dispersed generation. The two concepts should be distinguished, however.

Distributed generation consists of a number of small generation sources (a few megawatts at most) that can supply power to customers who are located close to the generator. High voltage transmission is not required to ship this power to the consumer. Dispersed generation, on the other hand, is the situation where the power from a number of small generation sources is joined (to achieve perhaps 30-40 megawatts) and then this power is placed on the transmission grid for transfer to customers a good distance away. Distributed generation, by definition, will not implicate high voltage transmission facilities, except to the extent it does not take up any capacity. Dispersed generation, however, must be accommodated when doing transmission planning.

Separation of Generation and Transmission. Another important factor to take into account with regard to transmission planning techniques is that since 1992, when Congress partially deregulated the wholesale electric power supply industry, generation and transmission are regulated differently. Utilities are required to comply with Standards of Conduct separating the "wholesale merchant function" of the organization from the "transmission function," to ensure comparable access to transmission services and transmission information. The result of this is that generation planning and transmission planning must now be performed separately and in a nondiscriminatory and transparent manner.

4.3 Planning Techniques

Transmission planning is a continuous, ongoing affair. Utility engineers are constantly looking at potential problems and concerns about the reliability and adequacy of the transmission system.

Issues can develop in at least two ways – from the occurrence of a problem on the system, such as low voltage or an overload, or from the identification of a specific need, like an interconnection request or the obligation to seek additional renewable energy.

Transmission planning engineers have developed computer models that simulate the operation and performance of the transmission grid under various scenarios. The engineers can plug into the models certain operating assumptions, and determine what the result is on the system, whether there are any overloads or constraints that develop.

The engineers will run the models under various potential operating conditions in an attempt to identify the most severe conditions to which the system will be subject. Typically these are the high-peak transfer situations, although normal operating conditions are also examined.

Then the engineers will model what would happen if one of the facilities in the system, such as a transmission line or a generating plant, were to be taken off line. This is known as the N-1 contingency, which means all facilities are operating normally except for one. NERC defines "contingency" as "The unexpected failure or outage of a system component, such as a generator, transmission line, circuit breaker, switch or other electrical element." The NERC definitions are found at: ftp://www.nerc.com/pub/sys/all_updl/standards/sar/Glossary_Clean_1-07-05.pdf

NERC requires utilities to be able to survive the loss of any one facility with no loss in service to the customers. The system must meet thermal and voltage standards even in the N-1 contingency situation. Then the utility must determine if a second facility should fail, what would be the situation on the transmission grid. NERC has several levels of emergency conditions, depending on how many contingencies have occurred.

The models that are developed contain information on the transmission grid in a wide area that crosses interstate boundaries. The models look not only at the impact on the utility's own facilities, but on facilities owned by other utilities. It is not enough to maintain normal operating conditions on the utility's own transmission lines and facilities; all other facilities also have to remain in normal operating conditions.

What the computer models examine is the electrical performance of the system, whether there are any overloads or voltage problems that develop from the assumptions that are modeled. The models typically do not take into account such other factors as economics or the environment. However, the planners will make estimates of the costs of various possible solutions to the situation being modeled, whether a load serving problem or new interconnection request or other situation, and will be cognizant of potential environmental issues associated with new transmission lines and power plants. The utilities will consider the available information on all these issues in deciding which transmission option to pursue.

Once the modeling and other analysis are complete, utilities must then follow appropriate regulatory procedures to obtain authorization to construct any new transmission facilities. Depending on the size and length of a proposed transmission line, a utility will need a Certificate of Need from the Public Utilities Commission for a proposed transmission line, and a route permit from the Commission for any new transmission line that is found to be needed. Costs and environmental impacts will be significant factors that will be considered in determining the best system alternative and the best route.

4.4 Inadequacies

Minnesota Statutes § 216B.2425, the statute that requires the Minnesota Transmission Owners to file this Biennial Transmission Projects Report, requires the utilities to identify "present and reasonably foreseeable future inadequacies in the transmission system in Minnesota." Section 216B.2425, subd. 2(1). Neither the statute nor the rules adopted by the Public Utilities Commission, Minnesota Rules chapter 7848, define the term inadequacy.

In preparing this Report, MTO has interpreted "inadequacy" to be a "need" for new or upgraded transmission facilities. When initial modeling determines that certain developments, such as potential load growth, a generation interconnection request, or a contingency event require additional transmission to address the situation, then a "need" for additional transmission has been identified. As described above, this means that without additional electric infrastructure, the utility has a thermal or voltage problem or a problem maintaining service in a contingency situation, or some other noncompliance situation that requires additional infrastructure to alleviate. If reliable service can be maintained even with increasing demand, or with the outage of one or more facilities, or with a new generation source being added, then, certainly, no new "need" has been identified.

In the discussion of inadequacies in Section 8 of this Report, MTO has attempted to identify the "need" that is driving the determination that additional transmission facilities are required.

4.5 Studies and Reports

In the course of conducting their planning activities, it is common for the utilities to undertake specific studies designed to address certain issues. Studies have to be undertaken to identify inadequacies in the system and to determine possible solutions to these inadequacies. Many times these studies are conducted by only one or two utilities to examine a small defined issue. For example, the *Eden Prairie-Minnetonka Area Load Serving Study* evaluated the system in that area of the Twin Cities (Tracking Number 2003-TC-N2). In the 2003 Transmission Projects Report, MTO listed at the end of each zone discussion the studies that were pertinent to inadequacies in that zone.

In the 2005 Report, rather than simply list these smaller studies at the end of each zone discussion, MTO has elected to identify a number of the broader, more wide-ranging studies that have been undertaken in the past two years or are underway or will be underway shortly, and provide a brief discussion of the purpose of the studies in a separate section of the Report. In those cases where a written report has been prepared, the MTO has provided a web citation if the study is posted on the Internet.

Many of these broader studies are ones that involve not only the MTO utilities, but also the Midwest Reliability Organization and the Midwest ISO. In addition to discussing a number of studies, this section also includes reference to MAPP and MISO reports.

4.5.1 The Northwest Exploratory Study

The Northwest Exploratory Study was intended to identify the best types of transmission expansion required to transmit 2000 megawatts of wind and coal generation in North Dakota and South Dakota to eastern Minnesota. The Northwest Exploratory Study was performed by MISO as a supplement to the regional expansion planning process.

The results of the Northwest Exploratory Study show that the best way to transmit 2000 MW of power from North Dakota and South Dakota to eastern Minnesota is to construct two 345 kilovolt transmission lines. One line would be routed from central North Dakota through eastern South Dakota, through the Minnesota Buffalo Ridge area, to the Twin Cities (the southern route), and a second line would be routed from central North Dakota through Fargo, North Dakota, to Alexandria, Minnesota, to the far northwest side of the Twin Cities (the northern route). No specific routes for either line have been identified.

Discussion of the Northwest Exploratory Study can also be found in the MTEP-05 Report.

4.5.2 Iowa/Southern Minnesota Exploratory Study

The Iowa/Southern Minnesota Exploratory Study is also an effort by MISO. The purpose of this exploratory study is to examine transmission options to transfer large blocks of wind power from the area to markets in Minnesota, Iowa, and Wisconsin.

The Iowa/Southern Minnesota Exploratory Study is still underway. The study will likely not be completed until next June when MISO issues its Transmission Expansion Plan for 2006 (MTEP-06).

4.5.3 Buffalo Ridge Incremental Generation Outlet Transmission Study (BRIGO Study)

The BRIGO Study looked at expanding wind generation from Buffalo Ridge beyond the 825 MW that is presently anticipated through relatively modest (i.e., 115 kV) facilities. The Study, which was finalized in June 2005, states:

> This electric transmission study addresses the development of transmission outlet capacity for additional electric generation capacity which may be constructed on the Buffalo Ridge in Southwestern Minnesota or adjacent South Dakota and Iowa portions of the Ridge. The study effort concentrated on developing and evaluating transmission options that could
>
> - provide several hundred MW of incremental outlet capacity
> - be implemented by the 2008-2009 timeframe
>
> It is recognized that continued generation development on the Buffalo Ridge will ultimately require addition of major

> transmission facilities to enable reliable and efficient transport of large blocks of power to the load centers located to the east. This Study is for the purpose of identifying smaller-scale improvements that can be implemented while those larger transmission plans are developed.

BRIGO Study at p. 2.

This Study is part of the efforts by MTO to examine ways to satisfy the state's Renewable Energy Objective. This effort to identify various options to expand wind outlet from Buffalo Ridge has been given its own Tracking Number in the Southwest Zone: 2005-SW-N2.

4.5.4 CapX 2020 Vision Plan

CapX 2020 is an effort of a group of utilities including Great River Energy, Otter Tail Power Company, Xcel Energy, Minnesota Power Company, Minnkota Power Cooperative, Missouri River Energy Services, Southern Minnesota Municipal Power Agency, and the Midwest Municipal Transmission Group, to focus on the need for additional transmission infrastructure by the year 2020 to meet a growing demand for electricity. CapX 2020 is an abbreviation for "Capital Expenditures by the Year 2020." CapX 2020 has developed a Vision Plan, identifying three 345 kV transmission lines and several other transmission lines required to satisfy a growing demand for power in the region. Since the CapX 2020 Vision Plan is a critical element of transmission planning in the state, an entire Section (Section 6) has been devoted to a discussion of the CapX 2020 effort.

4.5.5 Red River Valley Load Serving Study

Transmission Improvement Planning Study (TIPS)

In 2005 Great River Energy, Otter Tail Power Company, Minnesota Power, Missouri River Energy Service, and Xcel Energy undertook a load-serving study to identify electric transmission system improvements that will be required to accommodate future load growth in the Red River Valley. Specifically, the utilities looked at the Alexandria and Bemidji areas in Minnesota and four areas in North Dakota (Devils Lake, Fargo, Grand Forks, and Jamestown). The work has been completed but the written report has not been finalized as of November 1, 2005.

The study showed that transmission improvements are presently needed in the Bemidji/Cass Lake area. Several short-term and long-term alternatives were identified. See discussion for Tracking Number 2003-NW-N4.

4.5.6 Southwest Minnesota --> Twin Cities 345 kV EHV Development Study

The purpose of the Southwest Minnesota --> Twin Cities 345 kV EHV Development Study is to determine the overall increase in Buffalo Ridge outlet capability achieved with integrating new transmission facilities proposed as part of the Big Stone Unit II project with 345 kV facilities from the Granite Falls area to the Twin Cities metro area. The study was undertaken in 2005 and a written report is being finalized.

This study builds upon the work done in several other recent studies, including the CapX 2020 Vision Plan, the BRIGO study, the Northwest Exploratory Study, and the Big Stone II Interconnection Study. Taking into account these other studies, several alternative transmission improvement options were evaluated. These include:

Base Plan	Brookings County to the Twin Cities 345 kV
Base Plan (Double Circuit)	Same as Base Plan except double circuit 345 kV between Lyon County-Franklin-Helena substations
System Alternative	Brookings County to Blue Lake substation 345 kV
System Alternative	Brookings County to Blue Lake substation 345 kV with additional 345 kV segments.

The result of the study is that the Base Plan, Double Circuit option is the preferred option. It appears to offer the best results with respect to system performance, prevention of inadvertent flows, transfer capability, energy losses, practicality, and price. The 345 kV line from southwestern Minnesota to the Twin Cities will have taps at several locations, including at least the Lake Marion substation, the Franklin substation, and the Lyon County substation. Each of these taps will have transformers to support lower voltage systems.

This 345 kV line from Brookings, South Dakota, to the south side of the Twin Cities is part of the CapX 2020 Vision Plan. A Certificate of Need will be applied for in the first quarter of 2005.

4.5.7 C-BED Study

C-BED is an acronym for Community Based Energy Development. The Minnesota Legislature has directed the utilities to determine what transmission infrastructure is required to support the utilities' efforts to meet the state's Renewable Energy Objective. Minn. Stat. 216B.2425, subd. 7, as amended by Minn. Laws 2005, ch. 97, art. 2, sec. 3.

In a compliance filing submitted to the Public Utilities Commission on July 31, 2005, the MTO committed to undertake a study to determine the transmission upgrades that might be necessary to implement some community-based wind energy projects. A study scope is being developed that will look at transmission improvements required to deliver a certain amount of renewable energy in the West Central Zone. The utilities are hopeful the study can be completed by May 2006.

4.5.8 2005 MAPP Load and Capability Report

A Load and Capability Report is prepared each year by MAPP setting forth a two-year monthly and a ten-year seasonal load and capability forecast from each MAPP participant. The 2005

Report contains forecasts of monthly load and capability data for the period of May 2005 through December 2007 and seasonal load and capability data for the ten-year period Summer 2005 through Winter 2014. The MAPP Load and Capability Report is available on the MAPP webpage at:

www.mapp.org/assets/pdf/MAPP%20LC%202005.pdf

The MAPP-U.S. utilities forecast a capacity deficit beginning in 2011. The MAPP U.S. region's energy requirements are expected to grow by more than 18% over the next nine years, indicating a need to obtain more generation to serve the area.

4.5.9 Midwest ISO Transmission Expansion Plan 2005 (MTEP-05)

This Midwest ISO engages in annual regional transmission planning and enters the result of its planning activities in the MISO Transmission Expansion Plan (MTEP). The MTEP process coordinates the transmission plans of individual MISO member utilities to develop a coordinated regional transmission plan.

The MTEP-05 report was approved by MISO in June 2005. The report identifies transmission expansion required for a planning horizon extending through the peak season of 2009. MISO has identified 615 planned or proposed facility additions or enhancements representing an investment of $2.91 billion through 2009, primarily to maintain reliability. These expansion plans are listed in Appendix A to the MTEP-05 report, together with information about expected service dates, project owner, estimated project cost, and other information.

The MTEP-05 Report can be found on the MISO webpage at:

http://www.midwestiso.org/plan_inter/documents/expansion planning/MTEP05_Report_061605.pdf

4.6 Renewable Energy Objective

Minnesota Statutes § 216B.2425, subd. 7 – the statute requiring submission of this Report – provides:

> Subd. 7. Each entity subject to this section shall determine necessary transmission upgrades to support development of renewable energy resources required to meet objectives under section 216B.1691 shall include those upgrades in its report under subdivision 2.

The Renewable Energy Objective is a requirement to make a good faith effort to generate or procure at least one percent of an electric utility's total retail electric sales from renewable energy sources such as wind, hydropower, and biomass, beginning in 2005 and increasing that amount by 1% per year until 2015. Minn. Stat. § 216B.1691.

The MTO utilities have made a concerted effort to identify transmission infrastructure improvements that might be necessary to ensure compliance with the requirement to obtain an increasing percentage of power from renewable energy resources. As described above in Section 4.5, there are several studies underway or completed that are designed to examine ways to provide for the outlet of wind and other renewable energy. These studies have led to the identification, and in some cases to the proposal, of transmission lines that will allow for the transfer of additional renewable energy. The Big Stone lines (2005-WC-N1) are an example of transmission lines that the utilities are proposing to construct that will be helpful in providing for the transfer of renewable energy. The CapX 2020 Vision Plan (2005-CX-1) will lead to the submission of a certificate of need application for a 345 kV line that will increase the transfer capability of the Minnesota system. The BRIGO study identified a number of modest 115 kV improvements to aid in the transfer of renewable energy (2005-SW-N2). The C-BED study, to be undertaken in 2006, will look specifically at renewable energy development.

5. Public Participation

5.1 Requirements

The Public Utilities Commission has established in its rules – chapter 7848 – certain procedures the utilities must follow to advise local officials and the general public about planning activities and possible new high voltage transmission lines. These procedures involve the holding of a public meeting in each Transmission Planning Zone at least once per year. Minn. Rules part 7848.0900. The utilities must announce the public meetings by mailing notice to certain local and state and tribal officials and publishing notice in local and statewide newspapers. Minn. Rules part 7848.1000.

The rules require the utilities to prepare a summary of each planning meeting and mail or e-mail the summaries to all persons who have registered at any of the meetings and to liaisons with county government, tribal governments, and other state organizations and agencies. Minn. Rules part 7848.1100. The summaries are included with this Report as Attachment 3 (2004) and Attachment 4 (2005).

The utilities are required to keep materials from the public meetings for at least ten years. Minn. Rules part 7848. 1200.

These requirements are all in addition to the public notice requirements that apply when a utility applies for a certificate of need or a route permit for a new transmission line. See Minn. Rules parts 7829.2500 and 4400.1350.

5.2 Summaries of Public Meetings

The utilities have satisfied the PUC requirements to hold these annual transmission planning meetings. Meetings were held around the state in each of the Zones in October 2004 and in May 2005.

The utilities provided direct mail notice as required for each of the public meetings and published notice in local papers about the meetings. As the summaries show, however, not very many members of the public or local officials attended any of the hearings. Very few written comments were received after the public meetings.

5.3 Suggestions for Change

The procedures spelled out in the PUC rules are not working to involve the public early on in transmission planning. The public is simply not attending any of these meetings. Nor are local officials attending. The utilities have dutifully followed all the procedures spelled out in the rules, and the results have been disappointing.

The utilities have put a significant effort into holding these annual public meetings. Notice is being provided as required. Representatives from the utilities attend each meeting and make a public presentation. Opportunities for submitting written comments are being established. A good number of hours and a substantial amount of money are being spent to conduct these meetings. However, as the summaries show, these meetings are not well attended.

The major reason the public is not attending these planning meetings and participating in the process is because the public is interested in learning about whether new transmission lines are going to be constructed in their neighborhood, not whether, for instance, "flowgates" exist that are interfering with the buying and selling of electricity. The general public is not going to show up for these public meetings unless local residents are informed that a new powerline may be proposed to be routed near their home or business. The difficulty is that the utilities do not know at the early stages of planning where new transmission lines may be routed.

To be clear, the utilities are not suggesting that public meetings be abolished or that the public not be afforded an opportunity to become informed and participate; we are suggesting that the present system is not working to encourage the public to participate, and new mechanisms must be tried. The utilities suggest that as part of the process of reviewing this Transmission Projects Report, the Commission solicit ideas from interested parties on how the system might be improved.

It might also be appropriate to consider changing Minnesota Rules part 7848.1800, subp. 1, which identifies the persons who must be served with a copy of the full Transmission Projects Report. This list easily grows to over 200 people, considering all 87 counties must be served, along with any person who requests a copy. The service list for this 2005 Report illustrates how lengthy the list is. Since few people are showing up for the public meetings, it is likely the Report is not being reviewed either. Instead of requiring service of the entire Report, it might be appropriate to just mail notice that the Report is available, both in hard copy and on the web. The utilities will certainly provide a copy to any local official or interested person requesting one, but it seems unnecessary to require service of the entire Report on over 200 people. Another option would be to mail an Executive Summary – a shortened version of the Report – to people on the list.

The utilities also suggest that the Commission consider posting the Transmission Projects Report on its webpage. The general public might not know that such a Report even exists, and wouldn't know to go to the utilities' webpage to find it, but a person might come across it on the Commission's homepage if it were readily linked by the Commission. The Department of Commerce could also post the document. A prominent link on the homepage of both the Commission and the Department to possible projects might encourage the general public, who may be searching for other information, to click on the Biennial Report to learn more about any projects in the viewer's area.

Another forum that could serve to notify the public about possible projects is the Annual Hearing that the Public Utilities Commission is required to hold every November or December. Minn. Stat. § 116C.58 and Minn. Rules part 4400.6050. The Commission could use the Annual Hearing as a time to inform the public of possible transmission line projects. The utilities, of course, would participate in the Annual Hearing. While the Annual Hearing may not be accessible to many if it is held only in St. Paul, the Commission could consider holding sessions around the state, and even if held only once in St. Paul, the persons who attend are likely to be the citizens most interested in transmission projects.

Improvements are also appropriate regarding the notice that is required when a certification request is included with the biennial report, as is the case this year. Presently, Minnesota Rules part 7848.2000, subp. 1, requires a utility that seeks certification of a particular proposed transmission line to provide a copy of the certification request (which looks a lot like an application for a certificate of need) to every county in the state. In this year's situation, Minnesota Power and Great River Energy are required to notify all 87 counties of a proposal to build a 115 kV line in northern St. Louis County. It is highly unlikely that Nobles County officials, for example, are interested in a proposed transmission line in St. Louis County. The rule should be changed to require that no more than notice be provided to every county in the state, and that a copy of the entire application need not be served on all counties. For comparison, an applicant for a Certificate of Need is not required to serve the application on every county in the state.

These thoughts and ideas need further development and consideration. There are other improvements that can be made. It is worthwhile, however, for the Commission to consider as part of its review of the 2005 Transmission Projects Report whether improvements can be made in the transmission planning process established in chapter 7848.

6. CapX 2020 Vision Plan

Tracking Number. 2005-CX-1

Organization. In the spring of 2004 eight utilities initiated a concerted effort to ensure that the transmission system in Minnesota was adequate to serve a growing demand for electricity and to plan for major capital expenditures that would be required to construct major new transmission infrastructure in the near future.

The eight utilities are Great River Energy, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, Southern Minnesota Municipal Power Agency, and Xcel Energy. The name CapX 2020 is short for Capital Expenditures by the year 2020.

Mission. The mission of CapX 2020 is twofold:

- Create a joint vision of required transmission infrastructure investments needed to meet growing demand for electricity in Minnesota and the region.
- Work to create an environment that allows these projects to be developed in a timely, efficient manner, consistent with the public interest.

Existing Transmission System. Minnesota's electric transmission system consists of a network of transmission lines of 230 kilovolts and higher that span the state, moving electricity from power plants to load centers, like the Twin Cities and other population centers. The system is designed to maintain reliability even when faced with contingencies that arise due to weather and other factors that may temporarily remove a particular transmission facility from service.

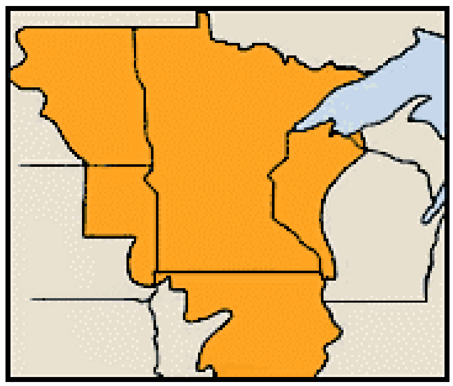
Most of the transmission facilities in the state were built in the 1960's and 1970's. Since 1987, only short, lower-voltage (less than 230 kV) transmission lines have been built, typically to meet local load-serving needs. Most of the transmission needs identified in Section 8 of this Report are these smaller-type projects designed to alleviate local issues.

The transmission system is also operated differently than it was in the past. A series of initiatives by the Federal Energy Regulatory Commission in the last ten years has opened the transmission system so that utilities must provide access to their high voltage transmission lines in a nondiscriminatory manner. Transmission planners must be prepared to meet the needs of all regional market participants, not just those of the utility or specific generation resource type.

Anticipated Load Growth. The CapX 2020 utilities used the individual utility load growth figures from the Mid-Continent Area Power Pool (MAPP) *2004 Load and Capability Report* to estimate that the demand for electricity could increase by roughly 6300 megawatts by 2020 in the region, including Minnesota and portions of the Dakotas, Iowa, and Wisconsin. The numbers are shown in the table below and the region is displayed in the map:

Table 2. CapX 2020 Anticipated Area Growth

Control Area	2009 load level (2004 MAPP Series) (MW)	Yearly growth rate (%)	Calculated 2020 load level (MW)
ALT (West)	3265.3	1.60	3888.2
Xcel Energy (North)	9632.6	2.68	12885.1
MP	1507.3	1.70	1814.4
SMMPA/RPU	330.0	2.70	442.4
GRE	2833.5	3.27	3943.2
OTP/MPC	1677.2	2.70	2248.3
DPC	954.7	2.60	1266.2
Total	20200.6	Ave.=2.49%	26487.8



Renewable Energy Objective. The CapX 2020 utilities were also aware of the state's policy to obtain 10% of retail sales from renewable energy sources by the year 2015. Minn. Stat. § 216B.1691. Much of this renewable energy will come from wind development along Buffalo Ridge in southwestern Minnesota and the Dakotas. This wind power will require access to the transmission system if it is going to be transported to the Twin Cities and other markets.

The CapX 2020 Planning Effort. The CapX 2020 utilities undertook a comprehensive planning effort to identify projects that will be needed to meet customer demand well into the future, considering the fact that demand is projected to grow at perhaps 2.5% per year in the region.

Two major efforts were established. One, called the CapX Vision Study, was designed to look at transmission needs throughout the state to accommodate the increasing demand. The second, called the Red River Valley Load Serving Study, or the Transmission Improvement Plan Study (TIPS), focused on the northern portion of the Red River Valley where transmission improvements presently are needed.

The utilities were also aware of and considered other studies that were underway, including the Northwest Exploratory Study, the Iowa/Southern Minnesota Exploratory Study, the Buffalo Ridge Incremental Generation Outlet Transmission Study (BRIGO), the Big Stone Interconnection Study, and other utility studies and MISO studies. These identified studies are described in Section 4.5 of this Report.

Planning Assumptions. In developing the scope of the study, a technical team made up of engineers from each of the utilities considered two potential scenarios for growth in electricity demand:

1. A low growth of 2.49% annually from 2009 through 2020, for an increase of 6300 megawatts.

2. A slower load growth of 4,500 megawatts, about 2/3 of the projected growth.

The team also established three generation scenarios, one with a bias for generation in the North and West of the region, one assuming generation in Minnesota, and one with a bias for generation in the East region. These generation scenarios are depicted below:

Table 3. Generation Scenarios

Generation areas	North/West Bias	Minnesota Bias	Eastern Bias
Northern MN	1700[1]	1250	550
Dakotas	2100	1000	1600
Southern MN/Iowa	1875	1875	2175
Metro	650	2200	1000
Wisconsin	0	0	1000
Total	6325	6325	6325

[1] This 1700-MW total includes a 1000-MW import from Manitoba.

Planning Techniques. The CapX 2020 technical team's primary goal was to create a common transmission backbone that could sustain the anticipated growth under all three generation scenarios. Initially, the team developed a list of possible transmission facilities, limited to facilities 345 kilovolts and larger. As a starting point, the team utilized the most probable transmission options from the exploratory studies already underway. These options include the following:

- A 345 kV line from North Dakota to Fargo and continuing on to the St. Cloud area;
- A 345 kV line from Prairie Island, near Red Wing, Minnesota, to Rochester, Minnesota, and continuing to southwest Wisconsin;
- Two 345 kV lines into central Iowa;
- A 345 kV or 500 kV line from Manitoba to the St. Cloud area; and
- Generation outlet transmission facilities presently under study through MISO.

Once these lines were identified, the team utilized computer models to analyze the impact on the system under the two load growth assumptions and the three generation scenarios. This exercise determined that a significant number of transmission overloads would occur if no additional transmission were built to serve the projected load growth. The team also simulated first contingency situations (N-1) to identify transmission alternatives that could better address potential low voltages and thermal overloads in contingency situations.

The CapX 2020 Vision Plan. In May 2005, CapX 2020 released its written report describing its planning effort. The report is entitled *CapX 2020 Technical Update: Identifying Minnesota's Electric Transmission Infrastructure Needs.* The Technical Update is on the CapX webpage at:

http://www.capx2020.com/Images/5-11-05%20CapX2020%20Tech%20Update.pdf

Based on the results of the planning effort, the CapX 2020 utilities have adopted a Vision Plan, setting forth a proposal for construction of over 1600 miles of 345 kV transmission lines at a cost of over $1.2 billion. The following table identifies these transmission lines.

Table 4. Summary of Vision Plan

Facility Name				
From	**To**	**Volt (kV)**	**Miles**	**Cost ($M)**[1]
Alexandria, MN	Benton County (St. Cloud, MN)	345	80	60
Alexandria, MN	Maple River (Fargo, ND)	345	126	94.5
Antelope Valley (Beulah, ND)	Jamestown, ND	345	185	138.75
Arrowhead (Duluth, MN)	Chisago County (Chisago City, MN)	345	120	90
Arrowhead (Duluth, MN)	Forbes (Northwest Duluth, MN)	345	60	45
Benton County (St. Cloud, MN)	Chisago County (Chisago City, MN)	345	59	44.25
Benton County (St. Cloud, MN)	Granite Falls, MN	345	110	82.5
Benton County (St. Cloud, MN)	St. Bonifacius, MN	345	62	45.5
Blue Lake (Southwest Twin Cities, MN)	Ellendale, MN	345	200	150
Chisago County (Chisago City, MN)	Prairie Island (Red Wing, MN)	345	82	61.5
Columbia	North LaCrosse	345	80	60
Ellendale, ND	Hettinger, ND	345	231	173.25
Rochester, MN	North LaCrosse	345	60	45
Jamestown, ND	Maple River (Fargo, ND)	345	107	80.25
Prairie Island (Red Wing, MN)	Rochester, MN	345	58	43.5
TOTAL			1620	$1,215 ($M)

[1] These cost estimates for the CapX projects are all preliminary estimates based on the costs of the lines only. They do not include any costs for terminations (work in substations) or lower voltage interconnections.

The planning effort undertaken by CapX 2020 establishes that the existing transmission system is adequate to meet the reliability needs of customers today, but that without substantial improvements in the near future, severe overloads, outages, and voltage problems will develop across the state.

Proposed Projects. The Vision Plan identifies three projects that the CapX utilities intend to pursue by filing certificate of need applications in 2006. These projects have been classified into a category called Group I. These projects are listed in the table below.

Table 5. Group I Projects

Project	Expected CON Filing	Expected in-service date
Buffalo Ridge to Twin Cities 345 kV	1st quarter 2006	2010
Fargo-Alexandria-Benton County 345 kV	4th quarter 2006	2012
Prairie Island-Rochester-LaCrosse 345 kV	1st quarter 2006	2011

In addition to the three projects described in the table, there are three other projects that are related to CapX 2020 in the sense that these lines will also provide additional capacity and reliability to meet the growing demand.

Table 6. Other Transmission Projects

Project	Expected CON Filing	Expected in-service date
Big Stone II Transmission	4th quarter 2005	2011
Buffalo Ridge Outlet 115 kV	1st quarter 2006	2009
Boswell-Wilton 230 kV	1st quarter 2006	2010

Future Projects. CapX 2020 has also identified a number of other projects that may be necessary in the future but additional analysis is required before any decisions can be made. None of these projects has been identified as an inadequacy or given a tracking number in Section 8 of this Report. However, for completeness, the following table is provided to identify a number of other possible projects that will continue to be evaluated. In the 2007 Transmission Projects Report, these projects can be updated.

Table 7. Future Transmission Projects

Project	Zone
Forbes – Arrowhead	NE
Benton County-Chisago 345 kV	WC/TC
Benton County-Granite Falls 345 kV	WC/SW
Benton County-St. Bonifacious 345 kV	WC
Arrowhead-Chisago 345	NE/TC
Antelope Valley-Jamestown-Maple River 345 kV	North Dakota
Columbia-North LaCrosse 345 kV	SE
Chisago-Prairie Island 345 kV	TC
Hettinger-Ellendale-Granite Falls 345 kV	SW

Tracking. The CapX 2020 projects identified in Table 5 above impact several of the transmission planning zones in the state. In Section 8 of this Report, MTO has included an entry for CapX 2020 projects in each zone that one of the transmission lines will be located in. However, no additional discussion is included beyond what is found here in Section 6.

7. Transmission Planning Zones

7.1 Introduction

Minnesota has been divided geographically into the following six Transmission Planning Zones:

- Northwest Zone
- Northeast Zone
- West Central Zone
- Twin Cities Zone
- Southwest Zone
- Southeast Zone

The map below shows the six Zones.

Section 7 of this Report describes each of the Transmission Planning Zones in the state. Maps of each zone and the transmission facilities in each zone are included in the discussion for each zone. The utilities that own high voltage transmission lines in the zone are identified. Although the maps reflect the best data available for mapping transmission lines in the state, not all 69 kV lines may be shown because the data for all 69 kV lines are not available.

Section 8 describes each of the needs that have been identified for each zone. A table identifying these needs in each zone is provided at the start of the discussion, and then further detail is provided in narrative form.

Transmission systems in one zone are highly interconnected with those in other zones and with regional transmission systems. A particular utility may own transmission facilities in a zone that is outside its exclusive service area, or where it has few or no retail customers. Different segments of the same transmission line may be owned and/or operated by different utilities. A transmission line may span more than one zone, and transmission projects may involve more than one zone.

7.2 Northwest Zone

The Northwest Planning Zone is located in northwestern Minnesota and is bounded by the North Dakota border to the west and the Canadian border to the north. Otter Tail and Wilkin counties are the southernmost counties in the zone while Lake of the Woods, Beltrami, Clearwater, Becker and Otter Tail counties are the easternmost counties in the zone. The Northwest Planning Zone includes the counties of Becker, Beltrami, Clay, Clearwater, Kittson, Lake of the Woods, Mahnomen, Marshall, Norman, Otter Tail, Pennington, Polk, Red Lake, Roseau, and Wilkin. Hubbard County was moved from the Northwest Planning Zone to the Northeast Planning Zone in 2004 with the knowledge of the Commission.

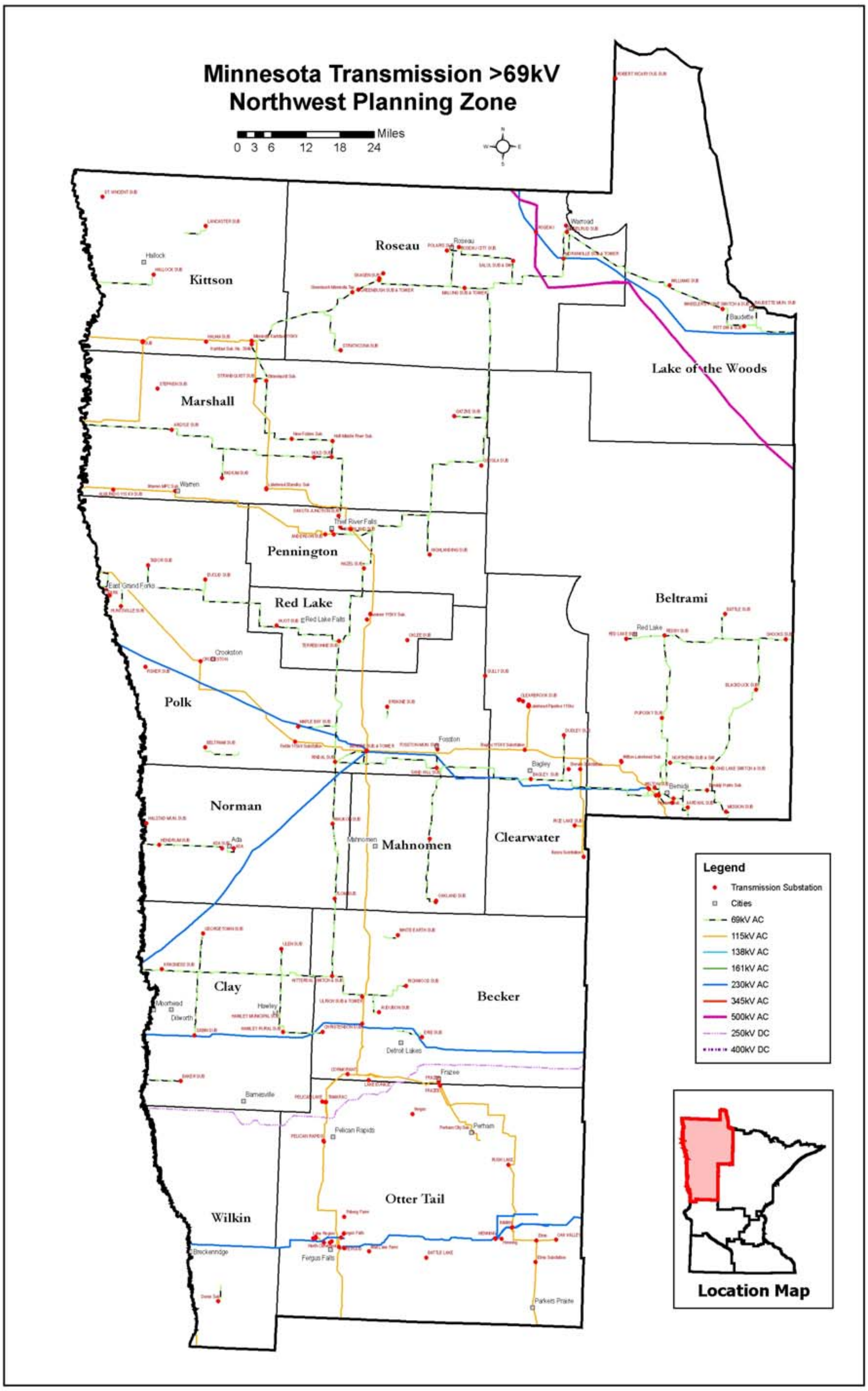
Primary population centers within the Northwest Planning Zone (population greater than 10,000) include the cities of Bemidji, Fergus Falls, and Moorhead.

The following utilities own transmission facilities in the Northwest Zone:

Great River Energy
Minnkota Power Cooperative
Missouri River Energy Services
Otter Tail Power Company
Xcel Energy

A major portion of the transmission system that serves northwestern Minnesota is located in eastern North Dakota. Two 230 kV lines and one 345 kV line reach from western North Dakota to substations in Fargo, North Dakota, and four 230 kV lines reach out to Audubon, Morris, and Winger, Minnesota, and Wahpeton, North Dakota. The 230 kV system supports an underlying 115 kV system. Much of the load in the zone is actually served by 69 kV and 41.6 kV subtransmission lines.

A map showing the 69 kV and above transmission facilities located in the Northwest Zone is shown below:


Minnesota Transmission >69kV
Northwest Planning Zone
Miles
0 3 6 12 18 24
Kittson
Roseau
Lake of the Woods
Marshall
Pennington
Red Lake
Beltrami
Polk
Norman
Mahnomen
Clearwater
Clay
Becker
Wilkin
Otter Tail
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Location Map

7.3 Northeast Zone

The Northeast Planning Zone covers the area north of the Twin Cities suburban area to the Canadian border and from Lake Superior west to the Walker and Verndale areas. The zone includes the counties of Aitkin, Carlton, Cass, Cook, Crow Wing, Hubbard, Isanti, Itasca, Kanabec, Koochiching, Lake, Mille Lacs, Morrison, Pine, St. Louis, Todd, and Wadena counties. (In the 2003 Minnesota Biennial Transmission Report Hubbard County was included in the Northwest Transmission Planning Zone. Hubbard County was moved to the Northeast Planning Zone with the knowledge of the Commission in 2004.)

The primary population centers in the Northeast Planning Zone include the cities of Brainerd, Cambridge, Cloquet, Duluth, Ely, Grand Rapids, Hermantown, Hibbing, International Falls, Little Falls, Long Prairie, Milaca, Park Rapids, Pine City, Princeton, Verndale, Virginia, and Walker.

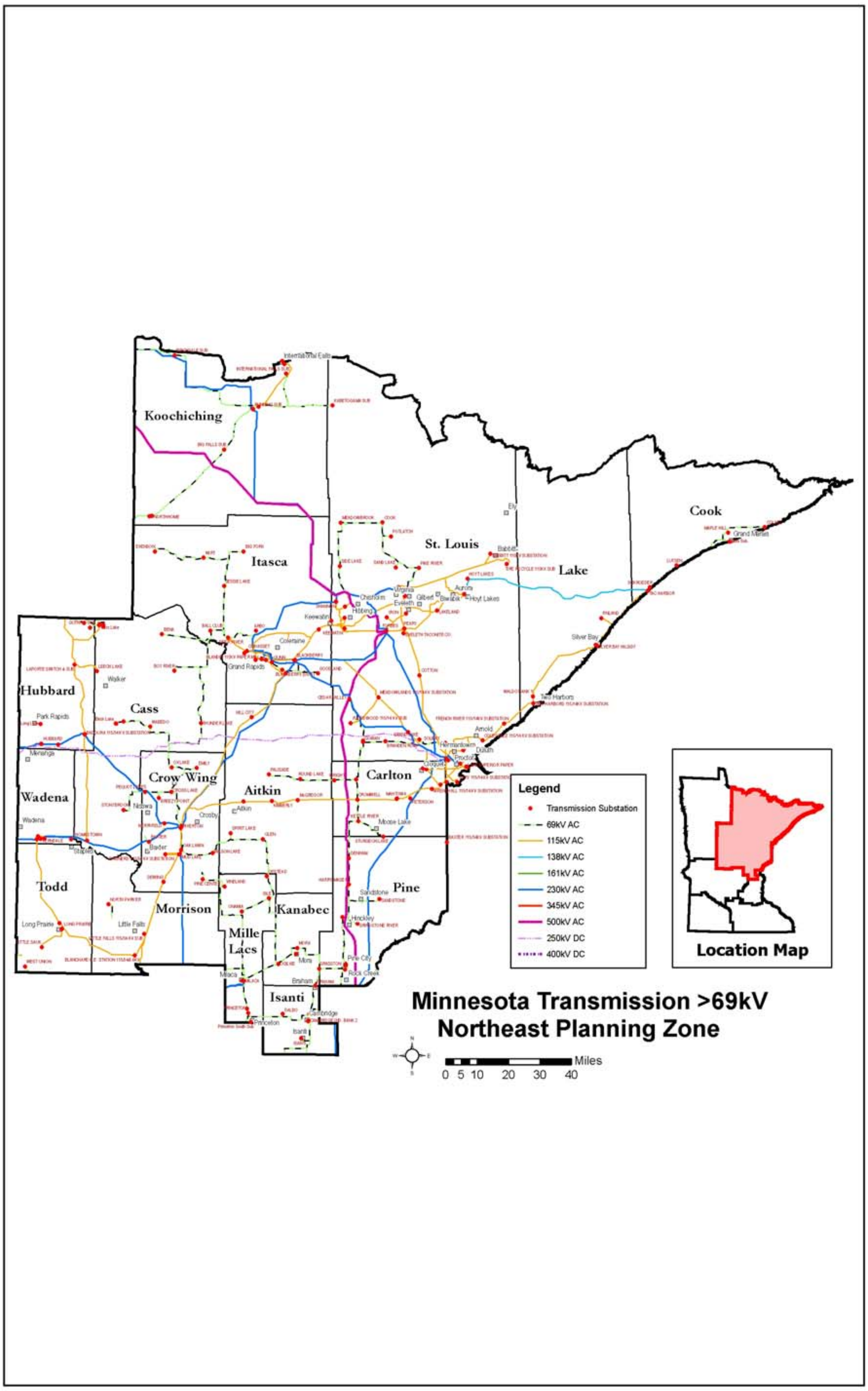
The following utilities own transmission facilities in the Northeast Zone:

American Transmission Company, LLC
Great River Energy
Minnesota Power
Xcel Energy

The transmission system in the Northeast Planning Zone consists mainly of 230 kV, 138 kV and 115 kV lines that serve lower voltage systems comprised of 69 kV, 46 kV, 34.5 kV, 23 kV and 14 kV. A 345 kV line between Duluth, Minnesota, and Wausau, Wisconsin, (the Arrowhead line) is currently under construction. The 345 kV and 230 kV system is used as an outlet for generation and to deliver power to the major load centers within the zone. From the regional load centers, 115 kV lines carry power to lower voltage substations where it is distributed to outlying areas. In a few instances, 230 kV lines serve this purpose.

A +/- 250 kV DC line runs from North Dakota to Duluth and serves as a generator outlet for lignite-fired generation located in North Dakota. In addition, a 500 kV line and a 230 kV line provide interconnections with Manitoba and a 115 kV line interconnects with Ontario at International Falls. The interconnections with Canada provide for generation resource sharing as well as seasonal and economic power interchanges between Minnesota and Canada.

A map showing the transmission lines in the Northeast Zone is shown below:


Koochiching
Itasca
St. Louis
Lake
Cook
Hubbard
Cass
Crow Wing
Aitkin
Carlton
Wadena
Todd
Morrison
Mille Lacs
Kanabec
Pine
Isanti
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Location Map
Minnesota Transmission >69kV
Northeast Planning Zone
Miles
0 5 10 20 30 40

7.4 West Central Zone

The West Central Transmission Planning Zone extends from Sherburne and Wright counties on the east, to Traverse and Big Stone counties on the west, bordered by Grant and Douglas counties on the north and Renville county to the south.

The primary population centers in the zone include the cities of Alexandria, Buffalo, Elk River, Glencoe, Hutchinson, Litchfield, Sartell, Sauk Rapids, St. Cloud, St. Michael, and Willmar.

The following utilities own transmission facilities in the West Central Zone:

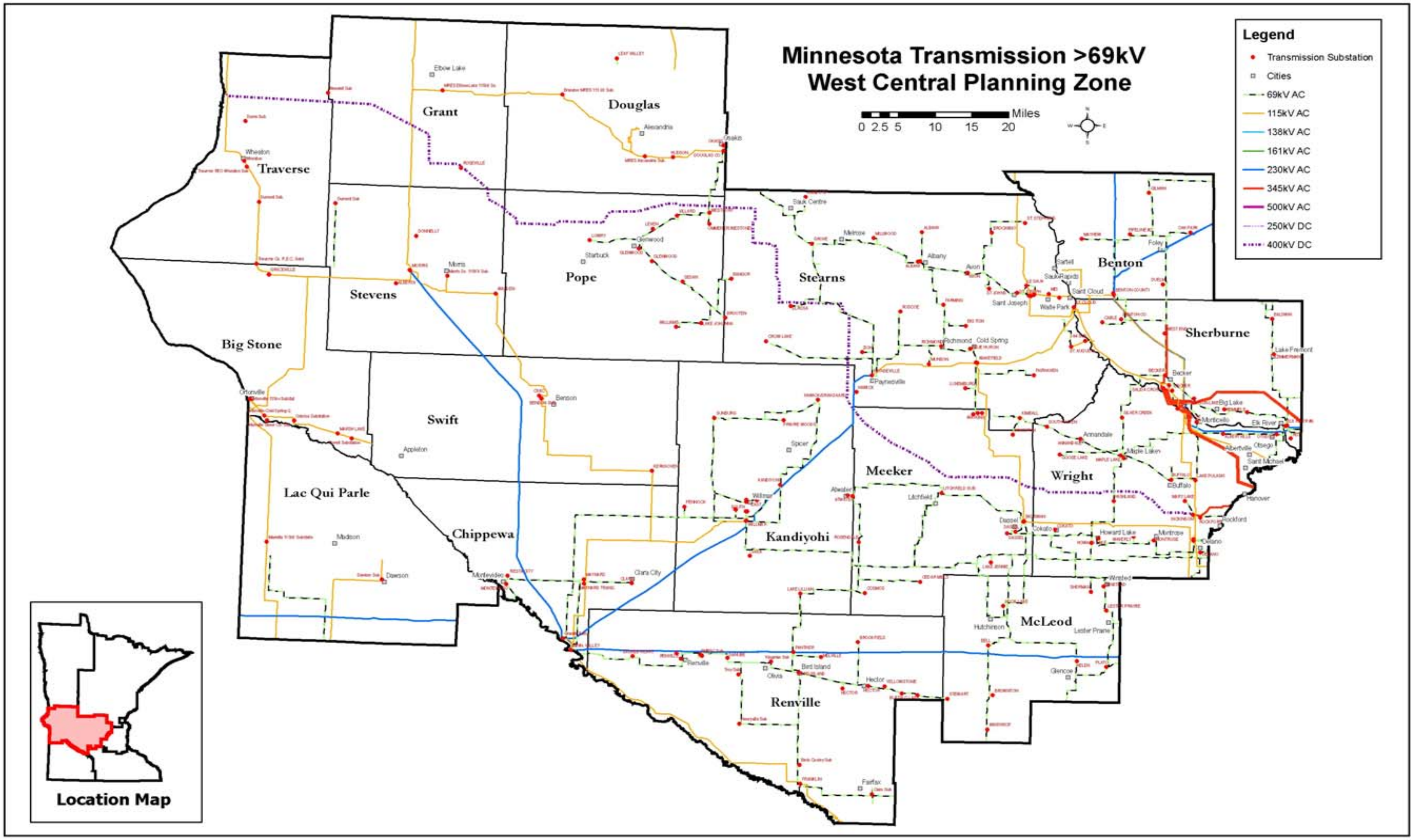
Great River Energy
Hutchinson Utilities Commission
Missouri River Energy Services
Otter Tail Power Company
Willmar Municipal Utilities
Xcel Energy

This transmission system in the West Central Planning Zone is characterized by a 115 kV loop connecting Grant County – Alexandria – West St. Cloud – Paynesville – Willmar – Morris and back to Grant County. These 115 kV transmission lines provide a hub from which 69 kV subtransmission lines provide transmission to loads in the zone.

A 345 kV line from Sherburne County to St. Cloud and 115 kV and 230 kV lines from Monticello to St. Cloud provide the primary transmission supply to St. Cloud and much of the eastern half of this zone. Two 230 kV lines from Granite Falls – one to the Black Dog generating plant in the Twin Cities and one to Willmar – provide the main source in the southern part of the zone.

Some of the 69 kV "subtransmission" network is becoming inadequate for supporting the growing load in the area. Solutions to the 69 kV transmission inadequacies may involve construction of new 115 transmission lines. Therefore, any discussion about the inadequacy of the existing system must include an analysis of parts of the existing 69 kV subtransmission system.

A map showing the 69 kV and above transmission facilities located in the West Central Zone is shown below:


Minnesota Transmission >69kV
West Central Planning Zone
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Miles
0 2.5 5 10 15 20
Traverse
Grant
Douglas
Stevens
Pope
Stearns
Benton
Sherburne
Big Stone
Swift
Lac Qui Parle
Chippewa
Kandiyohi
Meeker
Wright
McLeod
Renville
Location Map

7.5 Twin Cities Zone

The Twin Cities Planning Zone comprises the Twin Cities metropolitan area. It includes the counties of Anoka, Carver, Chisago, Dakota, Hennepin, Ramsey, Scott and Washington.

The following utilities own transmission facilities in the Twin Cities Zone:

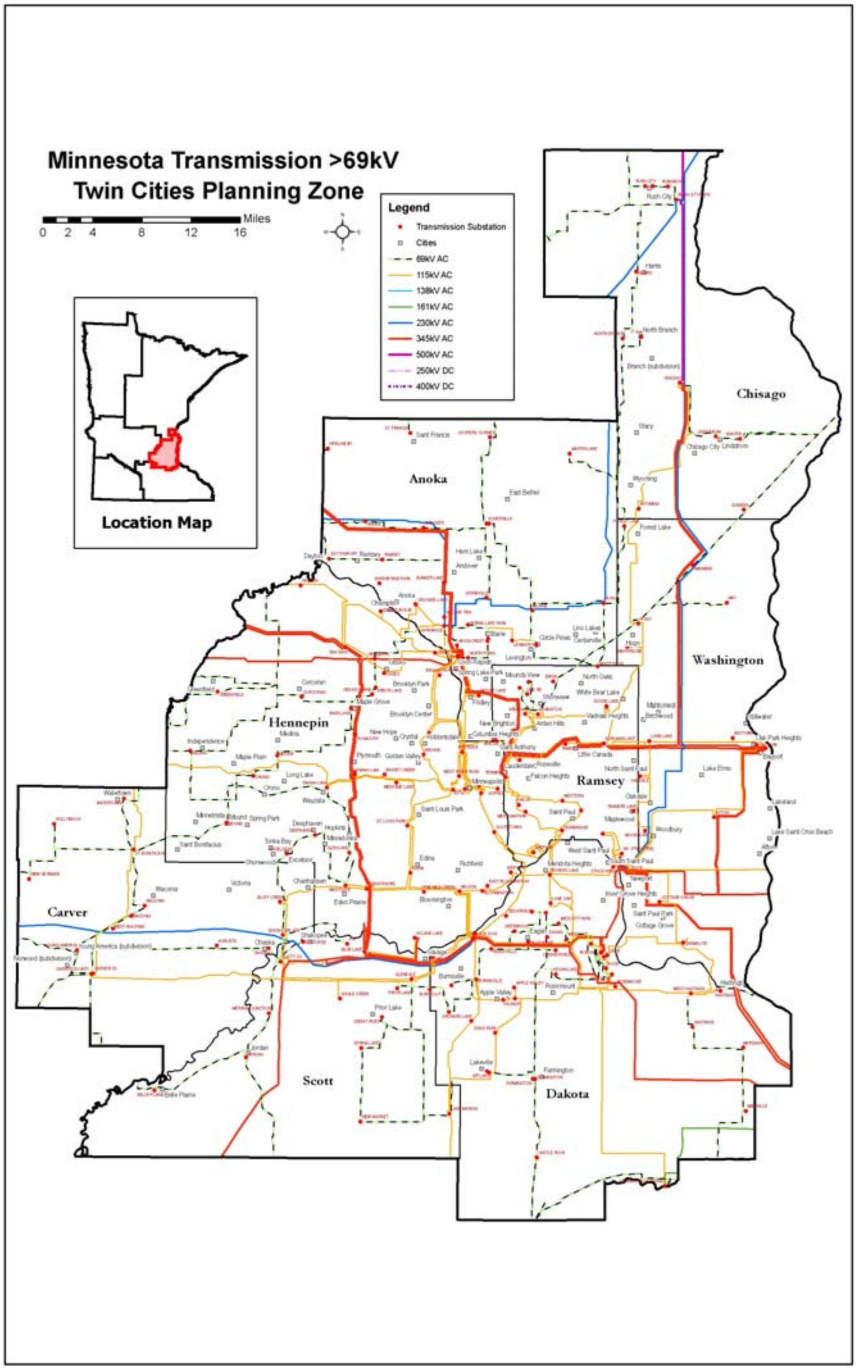
Great River Energy
Xcel Energy

The transmission system in the Twin Cities Planning Zone is characterized by a 345 kV double circuit loop around the core Twin Cities and first tier suburbs. Inside the 345 kV loop, a network of high capacity 115 kV lines serves the distribution substations. Outside the loop, a number of 115 kV lines extend outward from the Twin Cities with much of the local load serving accomplished via lower capacity, 69 kV transmission lines.

The GRE DC line and 345 kV circuits tie into the northwest side of the 345 kV loop and are dedicated to bringing generation to Twin Cities and Minnesota loads. Tie lines extend from the 345 kV loop to three 345 kV lines: one to eastern Wisconsin, one to southeast Iowa and one to southwest Iowa. The other tie is the Xcel Energy 500 kV line from Canada that is tied into the northeast side of the 345 kV loop.

Major generating plants are interconnected to the 345 kV transmission loop at the Sherburne County generating plant and the Monticello generating plant in the northwest, the Allen S. King plant in the northeast, and Prairie Island in the southeast. On the 115 kV transmission system in the Twin Cities Planning Zone there are three intermediate generating plants: Riverside (located in northeast Minneapolis), High Bridge (located in St. Paul), and Black Dog (located in north Burnsville). There are also two peaking generating plants – Blue Lake and Inver Hills – interconnected on the southeast and the southwest, respectively.

A map showing the 69 kV and above transmission facilities located in the Twin Cities Zone is shown below:


Minnesota Transmission >69kV
Twin Cities Planning Zone
Miles
0 2 4 8 12 16
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Location Map
Anoka
Chisago
Washington
Hennepin
Ramsey
Carver
Scott
Dakota

7.6 Southwest Zone

The Southwest Transmission Planning Zone is located in southwestern Minnesota and is generally bounded by the Iowa border on the south, Mankato on the east, Granite Falls on the north and the South Dakota border on the west. It includes the counties of Brown, Cottonwood, Jackson, Lincoln, Lyon, Martin, Murray, Pipestone, Redwood, Rock, Watonwan, and Yellow Medicine.

The primary population centers in the Southwest Zone include the cities of Fairmont, Granite Falls, Jackson, Marshall, New Ulm, Pipestone, St. James, and Worthington.

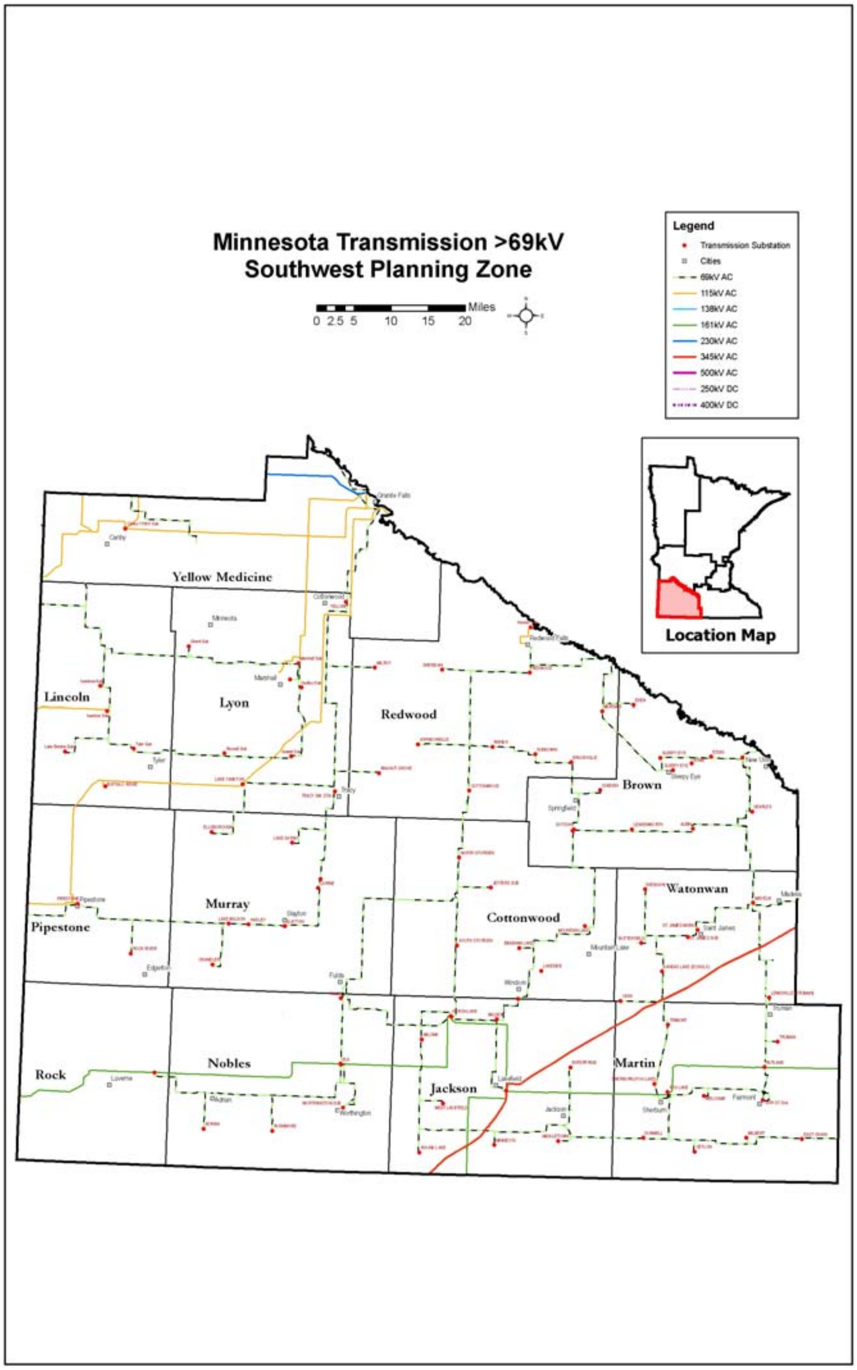
The following utilities own transmission facilities in the Southwest Zone:

Interstate Power and Light Company
East River Electric Power Cooperative
Great River Energy
L&O Power Cooperative
Marshall Municipal Utilities
Missouri River Energy Services
Otter Tail Power Company
Xcel Energy

The transmission system in the Southwest Zone consists mainly of a 345 kV transmission line from Lakefield Junction to Mankato, which serves as a major hub with several 161 kV lines throughout the zone. A number of 115 kV lines provide transmission service to loads in the area, particularly the large municipal load at Marshall. Much of the load in the southwestern zone is served by 69 kV subtransmission lines which have sources from 115/69 kV or 161/69 kV substations.

The 115 kV lines also provide transmission service for the wind generation that is being developed along Buffalo Ridge. The transmission system in this zone will soon be enhanced (2006-2007) by the addition of 345 kV and 115 kV transmission lines to provide additional outlet for the wind generation in the southwest zone. These lines will provide opportunities for new transmission substations to improve the load serving capability of the underlying subtransmission system.

A map showing the 69 kV and above transmission facilities located in the Southwest Zone is shown below:


Minnesota Transmission >69kV
Southwest Planning Zone
0 2.5 5 10 15 20 Miles
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Location Map
Yellow Medicine
Lincoln
Lyon
Redwood
Brown
Pipestone
Murray
Cottonwood
Watonwan
Rock
Nobles
Jackson
Martin

7.7 Southeast Zone

The Southeast Planning Zone includes Blue Earth, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Houston, Le Sueur, Mower, Nicollet, Olmsted, Rice, Sibley, Steele, Wabasha, Waseca, and Winona Counties. The zone is bordered by the State of Iowa to the south, the Mississippi River to the east, the Twin Cities Planning Zone and West Central Planning Zone to the north, and the Southwest Planning Zone to the west.

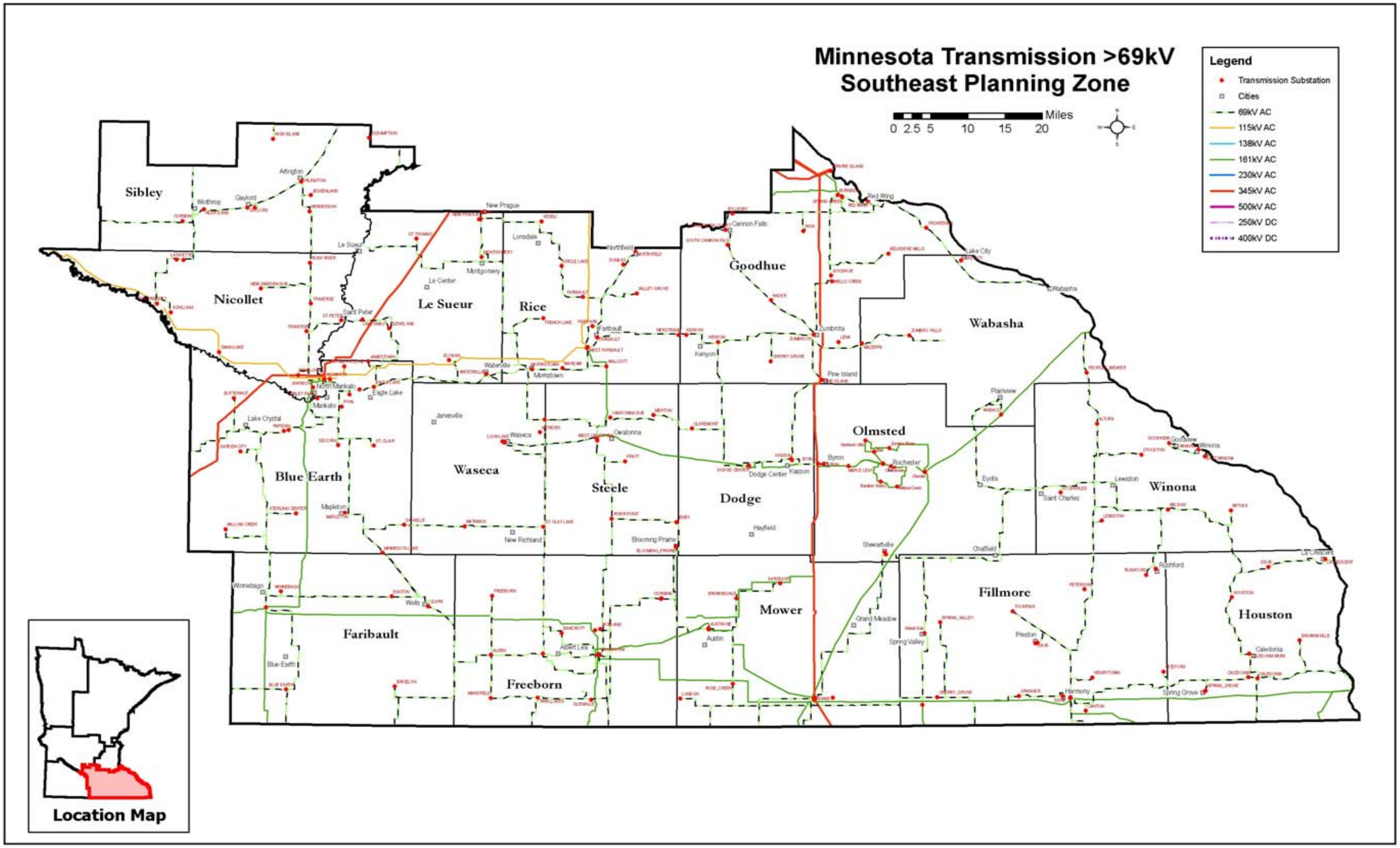
The primary population centers in the zone include the cities of Albert Lea, Austin, Faribault, Mankato, North Mankato, Northfield, Owatonna, Red Wing, Rochester, and Winona.

The following utilities own transmission facilities in the Southeast Zone:

Dairyland Power Cooperative
Great River Energy
Interstate Power and Light Company
Rochester Public Utilities
Southern Minnesota Municipal Power Agency
Xcel Energy

The transmission system in the Southeast Planning Zone consists of 345 kV, 161 kV, 115 kV and 69 kV lines that serve lower voltage distribution systems. The 345 kV system is used to import power to the Southeast Planning Zone for lower voltage load service from generation stations outside of the area. The 345 kV system also allows the seasonal and economic exchange of power from Minnesota to the east and south from large generation stations that are located within and outside of the zone. The 161 kV and 115 kV systems are used to carry power from the 345 kV system and from local generation sites to the major load centers within the zone. From the regional load centers and smaller local generation sites, 69 kV lines are used for load service to the outlying areas of the Southeast Planning Zone.

A map showing the 69 kV and above transmission facilities located the Southeast Planning Zone is shown below:


Minnesota Transmission >69kV
Southeast Planning Zone
Miles
0 2.5 5 10 15 20
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Sibley
Nicollet
Le Sueur
Rice
Goodhue
Wabasha
Blue Earth
Waseca
Steele
Dodge
Olmsted
Winona
Faribault
Freeborn
Mower
Fillmore
Houston
Location Map

8. Needs

8.1 Introduction

The crux of the 2005 Minnesota Biennial Transmission Projects Report is a list of the present and reasonably foreseeable needs in the transmission system in Minnesota. Section 8 sets forth each need that has been identified by the utilities for each of the six zones. A separate subsection has been created for each zone. The discussion for each zone begins with a table summarizing each need. A map of the zone showing the location of each need follows the table. Then each need is discussed in more detail. The following format has been established to describe each of the needs identified.

Tracking Number. A numbering system has been established to identify each need. The numbering system has three parts to it: the year refers to the year of the Biennial Report in which the need was first identified, the letters refer to the zone in which the need occurs, the N simply recognizes that what is being tracked is a transmission "need," and the chronological number is assigned in no particular order, starting with number one for each reporting year. Thus, Tracking Number 2003-NW-N1 refers to a need that was identified in the Northwest Zone in the 2003 Biennial Transmission Projects Report; the descriptive title given this need is the Lund 230/69 kV Substation. Tracking Number 2005-NW-N1 refers to a need identified in the 2005 Report for the Northwest Zone. The need is the 2nd Wilton 230/115/13.8 kV Transformer. The Tracking Number is used whenever a particular need is referred to and the number will be used from report to report.

Inadequacy. The intent with this category is to describe in simple understandable terms the "inadequacy" that has been identified. The need may be an overload of certain facilities in a contingency situation, it may be an interconnection request, it may be increasing demand, or it may be any of many other possible reasons for requiring additional transmission infrastructure.

Alternatives. The statute requires the utilities to identify alternative means of addressing each need listed. This category describes the alternatives that have been identified for each need. The alternatives in some instances will contain both short-term and long-term options. In some cases a preferred alternative has already been determined and that fact is mentioned.

Analysis. This category summarizes the information the utilities have compiled with respect to identifying the need and evaluating possible alternatives for addressing the situation. This information might include such topics as environmental impacts, economics, social concerns, and electrical performance. In some cases, studies have been completed or are underway and these studies can be consulted for more detailed information. Often the utilities do not have specific information with regard to each alternative, like cost estimates with dollar figures, but can make statements based on experience or common sense that certain alternatives are more expensive or raise greater environmental concern than others. For example, reconductoring an existing transmission line will be cheaper and have less impact than establishing an entirely new line along new right-of-way. Obviously, as the utilities get closer to implementing a solution to the need, more information will be compiled.

Schedule. This category sets forth the utilities' best estimate on when certain steps will have to be taken to avoid or correct a need. In some cases, the timing of a solution may depend on developments in the future, like load growth or decisions by independent power producers, and the timing is uncertain. Also, it is not always possible to know whether a particular option will have to be reviewed and approved by the Public Utilities Commission, but the utilities have attempted to identify those projects that would require a Certificate of Need and a permit from the Commission.

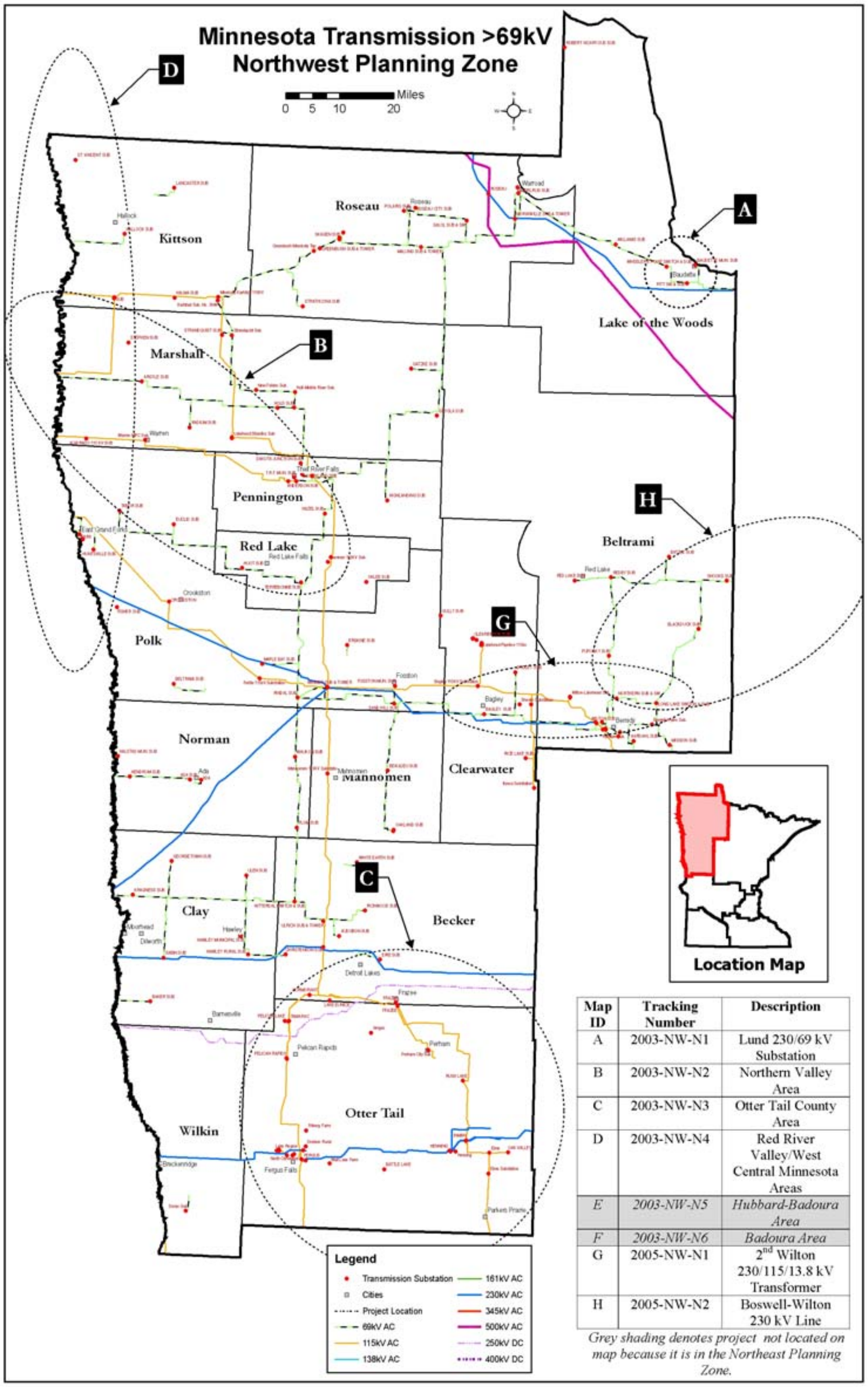
In some cases a utility may have already selected a preferred alternative and obtained authorization to construct the project. If the Public Utilities Commission or the Environmental Quality Board has issued a certificate of need or route permit for the project, information about the project may be available on the Internet at:

http://energyfacilities.puc.mn.us/

8.2 Northwest Zone

The following table provides a list of transmission needs identified in the Northwest Zone and the map on the following page shows the location of each item in the table:

Northwest Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2003-NW-N1	Lund 230/69 kV Substation	6/1/2006	Service reliability in the Little Fork – Warroad area	8.2.1
2003-NW-N2	Northern Valley Area	Unknown	Loading issues Hensel-Moranville transformers and expanded area under contingency conditions	8.2.2
2003-NW-N3	Otter Tail County Area (studies included: Otter Tail County Load Serving Study and Great River Long-Range Transmission Plan)	Staged first phase completed 4th quarter, 2004. Last phase in 2017	Summer peak load issues	8.2.3
2003-NW-N4	Red River Valley/West Central Minnesota Areas (includes RRV/WMN TIPS)	SVC 2006, Boswell-Wilton 2009 Fargo-St. Cloud unknown	Voltage stability issues and growing loads	8.2.4
2003-NW-N5	Hubbard-Badoura Area (2005 Report: See NE Zone Section for update 2003-NE-N10)	See Northeast Zone		8.2.5
2003-NW-N6	Badoura Area (2005 Report: See NE Zone Section: 2003-NE-N3: Pequot Lakes-Badoura Area)	See Northeast Zone		8.2.6
2005-NW-N1	2nd Wilton 230/115/13.8 kV Transformer (referenced as 2004-NW-N1 in December 2004 Compliance Filing: Exhibit No. 1)	7/26/05	Voltage issues	8.2.7
2005-NW-N2	Boswell-Wilton 230 kV Line	Year-end 2009	Low voltage issues in the Bemidji area	8.2.8
2005-CX-1	CapX 2020 Vision Plan Fargo – Alexandria – Benton County 345 kV			8.2.9



Map ID	Tracking Number	Description
A	2003-NW-N1	Lund 230/69 kV Substation
B	2003-NW-N2	Northern Valley Area
C	2003-NW-N3	Otter Tail County Area
D	2003-NW-N4	Red River Valley/West Central Minnesota Areas
E	*2003-NW-N5*	*Hubbard-Badoura Area*
F	*2003-NW-N6*	*Badoura Area*
G	2005-NW-N1	2nd Wilton 230/115/13.8 kV Transformer
H	2005-NW-N2	Boswell-Wilton 230 kV Line

Grey shading denotes project not located on map because it is in the Northeast Planning Zone.

8.2.1 Lund 230/69 kV Substation

Tracking Number: 2003-NW-N1

Inadequacy. The need for the Lund substation – to provide reliable service to the existing Minnkota Power Cooperative loads served from the existing 69 kV system between Littlefork and Warroad – was described in the 2003 Report. The Lund substation will be located south of Baudette, Minnesota.

Schedule. On June 16, 2005, the Environmental Quality Board issued a permit for construction of the Lund substation and two short 230 kV lines to connect the substation with a nearby existing 230 kV line. EQB Docket No. 05-93-TR-Minnkota. Minnkota plans to have the substation completed by June 2006.

8.2.2 Northern Valley Area

Tracking Number: 2003-NW-N2

Inadequacy. The Northern Valley Area consists of the northernmost part of the Northwest Planning Zone as well as a portion of northeastern North Dakota, and includes the communities of Donaldson, Karlstad, Viking, Thief River Falls, Plummer, Crookston, Falconer, Oslo and Warsaw in Minnesota and Hensel and Langdon in North Dakota. OTP and MPC serve retail customers in this region.

Historical customer demand data indicates that loads in this area have grown substantially over the past couple of years. Due to the increased load, concerns of high facility loadings and low voltage levels have arisen. This area is winter peaking and thus the transmission system has the highest loadings and lowest voltages during the winter months.

Along with loading concerns, the Northern Valley also suffers from low voltage issues even during normal operating conditions. When contingencies occur, additional low voltage can occur across the system and some voltages can sag to unacceptable levels.

A map of the area is shown on the following page.

Alternatives. Several alternatives, both short-term and long-term, have been identified. Short-term alternatives include (1) installation of capacitor banks, (2) reconductoring existing lines, and (3) employing alternative switching procedures. Long-term alternatives include (1) upgrading an existing 41.6 kV line to a 115 kV line, and (2) adding a new 230 kV source into the 115 kV system around the Warsaw/Minto area. Since the loading and voltage concerns within the area are so widespread, a combination of these alternatives is likely to be necessary to address the situation.

Analysis. A *Northern Valley Load Serving Study* is presently underway at OTP. The latest work completed during the summer of 2005 identified even more deficiencies with the existing system than were previously thought. OTP and Minnkota Power met in July to discuss some of the voltage issues and loading concerns on the sub-transmission system. The study is continuing to focus on the impacts of certain alternative switching procedures on the voltage and loading issues and will address the following:

Identify short-term voltage solutions (capacitor banks) and their necessary timing.

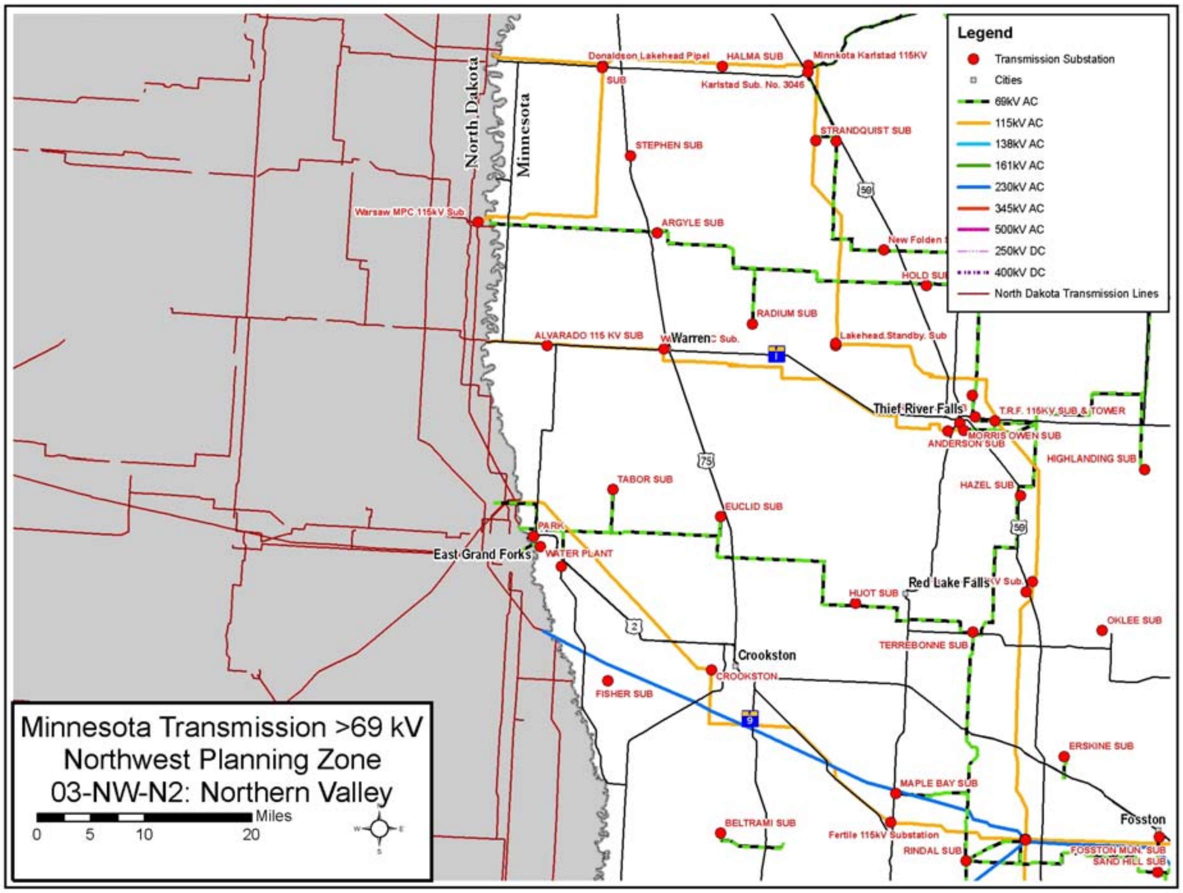
Identify short-term loading solutions (reconductor) and their necessary timing.

Identify long-term transmission solutions that are effective in voltage support and sub-transmission loading relief.

Compare long-term transmission alternatives from an economic point of view.

Recommend a "preferred" transmission plan that will meet the growing demand of this region well into the future.

Schedule. The Northern Valley Load Serving Study is expected to be completed by the end of 2006. Short-term improvements, like the addition of capacitor banks, are likely to be implemented in the 2007 timeframe. A decision on a long-term solution is expected in early 2007.


Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
North Dakota Transmission Lines
North Dakota
Minnesota
Donaldson Lakehead Pipel
SUB
HALMA SUB
Karlstad Sub. No. 3046
Minnkota Karlstad 115KV
STRANDQUIST SUB
STEPHEN SUB
Warsaw MPC 115kV Sub
ARGYLE SUB
New Folden
HOLD SUB
RADIUM SUB
ALVARADO 115 KV SUB
Warren
Sub.
Lakehead Standby Sub
Thief River Falls
T.R.F. 115KV SUB & TOWER
MORRIS OWEN SUB
ANDERSON SUB
HIGHLANDING SUB
TABOR SUB
EUCLID SUB
HAZEL SUB
PARK
East Grand Forks
WATER PLANT
Red Lake Falls
KV Sub.
HUOT SUB
OKLEE SUB
TERREBONNE SUB
Crookston
CROOKSTON
FISHER SUB
ERSKINE SUB
MAPLE BAY SUB
BELTRAMI SUB
Fertile 115kV Substation
RINDAL SUB
Fosston
FOSSTON MUN. SUB
SAND HILL SUB
Minnesota Transmission >69 kV
Northwest Planning Zone
03-NW-N2: Northern Valley
Miles
0 5 10 20

8.2.3 Otter Tail County Area

Tracking Number: 2003-NW-N3

Inadequacy. During summer peak contingency scenarios, the transmission and subtransmission system in Otter Tail County falls below operating limits. Contingency events cause transformer loading violations, line-loading violations, and under-voltage violations. During summer peak conditions, ten different contingencies on the 41.6 kV system between Fergus Falls and Henning violate system-operating criteria. In addition, load within Otter Tail County is increasing at a rate of 2.1% annually. This increase in future electrical power usage, combined with these previously identified problems, requires an upgrade in the electrical network in Otter Tail county.

A map of the area is shown on the following page.

Alternatives. The utilities identified several alternatives in the 2003 Report. The recommended short-term solutions identified in the Report (called the Integration of Subsystems) has been implemented. Construction of a new 2.5 mile 115 kV line to the Pelican Rapids Turkey plant was completed in January of 2005. This line is being operated at 41.6 kV and will be converted to 115 kV once the 2017 load levels are reached. The appropriate changes have been completed at the Pelican Rapids substation in order to serve the turkey plant on a dedicated circuit breaker. The new line to the turkey plant is shielded and will increase the reliability of service to the plant.

In addition, capacitor banks were installed between Fergus Falls and Henning during the fourth quarter of 2004. These capacitor banks are expected to maintain acceptable voltage levels until such time that the Silver Lake 230/41.6 kV substation is built near Battle Lake. The need for this new 230/41.6 kV substation is expected around 2011.

The other alternatives that are still under consideration are the same ones that were identified in the 2003 Report. They are listed here in abbreviated form for convenience.

Fergus Falls to Pelican Rapids Subsystem: Three alternatives:

(1) Convert the Pelican Rapids load from 41.6 kV to 115 kV.
(2) Replace two transformers at the Pelican Rapids substation with larger, load tap changing transformers.
(3) Construct a new substation at Erhard, approximately half way between Fergus Falls and Pelican Rapids.

Fergus Falls to Henning Subsystem: Two alternatives:

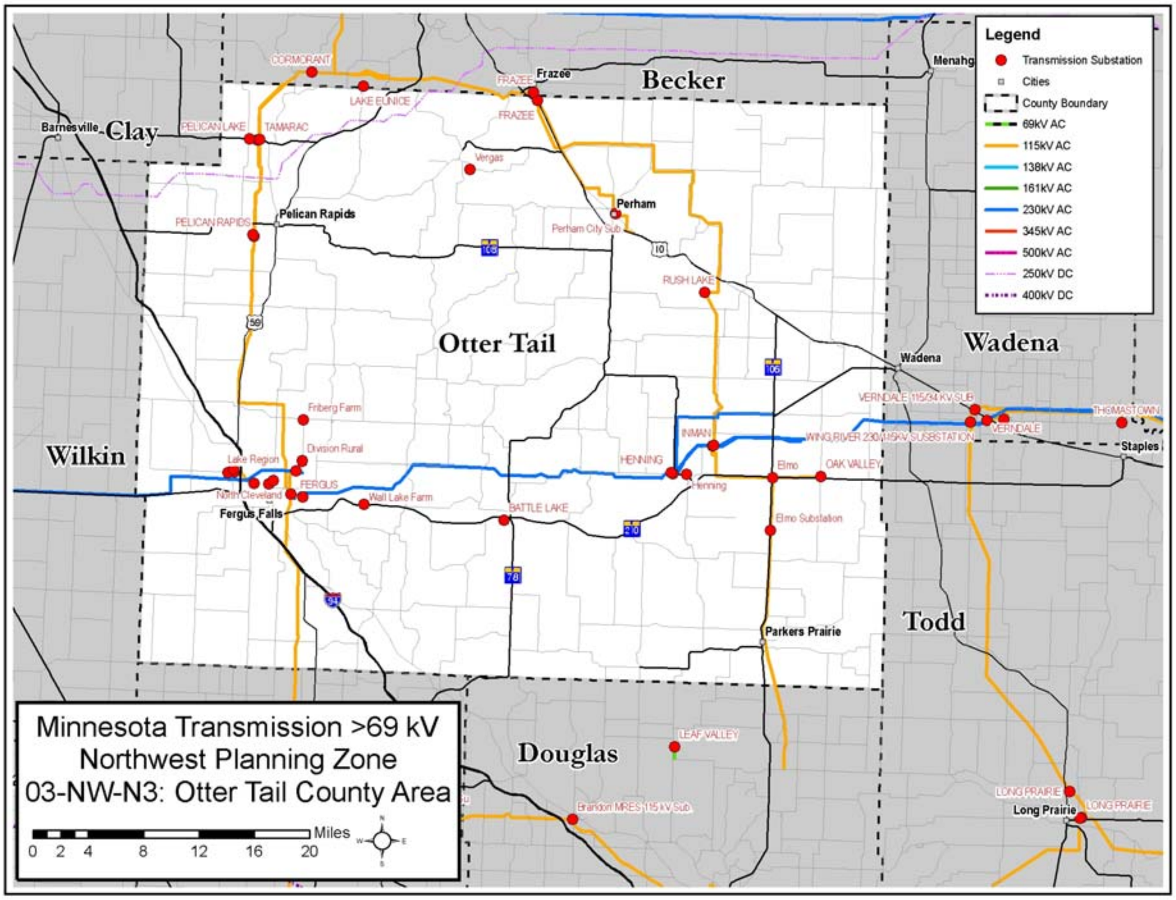
(4) Construct a new substation called Silver Lake near the City of Battle Lake
(5) Construct a new 115 kV transmission line from Fergus Falls to Henning (approximately 33 miles).

Analysis. Converting the voltage along an existing line and replacing transformers at an existing substation should be unobtrusive. New substations would require a plot of land but the likely areas are relatively remote. Constructing a new 115 kV transmission line for 50 miles or so would require new right-of-way.

The following table lists the estimated cost for each of the options listed above.

Alternative	Estimated Capital Investment
(1): Pelican Rapids 115 kV Load Conversion	$1,197,000
(2): 41.6 kV System Improvement	$2,888,000
(3): New 115/41.6 kV Source at Erhard	$1,810,000
(4): New 230/41.6 Source	$3,021,000
(5): Henning to Fergus Falls 115 kV Upgrade	$17,243,000

Schedule. It is likely that the next improvement will be construction of the new substation at Silver Lake. This substation is expected to be needed in 2011.


Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Minnesota Transmission >69 kV
Northwest Planning Zone
03-NW-N3: Otter Tail County Area
Miles
0 2 4 8 12 16 20
Clay
Becker
Otter Tail
Wilkin
Wadena
Todd
Douglas
Barnesville
Frazee
Pelican Rapids
Perham
Wadena
Staples
Fergus Falls
Parkers Prairie
Long Prairie
Menahga
CORMORANT
LAKE EUNICE
FRAZEE
PELICAN LAKE
TAMARAC
Vergas
PELICAN RAPIDS
Perham City Sub
RUSH LAKE
Friberg Farm
Division Rural
Lake Region
FERGUS
North Cleveland
Wall Lake Farm
BATTLE LAKE
HENNING
Henning
INMAN
Elmo
OAK VALLEY
Elmo Substation
WING RIVER 230/115KV SUSBSTATION
VERNDALE 115/34 KV SUB
VERNDALE
THOMASTOWN
LEAF VALLEY
Brandon MRES 115 kV Sub
LONG PRAIRIE

8.2.4 ed River Valley and West Central Minnesota Areas

Tracking Number: 2003-NW-N4

Inadequacy. The Red River Valley area and the West Central Minnesota area are both in need of significant electrical facility upgrades to meet a growing demand for power. Many electrical facilities are reaching their allowable operating limits. Under contingency scenarios, both line and transformer overloads occur and low voltage situations develop. The areas could potentially face voltage security issues in the future, which could result in partial or regional system blackouts.

A map of the area is shown on the following page.

Alternatives. In order to provide immediate voltage support and load serving capabilities, possible solutions have been divided into short-term and long-term categories.

- SHORT-TERM IMPROVEMENTS

Four possible alternatives were considered for near-term, post-contingent voltage and load serving support. These alternatives all involve improvements at various existing substations. The first two alternatives would provide support for the northern portion of the area (Bemidji/Cass Lake area), and the second two would bolster the southern portion (Fargo and west).

1.) The addition of a Static VAR Compensator (SVC) (a device to help regulate voltage) at the Wilton substation.

2.) The addition of a SVC at the Prairie substation.

3.) The addition of capacitors at the Jamestown substation.

4.) The addition of capacitors in the Audubon/Hubbard area.

- LONG-TERM IMPROVEMENTS

Four alternatives have been identified for long-term solutions to the issues in the Red River Valley. These four options involve at 230 and 345 kV line additions into the study area. It should be noted that these alternatives are representative of general concepts for providing improved transmission capability to the Red River Valley.

1.) A new 230 kV line from Boswell to Wilton.

2.) A new 345 kV line from Benton County (St. Cloud) to Alexandria to Maple River (Fargo).

3.) A new 230 kV line from Harvey to Prairie.

4.) A new 230 kV line from Letellier to Drayton to Prairie.

Analysis. The *Red River Valley Load Serving Study* (often called the TIPS study, for Transmission Improvement Planning Study) has just recently been completed and a written report is being prepared. This study looked at only the electrical issues related to addressing the concerns in the Red River Valley area. The study did not consider costs or environmental issues.

The electrical analysis suggests that the following short-term and long-term improvements are the most likely. The short-term solutions will provide voltage regulation during outage conditions and provide for long-term voltage support when new transmission lines can be built and brought online.

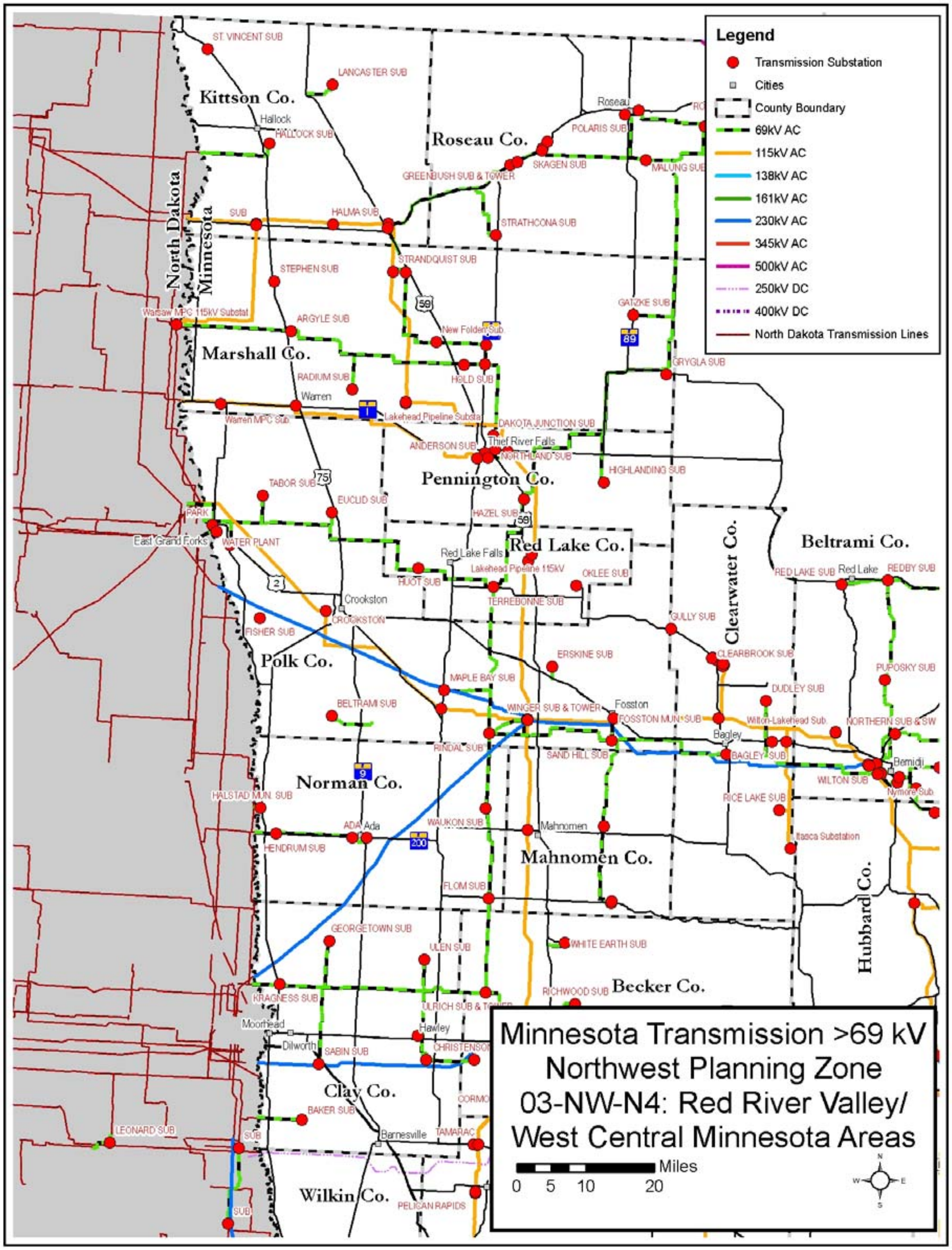
Priority	**Alternative**	**Description**
1.	#1	SVC addition at the Wilton substation
2.	#3 or #4	Capacitor additions at either the Jamestown substation or the Audubon/Hubbard area.
3.	#5	New 230 kV line from Boswell to Wilton
4.	#6	New 345 kV line form the St. Cloud area to the Fargo area.

The installation of a SVC at the Wilton substation and capacitors at the other substations should not raise any environmental issues because the facilities where this equipment will be installed already exist. The capacitor and SVC additions at the substations should not require review and approval from the Commission. The Jamestown substation and the Audubon/Hubbard area, in fact, are in North Dakota.

Lines of the size and length considered here will require both a certificate of need and a route permit from the Public Utilities Commission. The utilities are unsure when an application for PUC approval can be submitted.

Schedule. Otter Tail Power, Minnkota Power Cooperative, Minnesota Power, Great River Energy, Missouri River Energy Services, and Xcel Energy have decided to go forward with the 230 kV line from Boswell to Wilton because this line will serve more than just the Red River Valley. This line has been given its own tracking number – 2005-NW-N2. Further information about that line is found in section 8.2.8.

The SVC unit at the Wilton substation is tentatively scheduled to be installed by the end of 2006.


Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
North Dakota Transmission Lines
Minnesota Transmission >69 kV
Northwest Planning Zone
03-NW-N4: Red River Valley/
West Central Minnesota Areas
Miles
0 5 10 20
Kittson Co.
Roseau Co.
Marshall Co.
Pennington Co.
Red Lake Co.
Polk Co.
Norman Co.
Mahnomen Co.
Clearwater Co.
Beltrami Co.
Hubbard Co.
Becker Co.
Clay Co.
Wilkin Co.
North Dakota
Minnesota

8.2.5 Hubbard – Badoura Area

Tracking Number: 2003-NW-N5

Please see discussion under the Northeast Zone at Section 8.3.10.

8.2.6 Badoura Area

Tracking Number: 2003-NW-N6

Please see discussion under the Northeast Zone at Section 8.3.3.

8.2.7 2nd Wilton 230/115/13.8 kV Transformer

Tracking Number: 2005-NW-N1

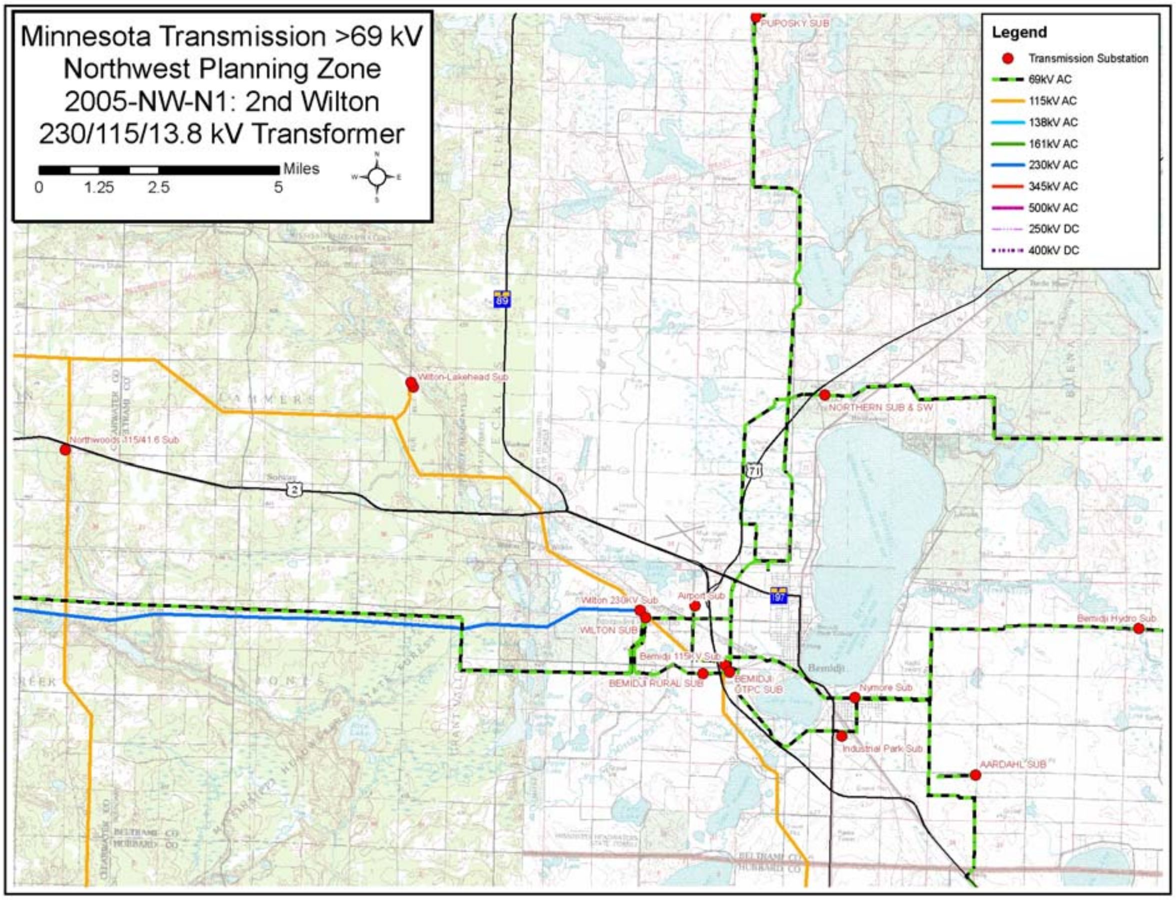
Inadequacy. There is a concern over voltage stability in the area because of a number of large loads served from the 115 kV system in the Bemidji/Wilton area.

A map of the area is shown on the following page.

Alternatives. Only one alternative has been identified – the installation of a second transformer at the Wilton substation.

Analysis. There should be no economic, environmental or social impacts associated with the installation of the second Wilton 230/115 kV transformer. The installation of the transformer will result in a positive economic impact in the form of improved system performance.

Schedule. Minnetonka Power Cooperative and Otter Tail Power Company installed a second 230/115/13.8 kV transformer at the Wilton substation located approximately three miles west of Bemidji.


Minnesota Transmission >69 kV
Northwest Planning Zone
2005-NW-N1: 2nd Wilton
230/115/13.8 kV Transformer
Miles
0 1.25 2.5 5
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
PUPOSKY SUB
Wilton-Lakehead Sub
NORTHERN SUB & SW
Northwoods 115/41.6 Sub
Wilton 230KV Sub
Airport Sub
WILTON SUB
Bemidji 115KV Sub
BEMIDJI RURAL SUB
BEMIDJI OTPC SUB
Nymore Sub
Industrial Park Sub
AARDAHL SUB
Bemidji Hydro Sub
Bemidji

8.2.8 Boswell – Wilton 230 kV Line

Tracking Number: 2005-NW-N2

Inadequacy. The Bemidji area experiences low voltage incidents during winter peak conditions. The outage of the Winger-Wilton 230 kV line would cause a significant outage for the Bemidji area. In spite of multiple recent capacitor additions on the 115 kV system in the Bemidji area, more load serving capability is needed.

A map of the area is shown on the following page.

Alternatives. The long-term alternatives for addressing the Bemidji situation are the same four long-term alternatives identified for the Red River Valley (see section 8.2.4). These alternatives include:

1. A new 230 kV line from Boswell to Wilton.
2. A new 345 kV line from Benton County (St. Cloud) to Alexandria to Maple River (Fargo).
3. A new 230 kV line from Harvey to Prairie.
4. A new 230 kV line from Letellier to Drayton to Prairie.

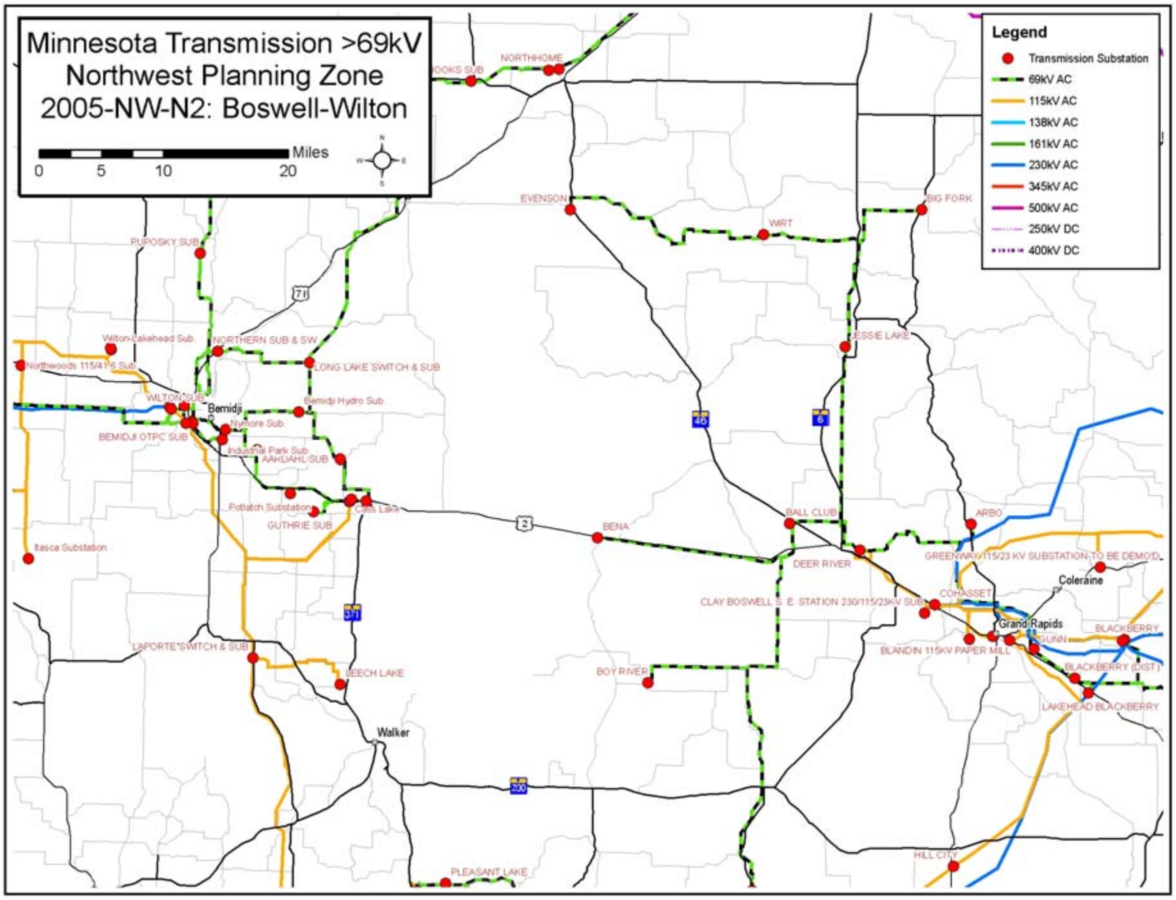
Analysis. Alternatives 3 and 4 are farther away from the Bemidji area and do not address the voltage situation in Bemidji as well as Alternatives 1 and 2 do. The Boswell to Wilton line performs the best electrically in the Bemidji area, as it provides support for all outages and improves the voltage stability throughout the area.

Alternative 2 also helps significantly with all incremental load serving issues, except for the contingency of losing the Maple River-Winger 230 kV line. This line may also be necessary in the future to address issues in the Red River Valley outside the Bemidji area.

At this time, routing options have not been examined for the Boswell/Wilton line. There is the potential to use existing transmission line corridors for portions of the line, but some new right-of-way will be required. The geographic area has numerous lakes, State and National forests, and the Leech Lake Indian Reservation, all of which may create routing challenges. The construction of the new transmission line designed to improve the reliability and capacity of the electric delivery network would have positive economic impacts.

Any new transmission line at the 230 kV or 345 kV voltage level would require both a certificate of need and a route permit from the Public Utilities Commission. All alternatives discussed in this section would require Commission approval.

Schedule. This new line is scheduled to be in service by the end of 2009. Applications for a certificate of need and a route permit will have to be filed by the end of 2006.


Minnesota Transmission >69kV
Northwest Planning Zone
2005-NW-N2: Boswell-Wilton
Miles
0 5 10 20
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
NORTHHOME
EVENSON
WIRT
BIG FORK
PUPOSKY SUB
Wilton-Lakehead Sub.
NORTHERN SUB & SW
LONG LAKE SWITCH & SUB
JESSIE LAKE
WILTON SUB
Bemidji
Bemidji Hydro Sub.
Nymore Sub.
BEMIDJI OTPC SUB
Industrial Park Sub.
AAKLIAHL SUB
Potlatch Substation
GUTHRIE SUB
Cass Lake
BENA
BALL CLUB
ARBO
DEER RIVER
Itasca Substation
CLAY BOSWELL S. E. STATION 230/115/23KV SUB
COHASSET
Coleraine
Grand Rapids
BLACKBERRY
BLANDIN 115KV PAPER MILL
GUNN
BLACKBERRY (DIST)
LAKEHEAD BLACKBERRY
LAPORTE SWITCH & SUB
LEECH LAKE
BOY RIVER
Walker
HILL CITY
PLEASANT LAKE

8.2.9 CapX 2020 Vision Plan

Fargo – Alexandria – Benton County 345 kV

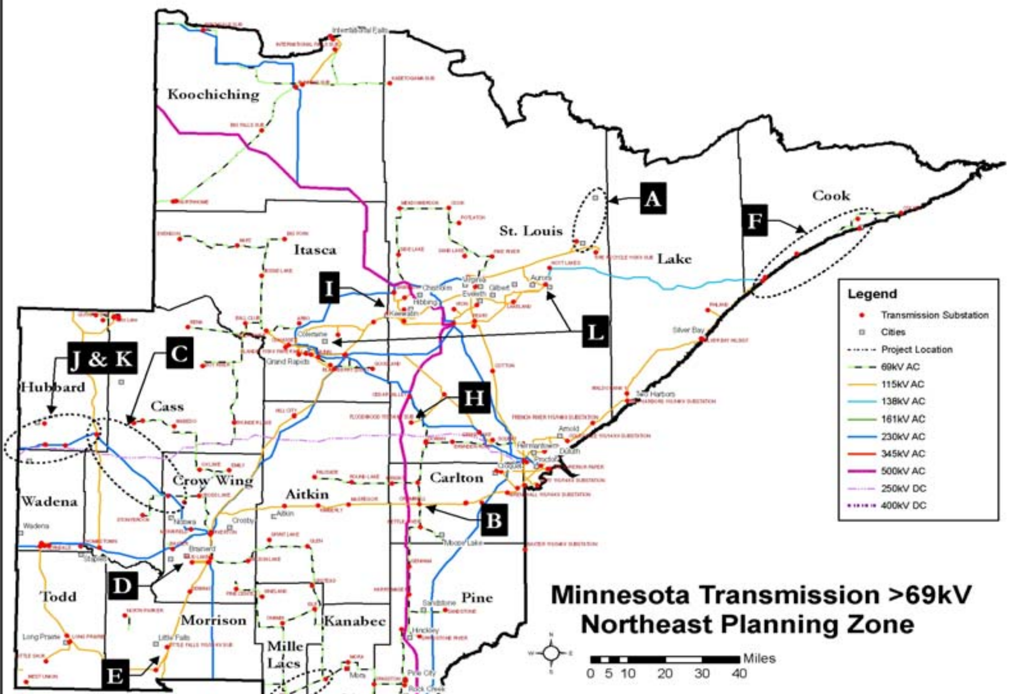
Tracking Number: 2005-CX-1

Discussion. The CapX 2020 Vision Plan is discussed in detail in Section 6. As part of the CapX work, a 345 kV line from Fargo to Alexandria to Benton County is being proposed. See Section 6 for discussion about that proposed transmission line.

8.3 Northeast Zone

The following table provides a list of transmission needs identified in the Northeast Zone and the map on the following page shows the location of each item in the table:

Northeast Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2003-NE-N1	Tower-Ely-Babbitt Area	2008-2009	Low voltage and line overloads	8.3.1
2003-NE-N2	Cromwell-Wrenshall-Mahtowa Area (2003 Report – referenced as Wrenshall-Mahtowa Area)	2011	Low voltage	8.3.2
2003-NE-N3	Pequot Lakes-Badoura Area (2003 Report – NW Zone Section: referenced as Badoura Area)	2008-2009	Low voltage and line overloads	8.3.3
2003-NE-N4	Central Lakes Area	2007	Overloads	8.3.4
2003-NE-N5	Pierz-Genola Area	2011	Low voltage and line overloads	8.3.5
2003-NE-N6	Taconite Harbor-Grand Marais Area	2015	Line overloads	8.3.6
2003-NE-N7	Mille Lacs Area	2008	Low voltage	8.3.7
2003-NE-N8	Floodwood Area	2012	Low voltage	8.3.8
2003-NE-N9	Nashwauk Area	2008	Low voltage and line overloads	8.3.9
2003-NE-N10	Hubbard-Badoura Area (referenced in the NW Zone Section of 2003 Report as 2003-NW-N5)	2005	Low voltage and line overloads	8.3.10
2005-NE-N1	Long Lake-Badoura Area	2008-2009	Low voltage and line overloads	8.3.11
2005-NE-N2	Mesaba IGCC Generation Facility		Generation interconnection	8.3.13
	Boswell-Wilton 230 kV Line	2009	2005 Report: See NW Zone Section: 2005-NW-N2 Boswell-Wilton 230 kV Line for update	8.3.12 8.2.8
	Other Zone Specific Issues			8.3.14



Map ID	Tracking ID	Description
A	2003-NE-N1	Tower-Ely-Babbitt Area
B	2003-NE-N2	Cromwell-Wrenshall-Mahtowa Area
C	2003-NE-N3	Pequot Lakes-Badoura Area (2003 Report – NW Zone Section: referenced as Badoura Area)
D	2003-NE-N4	Central Lakes Area
E	2003-NE-N5	Pierz-Genola Area
F	2003-NE-N6	Taconite Harbor-Grand Marais Area
G	2003-NE-N7	Mille Lacs Area
H	2003-NE-N8	Floodwood Area
I	2003-NE-N9	Nashwauk Area
J	2003-NW-N5	Hubbard-Badoura Area
K	2005-NE-N1	Long Lake-Badoura Area
L	2005-NE-N2	Mesaba IGCC Generation Facility

8.3.1 Tower-Ely-Babbitt Area

Tracking Number: 2003-NE-N1

Inadequacy. The need for additional transmission in the Tower – Ely – Babbitt Area was identified in the 2003 Report. Several alternatives, both short-term and long-term, were discussed in the 2003 Report.

Minnesota Power installed capacitors at the Ely Substation in 1991 and a capacitor addition is planned for the Tower Substation in 2006. Both of these additions will help address a voltage problem in the area. However, the long-term solution selected by the utilities (Minnesota Power and GRE) is to install a new 115 kV transmission line from the existing Minnesota Power 115 kV line #34 near Embarrass to an existing 46 kV line near Tower. The utilities hope to have this line built by 2009.

Certification Request. Minnesota Power and Great River Energy are seeking certification of this line as part of the 2005 Minnesota Biennial Transmission Projects Report. A separate certification document entitled *Biennial Transmission Projects Report, Certification of a High-Voltage Transmission Line, Tower Project*, will be filed with the Commission. The certification document will be available on the MTO website at :

http://www.minnelectrans.com/

8.3.2 Cromwell-Wrenshall-Mahtowa Area

Tracking Number: 2003-NE-N2

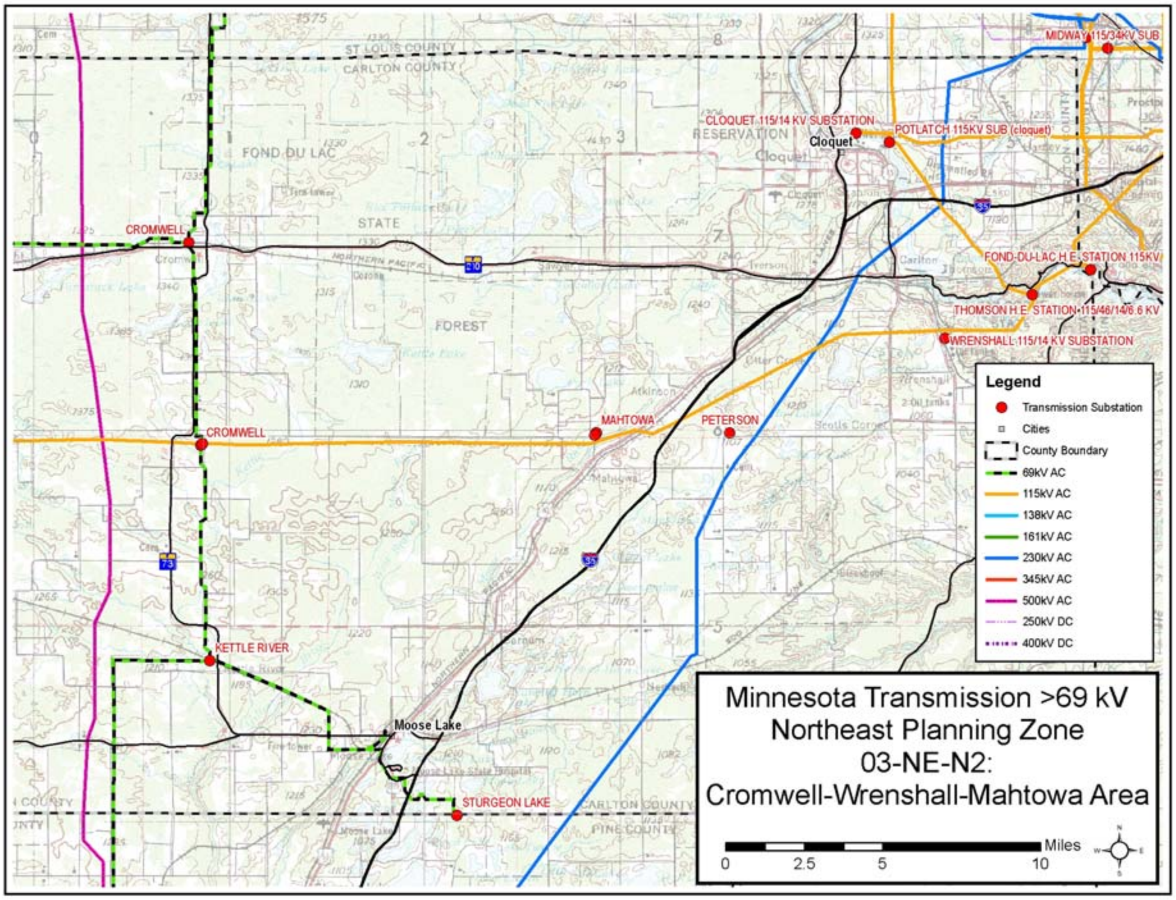
Inadequacy. The Cromwell – Wrenshall – Mahtowa area is supplied by a 90-mile 115 kV line running between 115 kV sources located at the Riverton substation near Brainerd and the Thompson substation located south of Duluth. Due to the distances between the two 115 kV sources and the total load served, the voltage in the Mahtowa and Wrenshall area is approaching unacceptable levels with a loss of the Thompson source. Currently, voltage can be maintained by switching some of the area's load off the 115 kV system and serving it from the GRE Bear Creek 69 kV substation if the Thompson source is lost. However, at current load growth it is expected that Bear Creek will no longer be able to provide this support by the 2010 to 2011 timeframe. In addition, GRE serves loads in the area via a 69 kV system between Cromwell, Floodwood and Four Corners. GRE also expects voltage issues for these loads by the 2011 timeframe if the Cromwell 69 kV source or the Four Corners 115 kV source is lost.

A map of the area is shown on the following page.

Alternative Solutions. Three alternatives have been identified: (1) upgrade of existing lower voltage lines, (2) construction of a new 115 kV line, and (3) distributed generation.

Analysis. Studies to determine the best method to improve the voltage situation in the area are underway. Upgrading existing lower voltage lines would potentially have less environmental and social impacts than developing a new route. A new line, however, might offer more positive economic impacts since it would bolster the electrical system more than upgrades would. Distributed generation might offer attractive economic features to consumers.

Schedule. At this time, it appears that a new 115 kV line would provide the best solution both electrically and economically. However, no alternatives have been ruled out. If the utilities decide to pursue a new transmission line, a certificate of need and route permit will be required from the Public Utilities Commission. A decision will be made no later than November 1, 2007, when the next Transmission Projects Report is due.


Minnesota Transmission >69 kV
Northeast Planning Zone
03-NE-N2:
Cromwell-Wrenshall-Mahtowa Area
Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Miles
0
2.5
5
10
MIDWAY 115/34KV SUB
CLOQUET 115/14 KV SUBSTATION
POTLATCH 115KV SUB (cloquet)
Cloquet
FOND-DU-LAC H.E. STATION 115KV
THOMSON H.E. STATION 115/46/14/6.6 KV
WRENSHALL 115/14 KV SUBSTATION
CROMWELL
CROMWELL
MAHTOWA
PETERSON
KETTLE RIVER
Moose Lake
STURGEON LAKE
ST LOUIS COUNTY
CARLTON COUNTY
PINE COUNTY
FOND DU LAC
STATE
FOREST

8.3.3 Long Lake – Badoura – Pequot Lakes Area

Tracking Number: 2003-NE-N3 and 2005-NE-N1

Inadequacy. This inadequacy was reported in the 2003 Report as the Badoura project in the Northwest Zone and Pequot Lakes – Badoura Area in the Northeast Zone. The problems are line overloading and voltage support in the area.

Certification Request. Minnesota Power and Great River Energy intend to address the Long Lake, Badoura, Pequot Lakes and Birch Lake area inadequacies with one project. The proposed solution consists of a new 115 kV line between Pequot Lakes and Badoura with taps to Birch Lake and Pine River and a new 115 kV line between Badoura and the Long Lake substation and associated substation additions. MP and GRE are seeking certification of this project as part of the 2005 Minnesota Biennial Transmission Projects Report. A separate certification document entitled, *Biennial Transmission Projects Report, Certification of a High-Voltage Transmission Line, Badoura Project*, will be filed with the Commission. The certification document will be available on the MTO website at:

http://www.minnelectrans.com/

8.3.4 Central Lakes Area

Tracking Number: 2003-NE-N4

Inadequacy. The Central Lakes area is the area around Brainerd and west to the Baxter area. The need is due to an increasing demand for power causing a potential overload situation.

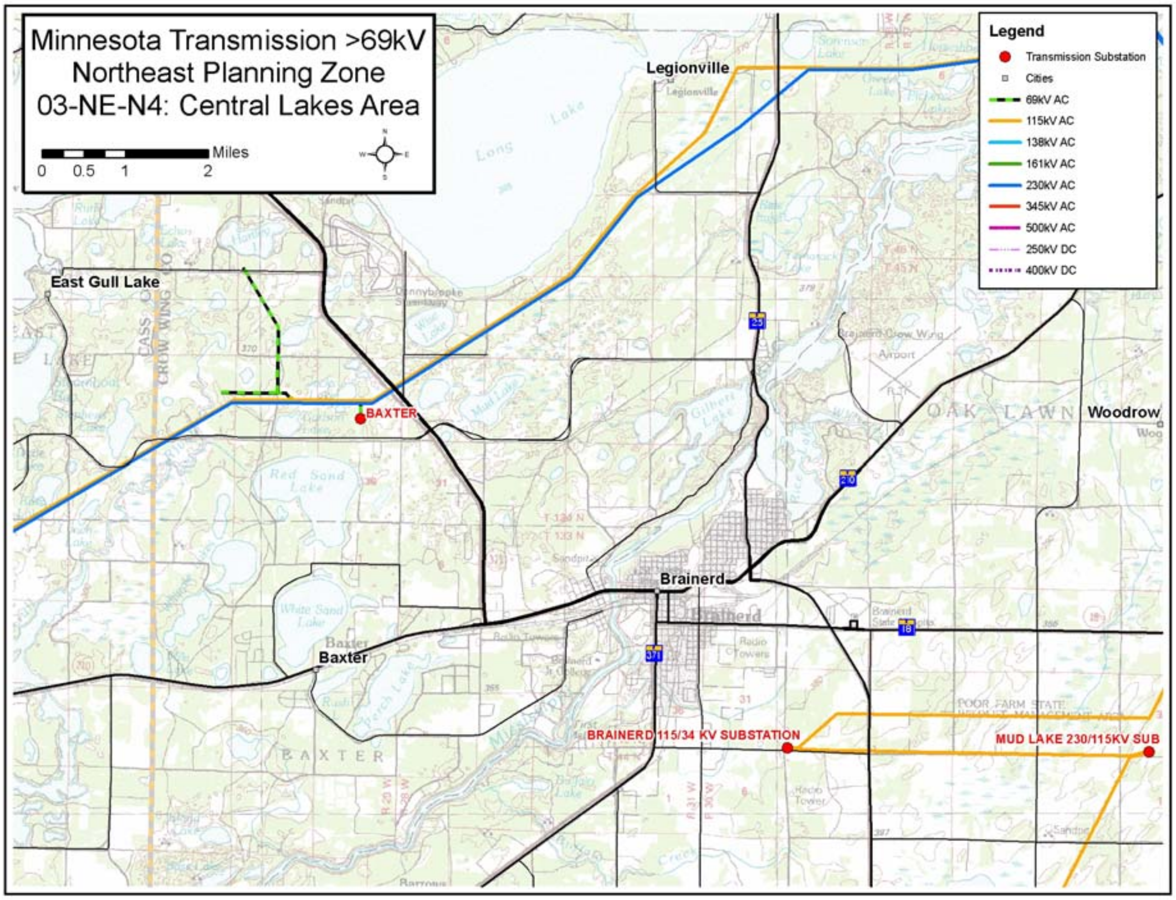
A map of the area is shown on the following page.

Alternatives. The only alternatives that appear feasible involve construction of additional 115 kV transmission lines in the 2006-2007 timeframe. The lines would go from Southdale to either of the Minnesota Power 115 kV lines identified as the 24 Line or 130 Line, which are located on the north side of Baxter. This would create a looped 115 kV system with a third source being provided to the Brainerd substation from the west.

Depending on the route of the Baxter-Southdale 115 kV line, a 115 kV breaker may be added at Dog Lake along with a short (1/2 mile) 115 kV extension of the 24 Line to eliminate the Dog Lake 115 kV tap. This would avoid a four-terminal line and is beneficial in reducing outage exposure to Thomastown and Aldrich.

Analysis. The Southdale 115 kV loop will involve some impacts in the populated areas. GRE and MP are coordinating development of an overall plan to address all of the needs in the area. A 115 kV loop will provide a long-term solution to the Central Lakes area and allow continued movement of load from the 34.5 kV system to the 115 kV system. MP and GRE will be working together to determine which 115 kV line (the 24 Line or 130 Line) will provide the best overall solution. Since this project may also be capable of providing support to the Brainerd Public Utilities electric system, MP and GRE have also been seeking their input.

Schedule. A Certificate of Need from the Commission will not be required for this project since the line will be less than ten miles in length. Plans are to proceed with a local review process in calendar year 2006.


Minnesota Transmission >69kV
Northeast Planning Zone
03-NE-N4: Central Lakes Area
Miles
0 0.5 1 2
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Legionville
East Gull Lake
BAXTER
Woodrow
Brainerd
Baxter
BRAINERD 115/34 KV SUBSTATION
MUD LAKE 230/115KV SUB

8.3.5 Pierz-Genola Area

Tracking Number: 2003-NE-N5

Inadequacy. The Pierz-Genola system consists of a 34.5 kV system that ties the 115/34.5 kV sources between Blanchard and Little Falls together. It was reported in the 2003 Report that load growth in the area has reached the point where the system may overload and voltage violations may occur.

Alternatives. One short-term solution identified by Minnesota Power is the construction of a new substation near Langola. Two long-term alternatives are: (1) the construction of a nine mile long 115 kV line from Little Falls to Genola, and (2) additional generation in the Buckman area.

Analysis. A new 115 kV line, which would be operated initially at only 34.5 kV, would provide the Little Falls area with excess capacity for future growth. The line would be routed through rural areas, avoiding the need to be constructed through high residential areas. Such a line would be an expensive option however.

Generation in the Buckman area would be attractive because it would place a voltage source in the middle of the system. However, it is uncertain whether generation would be able to resolve the voltage drop on the transmission lines, leading to continued voltage problems.

Minnesota Power is instituting one short-term solution – construction of a new 115/34.5 kV substation near Langola.

Schedule. Great River Energy will monitor the performance of the new substation. Load forecasts indicate that an upgrade of the area electric system will be needed by 2011. It appears that a new line would be the best solution, and GRE will determine how to proceed in the 2007-2008 timeframe.

8.3.6 Taconite Harbor-Grand Marais Area

Tracking Number: 2003-NE-N6

Inadequacy. The concern here is the overloading of a fifty mile long 69 kV line that runs along the North Shore. The load served by this line has been growing at a rate of approximately 3% per year and includes both GRE and SMMPA load. The voltage will be below acceptable levels without an upgrade sometime between 2006 and 2011.

Alternatives. The utilities identified several alternatives in the 2003 Report, including construction of a new 115 kV line, rebuild and upgrade of the existing 69 kV line, installation of capacitors, and installation of additional generation.

Analysis. Upgrading an existing line will have less environmental impact than construction of a new line. Short-term solutions may be the most economical and environmentally benign solutions. New generation is difficult to size, since any new generation will be looked to for meeting increased demand in the future.

GRE has determined that the thermal rating of the conductor on the 69 kV line can be increased by increasing the conductor sag clearances of the existing line. That will be sufficient to ensure acceptable performance until the load approaches 28 MVA, which is not expected until sometime past 2011.

Schedule. GRE increased the thermal rating of the conductor in 2005, and no further work is anticipated for at least five years.

8.3.7 Mille Lacs Area

Tracking Number: 2003-NE-N7

Inadequacy. The load in the Lake Mille Lacs area, particularly on the northwest side, continues to grow and will result in undervoltage conditions at certain facilities in a few years unless the situation is addressed.

Alternatives. Three alternatives were described in the 2003 Report. They include: (1) a new 115 kV line between Kimberly and Glen, (2) extending a 115 kV line from the Mud Lake substation to the load center at Wilson Lake, and (3) a generator at the Lake Wilson substation.

Analysis. A new line from the Mud Lake substation to the load center at Wilson Lake would put a strong source where it is needed. Even if a new line were built between Kimberly and Glen, the load in the Wilson Lake area would cause voltage problems and overloads.

Schedule. Great River Energy, the utility that will construct and own the new facilities, has determined that it will seek authorization to construct a new 12 mile 115 kV line from the Mud Lake Substation to the Wilson Lake Substation. The line would have an outlet to the Spirit Lake Switch and Pine Center Tap. An application for a certificate of need for this line will be filed with the Commission by April 1, 2006.

8.3.8 Floodwood Area

Tracking Number: 2003-NE-N8

Inadequacy. The Floodwood Area consists of the load served between the Cromwell and Four Corners 115/69 kV sources. Basically, it is a looped 69 kV system with two long radials extending from the loop consisting of a 29.0 mile line ending at Palisade and 17.6 mile line ending at Cedar Valley. The Palisade radial serves a fairly large amount of load resulting in the fourth highest radial mile exposure on the system. The annual load growth in the area is projected to be approximately 2.0%. Improvements are needed by 2012.

A map of the area is shown on the following page.

Alternatives. A new source needs to be established in the area. Many potential opportunities exist for bringing in a new source, but basically the options will consist of looking at lowering the radial line lengths. Also, some of the lines in the area are approaching age limitations and may be in need of rebuilding. Essentially four alternatives are being explored.

Alternative 1A: A new 69 kV line between the Kimberly substation and the Palisade substation, including the installation of a 115/69 kV source at Kimberly, and a second 69 kV circuit between the Cromwell substation and the Gowan substation.

Estimated Year	Facility
2012	Kimberly 115/69 kV, 60 MVA source
	Kimberly-Palisade 9.5 miles, 336 ACSR, 69 kV line
2013	Cromwell-Gowan 13.8 mile double circuit, 336 ACSR, 69 kV line

Alternative 1B: Same as Alternative 1A except under the assumption that a new Kimberly source is created to serve the Mille Lacs area before it is needed for the Floodwood area.

Estimated Year	Facility
2012	Kimberly 69 kV termination and breaker
	Kimberly-Palisade 9.5 miles, 336 ACSR, 69 kV line
2013	Cromwell-Gowan 13.8 mile double circuit, 336 ACSR, 69 kV line

Alternative 2: Tapping the existing Blackberry – Arrowhead 230 kV line in the Floodwood area and rebuilding several 69 kV lines to a higher capacity.

Estimated Year	Facility
2012	Floodwood 230/69 kV, 60 MVA source
	Rebuild Floodwood-Gowan Sw. 7.5 mile, 336 ACSR, 69 kV line
	Rebuild Gowan-Gowan Sw. 0.53 mile, 336 ACSR, 69 kV line
	Rebuild Gowan Sw.-Cromwell 13.8 mile, 336 ACSR, 69 kV line

Alternative 3: Connecting the radial Floodwood 115 kV line and the 69 kV line at a new substation and rebuilding several 69 kV lines to a higher capacity.

Facility	Rating MVA	Estimated Year	2011 MVA	2026 MVA
Floodwood-Gowan 69 kV line	8.7	2012	20.4	23.4
Gowan-Gowan Switch 69 kV line	24.3	2021	21.6	25.3
Gowan Switch-Cromwell 69 kV line	24.3	2016	22.9	26.9

Estimated Year	Facility
2012	Floodwood 115/69 kV, 60 MVA source
2012	Rebuild Floodwood-Gowan Sw. 7.5 mile, 69 kV line
2016	Rebuild Gowan Sw.-Cromwell 13.8 mile, 336 ACSR, 69 kV line
2021	Rebuild Gowan-Gowan Sw. 0.53 mile, 336 ACSR, 69 kV line

Analysis. With continued load growth in the area, overloads on certain 69 kV lines and low voltage at certain substations are anticipated by 2012, as shown in the table below.

Overloads

Facility	Rating MVA	Action	Estimated Year	2011 MVA	2026 MVA
Cromwell-Wright 69 kV line	9.7	Resag/Rebuild	2014	8.6	13.4
Cromwell-Cromwell Distribution	24.3		2016	20.9	29.82
Four Corners 115/69 kV transformer	28		2017	30.2	40.9
Wright-Round Lake 69 kV line	9.7	Resag/Rebuild	2019	7.2	11.4

Voltage Deficiencies (LTC adjusted)

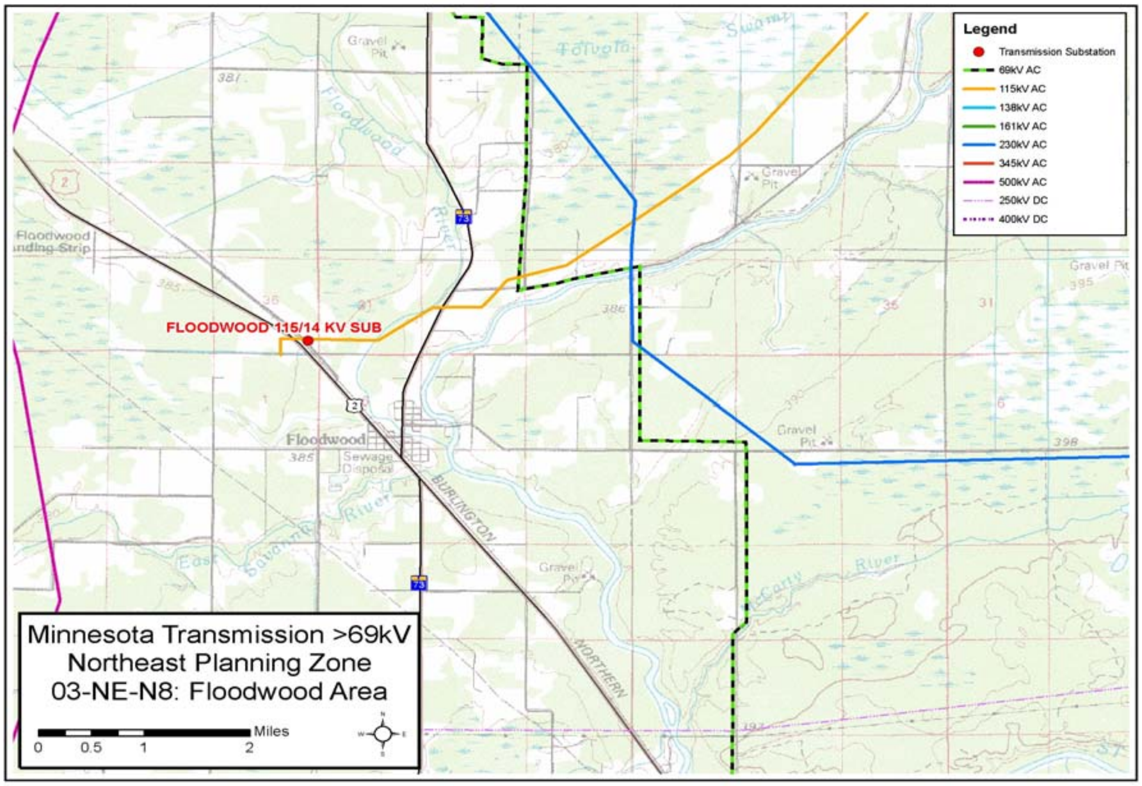
Substation	Estimated Year	2011 %	2026 %
Solway	2012	92.6	86.3
Palisade	2012	92.6	84.7

The Kimberly-Palisade line included in Alternatives 1 and 2 would eliminate the 69 kV radial which serves one-third of the load in the Floodwood Area. Establishing a source at Kimberly would also tie into a potential source needed in the Mille Lacs Area, thus the Kimberly source would potentially have two outlets. Even with the Palisade radial load removed, the voltage at Solway is deficient in 2013 on loss of the Four Corners transformer requiring a Cromwell-Gowan Switch double circuit 69 kV line to make the Kimberly source a stronger source to Solway.

Alternative 2 would provide a very strong source to the 69 kV; however through-flow will need to be examined.

Alternative 3 does not offer as strong a source as the Floodwood 230 kV line identified in Alternative 2, but this may be beneficial because the cost would be less and there would be less flow potential on loss of 115 kV facilities. Also, the Floodwood-Gowan-Gowan Switch-Cromwell 69 kV line will be ready for replacement based on age and voltage drop across the line segments. The new substation proposed in Alternative 3 would be in a predominantly rural area that would have a minimal footprint. It may also be coordinated with potential 115 kV development in the Cromwell-Wrenshall-Mahtowa area.

Schedule. Since the need in the Floodwood area is not expected to materialize until 2012, GRE will continue to monitor and examine its alternatives for this area.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
FLOODWOOD 115/14 KV SUB
Floodwood
Minnesota Transmission >69kV
Northeast Planning Zone
03-NE-N8: Floodwood Area
Miles
0 0.5 1 2

8.3.9 Nashwauk Area

Tracking Number: 2003-NE-N9

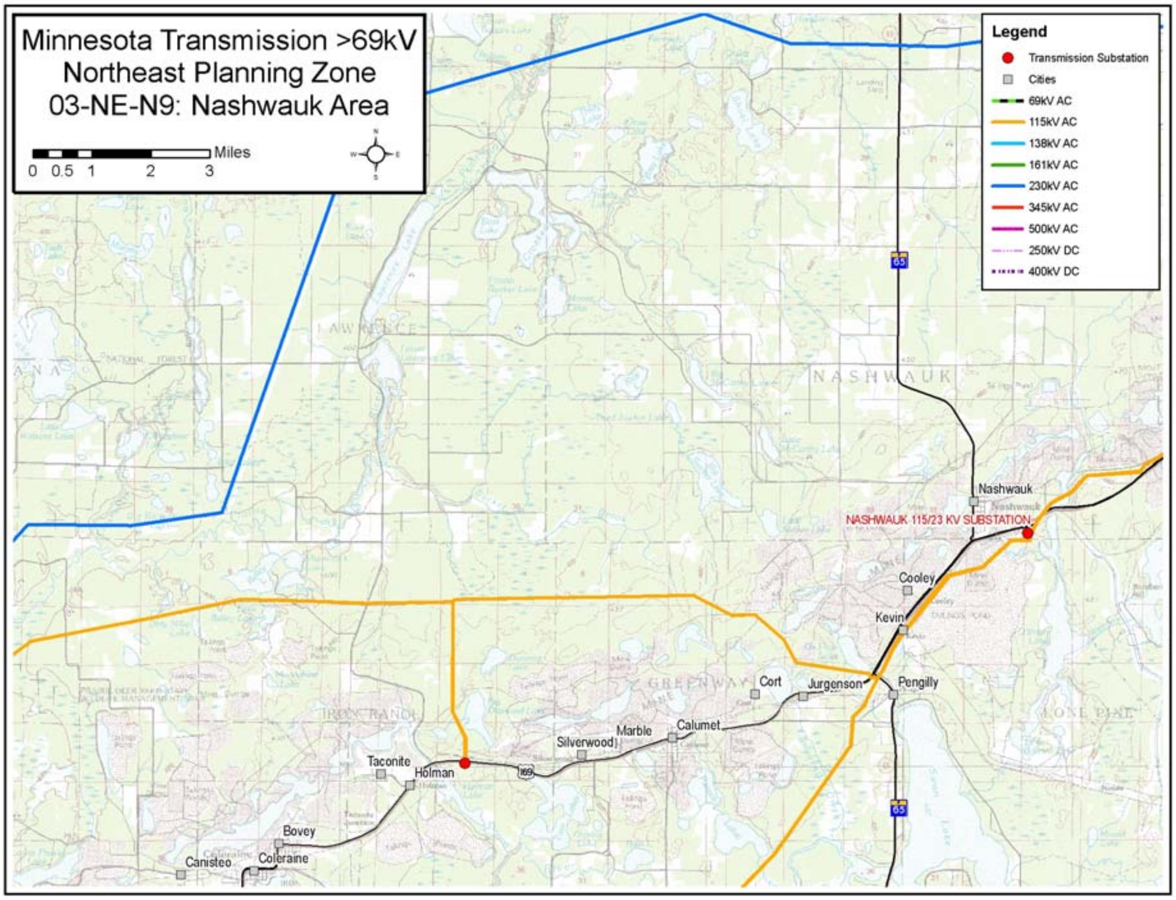
Inadequacy. The load in the Nashwauk and Crooked Lake area has been growing and is predicted to continue to grow, perhaps at a rate of as much as 4% per year. It is estimated that only 1.4 MW of total load can be served from the Nashwauk and Crooked Lake substations, which is 47% of the 2001 summer peak and 36% of the 2001 winter peak. The load on the line between Nashwauk and Crooked Lake Tap will become overloaded by 2006 and the tap to the Crooked Lake will become overloaded by 2011.

A map of the area is shown on the following page.

Alternatives. Three alternatives have been considered: (1) a new Shoal Lake 115 kV distribution substation west of the existing Nashwauk substation, (2) a new Lawrence Lake 115 kV distribution substation about five miles southwest of the Crooked Lake substation, and (3) additional generation.

Analysis. Lawrence Lake is the preferred location of the new distribution substation as it is located near the load center and the 115 kV line will be less than 5 miles.

Schedule. A decision will have to be made in 2007, unless load does not grow as fast as predicted.


Minnesota Transmission >69kV
Northeast Planning Zone
03-NE-N9: Nashwauk Area
Miles
0 0.5 1 2 3
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
NASHWAUK 115/23 KV SUBSTATION
Nashwauk
Cooley
Kevin
Pengilly
Jurgenson
Cort
Calumet
Marble
Silverwood
Taconite
Holman
Bovey
Coleraine
Canisteo
NASHWAUK
GREENWAY
LAWRENCE

8.3.10 Hubbard – Badoura Area

Tracking Number: 2003-NE-N10 (Previously 2003-NW-N5)

Completion of Project. As recommended in the 2003 Biennial Report (Hubbard-Badoura Area in the Northwest Zone), GRE completed construction of the Long Lake 115/34.5 kV substation in the Park Rapids area in 2005. This new substation is supplied by a single 115 kV line from the Hubbard substation.

The Long Lake substation was designed for the addition of a second 115 kV line to provide full redundancy when area loads reached the level where the existing 34.5 kV ties to the Hubbard, Badoura, and Akeley substations could no longer reliably serve as a redundant supply during loss of the substation's only 115 kV source. The load served out of the Long Lake substation has already reached the point that if the existing 115 kV line is out of service, multiple switching events are required to relieve overloads on the 34.5 kV system and to restore electric service to all customers served by Long Lake.

In order to address this inadequacy, GRE and MP are proposing to construct a 115 kV line from Pequot Lakes to Badoura and from Badoura to Long Lake. A certification request for this 115 kV line will be submitted on November 1, 2005. For further discussion of this project, see the discussion in sections 8.3.3 and 9.

8.3.11 Long Lake – Badoura Area

Tracking Number: 2005-NE-N1

Analysis. See Section 8.3.3

8.3.12 Boswell – Wilton 230 kV Line

Tracking Number: 2005-NW-N2

Analysis. See discussion under the Northwest Zone at Section 8.2.8

8.3.13 Mesaba IGCC Generation Facility

Tracking Number: 2005-NE-N2

Inadequacy. Excelsior Energy Inc. ("Excelsior"), an independent energy development company, is proposing to construct and operate the Mesaba Energy Project (the "Project"), an Integrated Coal Gasification Combined Cycle (IGCC) power plant to be located on the Iron Range. The initial Project would involve the construction of two phases of generation, each phase of which would nominally generate 600 megawatts of electricity.

Recently Excelsior announced that its preferred site for the Project is in Itasca County north of Taconite, Minnesota, ("West Range Site") and that the Cleveland Cliff's property north of Hoyt Lakes, Minnesota, would be the designated the alternate site ("East Range Site"). The Project must be interconnected with the transmission grid in order to provide an outlet for the power to be generated.

Alternatives. Excelsior has developed a number of 230 and 345kV development concepts for the generator outlet facilities to deliver the output of both phases of generation from each Project site to the associated point of interconnection. The preliminary evaluation of these concepts indicates that three 230kV generator outlet lines (10-18 miles in length) are possible for the West Range site while two 345kV generator outlet lines (each 35-40 miles in length) are possible for the East Range site. To minimize the need for new right of way, Excelsior is proposing that these new generator outlet lines replace existing Minnesota Power 115 kV lines with new double circuit structures carrying both the existing 115 kV line and the new 230 or 345 kV generator outlet line.

The alternatives are described below:

Generator Outlet Transmission for West Range site to Blackberry Substation

Alternative 1: 10 mile 230 kV double circuit line (6 miles of new ROW)

Alternative 2: 18.5 mile 230/115 kV double circuit line (no new ROW)

Alternative 3: 10 mile 230 kV line (add second circuit to d/c structures- no new ROW)

Generator Outlet Transmission for the East Range site to Forbes Substation

Alternative 4: 35.5 miles 345/115 kV double circuit line (2.5 miles new)

Alternative 5: 36.0 miles 345/115 kV double circuit line (4.5 miles new ROW)

Analysis. Since both the local utility (Minnesota Power) where the potential plant sites are located and the principal potential customer (Xcel Energy) are members of the new Midwest Independent System Operator ("MISO") organization, the MISO processes for generator interconnection and transmission delivery service must be followed.

Any power supplier wishing to connect a new generator to a MISO-controlled transmission system or increase the output of an existing generating asset connected to a MISO-controlled transmission system must first submit a written generator interconnect request to MISO. When the request is determined to be complete, it is posted in the queue. The queue position determines the order of the interconnection studies necessary to facilitate the Interconnection Request.

In October of 2004, Excelsior submitted an interconnection request for the first phase (600 MW) of the Project requesting network resource interconnection service with Minnesota Power's control area from the proposed East Range site with the point of interconnection (POI) proposed at Minnesota Power's Forbes 230kV Substation. MISO designated this request as Project G477 and assigned a Queue number of 38280-01. This was followed in May 2005 with a second request, again for the first phase of the Project, for the West Range site with the proposed POI at Minnesota Power's Blackberry 230kV Substation. MISO designated this as Project G519 and assigned a Queue number of 38491-01.

The basic procedure requires three studies with increasing complexity and cost to be performed, to assure generator interconnection and operation does not jeopardize the reliability of the transmission system. The three studies include:

- an Interconnection Feasibility Study:
- a System Impact Study; and:
- an Interconnection Facilities Study.

Currently, both requests are in the System Impact Study phase with reports due out before the end of the year, outlining any adverse impacts from interconnecting the Mesaba Energy Project at each proposed POI and what network upgrades will be required, if any, to the existing transmission network to enable delivery of the output of the first phase of the Project to the Twin Cities load serving entities.

Once MISO has completed the System Impact Study and sufficient work has been completed on the Interconnection Facilities Study, then Excelsior, MISO, Minnesota Power and any other transmission owner whose transmission facilities have been identified as requiring upgrading would begin the process of negotiating a Large Generator Interconnection Agreement (LGIA). The purpose of this agreement is to define what transmission facilities must be constructed and/or upgraded; who will be responsible for getting these completed; who will pay for them; and a projected schedule for completion. This agreement must be filed with FERC for approval prior to implementation.

Schedule. Excelsior plans to bring the first phase of the project online in 2011.

8.3.14 Other Zone –Specific Issues

System inadequacies in the Red River Valley and western Minnesota can impact the entire regional transmission system, including the Northeast Planning Zone. These issues are being studied by the area utilities through the Northern MAPP Sub-Regional Planning Group. This study, called the *Red River Valley-West Central Minnesota Transmission Improvement Planning Study*, or TIPS, has been broken down into three different phases. These phases include a base improvement plan, a wires study, and a generation alternatives study. One alternative being considered, which affects the Northwest Planning Zone, is a 230 kV transmission line from Boswell (Cohasset) to Wilton (Bemidji). A more complete discussion of the TIPS study can be found in the Northwest Planning Zone section of this report and in Section 4.5.5.

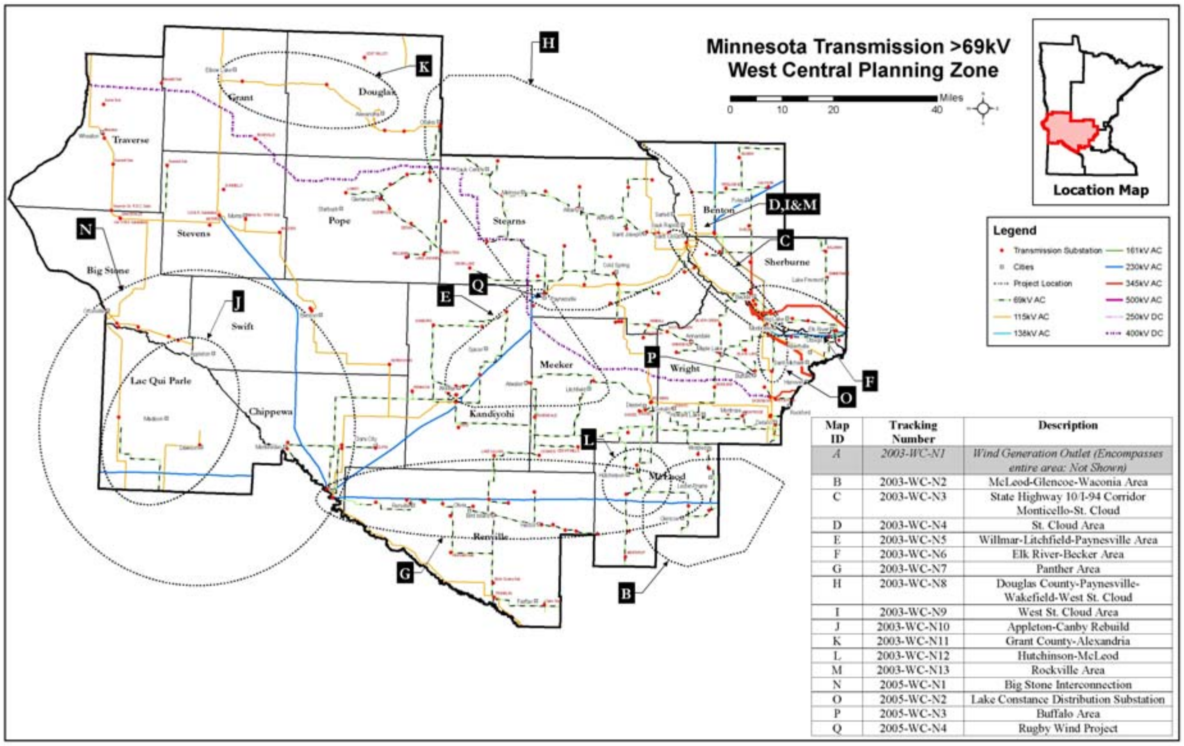
The addition of large industrial loads could also trigger the need for transmission additions not covered in this Biennial Report. The utilities serving the area are aware that companies are in the process of conducting feasibility studies for expansion of existing operations or addition of new operations that could impact the NE Zone until these companies plans are finalized, however, the utilities do not have the information necessary to determine if additional transmission will be required to serve the new load.

8.4 West Central Zone

The following table provides a list of transmission needs identified in the West Central Zone and the map on the following page shows the location of each item in the table:

West Central Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2003-WC-N1	Wind Generation Outlet	2007	825 MW of wind generation	8.4.1
2003-WC-N2	McLeod-Glencoe-Waconia Area (December 2004 Compliance Filing: Exhibit No. 1 referenced as Glencoe Load Serving) See TC Zone Section of 2005 Report for further updates; referenced as 2003-TC-N3: Carver County-Waconia Area	2005	Overloads and low voltages in the Glencoe area	8.4.2
2003-WC-N3	State Highway 10/I-94 Corridor Monticello-St. Cloud (December 2004 Compliance Filing: Exhibit No. 1; referenced as Monticello-St. Cloud Corridor)	2007	Monticello 345/230 kV transformer overload; Monticello-St. Cloud 115 kV line overload	8.4.3
2003-WC-N4	St. Cloud Area	2004	Benton County 230/115 kV transformer overload; Low voltages in St. Cloud and Stearns County; Monticello-St. Cloud 115 kV line overload	8.4.4
2003-WC-N5	Willmar-Litchfield-Paynesville Area (December 2004 Compliance Filing: Exhibit No. 1: referenced as Litchfield Low Voltage; referenced as Willmar-Paynesville Area in 2003 Report)	2004 (partial)	Willmar 115/69 kV transformer overload; Low voltages in Kandiyohi County	8.4.5
2003-WC-N6	Elk River-Becker Area	2007	69 kV line overloads between Elk River and Benton County	8.4.6
2003-WC-N7	Panther Area	2012	Crooks-Emmet 69 kV line overload; Olivia low voltage; Browntown low voltage; Hector low voltage	8.4.7
2003-WC-N8	Douglas County-Paynesville-Wakefield-West St. Cloud (December 2004 Compliance Filing: Exhibit No. 1: referenced as Stearns County)	2012	Albany-Big Fish-Farming line overload; Black Oak low voltage; Albany low voltages	8.4.8
2003-WC-N9	West St. Cloud Area	2009	West St. Cloud 115/69 kV transformer overload; Blue Heron-Wakefield line overload	8.4.9
2003-WC-N10	Appleton-Canby Rebuild	2008	Canby 115/41.6 kV transformer overload; Dawson low voltage	8.4.10

West Central Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2003-WC-N11	Grant County-Alexandria	2003	Elbow Lake-Grant County line overload	8.4.11
2003-WC-N12	Hutchinson-McLeod	2004	Low voltages at Litchfield; Big Swan 115/69 kV transformer overload	8.4.12
2003-WC-N13	Rockville Area	2006	Poor reliability	8.4.13
2005-WC-N1	Big Stone Interconnection	2010	New generation interconnection	8.4.14
2005-WC-N2	Lake Constance Distribution Substation		Load growth	8.4.15
2005-WC-N3	Buffalo Area, Wright County		Low voltage	8.4.16
2005-WC-N4	Rugby Wind Project		Paynesville 230 kV transient voltage problem	8.4.17
2005-CX-1	CapX 2020 Vision Plan Fargo – Alexandria – Benton County 345 kV			8.4.18



Map ID	Tracking Number	Description
A	*2003-WC-N1*	*Wind Generation Outlet (Encompasses entire area: Not Shown)*
B	2003-WC-N2	McLeod-Glencoe-Waconia Area
C	2003-WC-N3	State Highway 10/I-94 Corridor Monticello-St. Cloud
D	2003-WC-N4	St. Cloud Area
E	2003-WC-N5	Willmar-Litchfield-Paynesville Area
F	2003-WC-N6	Elk River-Becker Area
G	2003-WC-N7	Panther Area
H	2003-WC-N8	Douglas County-Paynesville-Wakefield-West St. Cloud
I	2003-WC-N9	West St. Cloud Area
J	2003-WC-N10	Appleton-Canby Rebuild
K	2003-WC-N11	Grant County-Alexandria
L	2003-WC-N12	Hutchinson-McLeod
M	2003-WC-N13	Rockville Area
N	2005-WC-N1	Big Stone Interconnection
O	2005-WC-N2	Lake Constance Distribution Substation
P	2005-WC-N3	Buffalo Area
Q	2005-WC-N4	Rugby Wind Project

8.4.1 Wind Generation Outlet

Tracking Number: 2003-WC-N1

Inadequacy. The 2003 Report described a need for additional transmission infrastructure to provide outlet capacity for 825 MW of wind energy off Buffalo Ridge.

Alternatives. A number of projects in the West Central Zone were identified in the 2003 Report.

Schedule. The projects in the West Central Zone have been implemented. For additional discussion of other projects required to provide outlet capacity from Buffalo Ridge, see the discussion in the Southwest Zone in Section 8.6.4.

8.4.2 McLeod-Glencoe-Waconia Area

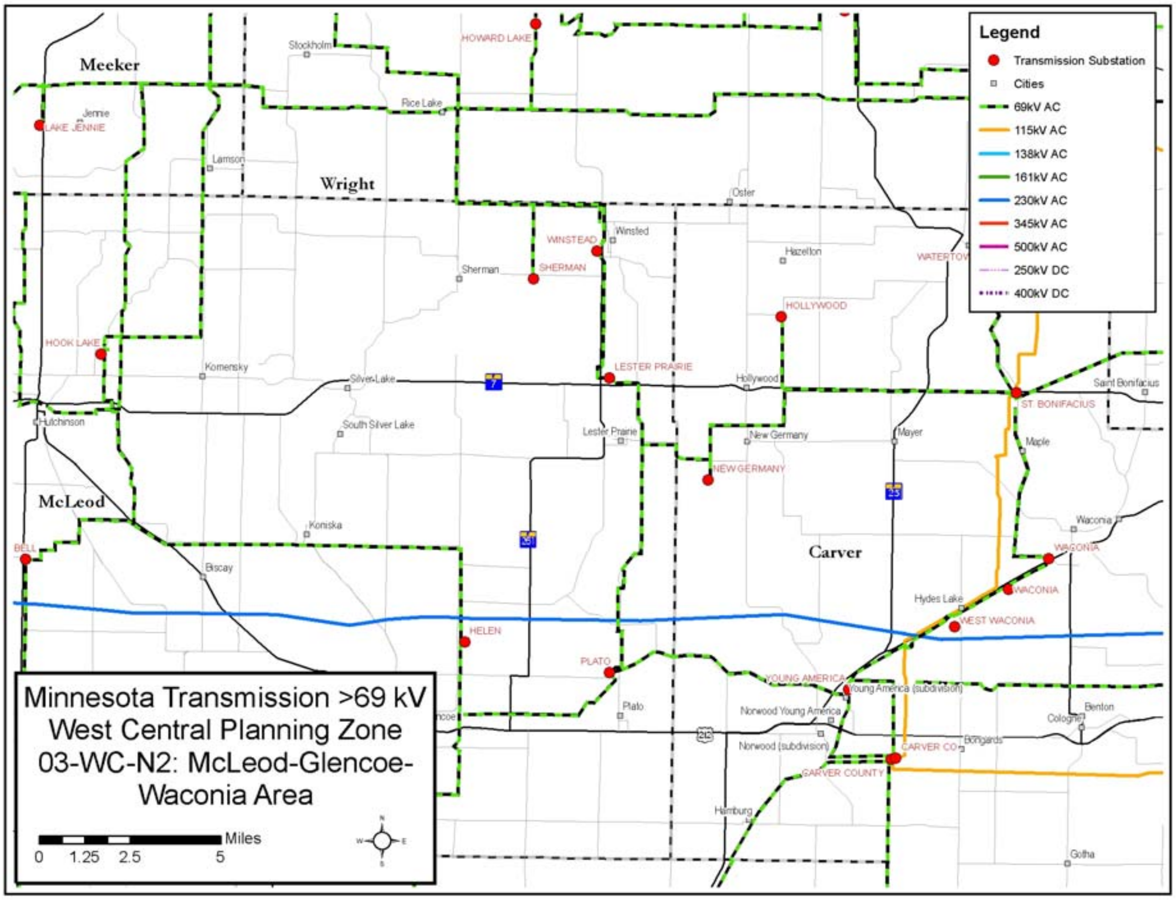
Tracking Number: 2003-WC-N2

Inadequacy. The utilities reported in the 2003 Report that additional infrastructure was required to handle anticipated load growth in the McLeod-Glencoe-Waconia area.

A map of the area is shown on the following page.

Completion of Project. The project that was selected to address the situation was the construction of a 9.5 mile long 115 kV transmission line between Glencoe and the McLeod substation. The Glencoe Light and Power Commission was responsible for construction of this line. No certificate of need was required because the line was under ten miles in length and a permit was obtained from McLeod County. The new line has been constructed and will be in operation by the end of the year.

The continued development of the 115 kV system from Glencoe to the Waconia area is still under study to determine the appropriate eastern termination point. See the discussion about the Carver County-Waconia area in the Twin Cities section of this report. Tracking Number 2003-TC-N3.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N2: McLeod-Glencoe-Waconia Area
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Miles
0 1.25 2.5 5
Meeker
Wright
McLeod
Carver
LAKE JENNIE
HOOK LAKE
HOWARD LAKE
WINSTEAD
SHERMAN
LESTER PRAIRIE
HOLLYWOOD
NEW GERMANY
ST. BONIFACIUS
WACONIA
WEST WACONIA
YOUNG AMERICA
CARVER CO
CARVER COUNTY
PLATO
HELEN
BELL
Hutchinson
Stockholm
Rice Lake
Lamson
Komensky
Silver Lake
South Silver Lake
Koniska
Biscay
Sherman
Winsted
Oster
Hazelton
Hollywood
New Germany
Lester Prairie
Mayer
Maple
Saint Bonifacius
Hydes Lake
Plato
Norwood Young America
Norwood (subdivision)
Young America (subdivision)
Hamburg
Bongards
Cologne
Benton
Gotha

8.4.3 State Hwy 10/I-94 Corridor, Monticello-St. Cloud

Tracking Number: 2003-WC-N3

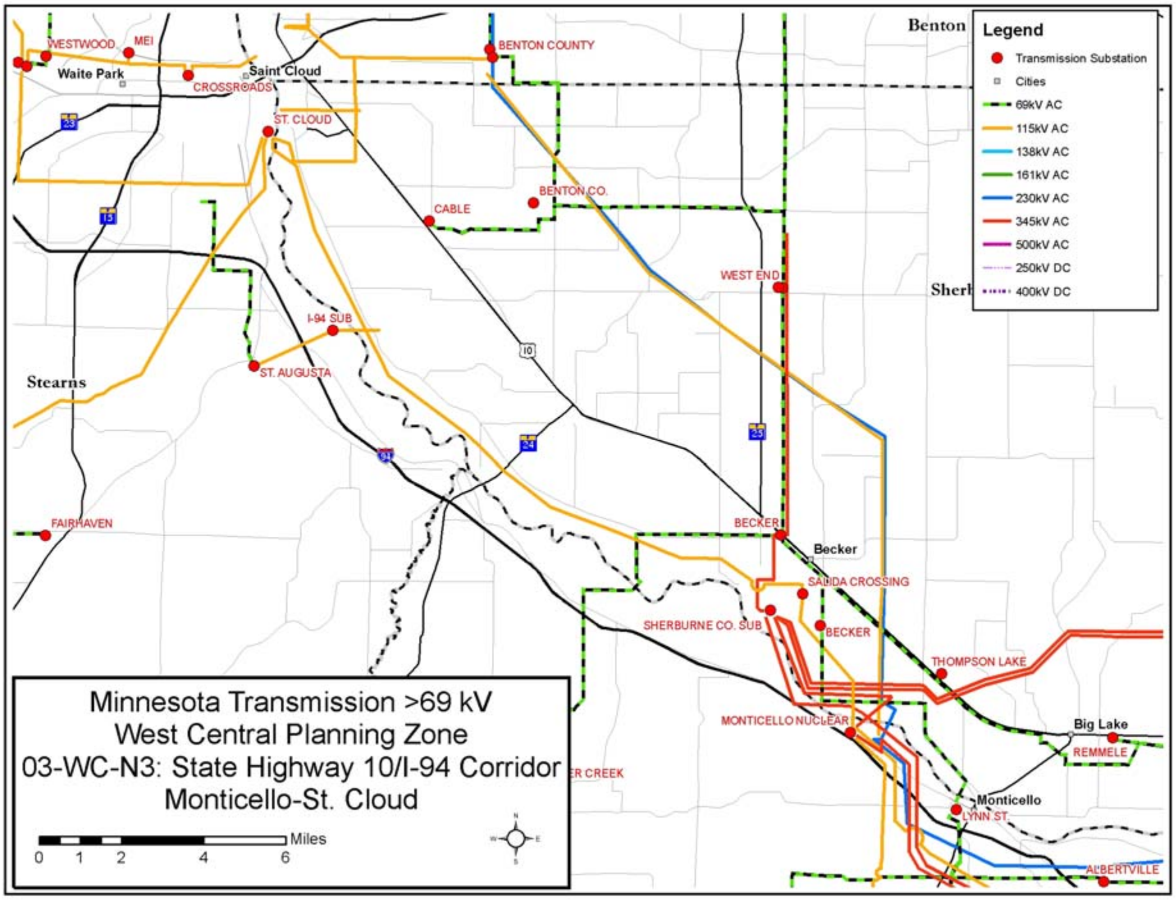
Inadequacy. An existing transformer at Monticello would overload significantly if the Benton County/Sherco 345 kV line were to trip out during winter peak conditions, and by 2006, the entire 115 kV line from Monticello to St. Cloud would exceed acceptable limits under such a contingency.

A map of the area is shown on the following page.

Alternatives. Two alternatives were identified in the 2003 Report: (1) a new 345/115 kV transformer at Sherco and upgrade of the 115 kV line from Monticello to St. Cloud, and (2) a second transformer at Monticello and upgrade of the 115 kV line from Monticello to St. Cloud.

Analysis. The economic analysis showed that Alternative 1 was significantly cheaper.

Schedule. Xcel Energy notified the Commission of the upgrade of the Monticello to St. Cloud 115 kV line in 2004. The scope of work is to upgrade the 115 kV line and expand the Sherco substation, which was approved in September 2005. This plan also provides for a new 115/69 kV substation near Salida Crossing where GRE has identified the need for a new mid-system, 69 kV voltage source. (See the Elk River-Becker area for discussion on this need. Tracking Number 2003-TC-N6). The projects should all be complete in 2007. If a transmission issue should occur prior to 2007, special transmission switching procedures can address the issue.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N3: State Highway 10/I-94 Corridor
Monticello-St. Cloud
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Miles
0 1 2 4 6
WESTWOOD
MEI
Waite Park
CROSSROADS
Saint Cloud
ST. CLOUD
BENTON COUNTY
BENTON CO.
CABLE
WEST END
I-94 SUB
ST. AUGUSTA
Stearns
Benton
FAIRHAVEN
BECKER
Becker
SAUDA CROSSING
SHERBURNE CO. SUB
THOMPSON LAKE
MONTICELLO NUCLEAR
Big Lake
REMMELE
Monticello
LYNN ST.
ALBERTVILLE

8.4.4 St. Cloud Area

Tracking Number: 2003-WC-N4

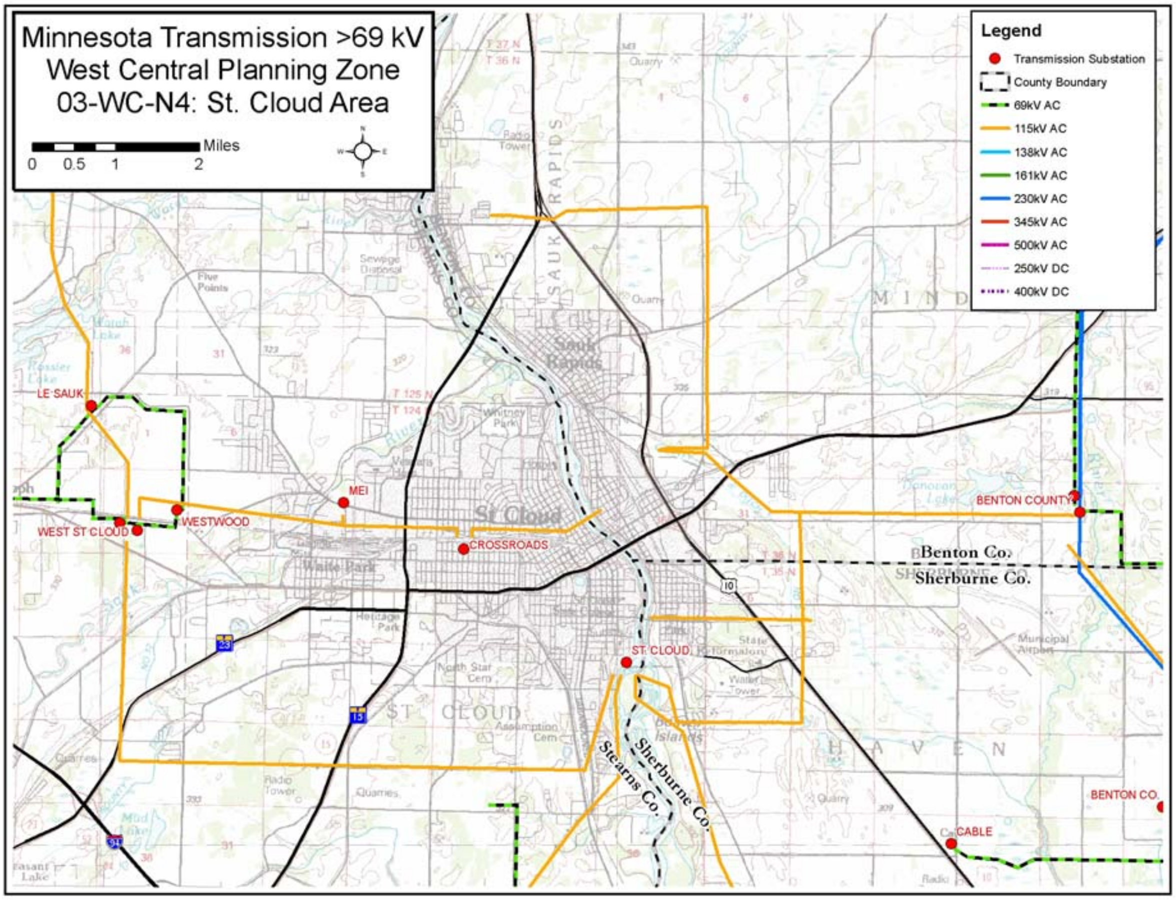
Inadequacy. The St. Cloud area includes the city of St. Cloud and surrounding suburbs. The area is bounded by Benton County, Granite City, St. Regis, West St. Cloud to the west and Monticello, Paynesville and Sherco to the south. The entire St. Cloud area and much of central Minnesota relies on the single source of the Benton County substation and the single, 115 kV double circuit line from Benton County. The total load exceeds the capability of the 115 kV loop to supply the area during a contingency. Within five to seven years some form of additional bulk power supply will be needed into St. Cloud and central Minnesota.

A map of the area is shown on the following page.

Alternatives. The long range solution to the St. Cloud service concerns is the construction of a new bulk supply source – a new 345 kV line running in the vicinity of St. Cloud that can be tapped for local service in the area. The CapX 2020 Vision Plan has identified a 345 kV line running from Fargo, North Dakota, to the Twin Cities, passing near the St. Cloud area. See the discussion in Section 6 about CapX.

Analysis. A St. Cloud study that is currently underway is evaluating alternative ways to tap into a new 345 kV line near St. Cloud to provide a new bulk supply for the 115 kV loop and to address distribution issues in the area. The Red River Valley Load Serving Study/TIPS contains the latest information on the 345 kV line.

Schedule. The utilities will be considering the implications of tapping into the 345 kV line at the same time further analysis of the Fargo-Twin Cities 345 kV line continues.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N4: St. Cloud Area
Miles
0 0.5 1 2
Legend
Transmission Substation
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
LE SAUK
MEI
WESTWOOD
WEST ST CLOUD
CROSSROADS
ST CLOUD
BENTON COUNTY
BENTON CO
CABLE
Benton Co.
Sherburne Co.
Stearns Co.
Sherburne Co.

8.4.5 Willmar-Litchfield-Paynesville Area

Tracking Number: 2003-WC-N5

Inadequacy. This is a large area that could incur low voltages during various contingency events, such as line outages along the 69 kV loop, as early as 2006.

A map of the area is shown on the following page.

Alternatives. Numerous alternatives were evaluated in the *West Central Transmission Study* (completed in September 1999). An updated version of the study focusing on the western portion of this area, particularly re-analyzing the 69 kV Kandiyohi County loop, was completed in August, 2005. Because the inadequacies covered such a relatively large geographic area, the solutions were developed in two sets; a western set of solutions and an eastern set of solutions.

The western set of solutions included the following:

W1: Rebuild the Granite Falls—Willmar 69 kV line
W2: Rebuild the Granite Falls—Willmar 69 kV line to 115 kV operation
W3: Rebuild Granite Falls—Willmar 69 kV line to 230 kV operation
W4: Construct a new 230/115 kV substation at Six Mile Grove
W5: Remove the Granite Falls—Willmar 69 kV line from service

The eastern set of solutions included the following:

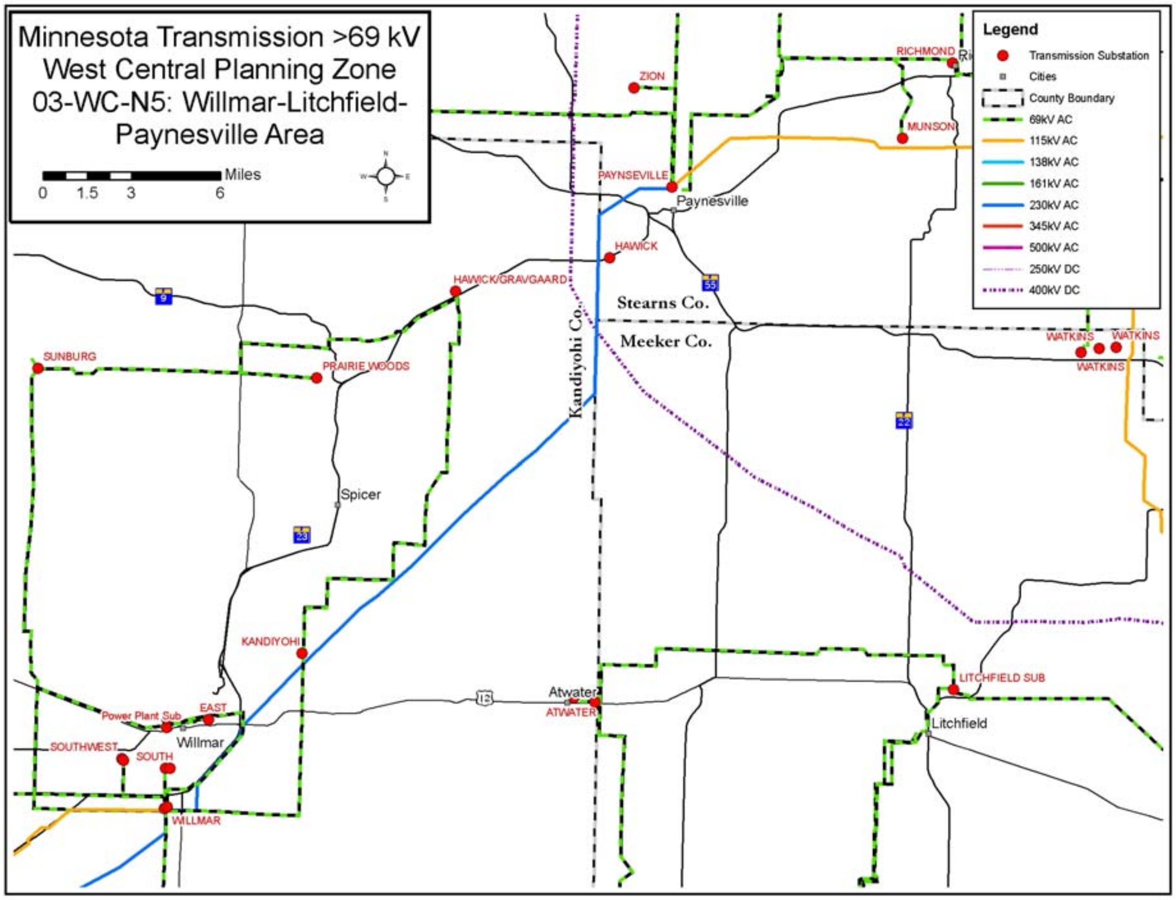
E1: Kandiyohi County substation and connection to the Big Swan—Panther 69 kV line
E2: Kandiyohi County substation and second Big Swan—Litchfield 69 kV line
E3: Paynesville—Gravgaard (Hawick) 69 kV line

A number of other facilities have been identified that would improve the system. These are shown in the table below.

Estimated Year	Facility
2006	Capacitor Banks at Benson and Willmar
2006	Add 16 MVAR capacitor bank at Litchfield Municipal
2007	Conversion of Pennock to 115 kV Operation
2013	Construct 230/69 kV substation near Spicer
2013	Build 2.5 mile double circuit 69 kV line: Kandiyohi - SH line
2013	Build 9.2 double circuit 69 kV line: Kandiyohi - Atwater
2019	Add second 230/69 kV transformer at Panther

Analysis. The engineering study is still being reviewed to determine the technical viability of the alternatives. Once that process is complete, the economic, environmental, and social issues associated with the alternatives will be analyzed along with the technical results.

Schedule. The anticipated years for implementing the projects in the above table are given in the table. The timeframe for the other alternatives is still being developed.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N5: Willmar-Litchfield-Paynesville Area
Miles
0 1.5 3 6
Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
ZION
RICHMOND
MUNSON
PAYNSEVILLE
Paynesville
HAWICK
HAWICK/GRAVGAARD
Stearns Co.
Meeker Co.
Kandiyohi Co.
SUNBURG
PRAIRIE WOODS
WATKINS
Spicer
KANDIYOHI
LITCHFIELD SUB
Litchfield
Atwater
ATWATER
Power Plant Sub
EAST
Willmar
SOUTHWEST
SOUTH
WILLMAR

8.4.6 Elk River-Becker Area

Tracking Number: 2003-WC-N6

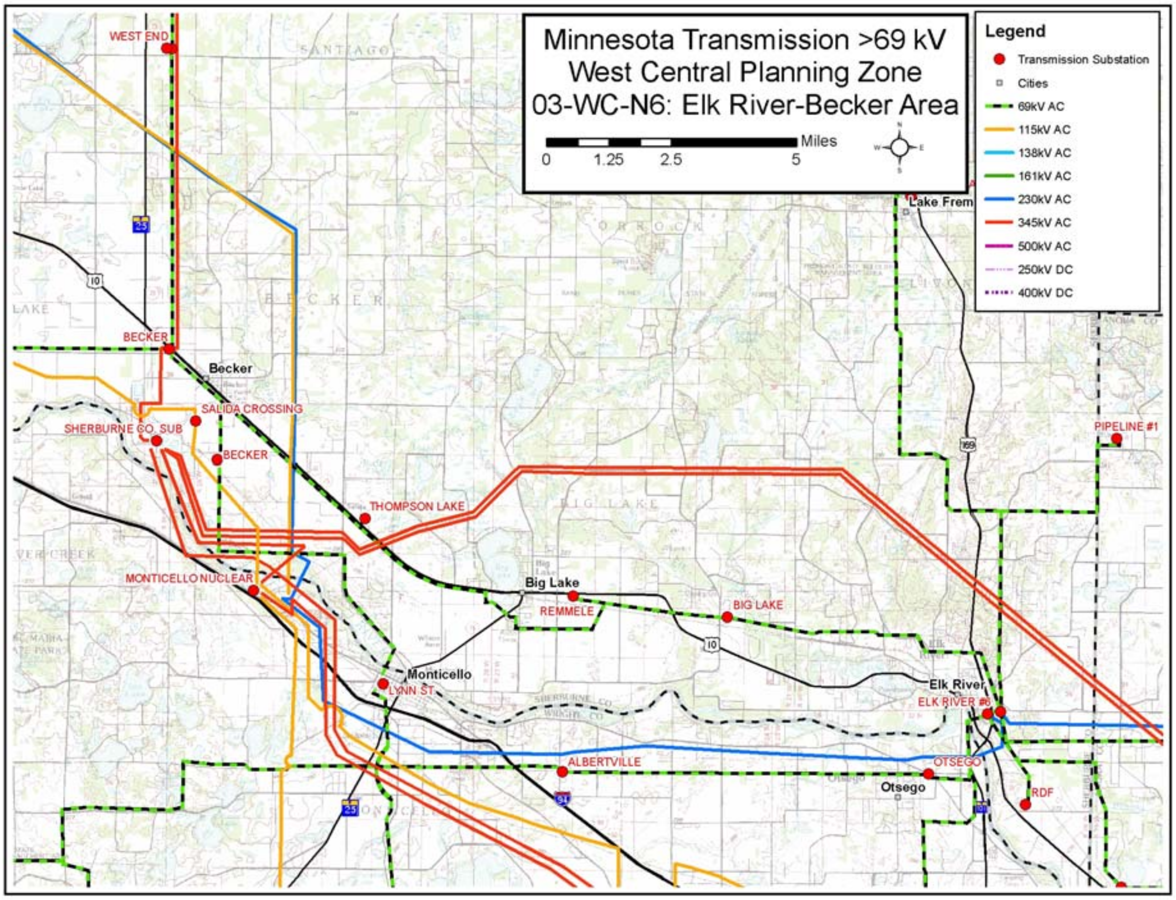
Inadequacy. This area is served by two 230/69 kV sources at Elk River and Benton County. The loss of either the Elk River source or the Benton County source causes overload problems in the area between Elk River and Benton County. Other outages can cause low voltages on the system as well.

A map of the area is shown on the following page.

Alternatives. In the 2003 Report, three alternatives were identified, involving the construction of a new substation at various locations. Great River Energy has decided on the construction of a new 115/69 kV substation, called Liberty Substation, along the Monticello-Sherco 115 kV line.

Analysis. No adverse environmental impacts are expected with the Liberty substation. This area is growing rapidly and the continued availability of reliable electric supply is important to the social and economic development in the area.

Schedule. GRE hopes to complete the Liberty substation in early 2007. No certificate of need will be required because any 115 kV line construction to tap into the Monticello-Sherco 115 kV line will be well under one mile.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N6: Elk River-Becker Area
Miles
0 1.25 2.5 5
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
WEST END
BECKER
Becker
SALIDA CROSSING
SHERBURNE CO. SUB
BECKER
THOMPSON LAKE
MONTICELLO NUCLEAR
Big Lake
REMMELE
BIG LAKE
Monticello
LYNN ST
ALBERTVILLE
Elk River
ELK RIVER #6
OTSEGO
Otsego
RDF
PIPELINE #1
Lake Frem

8.4.7 Panther Area

Tracking Number: 2003-WC-N7

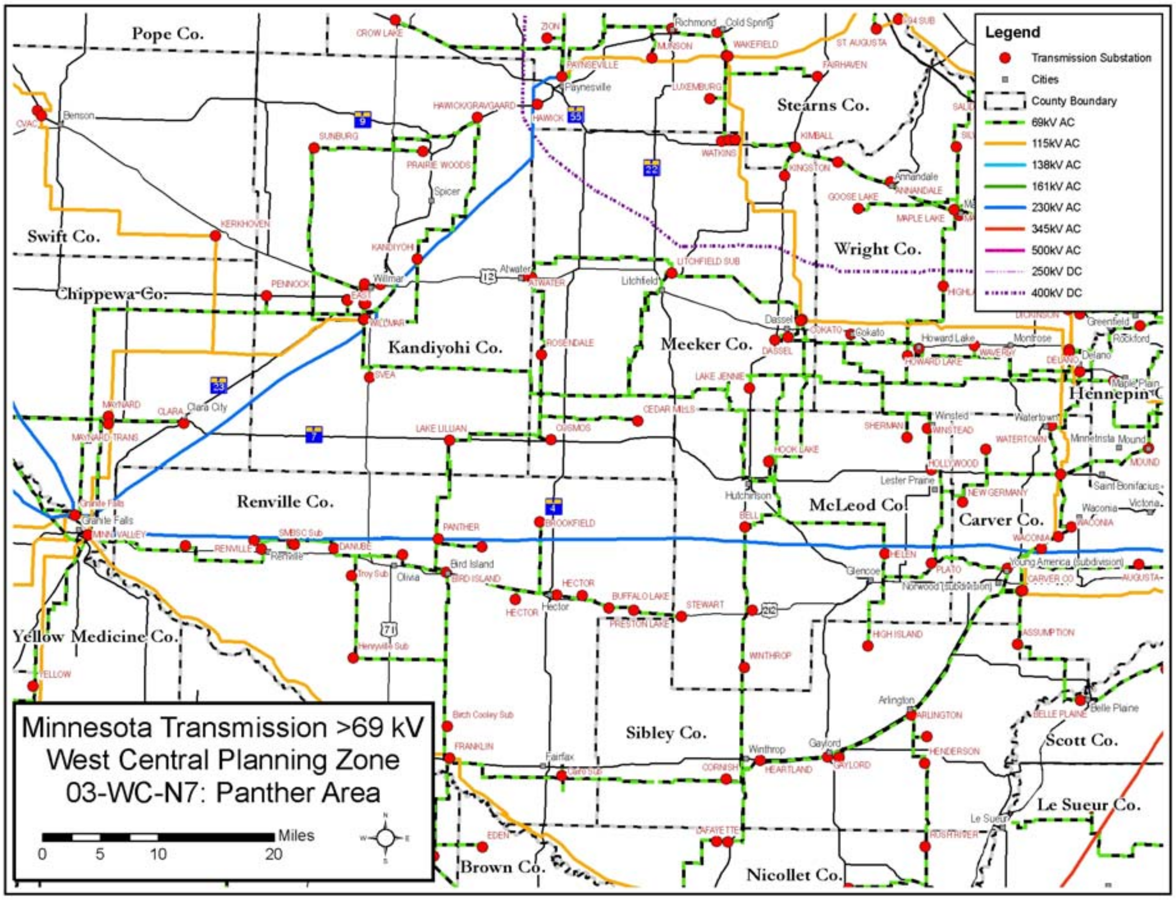
Inadequacy. Panther is a substation north of Bird Island, Minnesota. The Bird Island/Olivia area suffers low voltage and line overloads if any of the 69 kV lines serving the area are out of service. Also, the upgrade of some lines in the area might help provide higher output of wind generation from the Buffalo Ridge area.

A map of the area is shown on the following page.

Alternatives. The only short-term solution identified for the local load serving concern was the installation of a capacitor bank at either the Hector Substation or the Buffalo Lake Substation. Longer term, 2012 or later, a new transmission line and substation may be needed. Upgrades of some of the existing 69 kV lines in the area and a new 69 kV breaker station for wind outlet has also provided load serving benefits to the area. By 2019 it is expected that a second 230/69 kV transformer will be required at the Panther substation.

Analysis. The capacitor additions and upgrades or rebuilds of existing lines will not have a significant impact since existing substations sites and rights-of-way will be used. The rebuild of the Franklin/Bird Island 69 kV line along with the new Troy Switching Station that enabled closing the 69 kV line between Henry and Troy has had a positive impact on voltages and line overloads in the area. The capacitor addition at Hector will defer the need for a long-term solution until about 2012, when a new Brownton/McLeod 115 kV line and Brownton substation will be needed. A 69 kV breaker station at Brownton might be the first step in implementing this plan. The addition of a new 115 kV circuit between Brownton and McLeod would require the routing of a new transmission line along new right-of-way.

Schedule. The new capacitor bank was installed at the Hector substation in 2005 and is in service. The rebuild of the Franklin/Bird Island 69 kV line and Troy Switching Station were completed in 2004. A decision on a new 115 kV circuit will not be made for several years.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N7: Panther Area
Miles
0 5 10 20
Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Pope Co.
Swift Co.
Chippewa Co.
Kandiyohi Co.
Meeker Co.
Stearns Co.
Wright Co.
Hennepin Co.
Renville Co.
McLeod Co.
Carver Co.
Yellow Medicine Co.
Sibley Co.
Scott Co.
Le Sueur Co.
Brown Co.
Nicollet Co.

8.4.8 Douglas County-Paynesville-Wakefield-West St. Cloud

Tracking Number: 2003-WC-N8

Inadequacy. As described in the 2003 Report, this area is experiencing an increasing demand for power. Demand is expected to nearly double in the next 25 years. In addition, low voltages would be experienced now if certain lines or transformers were out of service.

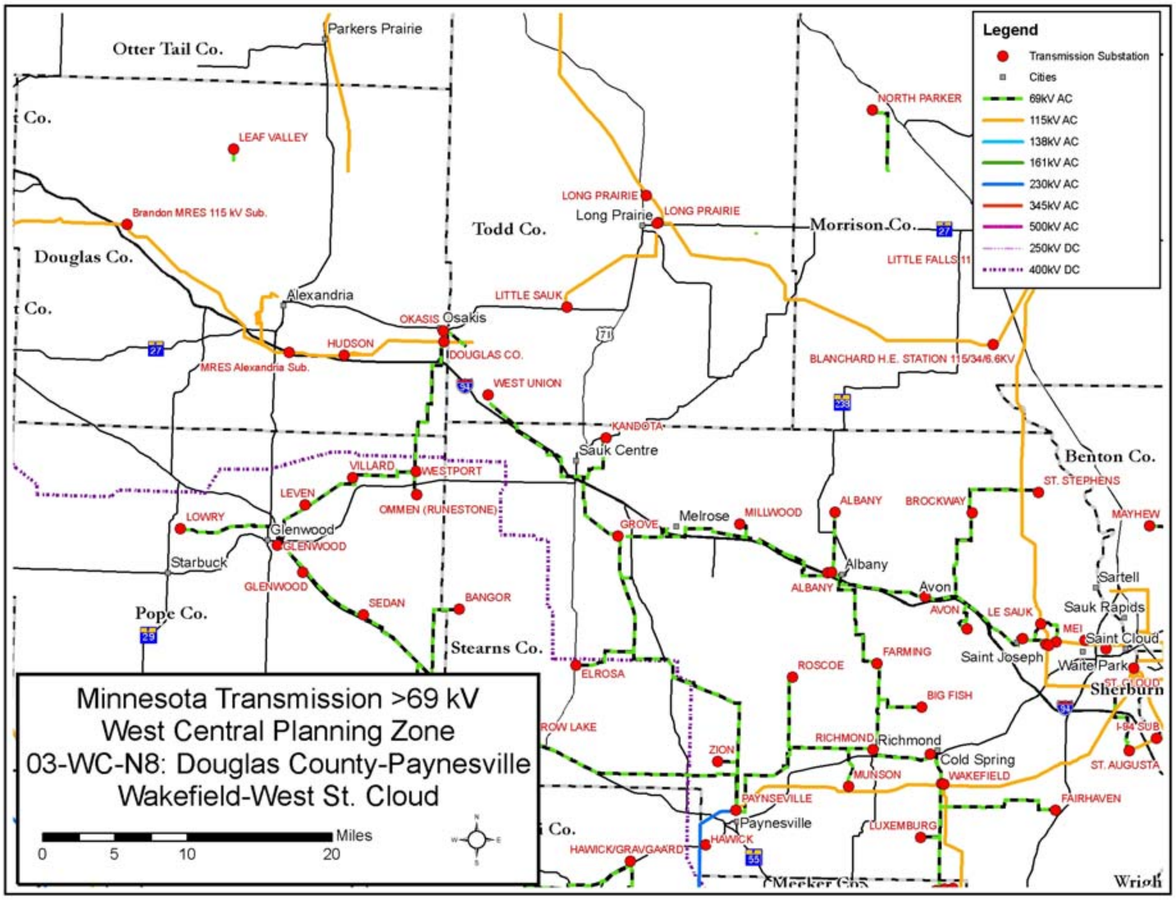
A map of the area is shown on the following page.

Alternatives. Two general alternatives were described in the 2003 Report: (1) a new 115 kV line from Alexandria to West St. Cloud along with substation upgrades, and (2) improving the existing 69 kV system through capacitor additions and additional 69 kV lines.

Analysis. Alternative 1 was found to be cheaper than Alternative 2. Alternative 1 offers a long-term solution, as it provides potential sources for future load growth along I-94, while Alternative 2 is only capable of serving the area if load growth is low.

Schedule. Two 10 Mvar capacitors were installed at the Black Oak 69 kV substation in 2005. These are part of the short term solution for loss of the Paynesville or Douglas County sources that resulted in low voltages in the Black Oak area. The schedule for increasing the capacitor bank at the Paynesville bus has yet to be determined.

Due to the significant commercial and residential development along the I-94 corridor between Alexandria and St. Cloud, this area needs further study to determine the appropriate expansion of the transmission system required to provide continued reliable electric service to the area.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N8: Douglas County-Paynesville
Wakefield-West St. Cloud
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Otter Tail Co.
Todd Co.
Morrison Co.
Douglas Co.
Pope Co.
Stearns Co.
Benton Co.
Sherburn
Parkers Prairie
Long Prairie
Alexandria
Osakis
Sauk Centre
Melrose
Albany
Avon
Glenwood
Starbuck
Sartell
Sauk Rapids
Saint Cloud
Saint Joseph
Waite Park
Richmond
Cold Spring
Paynesville
LEAF VALLEY
NORTH PARKER
Brandon MRES 115 kV Sub.
LONG PRAIRIE
LITTLE SAUK
OKASIS
HUDSON
DOUGLAS CO.
MRES Alexandria Sub.
WEST UNION
BLANCHARD H.E. STATION 115/34/6.6KV
KANDOTA
VILLARD
WESTPORT
LEVEN
OMMEN (RUNESTONE)
LOWRY
GLENWOOD
SEDAN
BANGOR
GROVE
MILLWOOD
ALBANY
BROCKWAY
ST. STEPHENS
MAYHEW
AVON
LE SAUK
MEI
FARMING
ROSCOE
ELROSA
BIG FISH
RICHMOND
ZION
MUNSON
WAKEFIELD
PAYNSEVILLE
HAWICK
LUXEMBURG
HAWICK/GRAVGAARD
FAIRHAVEN
ST. AUGUSTA
I-94 SUB
ST. CLOUD
Miles
0
5
10
20

8.4.9 West St. Cloud Area

Tracking Number: 2003-WC-N9

Inadequacy. A loss of certain facilities serving customers in the Stearns Electric Association service area on the west side of St. Cloud would cause transformers to overload and voltage to drop.

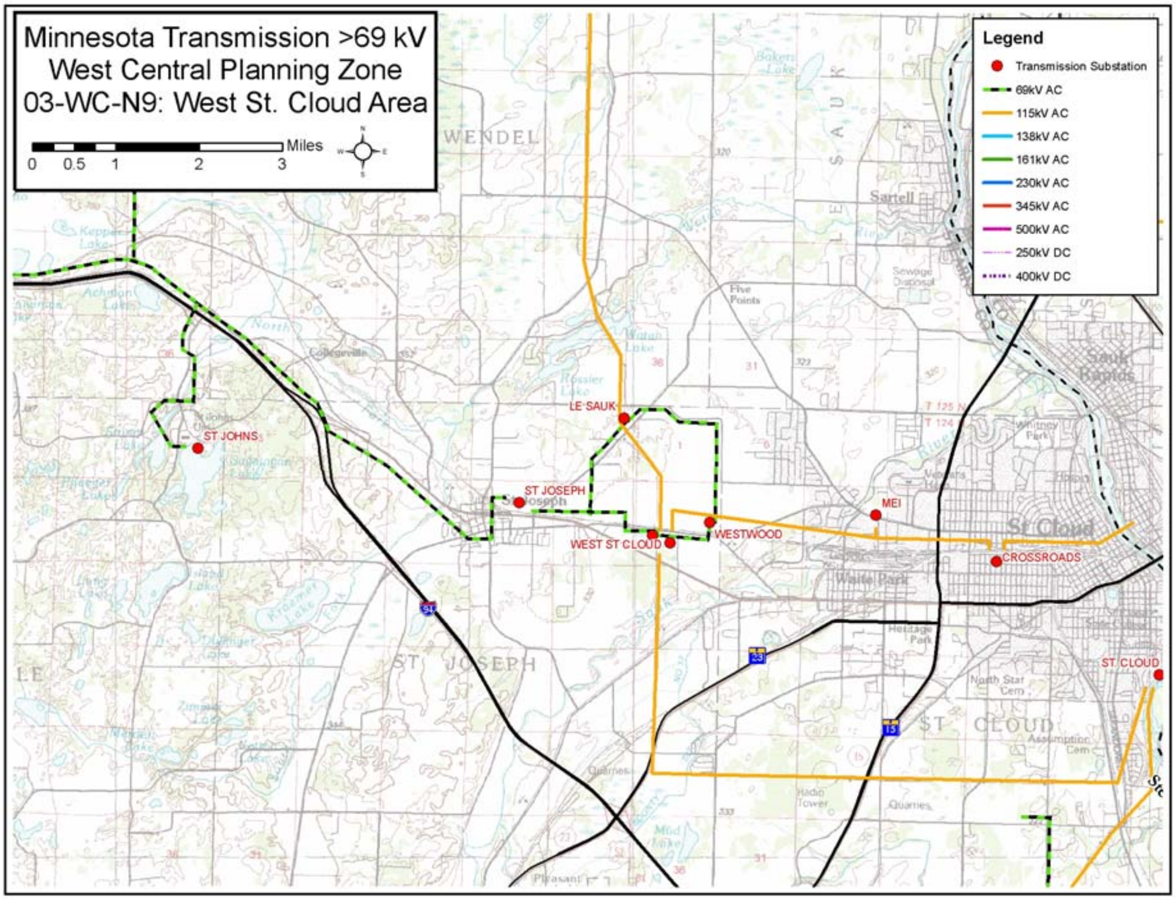
A map of the area is shown on the following page.

Alternatives. The alternatives involve converting certain loads at substations from 69 kV to 115 kV.

Analysis. The impacts for converting substations would be minimal due to use of existing substations and transmission lines.

Schedule. One-half of the Stearns Electric Association Westwood Substation has been converted to 115 kV. It is a two-bank station; one bank on the 69 kV and one-bank on the 115 kV. Other 69 kV loads (Westwood #1, Le Sauk) will be converted in the future. Timing for the conversions will be determined based on load growth.

An additional study will be needed to determine the next steps after the load conversions.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N9: West St. Cloud Area
Miles
0 0.5 1 2 3
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
ST JOHNS
LE SAUK
ST JOSEPH
WEST ST CLOUD
WESTWOOD
MEI
CROSSROADS
ST CLOUD

8.4.10 Appleton-Canby Rebuild

Tracking Number: 2003-WC-N10

Inadequacy. Load growth in the Appleton-Canby area has caused electrical facilities in this area to exceed allowable capacity. Under present loading conditions, the transformer at the Canby substation becomes overloaded during critical contingency situations.

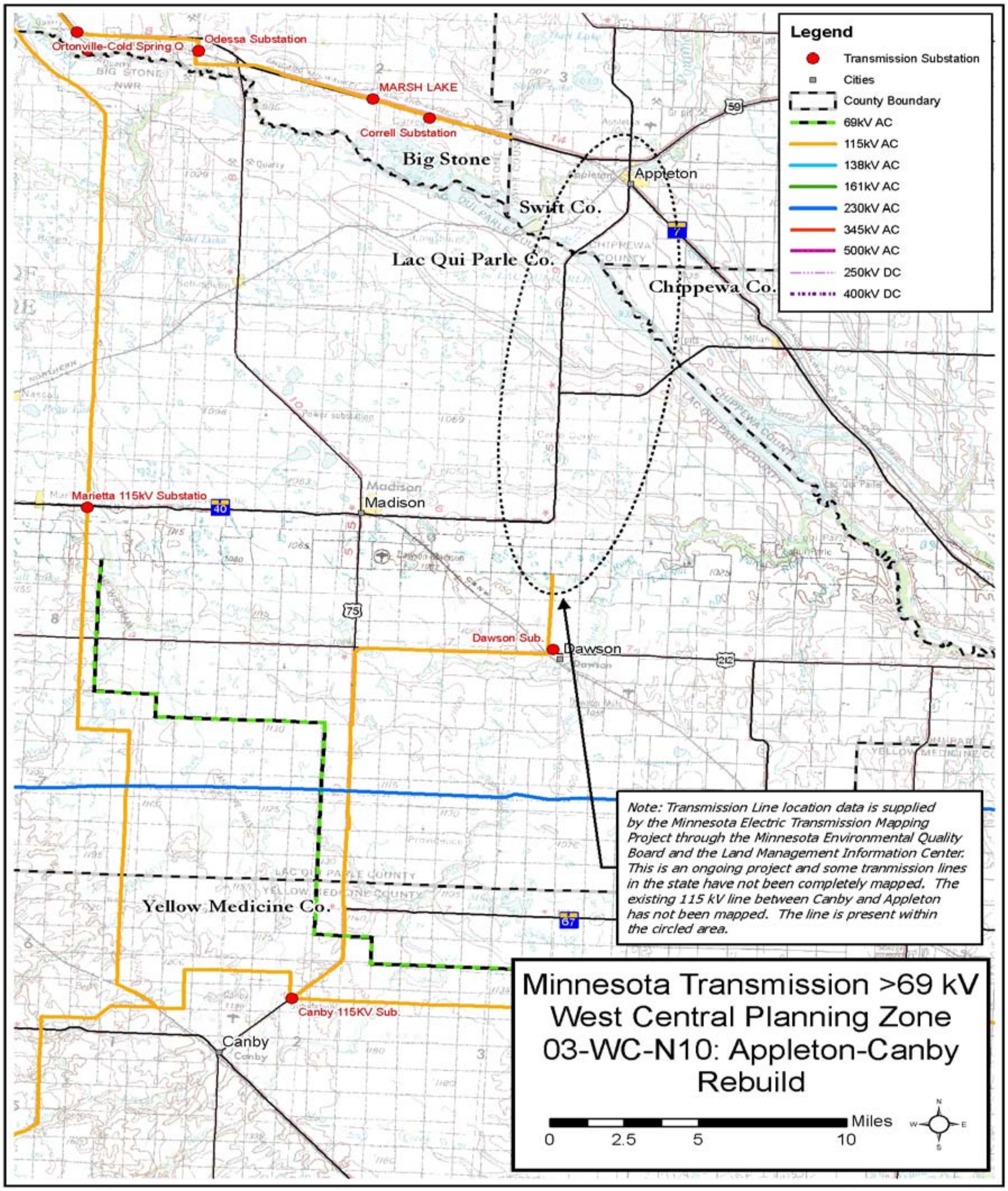
A map of the area is shown on the following page.

Alternatives. The only practical alternative that has been identified is the upgrade of the existing 41.6 kV line between Appleton and Canby.

Analysis. Further study work was completed during the summer of 2005. The result of this latest study work has indicated that this line will need to be converted to 115 kV in the 2008 timeframe. For ease of constructability, it has been determined that the entire 42 miles of upgraded line will occur in a single timeframe instead of previous conceptions of converting the Canby to Dawson piece of line (21 miles) first with the subsequent piece from Dawson to Appleton (21 miles) a few years later. The intermediate costs of back-up service in the lapse of time between the two phases of construction is not desirable from an economic and constructability standpoint.

The cost of the project is estimated at $2,000,000. The recommended upgrade of the 41.6 kV line to 115 kV should have relatively little environmental or social impact. The upgraded line will follow existing line right-of-way and be on single-pole structures, similar to the existing line. Upgrading the line will result in a positive economic impact in the form of reduced system losses.

Schedule. A certificate of need will be required for the upgrade to 115 kV, as will a route permit. Applications will be submitted sometime in 2006 or early 2007 in order to obtain the necessary approvals and complete construction in 2008.


Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Ortonville-Cold Spring O
Odessa Substation
MARSH LAKE
Correll Substation
Big Stone
Appleton
Swift Co.
Lac Qui Parle Co.
Chippewa Co.
Marietta 115kV Substatio
Madison
Dawson Sub.
Dawson
Yellow Medicine Co.
Canby 115KV Sub.
Canby
Note: Transmission Line location data is supplied by the Minnesota Electric Transmission Mapping Project through the Minnesota Environmental Quality Board and the Land Management Information Center. This is an ongoing project and some tranmission lines in the state have not been completely mapped. The existing 115 kV line between Canby and Appleton has not been mapped. The line is present within the circled area.
Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N10: Appleton-Canby
Rebuild
Miles
0
2.5
5
10

8.4.11 Grant County-Alexandria

Tracking Number: 2003-WC-N11

Inadequacy. The Grant County-Elbow Lake section of the 115 kV line will overload with the outage of the Fergus-Henning 230 kV line.

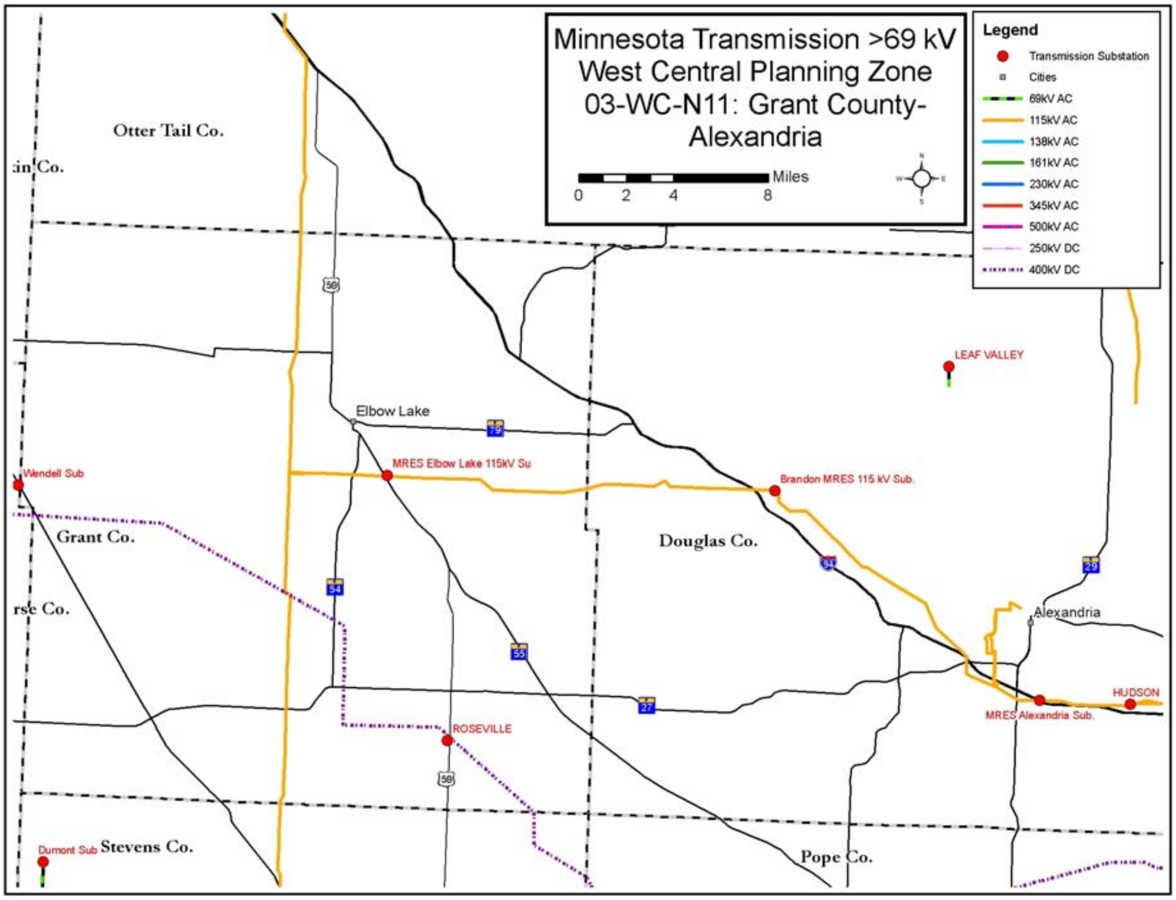
A map of the area is shown on the following page.

Completion of Project. Missouri River Energy Services reconductored the Grant County to Alexandria 115 kV line in late 2003. This line is approximately 35.6 miles long and is broken into the following pieces:

- Grant County – Elbow Lake = 3.63 miles
- Elbow Lake – Brandon = 16.62 miles
- Brandon – Alexandria Switching Station = 13.22 miles
- Alexandria Switching Station – Alexandria = 2.13 miles

The reconductor effort was completed in pieces starting at Grant County and finishing at the Alexandria substation. The last piece of the reconductor was completed in late November of 2003.

The reconductor effort replaced the existing 96 MVA rated conductors (266 ACSR) with a larger conductor (795 ACSS) capable of approximately 310 MVA. However, this line is currently limited to approximately 160 MVA due to sag issues related to low ground clearances in some key locations. There are currently no plans to raise the conductor to achieve a higher rating since the current 160 MVA rating is adequate at the present time.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N11: Grant County-
Alexandria
Miles
0 2 4 8
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Otter Tail Co.
Grant Co.
Douglas Co.
Stevens Co.
Pope Co.
Elbow Lake
Alexandria
Wendell Sub
MRES Elbow Lake 115kV Su
Brandon MRES 115 kV Sub.
LEAF VALLEY
ROSEVILLE
HUDSON
MRES Alexandria Sub.
Dumont Sub

8.4.12 Hutchinson-McLeod

Tracking Number: 2003-WC-N12

Inadequacy. As reported in the 2003 Report, there is a concern about low voltage and overloads in the Hutchinson area under certain contingency situations.

Alternatives. A new substation called the Big Swan Substation north of the city of Dassel, with a short (500 foot) tap to an existing 115 kV line owned by GRE, will address the immediate concern.

Analysis. With continued electrical load growth in the Meeker Cooperative Light and Power Association service area near Dassel, Kingston, and Litchfieled, the problem could become more critical sometime after 2011. Further analysis will be undertaken before that time. Additional transmission sources into the area may be available as a result of providing additional transmission outlet for wind generation on Buffalo Ridge.

Schedule. The new Big Swan Substation was completed in 2005. Meeker County prepared an Environmental Assessment on the construction of the Big Swan Substation. It is available at:

http://www.eqb.state.mn.us/pdf/FileRegister/02-44-GEN-Local%20Review/SwanLakeSub-EA.pdf

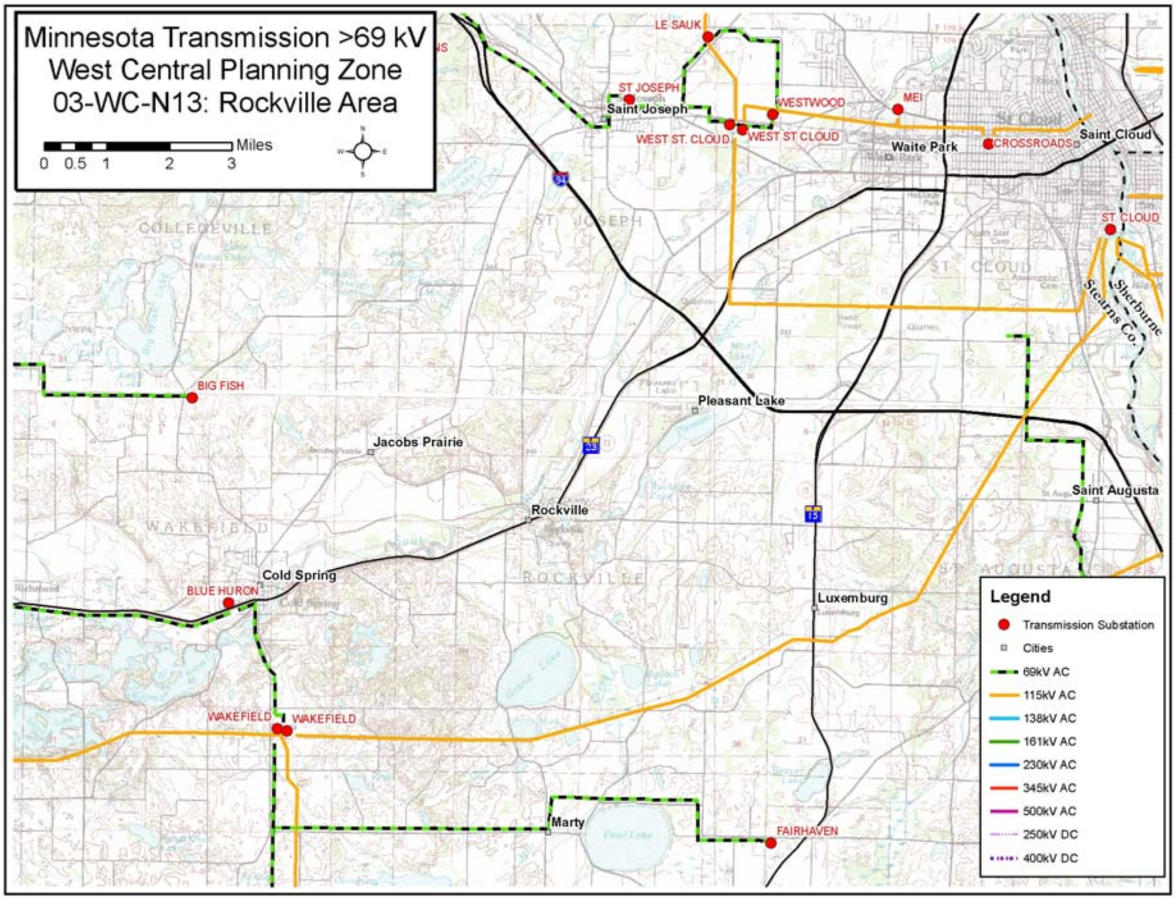
8.4.13 Rockville Area

Tracking Number: 2003-WC-N13

Inadequacy. The Rockville substation has experienced poor reliability performance over the past several years.

A map of the area is shown on the following page.

Schedule. The project to convert the Rockville load to 115 kV operation is presently under construction. The work will be completed in early 2006.


Minnesota Transmission >69 kV
West Central Planning Zone
03-WC-N13: Rockville Area
Miles
0 0.5 1 2 3
LE SAUK
ST JOSEPH
Saint Joseph
WESTWOOD
MEI
WEST ST. CLOUD
WEST ST CLOUD
Waite Park
CROSSROADS
Saint Cloud
ST. CLOUD
Stearns Co.
Sherburne
BIG FISH
Pleasant Lake
Jacobs Prairie
Rockville
Saint Augusta
Cold Spring
BLUE HURON
Luxemburg
WAKEFIELD
WAKEFIELD
Marty
FAIRHAVEN
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC

8.4.14 Big Stone Interconnection

Tracking Number: 2005-WC-N1

Inadequacy. Seven utilities (Otter Tail Power Company, Great River Energy, Missouri River Energy Services, Montana-Dakota Utilities, Southern Minnesota Municipal Power Agency, Heartland Consumer Power District, and Central Minnesota Municipal Power Agency) are proposing to build a new 600 MW power plant next to the existing Big Stone Power Plant in South Dakota. The existing transmission system cannot support the output from the proposed new plant. Transmission is required to be able to deliver the output of the proposed plant to the transmission system without jeopardizing the reliability of the grid.

Alternatives. Two alternative transmission options were considered:

Alternative 1. A 230 kV line from the Big Stone Plant to Morris, Minnesota, and a 345 kV line from the plant to Granite Falls, Minnesota.

Alternative 2. A 230 kV line from the Big Stone Plant to the Willmar, Minnesota, area and a 345 kV line from the plant to Granite Falls, Minnesota.

Analysis. On October 3, 2005, the utilities submitted an application for a certificate of need for the two lines in Alternative 1 to the Public Utilities Commission. The CON application is available online at: http://www.otpco.com/NewsInformation/BigStoneTransMNCertOfNeed.asp

The new lines are also intended to increase transmission capacity and improve reliability of transmission system in western/southwestern Minnesota and serve as the first phase of a Buffalo Ridge – Twin Cities 345 kV regional transmission expansion plan.

The cost of the two transmission lines is estimated to be $135 million in 2010 dollars.

Additional information about the Big Stone transmission lines can be found in Section 6 under the CapX discussion.

Schedule. The certificate of need application is pending before the Commission. The plant and transmission lines are scheduled to be online in 2011.

8.4.15 Lake Constance Distribution Substation

Tracking Number: 2005-WC-N2

Inadequacy. Load growth in the Buffalo area requires a new source to relieve load on existing substations. The new substation is required by Wright-Hennepin Cooperative Electric Association.

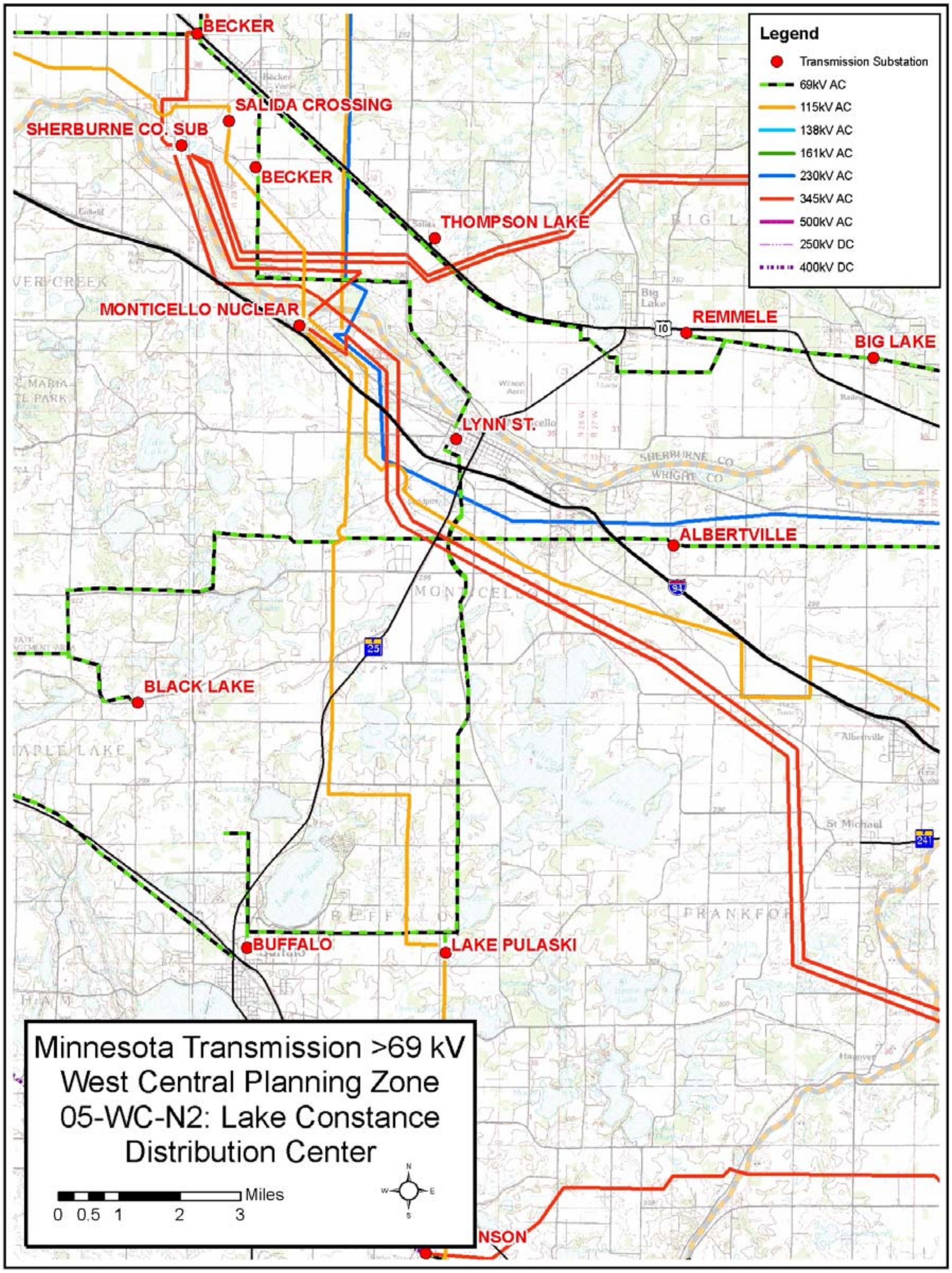
A map of the area is shown on the following page.

Alternatives. The only alternative considered was the construction of a new 115/12.5 kV substation near Lake Constance.

Analysis. A new substation near Lake Constance would relieve the load on several existing substations, including the Pulaski substation, Mary Lake substation, and Black Lake substation.

The substation site is approximately 1 acre in size. No significant environmental issues have been identified with the site.

Schedule. The project to build Lake Constance substation is presently under construction. The substation will be in operation in the spring of 2006.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
BECKER
SALIDA CROSSING
SHERBURNE CO. SUB
BECKER
THOMPSON LAKE
MONTICELLO NUCLEAR
REMMELE
BIG LAKE
LYNN ST.
ALBERTVILLE
BLACK LAKE
BUFFALO
LAKE PULASKI
NSON
Minnesota Transmission >69 kV
West Central Planning Zone
05-WC-N2: Lake Constance
Distribution Center
Miles
0 0.5 1 2 3

8.4.16 Buffalo Area, Wright County

Tracking Number: 2005-WC-N3

Inadequacy. The city of Buffalo in Wright County is normally served from the Lake Pulaski 115/69 kV source. The alternate source is Maple River (Wakefield 115/69 kV), which is normally open. Both the city and the surrounding loads exceeded their projected 2005 load forecasts this year. A 0.02 mile line coming out of Lake Pulaski overloaded under system intact conditions. Due to the overload the city was switched to an alternate source (Wakefield). Marginal voltages were experienced on the low side by the city after the switching occurred.

A map of the area is shown on the following page.

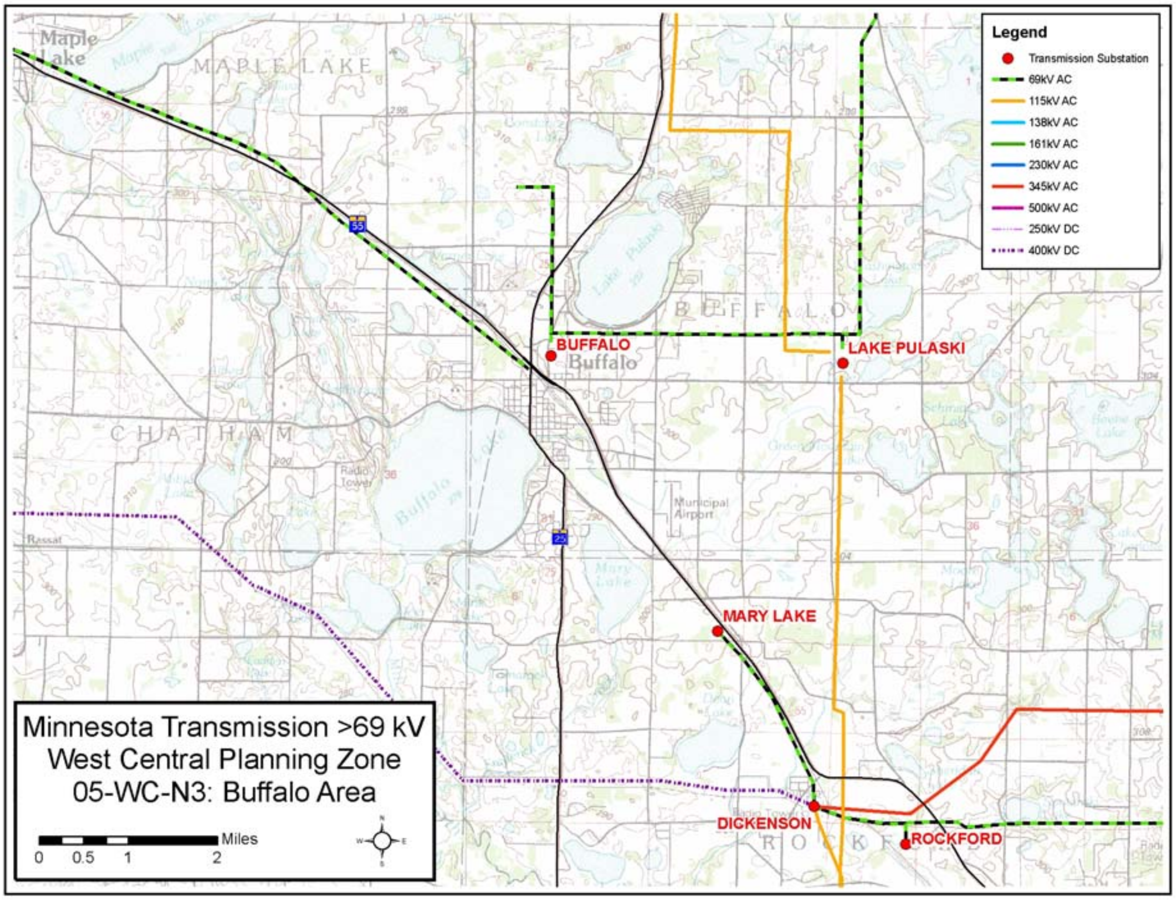
Alternatives. Two alternatives are being examined in a joint study being conducted by Xcel Energy, GRE, and the City of Buffalo.

Alternative 1: A new 115 kV source from Dickinson to Buffalo. This would involve upgrading 2.2 miles of the existing 69 kV line between Dickinson and Mary Lake and constructing 4 miles of 115 kV between Mary Lake and Buffalo. Another 3.3 miles of 69 kV line from Lake Pulaski to Buffalo would be upgraded to 115 kV.

Alternative 2: A new 115 kV source from Lake Constance to Buffalo (about 4 miles). The 3.3 miles of 69 kV from Lake Pulaski to Buffalo would also be upgraded to 115 kV.

Analysis. No economic, environmental or social issues have yet been evaluated since the study just began.

Schedule. The utilities will determine in 2006 which alternative to pursue. The 115 kV lines under construction are under ten miles in length and a Certificate of Need will not be required.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Maple Lake
MAPLE LAKE
BUFFALO
Buffalo
LAKE PULASKI
CHATHAM
Municipal Airport
MARY LAKE
DICKENSON
ROCKFORD
Minnesota Transmission >69 kV
West Central Planning Zone
05-WC-N3: Buffalo Area
Miles
0 0.5 1 2

8.4.17 Rugby Wind Project

Tracking Number. 2005-WC-N4

Inadequacy. An independent power producer has proposed to connect 150 MW of wind generation in North Dakota at the Rugby 230 kV bus on the Otter Tail Power Company system. The connection would cause a transient voltage problem at the Paynesville 230 kV bus in Minnesota.

Alternatives. A system impact study conducted by MISO found that one of the capacitor banks at the Paynesville 115 kV bus should be increased. No other alternatives have been identified.

Analysis. The MISO study recommended increasing one of the 20 Mvar capacitor banks to 30 Mvar at the Paynesville 115 kV bus.

Schedule. The schedule for increasing one of the capacitor banks is yet to be determined.

8.4.18 CapX 2020 Vision Plan

Fargo-Alexandria-Benton County 345 kV

Tracking Number. 2005-CX-1

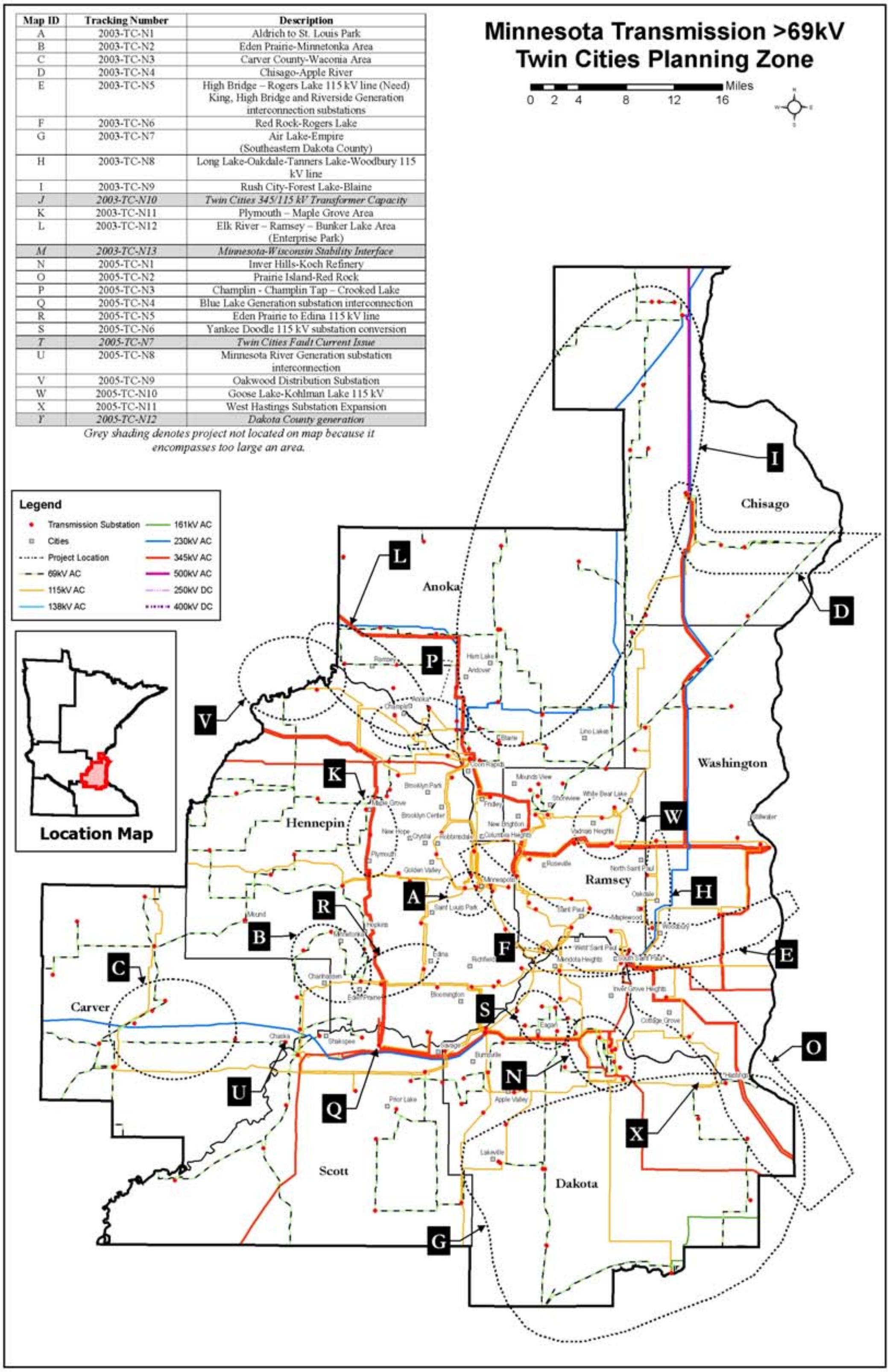
Discussion. The CapX 2020 Vision Plan is discussed in detail in Section 6. As part of the CapX work, a 345 kV line from Fargo to Alexandria to Benton County is being proposed. See Section 6 for discussion about that proposed transmission line.

8.5 Twin Cities Zone

The following table provides a list of transmission needs identified in the Twin Cities Zone and the map on the following page shows the location of each item in the table:

Twin Cities Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2003-TC-N1	Aldrich to St. Louis Park	2006	Overloads during contingencies	8.5.1
2003-TC-N2	Eden Prairie-Minnetonka Area	2006	Overloads from transmission outages and load growth	8.5.2
2003-TC-N3	Carver County-Waconia Area	2008	Load growth	8.5.3
2003-TC-N4	Chisago-Apple River	2008	Overloads and low voltages	8.5.4
2003-TC-N5	High Bridge – Rogers Lake 115 kV line (Need) King, High Bridge and Riverside Generation interconnection substations	2008	Generation outlet	8.5.5
2003-TC-N6	Red Rock-Rogers Lake	2004	Thermal overloads from transmission outages	8.5.6
2003-TC-N7	Air Lake-Empire (Southeastern Dakota County)	To be Determined	Load growth	8.5.7
2003-TC-N8	Long Lake-Oakdale-Tanners Lake-Woodbury 115 kV line	2006 and To be Determined	Thermal overloads from transmission outages	8.5.8
2003-TC-N9	Rush City-Forest Lake-Blaine	2007	Low voltage and line overloads	8.5.9
2003-TC-N10	Twin Cities 345/115 kV Transformer Capacity	To be Determined	Approaching emergency loading levels	8.5.10
2003-TC-N11	Plymouth – Maple Grove Area	2006	Overload with contingencies and load growth	8.5.11
2003-TC-N12	Elk River – Ramsey – Bunker Lake Area (Enterprise Park)	2009	Low voltage and line overloads	8.5.12
2003-TC-N13	Minnesota-Wisconsin Stability Interface	To be Determined	Regional constraint	8.5.13
2005-TC-N1	Inver Hills-Koch Refinery	2006	Overloads during transmission outages	8.5.14
2005-TC-N2	Prairie Island-Red Rock	2007	Overloads during transmission outages	8.5.15
2005-TC-N3	Champlin - Champlin Tap – Crooked Lake	2007-2009	Overloads during transmission outages contingencies	8.5.16
2005-TC-N4	Blue Lake Generation substation interconnection	2005	Generation outlet	8.5.17
2005-TC-N5	Eden Prairie to Edina 115 kV line	To be Determined	Overloads during transmission outages	8.5.18
2005-TC-N6	Yankee Doodle 115 kV substation conversion	2006 – 1st source To be Determined – 2nd	Load growth	8.5.19

Twin Cities Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No.**
2005-TC-N7	Twin Cities Fault Current Issue	To be Determined	Load growth	8.5.20
2005-TC-N8	Minnesota River Generation substation interconnection	To be Determined	Generation outlet	8.5.21
2005-TC-N9	Oakwood Distribution Substation	2006	To relieve loading on the Otsego and Albertville substations and to serve present and future growth in the area	8.5.22
2005-TC-N10	Goose Lake-Kohlman Lake 115 kV	2006	This project is required to prevent overloading this line during transmission contingencies.	8.5.23
2005-TC-N11	West Hastings Substation Expansion	2006	Hastings substation distribution transformers need to be relieved due to load growth in the city. The project adds a new distribution substation at the W. Hastings Substation.	8.5.24
2005-TC-N12	Dakota County generation	To be Determined	Load serving; transmission infrastructure investments needed to meet growth in demand for electricity in Minnesota and the region.	8.5.25
2005-CX-1	CapX 2020 Vision Plan Buffalo Ridge - Metro 345 kV	2006		8.5.26



Map ID	Tracking Number	Description
A	2003-TC-N1	Aldrich to St. Louis Park
B	2003-TC-N2	Eden Prairie-Minnetonka Area
C	2003-TC-N3	Carver County-Waconia Area
D	2003-TC-N4	Chisago-Apple River
E	2003-TC-N5	High Bridge – Rogers Lake 115 kV line (Need) King, High Bridge and Riverside Generation interconnection substations
F	2003-TC-N6	Red Rock-Rogers Lake
G	2003-TC-N7	Air Lake-Empire (Southeastern Dakota County)
H	2003-TC-N8	Long Lake-Oakdale-Tanners Lake-Woodbury 115 kV line
I	2003-TC-N9	Rush City-Forest Lake-Blaine
J	*2003-TC-N10*	*Twin Cities 345/115 kV Transformer Capacity*
K	2003-TC-N11	Plymouth – Maple Grove Area
L	2003-TC-N12	Elk River – Ramsey – Bunker Lake Area (Enterprise Park)
M	*2003-TC-N13*	*Minnesota-Wisconsin Stability Interface*
N	2005-TC-N1	Inver Hills-Koch Refinery
O	2005-TC-N2	Prairie Island-Red Rock
P	2005-TC-N3	Champlin - Champlin Tap – Crooked Lake
Q	2005-TC-N4	Blue Lake Generation substation interconnection
R	2005-TC-N5	Eden Prairie to Edina 115 kV line
S	2005-TC-N6	Yankee Doodle 115 kV substation conversion
T	*2005-TC-N7*	*Twin Cities Fault Current Issue*
U	2005-TC-N8	Minnesota River Generation substation interconnection
V	2005-TC-N9	Oakwood Distribution Substation
W	2005-TC-N10	Goose Lake-Kohlman Lake 115 kV
X	2005-TC-N11	West Hastings Substation Expansion
Y	*2005-TC-N12*	*Dakota County generation*

Grey shading denotes project not located on map because it encompasses too large an area.

8.5.1 Aldrich to St. Louis Park

Tracking Number: 2003-TC-N1

Inadequacy. The Aldrich–St. Louis Park 115 kV line is subject to overload if another line in the area were to be out of service.

Alternatives. Two alternatives have been identified – both alternatives involve the reconductoring of a 3.7 mile long portion of the Aldrich line to a higher capacity. Alternative 1 calls for upgrading the line to an intermediate level in 2006 (310 MVA) and to a higher level by 2018 (348 MVA). Alternative 2 calls for rebuilding the line to a higher level in 2006 (348 MVA). The alternatives differ in that Alternative 1 defers rebuilding of the line until more capacity is required.

Analysis. The need to upgrade the Aldrich/St. Louis Park line is documented in the Report of Study of Aldrich-St. Louis Park 115kV and Edina-Eden Prairie 115kV Transmission Line Upgrades (2005). Loss of the double circuit Parkers Lake – Dickenson 345 kV line and the Parkers Lake – Elm Creek 345 kV line causes the Aldrich/St. Louis Park 115 kV line to load to 120% of its rating. The Aldrich/St. Louis Park line has also been shown to overload when other system elements are out of service.

Both alternatives include the upgrade of existing transmission lines and substations, so there should be minimal new environmental impacts. No major social issues have been identified. Alternative 1 defers a major transmission investment for a number of years – perhaps until as late as 2018 – until load grows to a certain point. The cost estimate for planning purposes for Alternative 1 is $3 million. The estimate for Alternative 2 is $3.1 million.

Schedule. The engineering work to increase the capacity of 3.7 miles of the line to immediate level began in 2005. This work will be completed by fall 2006. The need for the second phase of the plan – to reconductor the line to an even higher capacity – will be considered periodically in light of the load in the area.

8.5.2 Eden Prairie-Minnetonka Area

Tracking Number: 2003-TC-N2

Inadequacy. The Eden Prairie–Minnetonka Area is bordered by Minnetonka Boulevard on the north, the Minnesota River on the south, and Highway 169 on the east. The western boundary includes Lake Minnetonka and the area extending south from the west end of the lake. The area includes the cities of Chanhassen, Chaska, Eden Prairie, Hopkins, southern Minnetonka, and the smaller, south Lake Minnetonka communities of Deephaven, Excelsior, Greenwood, Shorewood, Tonka Bay and Victoria.

A contingency situation, i.e., the loss of the Scott County – Chaska 69 kV line, may cause overloading of the transformers at the Westgate in 2006 and 2007. Loss of both Eden Prairie–Westgate 115 kV lines may cause low bus voltages in the area by 2008.

A map of the area is shown on the following page.

Alternatives. Because the Westgate-Deephaven area is at risk in upcoming years, two alternatives were developed to address this concern. Both alternatives involve upgrading existing 69 kV lines in the area to 115 kV.

Alternative 1: Upgrade Westgate-Glen Lake-Gleason Lake to 115 kV

The first alternative would be to upgrade the Westgate-Glen Lake-Gleason Lake 69 kV line to 115 kV. This plan also involves expanding the existing Glen Lake substation and adding a second 115/13.8 kV substation north of the existing substation. The distribution system would be designed to carry much of the new load growth in this area from the upgraded Glen Lake substation. This plan also defers the installation of a capacitor bank at Westgate in 2008.

This alternative consists of the following transmission components:

- Rebuild 10 miles of the Westgate-Glen Lake-Gleason Lake 69 kV line to 115 kV in 2006-2007
- Expand the existing Glen Lake substation by installing two larger 115/13.8 kV transformers
- Build a new distribution substation with two transformers north of the existing substation

Alternative 2: Upgrade Westgate-Deephaven-Excelsior-Scott County to 115 kV

The second alternative involves first reconductoring 15 miles of Westgate-Deephaven-Excelsior 69 kV to higher capacity conductor and then rebuilding it to 115 kV in the 2011 timeframe. Some substation equipment at Deephaven, Excelsior and Scott County would also be upgraded. The Westgate-Deephaven-Excelsior-Scott County 69 kV line would be rebuilt to 115 kV when more capacity is required from the line. The equipment at the substations would also be upgraded.

Alternative 2 consists of the following transmission components:

- Reconductor the Westgate-Deephaven-Excelsior-Scott County 69 kV line (15 miles) to 107 MVA capacity in 2006-2007, although the line will be limited to 84 MVA by substation equipment
- Install a 115 kV capacitor at Westgate in 2008
- Rebuild 15 miles of the Westgate-Deephaven-Excelsior-Scott County 69 kV line to 115 kV using 795 SSAC conductor to yield 310 MVA in 2012 –2015
- Upgrade Westgate-Eden Prairie 115 kV #1 and #2 to 600MVA in 2012-2015

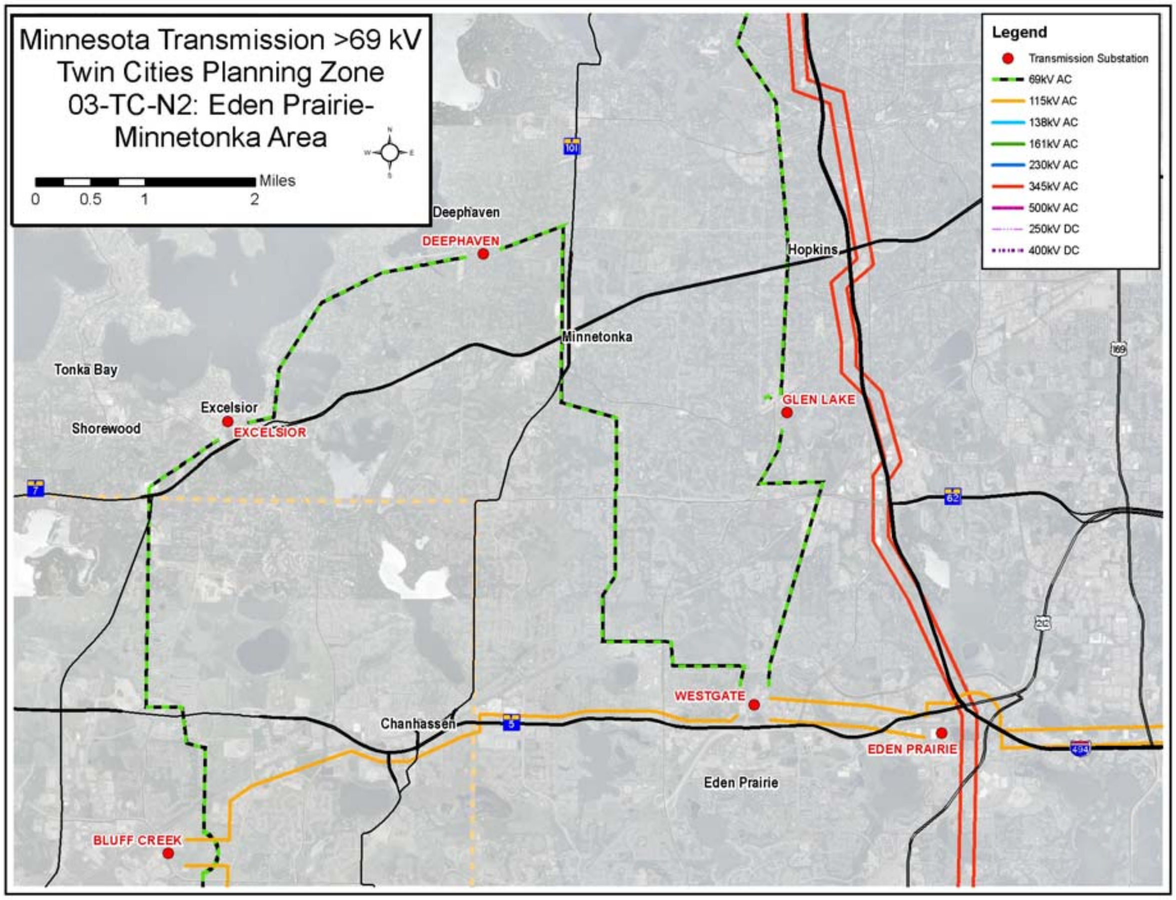
Analysis. Both alternatives include the upgrade of existing transmission lines and substations, so there should be minimal new environmental impacts, although both lines are in areas where significant residential and commercial development has occurred. Also, rebuilding a 69 kV line to 115 kV could require some additional right-of-way.

The estimated costs for the projects were presented in the 2003 Report. These costs have not been updated but the costs should still be comparable. The estimates are repeated below:

Description of Options	Base Cost	2003 NPV
Alternative 1: Rebuild 10 miles Westgate-Glen Lake- Deephaven 69 kV to 115kV in 2006	$ 20,700,000	$16,000,000
Alternative 2: Reconductor 15 miles Westgate-Deephaven-Excelsior-Scott County 69 kV to 107 MVA in 2006-2007. Rebuild to 115 kV in 2011-2015	$ 19,200,000	$13,750,00

A major difference between Alternative 1 and Alternative 2 is that Alternative 1 calls for a rebuild to 115 kV capacity in 2006 and Alternative 2 postpones that rebuild until at least the 2011-2015 timeframe, until the loads at Deephaven and Excelsior require the rebuild. Alternative 2 allows the utility to postpone the investment for another five years or more.

Schedule. Alternative 2 was the recommended approach in 2003 and initial steps have been taken to implement it. The 69 kV reconductor and substation upgrades have an in-service date of fall 2006 and spring 2007 respectively.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
03-TC-N2: Eden Prairie-
Minnetonka Area
Miles
0 0.5 1 2
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Deephaven
DEEPHAVEN
Hopkins
Minnetonka
Tonka Bay
Excelsior
Shorewood
EXCELSIOR
GLEN LAKE
WESTGATE
Chanhassen
EDEN PRAIRIE
Eden Prairie
BLUFF CREEK

8.5.3 Carver County-Waconia Area

Tracking Number: 2003-TC-N3

Inadequacy. The Carver County-Waconia Area (often called a sub-area) is bounded by Delano on the northeast, the Carver County substation on the southeast, Glencoe on the southwest, and Lester Prairie on the northwest. It includes the cities of Glencoe, Waconia, Watertown, Young America, and several smaller communities. Rapid load growth could develop in this area, as has been observed in other similarly situated communities on the fringe of the Twin Cities metropolitan area.

The Carver County-Waconia area load is served from 69 kV transmission lines that are supplied by three 115-69 kV transformers, one at the St. Bonifacius substation and two at the Carver County substation. The Glencoe Municipal Utility, GRE, and Xcel Energy all have distribution substations on the 69 kV transmission lines in this area.

A significant number of overload situations could occur today at summer peak demand under contingency conditions, like the loss of certain 69 kV or 115 kV lines or the loss of any one of a number of transformers, and the overloads will only be worse as the peak continues to grow.

A map of the area is shown on the following page.

Alternatives. Three alternatives were identified in the 2003 Report. These are:

Alternative 1: McLeod to Glencoe Option – a 115 kV Option

Alternative 1 consists of the following improvements spread out over a several year period:

- Build 9.9 miles of new 115 kV line from McLeod-Glencoe in 2005
- Install second 115/69 transformer at Carver County (completed)
- Install a capacitor bank at West Waconia (completed)
- Rebuild 6.9 miles of the Young America Tap-Glencoe Tap 69 kV to 115 kV in 2010 timeframe
- Rebuild 1 mile of the Carver County-Young America 69 kV line in 2008-2010 period
- Install a second capacitor bank at West Waconia in 2010
- Install a capacitor at Watertown in 2010

Alternative 2: Carver County to Glencoe Option – a 69 kV Option

Alternative 2 consists of the following improvements spread out over a several year period:

- Build a second 17.1 miles of 69 kV from Carver County-Glencoe
- Install a second transformer at Carver County
- Install a capacitor bank at West Waconia
- Install a second transformer at St. Bonifacius

- Rebuild 6.9 miles of the Young America Tap-Glencoe Tap 69 kV in 2008
- Install a second capacitor bank at West Waconia in 2010
- Rebuild 1 mile of the Carver County-Young America line 69 kV in 2008
- Install a capacitor at Watertown in 2010

Alternative 3: Glencoe to St Bonifacius Option – a 69 kV option

The third alternative calls for the construction of a second 69 kV line to the Glencoe Municipal Utility Substation from St. Bonifacius via New Germany.

Analysis. Because load growth is likely to be rapid in this area, the preferred alternative is Alternative 1 because it is a 115 kV fix, while Alternatives 2 and 3 involve 69 kV approaches. Alternative 1 was recommended in the 2003 Report and remains the preferred option.

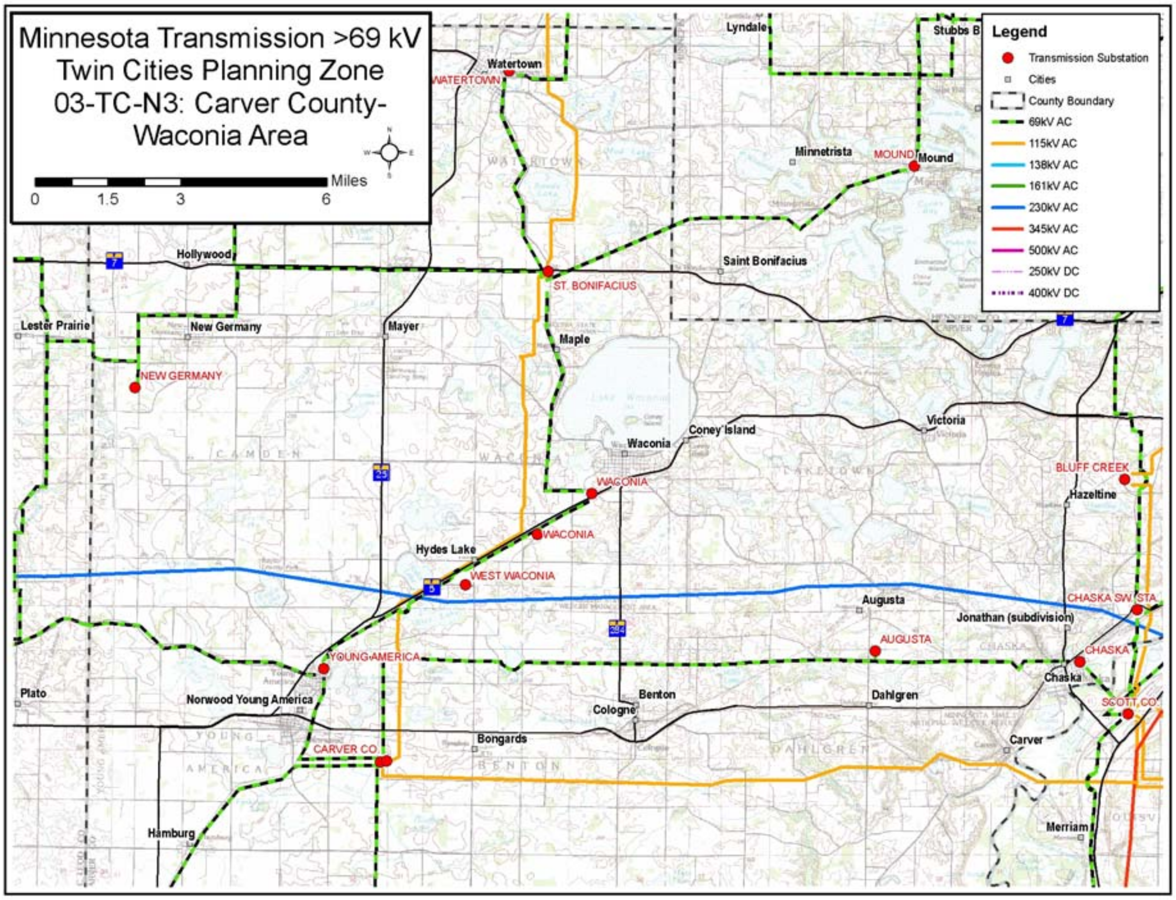
There are corridor sharing opportunities for all the possible new transmission lines. No major environmental or social issues have been identified.

No new cost estimates have been developed since the following estimates were reported in 2003.

Description of Alternative	Base Cost	2003 Net Present Value
Alternative 1: 115 kV Glencoe—McLeod	$10,925,000	$9,300,000
Alternative 2: 2nd 69 kV Carver County-Glencoe	$9,940,000	$8,400,000
Alternative 3: 2nd 69 kV Glencoe—St. Bonifacius-Glencoe	$11,650,000	$10,000,000

Schedule. Initial steps under Alternative 1 have begun. The second transformer at the Carver County substation was installed and the capacitor additions at West Waconia substation were completed in 2004. The Glencoe Power and Light Commission is constructing the new 115 kV line between McLeod and Glencoe and the line is expected to be in service by the end of the year. The line is under 10 miles so no Certificate of Need was required from the Commission and the project was permitted locally.

The next steps in the plan are not needed until 2008 or later. Planning analysis is expected over the next year to confirm that the best long-range strategy still is extending 115 kV from Glencoe to the east and to determine if it should be built to Carver County or the West Waconia substation. Either option may involve rebuilding some of the 69 kV transmission line in the area to 115 kV. The Young America tap to Glencoe tap 69 kV line could be rebuilt to 115 kV in 2010 timeframe when it overloads for outage of the new Glencoe to McLeod 115 kV.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
03-TC-N3: Carver County-
Waconia Area
Miles
0
1.5
3
6
Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Watertown
WATERTOWN
Lyndale
Minnetrista
MOUND
Mound
Hollywood
ST. BONIFACIUS
Saint Bonifacius
Lester Prairie
New Germany
Mayer
Maple
NEW GERMANY
Coney Island
Victoria
Waconia
WACONIA
BLUFF CREEK
Hazeltine
Hydes Lake
WEST WACONIA
Augusta
CHASKA SW STA
Jonathan (subdivision)
AUGUSTA
YOUNG AMERICA
CHASKA
Chaska
Plato
Norwood Young America
Benton
Cologne
Dahlgren
SCOTT CO
Bongards
CARVER CO
Carver
Merriam
Hamburg

8.5.4 Chisago-Apple River

Tracking Number: 2003-TC-N4

Inadequacy. The Chisago County-Apple River area includes Chisago County and parts of northwestern Wisconsin. The area is served by a 69 kV line running between Arden Hills and St. Croix Falls, by a 69 kV tap from the Chisago County substation to Scandia, and by the Apple River-St. Croix Falls 69 kV line from the east. Demand in the Chisago County area has increased over the past few years and is expected to continue to grow in the future. The present system can not serve the demand with the loss of the Apple River-St. Croix Falls 69 kV. The loss of the Apple River-St. Croix Falls 69 kV line during times of peak loading can result in low voltage at several substations in western Wisconsin, overloading of surviving lines, and even loss of power for certain areas.

Alternatives. Four alternatives were identified in the 2003 Report – Chisago Electric Reliability Project – East Central Minnesota and Northwestern Wisconsin Transmission Load Serving Analysis – and these continue to be the available options. The four alternatives are:

Alternative 1: A Chisago Lawrence Creek 115 kV line, a new Lawrence Creek substation, a Lawrence Creek-St. Croix Falls-Border 161 kV line, and a Border-Apple River 161/69 kV double circuit line.

Alternative 2: Reconfiguration of the 69 kV system in east central Minnesota and northwestern Wisconsin, upgrade Chisago 115-69 kV transformer, and additional reactive support.

Alternative 3: Distributed Generation which is 30 MW of firm generation capability at a Lawrence Creek substation, near Taylors Falls.

Alternative 4: Chisago-St. Croix Falls-Apple River 69 kV line rebuilt at 69 kV, add a new Lawrence Creek substation, and upgrade the Chisago 115-69 kV transformer.

Analysis. The preferred option is Alternative 1 – rebuild the existing 69 kV line between the Chisago County substation and the new Lawrence Creek substation to 115 kV and from Lawrence Creed to Apple River the voltage will be 161 kV with the majority of the section of line being a 161/69 kV double circuit. The higher voltage is more compatible with the 115 kV load serving system in the Twin Cities area and affords 50% more load serving capability than rebuilding at 69 kV. The exact costs for the various alternatives are being updated. The costs for the project will be impacted if portions of the line have to be installed underground or under the St. Croix River. Environmental and social issues will need to be addressed in routing the line through more developed areas such as Lindstrom and Chisago City and through sensitive areas such as the St. Croix National Scenic Riverway. The site for the new Lawrence Creek substation on the east end near Taylors Falls will have to be selected.

Reconfiguring the existing 69 kV system avoids the impacts of new transmission line construction but is less desirable electrically, and will require a new switching station in Wisconsin.

Distributed generation would carry its own environmental, social, and economic impacts, but these are difficult to establish when it is uncertain where such generation facilities would be located and what type of facilities they would be and how many facilities there would be. Distributed generation will also likely require some transmission upgrades.

Schedule. Xcel Energy and Dairyland Power Cooperative have selected Alternative 1 as the preferred option and intend to apply to the Public Utilities Commission for a Certificate of Need and route permit in 2006. The Wisconsin Public Service Commission has already approved a 161 kV line on the Wisconsin side, from the Border Substation in St. Croix Falls to the Apple River substation.

8.5.5 High Bridge-Rogers Lake 115 kV Line King, High Bridge and Riverside Generation Interconnection Substations

Tracking Number: 2003-TC-N5

Inadequacy. As part of the Metropolitan Emissions Reduction Project (MERP), Xcel Energy has proposed substantial changes at three Twin Cities power plants – the Allen S. King plant in Bayport will have new pollution control equipment installed and an additional 20 MW of output; the Riverside plant in north Minneapolis will be converted from coal to natural gas and have 125 MW of additional capacity; and the High Bridge plant in St. Paul will be replaced with a natural gas facility with a capacity increase of 311 MW.

The Midwest Independent System Operator (MISO) has conducted studies to determine the transmission requirements for this additional generation. MISO has determined that the King generation increase does not overload any transmission facilities. However, MISO found that the increased capacities at the Riverside plant and the new High Bridge plant would overload the 115 kV transmission line leading from the High Bridge plant to the Rogers Lake substation in Mendota Heights.

Alternatives. Two alternatives have been identified: (1) Upgrade the 115 kV line between High Bridge and Rogers Lake to a higher rating, and (2) Build a new 115 kV line between the Dayton's Bluff substation in St. Paul to the Red Rock substation in Newport.

Analysis. The first alternative is the preferred alternative. Upgrading the High Bridge to Rogers Lake 115 kV line will have less environmental impact than building a new Dayton's Bluff to Red Rock 115kV line, which would have to be routed through a highly populated and developed area. Also, upgrading an existing line is cheaper than constructing a new line.

Upgrading the line will help ensure that the planned High Bridge and Riverside upgrades can be nominated as Xcel Energy network resources. In addition, the High Bridge substation will be rebuilt and the Riverside substation will be reconfigured to install a row of breakers.

In the 2003 Report it was reported that there was also a concern about overloading on the High Bridge to Rogers Lake line if certain 345 kV circuits in the Twin Cities loop were to be lost. Those concerns were addressed by establishing new dispatch procedures to implement in the event of such a contingency occurring.

Schedule. The High Bridge/Rogers Lake line will be upgraded in the 2007-2008 timeframe.

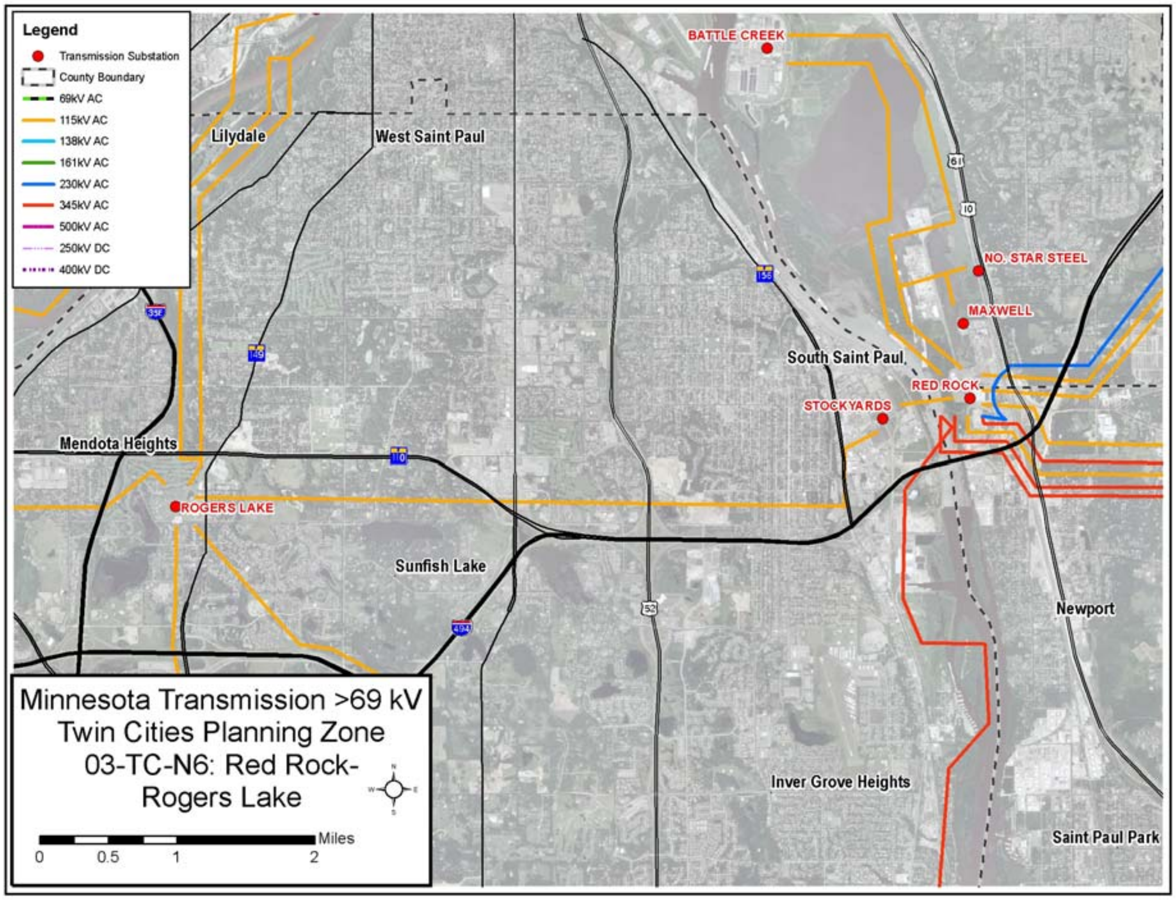
8.5.6 Red Rock-Rogers Lake

Tracking Number: 2003-TC-N6

Inadequacy. Transmission outages would cause thermal overloads on this line.

A map of the area is shown on the following page.

Completion of Project. A second circuit was added to the existing 115 kV line from the Red Rock substation in Newport to the Rogers Lakes substation in Mendota Heights. The line was permitted locally in 2001 and 2002 and was placed in service in 2005.


Legend
Transmission Substation
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Minnesota Transmission >69 kV
Twin Cities Planning Zone
03-TC-N6: Red Rock-
Rogers Lake
Miles
0 0.5 1 2
BATTLE CREEK
Lilydale
West Saint Paul
NO. STAR STEEL
MAXWELL
South Saint Paul
RED ROCK
STOCKYARDS
Mendota Heights
ROGERS LAKE
Sunfish Lake
Newport
Inver Grove Heights
Saint Paul Park

8.5.7 Air Lake-Empire (Southeastern Dakota County)

Tracking Number: 2003-TC-N7

Inadequacy. The Lakeville–Farmington area is experiencing significant housing and commercial development and the demand for power is growing. The existing transmission system needs improvements in order to avoid low voltages and line overloads during contingency situations arising in 2006.

Alternatives. The two alternatives that were identified in the 2003 Report were (1) to install a new 115 kV line between the Air Lake substation and the Empire substation and (2) to expand the 69 kV system in the area.

Analysis. Great River Energy and Xcel Energy applied for a route permit for a new 115 kV line between Air Lake and Empire in April 2004. The Environmental Quality Board issued a permit for a new route in February 2005. EQB Docket No. 04-82-TR-Air Lake Empire.

Schedule. The utilities are continuing with efforts to install the new line. The City of Farmington and a number of residents in the area have filed an appeal in the Minnesota Court of Appeals challenging the EQB's route designation. The new in-service date cannot be determined until the appeal process has been completed, but it is likely that the summer of 2006 in-service date will not be met.

8.5.8 Long Lake-Oakdale-Tanners Lake-Woodbury 115 kV line

Tracking Number: 2003-TC-N8

Inadequacy. There is a 115 kV line located in the suburbs just east of St. Paul that runs from the Long Lake substation on the north to the Oakdale substation to the Tanner Lake substation to the Woodbury substation on the south. The loss of a separate 115 kV line from the Baytown substation feeding the Long Lake substation results in a significant overload of the line between Tanners Lake and Woodbury, and the loss of a 115 kV line from the Red Rock substation feeding the Woodbury substation causes an overload of the segments between Tanners Lake and Long Lake.

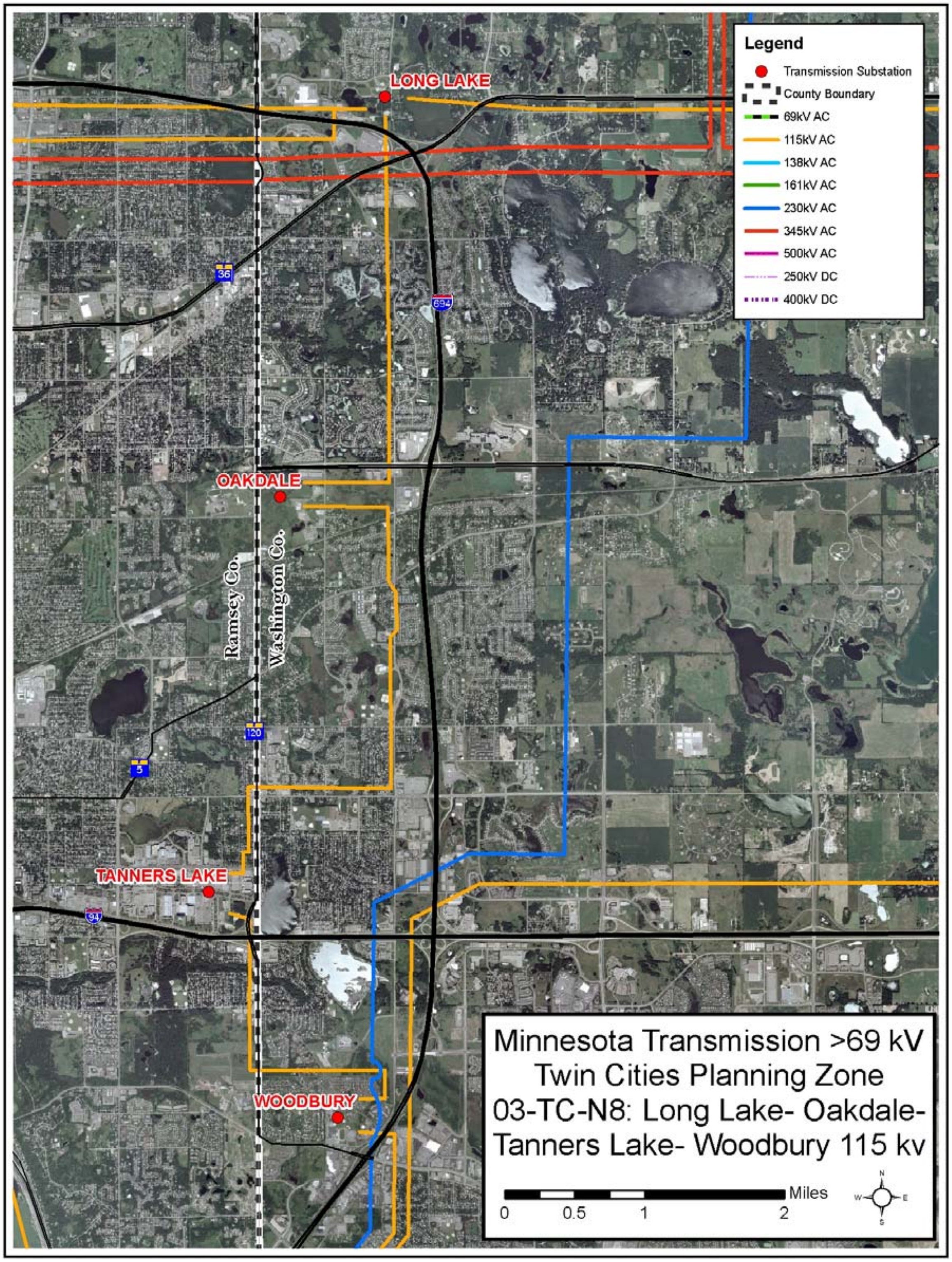
A map of the area is shown on the following page.

Alternatives. There are two possible alternatives: (1) Upgrade the conductors to handle a higher capacity, and (2) Install a second 115 kV line in the area.

Analysis. This area was last studied in the NSP *Long-Range Delivery System Study: Central Twin Cities Area* (February 2000). The study identified the problem and the possible alternatives. The possibility of changing the operating procedures was rejected because in the contingency situation of concern, there is only one remaining source supplying the line. Upgrading the present conductor is a cheaper solution than constructing a new line. Upgrading the new line may create some concerns in this high density area, but impacts will be less than building a new line. The substations will likely have to be upgraded as well but no significant impacts are anticipated because the work can be accomplished within the existing fence line of the substations.

The cost for the upgrade of the Oakdale – Tanners Lake stretch is estimated for planning purposes to be $650,000. Cost estimates for the other stretches have not been made.

Schedule. Xcel Energy will begin to upgrade the conductor on the Oakdale to Tanners Lake stretch of the line in 2006. This work will be completed in 2006. Xcel Energy intends to continue upgrading substation equipment that limits the rating of the Long Lake to Oakdale stretch and the Tanners Lake to Woodbury stretch. A decision on the timing of this work will be made in 2006.


Legend
Transmission Substation
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
LONG LAKE
OAKDALE
TANNERS LAKE
WOODBURY
Ramsey Co.
Washington Co.
36
694
120
5
94
Minnesota Transmission >69 kV
Twin Cities Planning Zone
03-TC-N8: Long Lake- Oakdale-
Tanners Lake- Woodbury 115 kv
Miles
0
0.5
1
2

8.5.9 Rush City-Forest Lake-Blaine

Tracking Number: 2003-TC-N9

Inadequacy. This area is served by two 230/69 kV sources, one from Rush City and one from Blaine. The loss of either one of these lines results in low voltages and overload problems in the area between Rush City and Blaine. By 2010, given the anticipated load growth, transformers at either end would overload if the other transformer were out of service.

A map of the area is shown on the following page.

Alternatives. Three possible long-term solutions were reported in the 2003 Report.

Alternative 1: Linwood 230/69 kV Development – a new 230/69 kV source at Linwood and a new 69 kV line from Martin Lake substation to Athens substation.

Alternative 2: Rush City/Blaine Conversion – converting the 69 kV line between Rush City and Blaine to 115 kV.

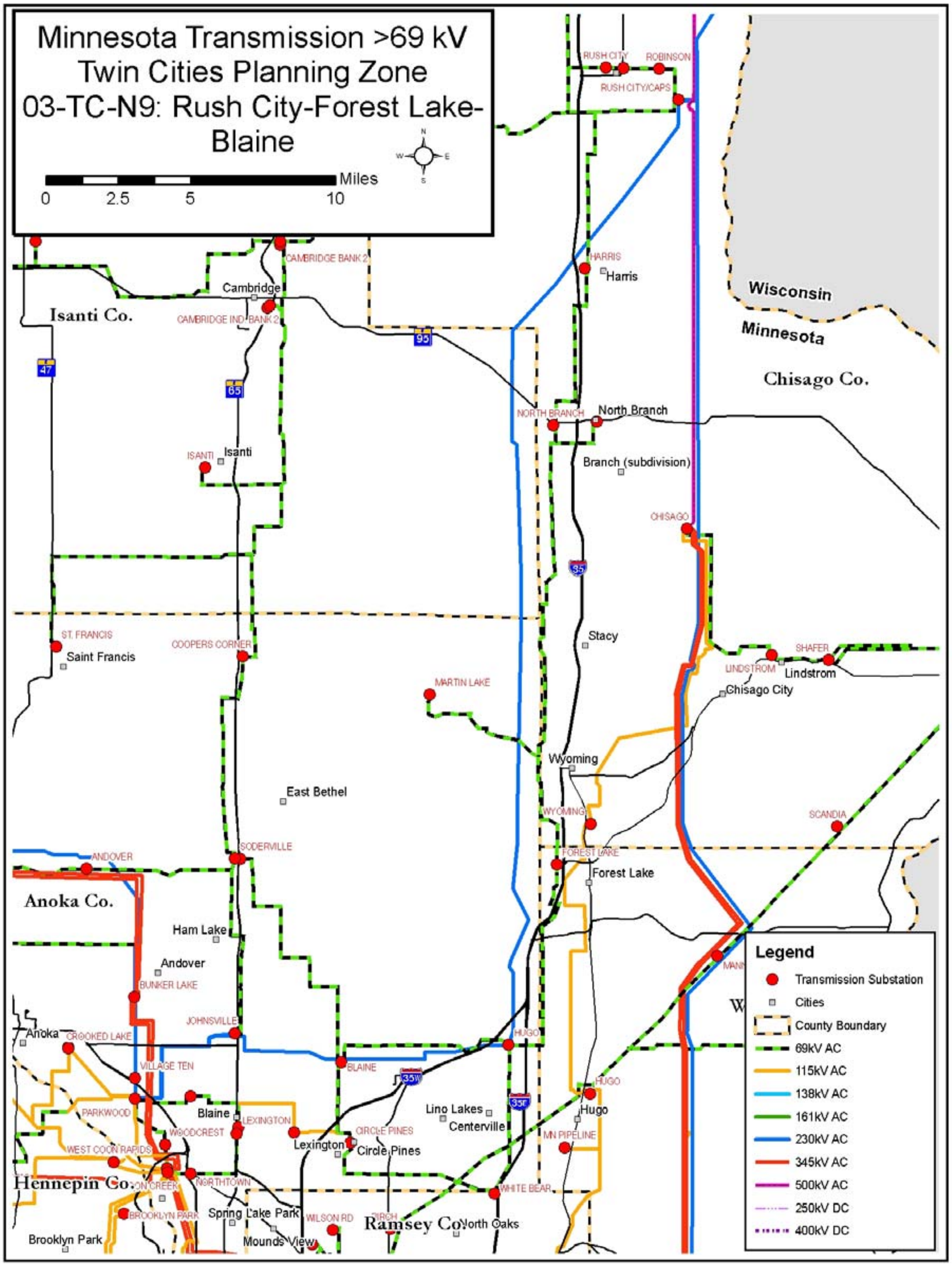
Alternative 3: 69 kV System Improvement - rebuilding the 69 kV lines to carry a higher capacity conductor and installing another transformer at Rush City.

Analysis. Alternative 1 – the new source at Linwood – will maintain voltages, relieve line overloads, and relieve transformer flow at Blaine and Rush City. This alternative establishes a breaker station in the middle of the 69 kV system (at Linwood) that will have a strong 230 kV source. It also provides benefits to the Highway 65 corridor with a proposed 69 kV line to the Athens area, and will enhance the load serving capability that is needed in this corridor. Alternative 1 appears to be the least cost alternative, although cost estimates have not been finalized. The estimated cost for this alternative is $11 million.

Alternative 2 – the 115 kV alternative-would be the most expensive option. The new line between Blaine and Rush City would be about 52 miles long, although presumably an existing corridor could be utilized. Distribution substations would have to be converted to 115 kV. This alternative would, however, provide the greatest capacity for future growth. The estimated cost for this alternative is $18 million.

Alternative 3 – the 69 kV system upgrade-would also require 52 miles of line upgrade, but would be cheaper than Alternative 2 because the distribution substations would not have to be reconstructed to a higher voltage. The estimated cost for this alternative is $9 million.

Schedule. Great River Energy has decided to implement Alternative 1, based on least cost analysis and considering system losses. The Linwood substation will require a Certificate of Need and a route permit. Authorization for the project will be sought in 2006, with a planned in-service date of sometime in mid-2007.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
03-TC-N9: Rush City-Forest Lake-Blaine
Miles
0 2.5 5 10
RUSH CITY
ROBINSON
RUSH CITY/CAPS
CAMBRIDGE BANK 2
Cambridge
CAMBRIDGE IND BANK 2
Isanti Co.
HARRIS
Harris
Wisconsin
Minnesota
Chisago Co.
NORTH BRANCH
North Branch
Branch (subdivision)
ISANTI
Isanti
CHISAGO
Stacy
ST. FRANCIS
Saint Francis
COOPERS CORNER
MARTIN LAKE
LINDSTROM
Lindstrom
SHAFER
Chisago City
Wyoming
WYOMING
East Bethel
SCANDIA
SODERVILLE
ANDOVER
FOREST LAKE
Forest Lake
Anoka Co.
Ham Lake
Andover
BUNKER LAKE
JOHNSVILLE
Anoka
CROOKED LAKE
HUGO
VILLAGE TEN
BLAINE
Blaine
LEXINGTON
PARKWOOD
WOODCREST
Lino Lakes
Centerville
CIRCLE PINES
Lexington
Circle Pines
Hugo
MN PIPELINE
WEST COON RAPIDS
Hennepin Co.
NORTHTOWN
WHITE BEAR
BROOKLYN PARK
Spring Lake Park
WILSON RD
Ramsey Co.
North Oaks
Mounds View
Brooklyn Park
Legend
Transmission Substation
Cities
County Boundary
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC

8.5.10 Twin Cities 345/115 kV Transformer Capacity

Tracking Number: 2003-TC-N10

Inadequacy. There are nineteen 345/115 kV or 230/115 kV transformers in the Twin Cities area. These transformers serve a majority of the Twin Cities load from remote generation from Xcel Energy's Allen S. King, Monticello, Prairie Island and Sherburne County plants, from Great River Energy's plants in North Dakota, and by hydropower from Manitoba.

Xcel Energy has made an initial assessment of the loading on these transformers. A number of the transformers are near their emergency loading criteria. However, this is very dependent on Twin City generation schedules.

Alternatives. The two alternatives are to replace existing transformers with larger capacity units or install additional units at the affected substations.

Analysis. Preliminary analysis suggests that additional transformer capacity may be needed in the 2009-2010 timeframe.

Schedule. Further analysis is planned to determine when additional 345/115 kV transformer capacity will be required within the Twin Cities Zone.

8.5.11 Plymouth-Maple Grove Area

Tracking Number: 2003-TC-N11

Inadequacy. This suburban area northwest of the Twin Cities metro has seen significant residential and commercial development. The existing 69 kV transmission system is inadequate, during contingencies, to serve the growing load in this area. Overload conditions will continue to worsen with the increased load.

Alternatives. In its Certificate of Need application filed with the Public Utilities Commission in 2001, Great River Energy evaluated several alternatives, including distributed generation, rebuilding the existing lines at 69 kV, adding a new 69 kV source in the area, and rebuilding the 69 kV line to 115 kV.

Analysis. In November 2002, the Commission issued a Certificate of Need for a new 115 kV line between Maple Grove and Plymouth.

The Environmental Quality Board issued a route permit for the 115 kV line in May 2004. EQB Docket No. 03-65-TR-GRE MPG. In September 2005, GRE applied for an amendment of the route permit to modify about 0.75 miles of the route to accommodate a proposed commercial development close to I-94. The matter is now PUC Docket No. ET2/TR-05-14. The in-service date for this project is May of 2006.

Schedule. The project is under construction. The line should be in service in May 2006.

8.5.12 Elk River-Ramsey-Bunker Lake Area (Enterprise Park)

Tracking Number: 2003-TC-N12

Inadequacy. This area is served by two 230/69 kV sources, one from the Elk River substation and one from the Bunker Lake substation. The Enterprise Park substation, between the two sources, is a radial-fed substation, which means it has only one line (source) leading to it. The loss of one of the 230/69 kV sources on either end results in an overload situation on the other 69 kV line. The growth potential in this area is high because of undeveloped land along Highway 10 in Ramsey, and the problem is expected to become worse.

A map of the area is shown on the following page.

Alternatives. Three long-term alternatives were identified in the 2003 Report. They are:

Alternative 1: A new 115/69 kV source at Enterprise Park.

Alternative 2: Converting the 69 kV system between Elk River and Bunker Lake to 115 kV.

Alternative 3: Rebuild the 69 kV system between Elk River and Bunker Lake.

In addition, a short-term solution is to increase the clearance on the existing 69 kV lines, which would allow additional capacity to be placed on the lines without violating NESC line clearance standards since increased capacity would result in greater line sag.

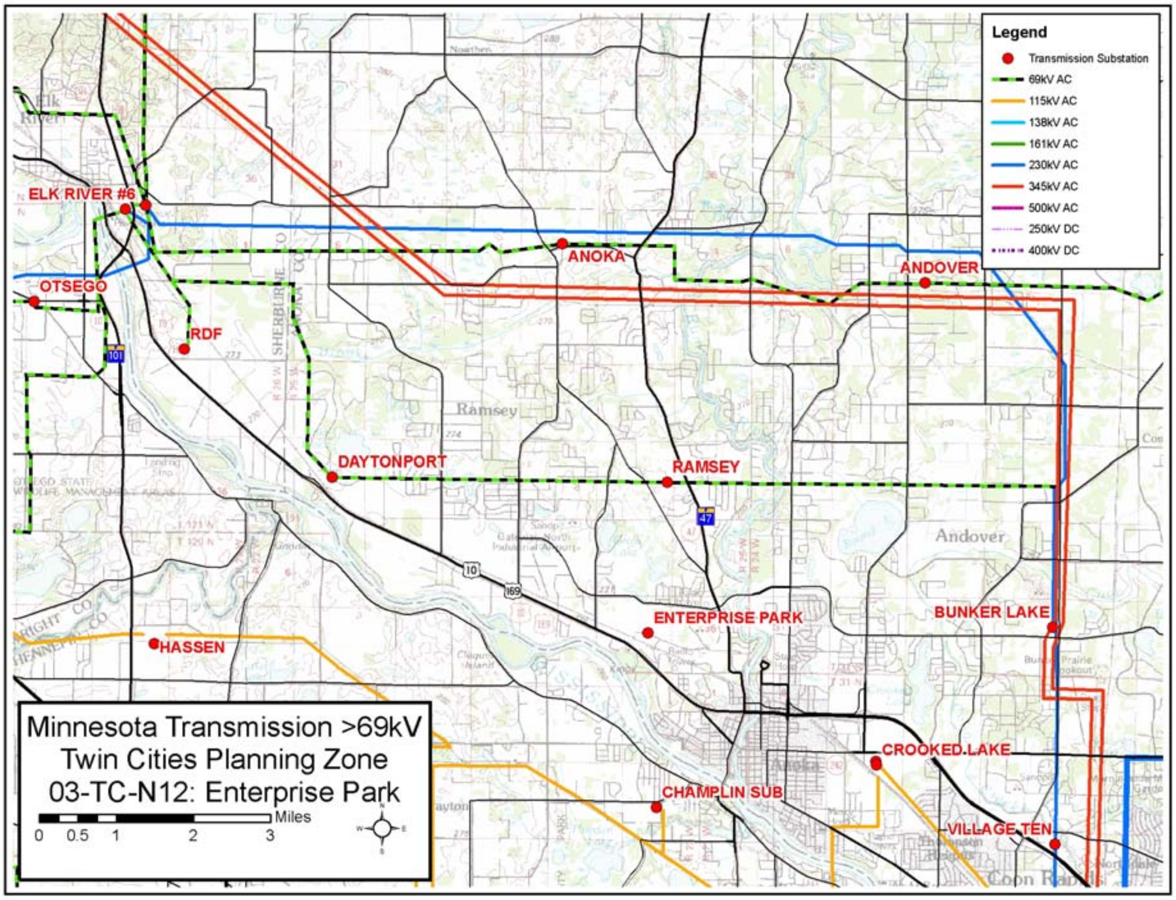
Analysis. Alternative 1 will relieve overloads and relieve transformer loadings at Elk River and Bunker Lake. In addition, this option will provide a loop-feed service to the existing radially fed Enterprise Park substation. The 115 kV line would be from the Crooked Lake 115 kV substation and involve about 3.5 miles of construction. The estimated cost is $2.4 million.

Alternative 2 will provide greater capacity for future load growth than the other options. In addition, this option will greatly relieve the transformer flow at Elk River and Bunker Lake. This alternative is considered to be very expensive, as the distribution substation would need to be converted to 115 kV, and Elk River and Bunker Lake substations would need to be modified to establish 115 kV buses. The estimated cost is $12.7 million.

Alternative 3 eliminates the overload problems but the major loads of Energy Park and Enterprise Park would continue to be served from a radial 69 kV system with no backup source. Alternative No. 3 offers only a slight improvement in the situation. The estimated cost is $2.6 million.

Alternative 1 would have the greatest land impact because a corridor would have to be established, although a railroad corridor through mainly industrial park areas presently exists and will offer a direct route to Enterprise Park. Alternative No. 1 is the most reliable because it would establish a third source into the area. Alternative 1 also provides the least cost plan when losses are taken into account.

Schedule. Alternative 1 provides the best least-cost, long-term solution, and is the preferred option. The new line is less than ten miles in length so a Certificate of Need from the Commission is not required. The line is not expected to be built until the 2009-2020 timeframe.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
ELK RIVER #6
OTSEGO
RDF
ANOKA
ANDOVER
DAYTONPORT
RAMSEY
ENTERPRISE PARK
BUNKER LAKE
HASSEN
CROOKED LAKE
CHAMPLIN SUB
VILLAGE TEN
Ramsey
Andover
Minnesota Transmission >69kV
Twin Cities Planning Zone
03-TC-N12: Enterprise Park
Miles
0 0.5 1 2 3

8.5.13 Minnesota-Wisconsin Stability Interface

Tracking Number: 2003-TC-N13

Inadequacy. The Minnesota-Wisconsin Stability Interface (MWSI) is a measure of the power flowing from or through the Twin Cities area to areas south and east. The MWSI is presently a regional constraint that limits the delivery of power in MAPP/MRO and MISO. The MWSI has transmission reservations that exceed the capacity of the interface. This constraint limits the implementation of new wholesale transactions and the construction of new generation within Minnesota, even to serve Minnesota load, because parallel path flows (loop flows) often impact this interface.

Alternatives. There is a major effort underway at this time to develop a plan to upgrade the transmission system in SE Minnesota to support Rochester and other areas, which as a side benefit will increase MWSI. A 345 kV line from Prairie Island to Rochester to La Crosse is one of the lines that was identified in the CapX 2020 Vision Plan.

Analysis. In 2003 it was expected that MISO would initiate an exploratory study to determine options (either new construction or operating procedures) to alleviate the MWSI constraint. However, this effort has been deferred while other major visionary studies such as the MISO Northwest Exploratory Study and the CAPX 2020 Vision Plan are completed. Some of the recommendations made as a result of this study work will likely have an impact on the MWSI flow. Also, the Rochester and La Crosse load serving study proposals could increase the MWSI.

A number of MISO exploratory studies and the CapX 2020 work address the need to increase transfer capability in the Twin Cities and Southeast Minnesota areas.

Schedule. See the CapX 2020 discussion in Section 6 and the Rochester area inadequacy in Section 8 (Tracking Number 2003-SE-N1).

8.5.14 Inver Hills-Koch Refinery

Tracking Number: 2005-TC-N1

Inadequacy. There is a 115 kV transmission line that runs from a substation near the Koch (Flint Hills Resources) refinery to the Inver Hills substation, a distance of about 1.8 miles. This line is an integral part of the system serving the refinery and northern Dakota County. With increasing loads at the refinery and throughout Dakota County, there is concern about overloads at the substation and overload of the line during contingency situations such as the loss of the Black Dog to Burnsville 115 kV line. Presently, the circuit breakers at the Inver Hills substation are overstressed slightly under normal conditions.

A map of the area is shown on the following page.

Alternatives. Two alternatives have been identified: (1) reconductor the existing 115 kV line between Koch refinery and Inver Hills to increase the capacity of the line, and (2) construct a second 115 kV line between Koch refinery and Inver Hills.

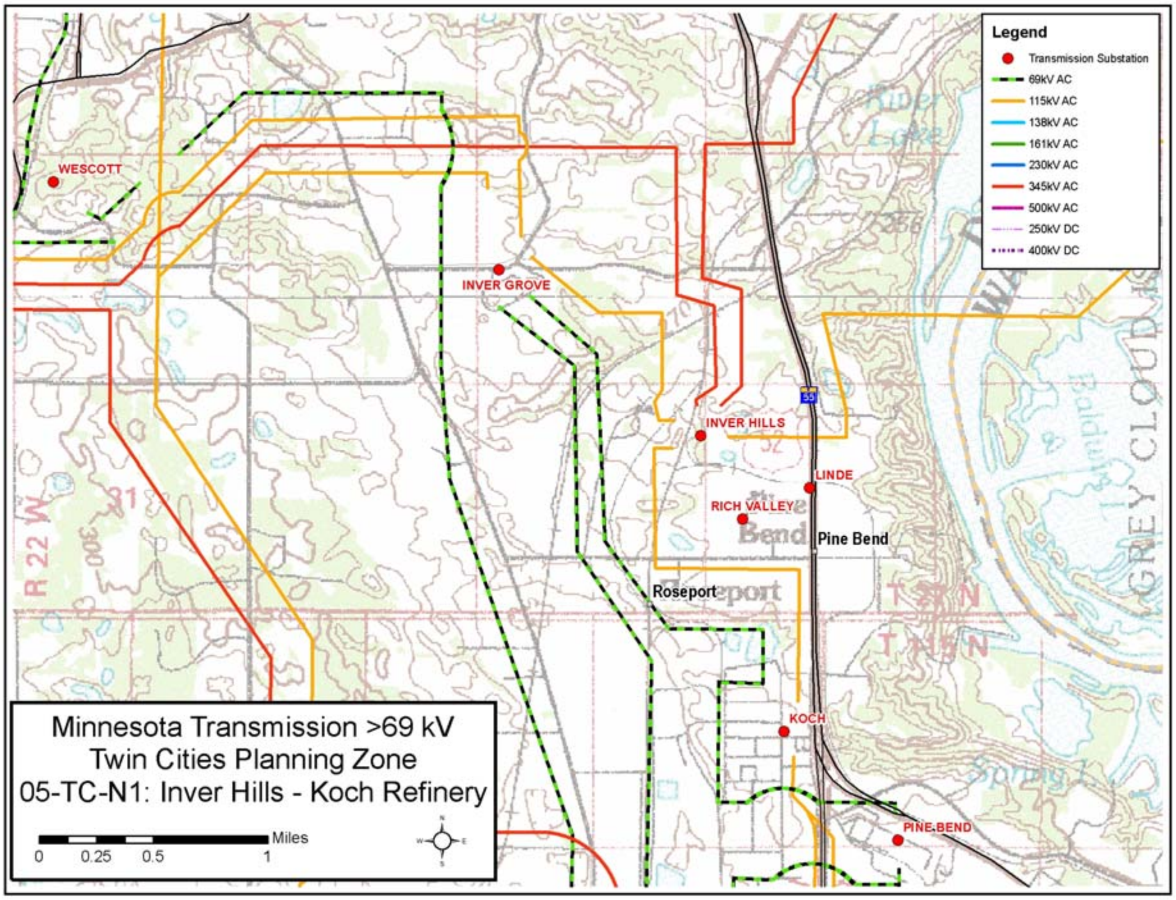
Analysis. The first option, in addition to reconductoring the line, would require the rebuild of the Koch substation, including the replacement of the 115 kV breakers. Also, the two overstressed breakers associated with the line termination at Inver Hills would have to be replaced. The estimated cost of Alternative 1 is $2.3 million.

The second alternative, in addition to a new line, would also require the rebuild of the Koch substation and the replacement of the Inver Hills overstressed breakers. This option would cost at least $1.1 million more than Alternative 1.

Reconductoring the existing transmission line will not create new environmental or social issues for this area. The second alternative involves building a new transmission line, which would most likely involve new right-of-way.

In both alternatives, to address the distribution transformer loading concern, it is planned to expand the substation on the refinery's property and add two additional distribution transformers.

Schedule. Alternative 1 – reconducting the line – is the preferred option. This alternative has been initiated. The Inver Hills breakers, the line capacity upgrade and the addition of two distribution transformers are scheduled for completion in 2006 with the remaining Koch Refinery substation rebuild scheduled for 2007.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
WESCOTT
INVER GROVE
INVER HILLS
LINDE
RICH VALLEY
Pine Bend
Roseport
KOCH
PINE BEND
Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N1: Inver Hills - Koch Refinery
Miles
0 0.25 0.5 1

8.5.15 Prairie Island-Red Rock

Tracking Number: 2005-TC-N2

Inadequacy. An Xcel Energy 345 kV double circuit runs from the Prairie Island Generating Plant to the Red Rock substation in Newport. One of the 345 kV circuits (Circuit #2) was constructed under an old standard so that this older circuit is rated for a much lower capacity than the new circuit (568 MVA versus 1198 MVA). With the anticipated addition of a number of new generating plants on the system in 2006 through 2009, a number of transmission outage scenarios would begin to excessively load the older line. In the event of such a contingency, generation at the Prairie Island Plant would need to be reduced and generation would have to be redispatched to other Twin Cities area facilities.

A map of the area is shown on the following page.

Alternatives. Two alternative solutions were developed to increase the rating of the Prairie Island to Red Rock 345 kV Circuit #2. Both alternatives involve raising or replacing the structures on which the conductor is hanging. Raising the height from ground level allows the conductor to transport more power because while the higher capacity results in greater sag of the line, clearances will still be within standards. The objective is to allow the conductor to operate at maximum temperature (100° C).

Alternative 1: Raise 29 structures and replace two structures for an increased rating of 700 MVA by November 2005 to allow the conductor to operate at a higher temperature (66°C). Raise an additional 28 structures and replace an additional two structures in 2007. This will result in the circuit being 100°C operational and will have a continuous summer rating of 1162 MVA.

Alternative 2: Raise 29 structures and replace two structures for an increased rating of 700 MVA by November 2005 (66°C). Replace an additional 30 structures in 2007. The circuit will be 100°C operational and will have a continuous summer rating of 1162 MVA.

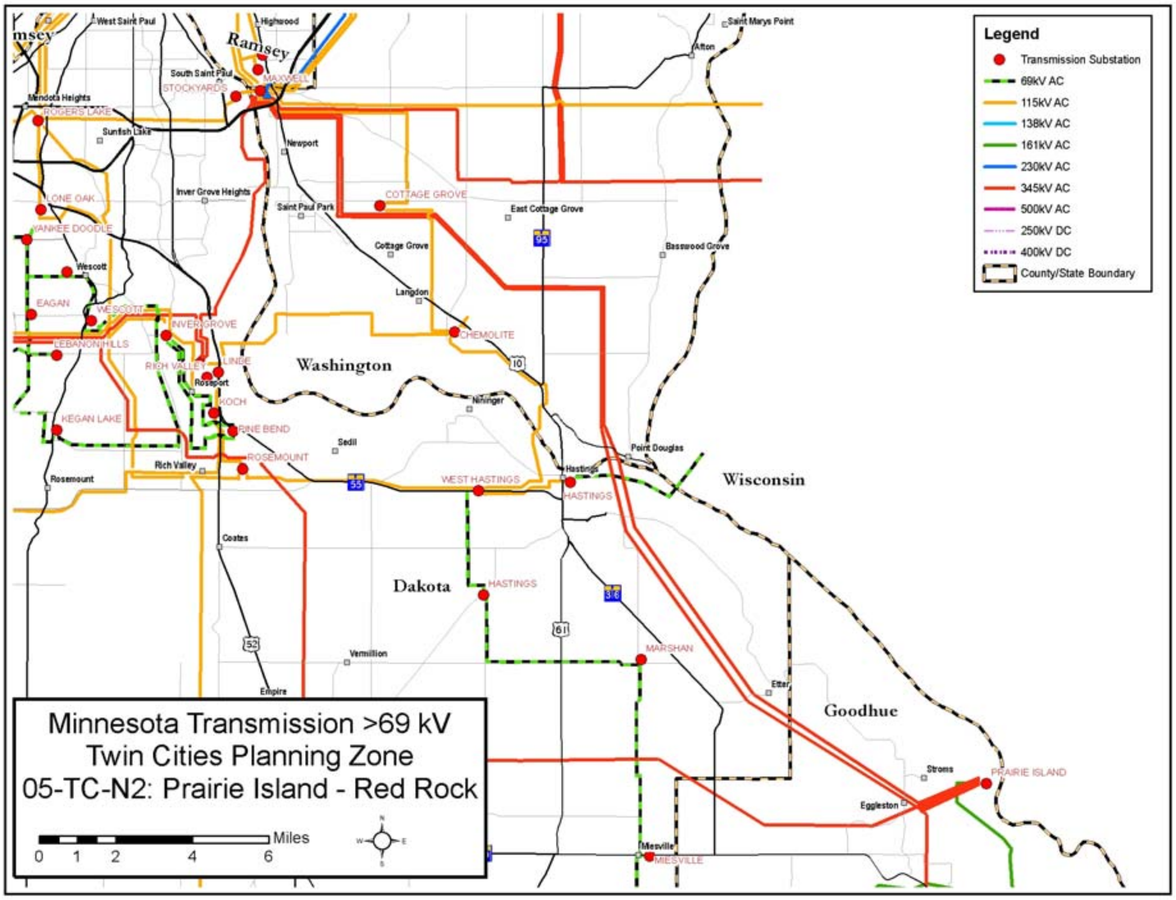
Analysis. The need to upgrade this circuit is documented in the MISO MTEP-05 Report and 2004 MISO Summer Assessment Operating Study. Other MISO studies have also identified this line as becoming overloaded for certain transmission outages.

Alternative 1, which involves mostly raising existing transmission structures, will not create new environmental or social issues for this area. The second alternative, which will involve replacing some of the existing wooden structures with steel ones, may involve additional right-of-way. The overall construction impacts will be similar since construction equipment will be required at the structures for both alternatives. Overall, the environmental impacts of both alternatives are minimal.

The total cost of the first alternative is $1,585,000. The cost of the second alternative is $2,585,000.

There is a weakness in the structure design of this line that was discovered after this line was built. Because Alternative 2 addresses this structural weakness issue, Alternative 2 is the recommended option, even though it is more expensive.

Schedule. The raising of the 29 structures, which is the identical first step in either alternative, was begun in 2005 and will be completed by the end of the year. The additional 30 structures will be replaced by 2007. No review by the Public Utilities Commission is required for this replacement.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N2: Prairie Island - Red Rock
Miles
0 1 2 4 6
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County/State Boundary
Washington
Dakota
Goodhue
Wisconsin
Ramsey
West Saint Paul
Highwood
South Saint Paul
STOCKYARDS
MAXWELL
Mendota Heights
ROGERS LAKE
Sunfish Lake
Newport
Inver Grove Heights
Saint Paul Park
COTTAGE GROVE
East Cottage Grove
LONE OAK
YANKEE DOODLE
Wescott
Cottage Grove
Basswood Grove
Langdon
EAGAN
WESCOTT
INVER GROVE
CHEMOLITE
LEBANON HILLS
RICH VALLEY
LINDE
Rosemount
KOCH
Nininger
KEGAN LAKE
PINE BEND
Sedil
ROSEMOUNT
Point Douglas
Rich Valley
Hastings
WEST HASTINGS
HASTINGS
Coates
Vermillion
MARSHAN
Empire
Etter
Storns
PRAIRIE ISLAND
Eggleston
Miesville
MIESVILLE
Saint Marys Point
Afton

8.5.16 Champlin-Champlin Tap-Crooked Lake

Tracking Number: 2005-TC-N3

Inadequacy. A 115 kV line between Champlin, the Champlin Tap, and Crooked Lake in the Northwest part of the Twin Cities needs to be upgraded due to continued load growth in the vicinity of Champlin and Anoka. Certain contingency situations involving the loss of transmission lines overloads the Champlin – Champlin Tap in summer peak conditions.

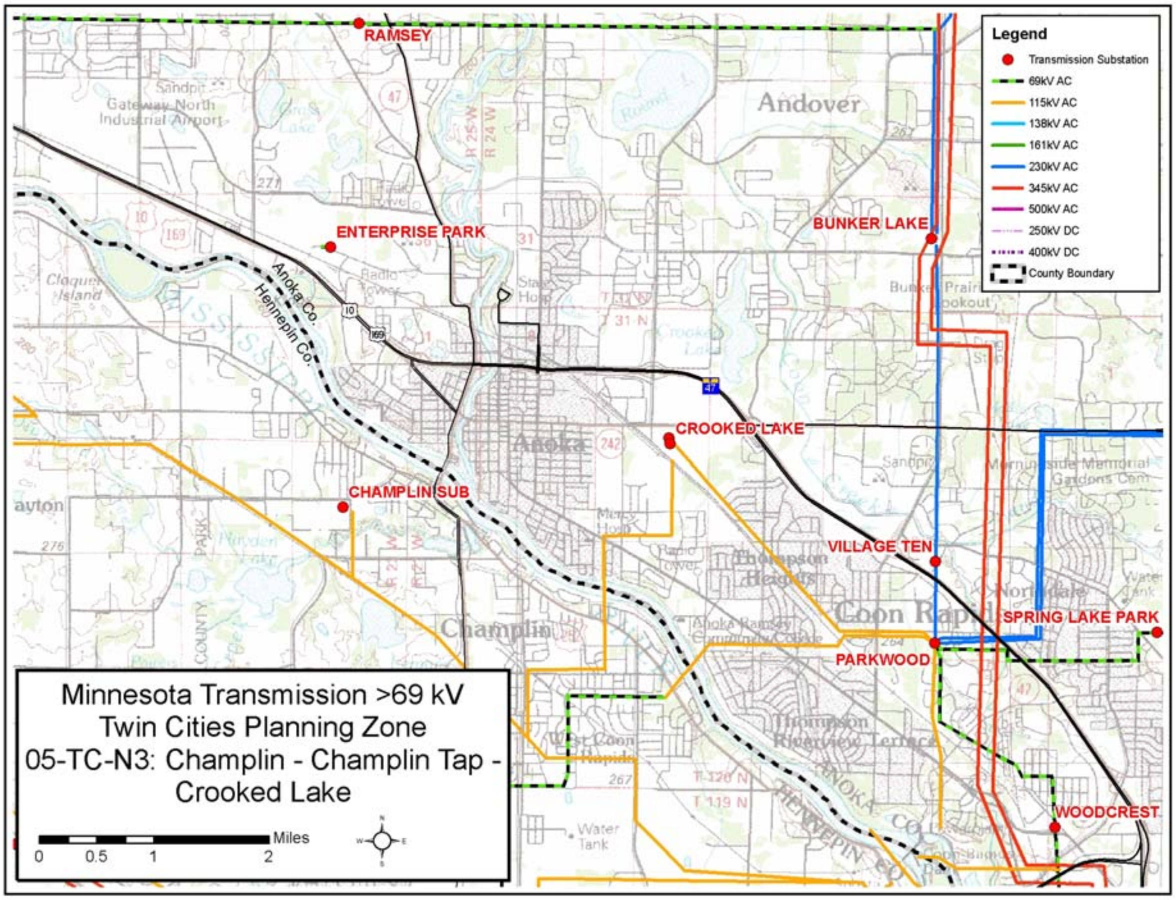
A map of the area is shown on the following page.

Alternatives. The two possible solutions are to replace the Champlin-Champlin Tap 115kV and the Champlin Tap to Crooked Lake 115kV line with a higher capacity high temperature conductor or to construct a new 115 kV transmission line.

Analysis. The need to upgrade this line is documented in the MISO MTEP-05 Report.

The cost to upgrade Champlin to Champlin Tap to Crooked Lake 115kV is estimated for planning purposes at $770,000. A new line would be more expensive but no estimate has been made. The proposed projects should have minimal new environmental impacts since it does not require new right-of-way. An entirely new line would probably involve new right-of-way.

Schedule. The Champlin to Champlin Tap 115 kV upgrade has a planned in-service date of 2007 with an operating procedure in place prior to 2007 to quickly restore the Coon Creek 345/115 kV transformer for this condition. Champlin Tap to Crooked Lake 115kV upgrade project is expected to be implemented in the 2008-2009 time frame.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N3: Champlin - Champlin Tap - Crooked Lake
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
RAMSEY
ENTERPRISE PARK
BUNKER LAKE
CROOKED LAKE
CHAMPLIN SUB
VILLAGE TEN
SPRING LAKE PARK
PARKWOOD
WOODCREST
Andover
Anoka
Champlin
Coon Rapids
Anoka Co.
Hennepin Co.
Miles
0 0.5 1 2

8.5.17 Blue Lake Generation Substation Interconnection

Tracking Number: 2005-TC-N4

Inadequacy. Xcel Energy installed a new combustion turbine at its Blue Lake Generating Plant in 2005. Additional transmission infrastructure was required to connect the new plant to the system.

Completion of Project. The Blue Lake Plant expansion has been constructed and is in service. The transmission line has been constructed and is in service. The 230/115 kV transformer at Black Dog was relocated to Blue Lake. The Blue Lake to Black Dog 230 kV line was re-energized at 115 kV and upgraded to achieve 330 MVA. See EQB Docket No. 04-75-PPS-Xcel

More information about the Blue Lake expansion is available at:

http://energyfacilities.puc.state.mn.us/Docket.html?Id=5694Id

8.5.18 Eden Prairie to Edina 115 kV line

Tracking Number: 2005-TC-N5

Inadequacy. The Edina-Eden Prairie 115 kV transmission line is located in the southwestern part of the Twin Cities metropolitan area. This line needs to be upgraded because of continued growth in the southwest suburbs of Minneapolis. A number of contingencies were found to cause overload of the line with a Twin Cities load of nearly 6000 MW. Among them are:

(1) loss of both Eden Prairie-Westgate 115 kV lines and both Westgate 115/69 transformers; and
(2) loss of Saint Louis Park-Cedar Lake 115 kV line and Aldrich-St. Louis Park 115 kV line.

Both contingencies create line loadings of approximately 430 MVA – approximately 135% of the line's 310 MVA rating.

A map of the area is shown on the following page.

Alternatives. The Edina-Eden Prairie 115 kV line is comprised of five different sections of conductor, so that the rating of the line is different in various sections, depending on the conductor. About 3.5 miles of the line are bifurcated, which means that two conductors are connected together at the ends before terminating at the substation. Since the loading of the line is seen under some conditions to go to 430 MVA in 2006, all of the existing sections of the line may overload; therefore the entire line should be rebuilt.

Two alternatives were developed for upgrading the line:

Alternative 1: Rebuild Edina to Eden Prairie 115 kV transmission line with double circuit double-bundled higher capacity high temperature conductor.

Alternative 2: Make use of the existing bifurcated Eden Prairie-Edina-Nine Mile Creek-Wilson line by de-bifurcating it to create an Eden Prairie-Edina line and an express Eden Prairie-Wilson line.

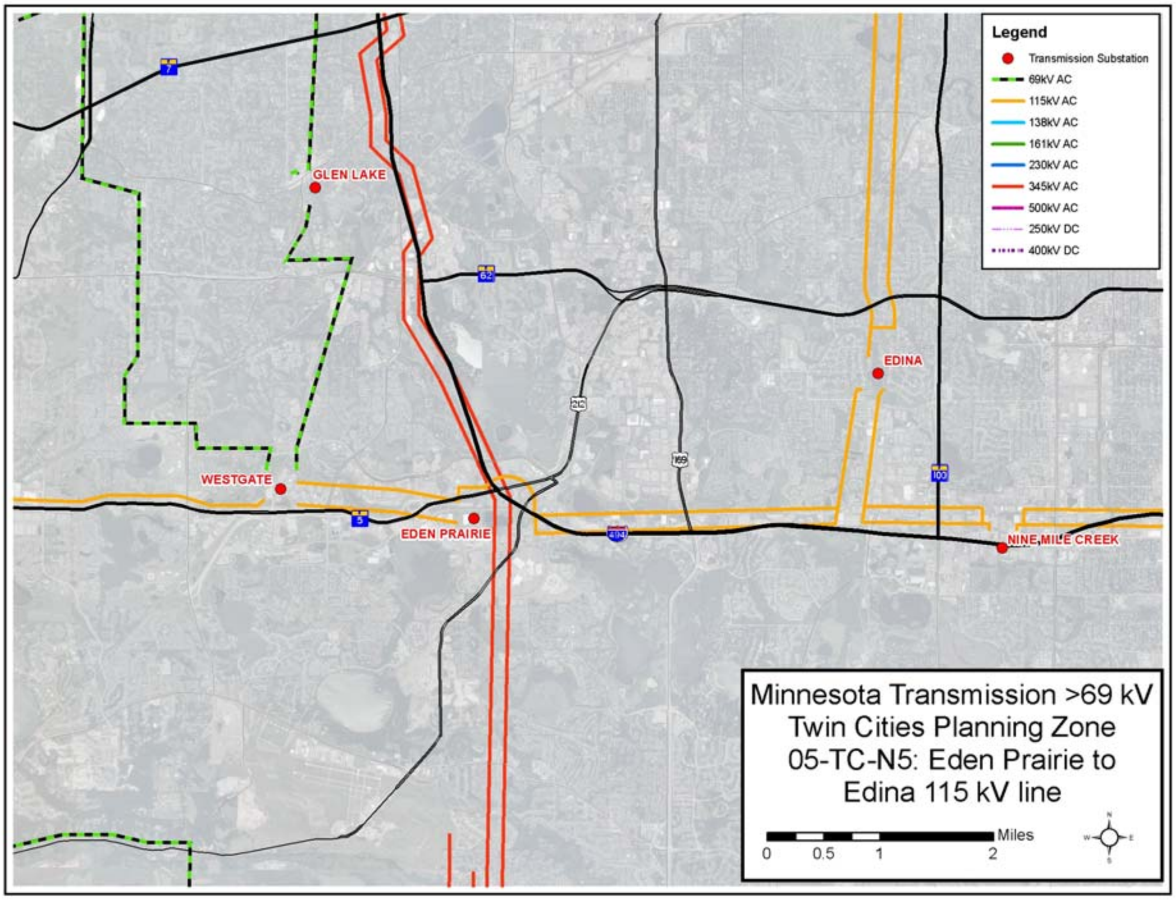
Analysis. The need to upgrade this line is documented in the Report of Aldrich-St. Louis Park 115kV and Edina-Eden Prairie 115kV Transmission line upgrades (2005).

Both Alternatives include the upgrade of existing transmission lines. Alternative one involves minimal substation work. Alternative 2 involves separating an existing bifurcated line. Extensive substation work at Wilson would be part of the scope for Alternative 2 which would be very expensive.

Both Alternatives have environmental and social issues to consider. The work for both options would be located within densely populated areas of the Twin Cities. While there would be the addition of another circuit in Alternative 1, the existing Edina-Eden Prairie line is currently a bifurcated facility. Both Alternatives would impact the same areas for the Edina-Eden Prairie section of the project. Alternative 2 would impact a greater area.

The cost estimate for planning purposes for Alternative 1 is $5 million. For Alternative 2, the planning estimate is $18-21 million.

Schedule. Xcel Energy intends to implement Alternative 1. The schedule to upgrade this line will be determined during the coming year.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
GLEN LAKE
EDINA
WESTGATE
EDEN PRAIRIE
NINE MILE CREEK
Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N5: Eden Prairie to
Edina 115 kV line
Miles
0
0.5
1
2

8.5.19 Yankee Doodle 115 kV Substation Conversion

Tracking Number: 2005-TC-N6

Inadequacy. The Yankee Doodle substation, located in Eagan, is part of the Dakota Electric Cooperative system. (Dakota Electric is a member of Great River Energy). Because of load growth in the area, Dakota Electric has requested an upgrade of the substation. In addition, this substation no longer has adequate backup for its single transformer. Also, the transformer capacity of Pilot Knob Substation, which serves this 69 kV system, has also reached its limit of expansion.

A map of the area is shown on the following page.

Alternatives. The objective is to convert the Yankee Doodle Substation to a two-transformer 115 kV station with two sources of high capacity 115 kV transmission. First, a 115 kV source must be tapped into Yankee Doodle, and then, a second 115 kV source must be connected.

There are two options for the first 115 kV source: (1) a tap from the Lone Oak Substation, and (2) a new 115 kV line from some other substation in the Dakota County area.

There are three possibilities for introducing a second source into Yankee Doodle: (1) a Rogers Lake-Lone Oak-Yankee Doodle-Rogers Lake loop, (2) a line from the Pilot Knob substation, and (3) a line from the Inver Grove substation.

Analysis. Connecting to the Lone Oak substation for the first source would require little new transmission work as it uses an existing transmission facility. Building this 115 kV source from another substation was infeasible given the in-service date desired by Great River Energy.

Establishing a Rogers Lake-Lone Oak-Yankee Doodle-Rogers Lake loop as the second source would involve either a double circuit from Lone Oak to Yankee Doodle or building a new line across to the Rogers Lake-Lone Oak line two. This loop option is problematic because a double circuit does not provide adequate reliability, and because if a new line is to be built, it makes more sense electrically to build to Inver Grove rather than to Rogers Lake.

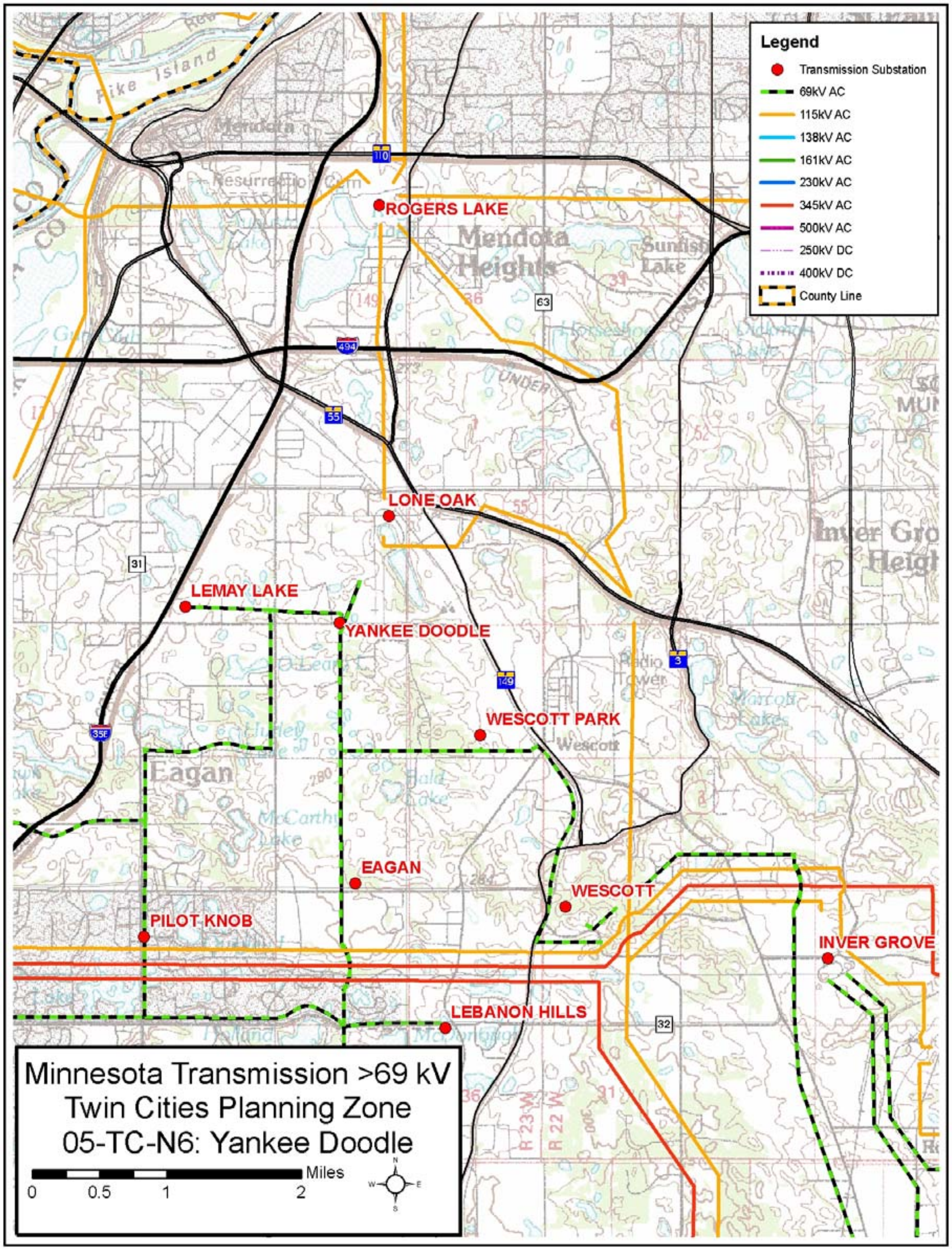
The two other choices for a second source were Inver Grove and Pilot Knob. A source from either Pilot Knob or Inver Grove works well. A new 115 kV source from Pilot Knob (approximately 3.2 miles) is expected to be less expensive than a 115kV source from Inver Grove. Both alternatives would have siting and permitting issues, but it is expected that a new Pilot Knob source would have fewer impacts since it can be double circuited with an existing transmission line for the entire route, whereas a new Inver Grove line will likely require new right-of-way.

It is recommended that the first 115 kV source to Yankee Doodle connect from the Lone Oak substation, as this would fit with either second source option and require little new transmission work as it uses an existing transmission facility. Pilot Knob is the recommended source for the second 115 kV line to Yankee Doodle, based on cost and expected permitting issues. The Pilot

Knob line can be double circuited the entire way whereas the Inver Grove line may require new right-of-way.

A study entitled *Providing 115kV sources to Yankee Doodle Substation* was completed in June 2005.

Schedule. Construction of the first connection from the Lone Oak substation will be commenced and in service in 2006. Pilot Knob is the recommended source for the second 115 kV line to Yankee Doodle. The schedule for implementing the second source will be determined within the next year. A Certificate of Need is not required for Pilot Knob because the line is less than ten miles in length.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Line
ROGERS LAKE
LONE OAK
LEMAY LAKE
YANKEE DOODLE
WESCOTT PARK
EAGAN
WESCOTT
PILOT KNOB
INVER GROVE
LEBANON HILLS
Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N6: Yankee Doodle
Miles
0 0.5 1 2

8.5.20 Twin Cities Fault Current Issue

Tracking Number: 2005-TC-N7

Inadequacy. General fault current levels on the system in the Twin Cities are increasing as transmission lines and generation get added to the transmission system. The grounding capability in the inner Twin Cities substations may be exceeded as loads continue to increase. At present there is no immediate need to address this concern, but a long range study should be made in the next few years addressing ways to reduce the fault current levels in the inner Twin Cities.

Alternatives. Sectionalizing the system may be needed to decrease the fault current levels, but no alternatives have been identified or evaluated.

Analysis. These issues have not yet been evaluated at this early stage of the planning process. Until possible solutions are identified, it is not possible to determine the possible environmental impacts. A planning study is needed to evaluate possible alternatives.

Schedule. The date for the planning study has not been determined.

8.5.21 Minnesota River Generation Substation Interconnection

Tracking Number: 2005-TC-N8

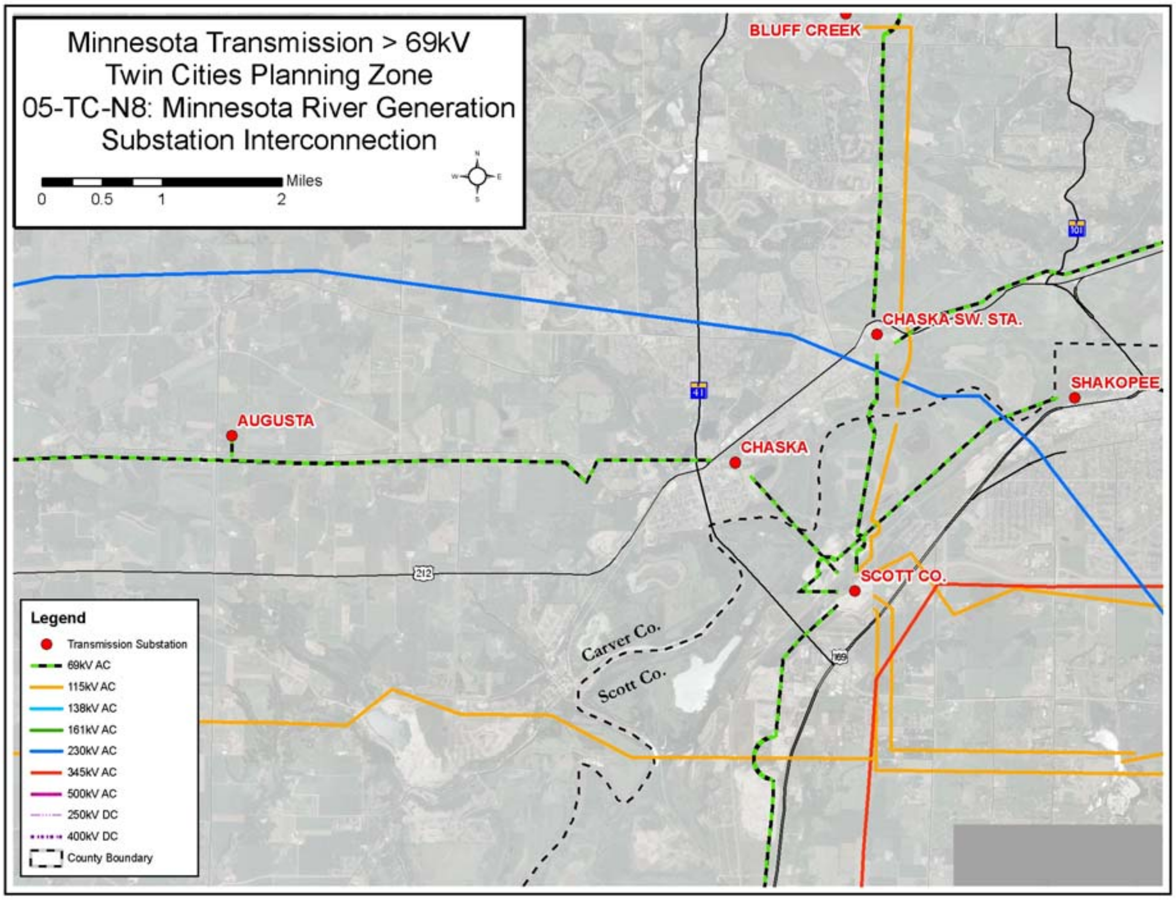
Inadequacy. The Minnesota River Generating Station, located approximately 30 miles southeast of downtown Minneapolis, is owned by the City of Chaska, which is not a member of MISO. The plant has an existing capacity of 50 MW, and the City is proposing to install a second gas fired combustion turbine facility of 180 MW at the same location. The City will require an interconnection to the transmission system for the second unit.

A map of the area is shown on the following page.

Alternatives. The new plant can be connected to the existing 115 kV Minnesota River substation without any system upgrades.

Analysis. The interconnection study for this generator is documented in MISO's G356 Generator Interconnection Evaluation Study, March 2005 (MISO queue number 37830-01). While the present MISO study establishes that the output from the second unit can be connected to the Minnesota River substation, additional study is required to determine whether any transmission upgrades will be required to transport the power.

Schedule. The type of transmission service that the City of Chaska (as the new generator owner) will require has not yet been determined. The schedule for additional study work by MISO depends on decisions by the City.


Minnesota Transmission > 69kV
Twin Cities Planning Zone
05-TC-N8: Minnesota River Generation
Substation Interconnection
Miles
0 0.5 1 2
BLUFF CREEK
CHASKA SW. STA.
SHAKOPEE
AUGUSTA
CHASKA
SCOTT CO.
Carver Co.
Scott Co.
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary

8.5.22 Oakwood Distribution Substation

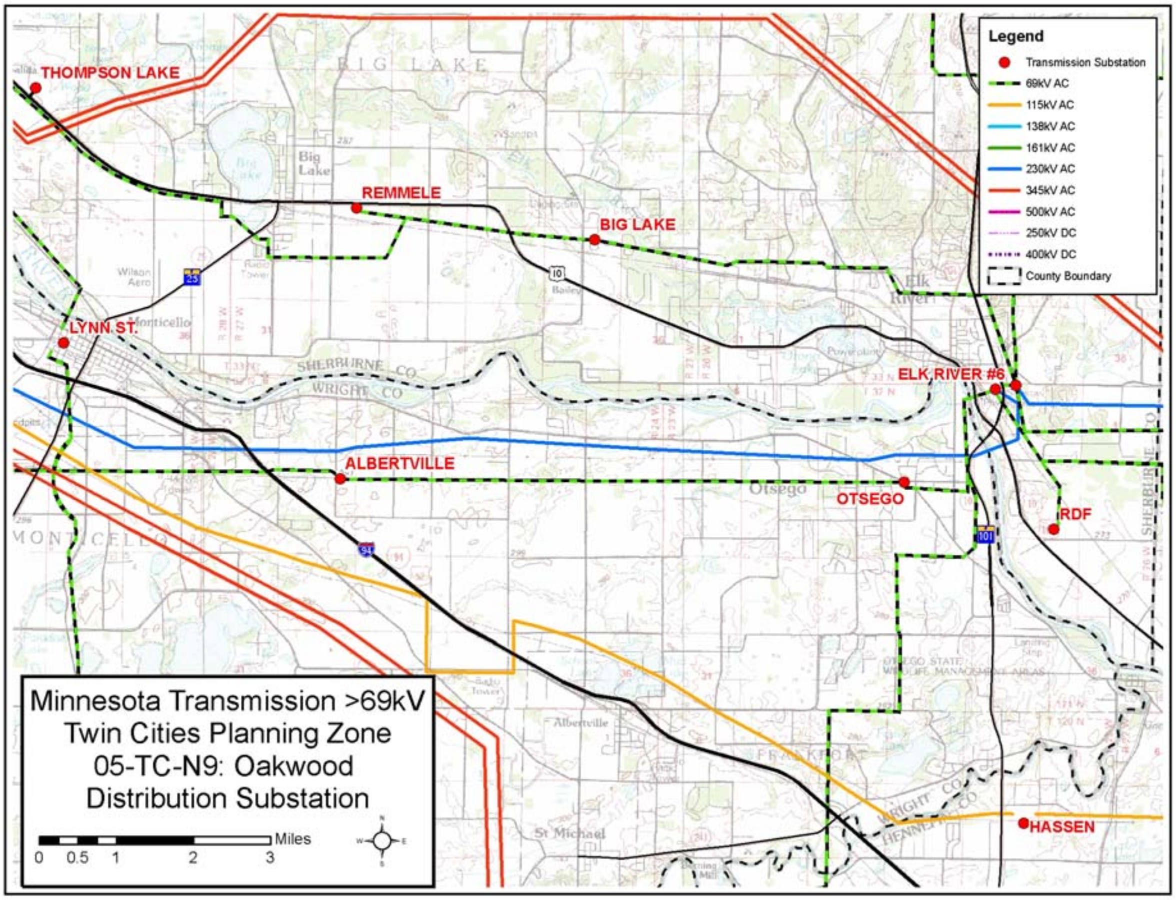
Tracking Number: 2005-TC-N9

Inadequacy. A new 115/12.5 kV substation is required by Wright-Hennepin Cooperative Electric Association to relieve loading on the Otsego and Albertville substations and to serve present and future growth in the area.

A map of the area is shown on the following page.

Analysis. This substation is included in the Wright-Hennepin Cooperative Electric Association Long-Range Plan. The substation site is approximately one acre in size.

Completion of Project. The Oakwood Substation has been installed and is in service.


Minnesota Transmission >69kV
Twin Cities Planning Zone
05-TC-N9: Oakwood
Distribution Substation
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
THOMPSON LAKE
REMMELE
BIG LAKE
LYNN ST.
ELK RIVER #6
ALBERTVILLE
OTSEGO
RDF
HASSEN
Miles
0 0.5 1 2 3

8.5.23 Goose Lake-Kohlman Lake 115 kV

Tracking Number: 2005-TC-N10

Inadequacy. The last three spans into the Goose Lake substation of the Kohlman Lake-Goose Lake 115 kV line in St. Paul are on double circuit structures and have half the rating of the rest of the line. A 2005 analysis of the area found that this line may overload during high summer loads and transmission outages under two contingencies:

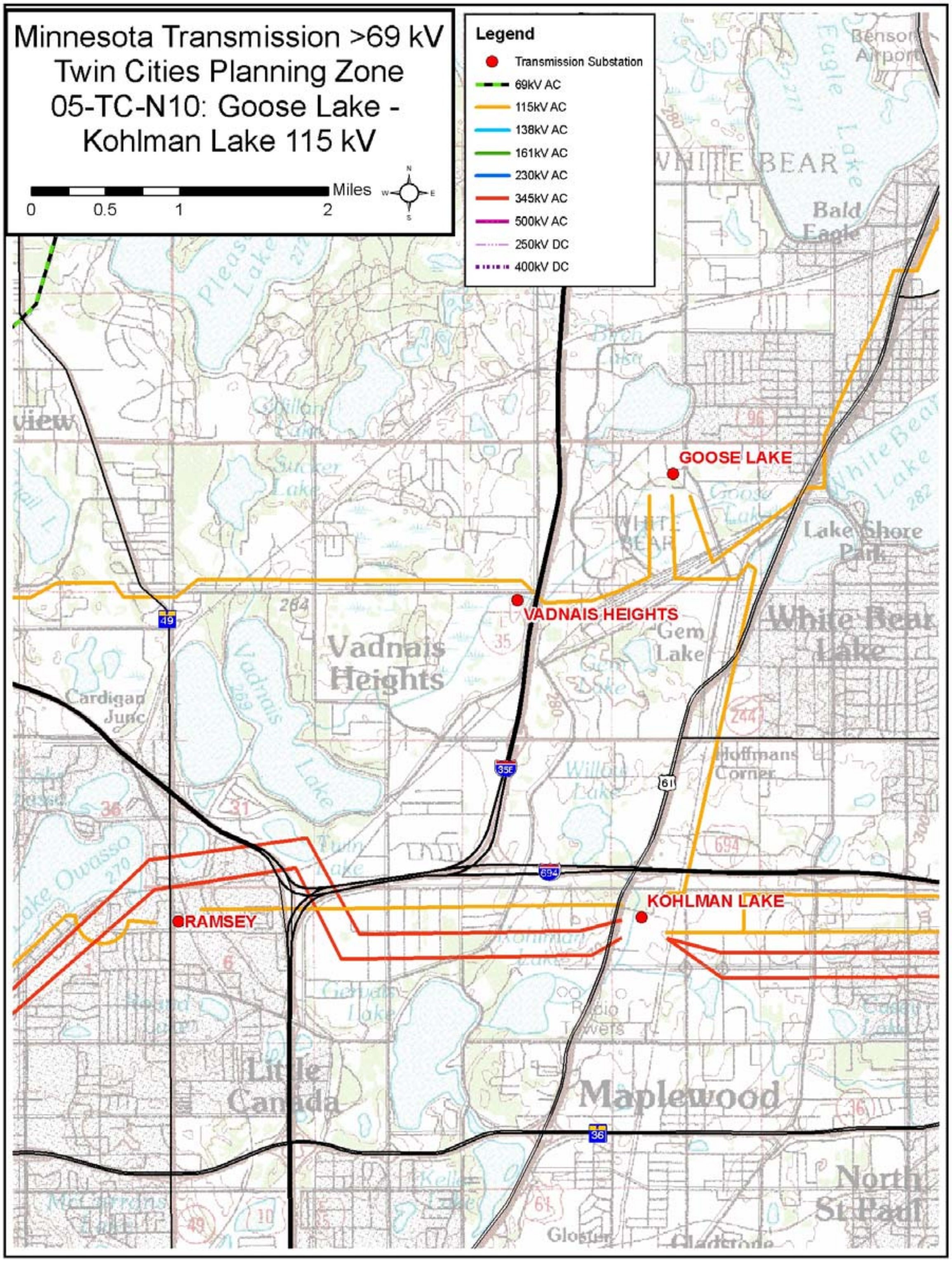
- Outage of the Terminal-Arden Hills/Apache line
- Outage of the Chisago- Wyoming line

A map of the area is shown on the following page.

Alternatives. There are two options: (1) upgrade the last three spans, and (2) build a new line.

Analysis. The preferred alternative is to upgrade the last three spans out of Goose Lake. Any other alternative would involve building a new transmission source into the Goose Lake substation. The nearest source is Kohlman Lake, three miles away. Any new source would be much more expensive than upgrading the 0.4 mile section of line. Upgrading a small section of the existing line should have minimal environmental impacts. Bringing in a new source would probably require new right-of-way.

Schedule. Construction to upgrade 0.4 mile section of the Goose Lake-Kohlman Lake 115 kV line is expected to begin in 2006 and be completed before the end of the year.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N10: Goose Lake -
Kohlman Lake 115 kV
Miles
0
0.5
1
2
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
GOOSE LAKE
VADNAIS HEIGHTS
KOHLMAN LAKE
RAMSEY
Vadnais Heights
White Bear Lake
Maplewood
Little Canada
North St Paul
Lake Shore Park
Gem Lake
Bald Eagle

8.5.24 West Hastings Substation Expansion

Tracking Number: 2005-TC-N11

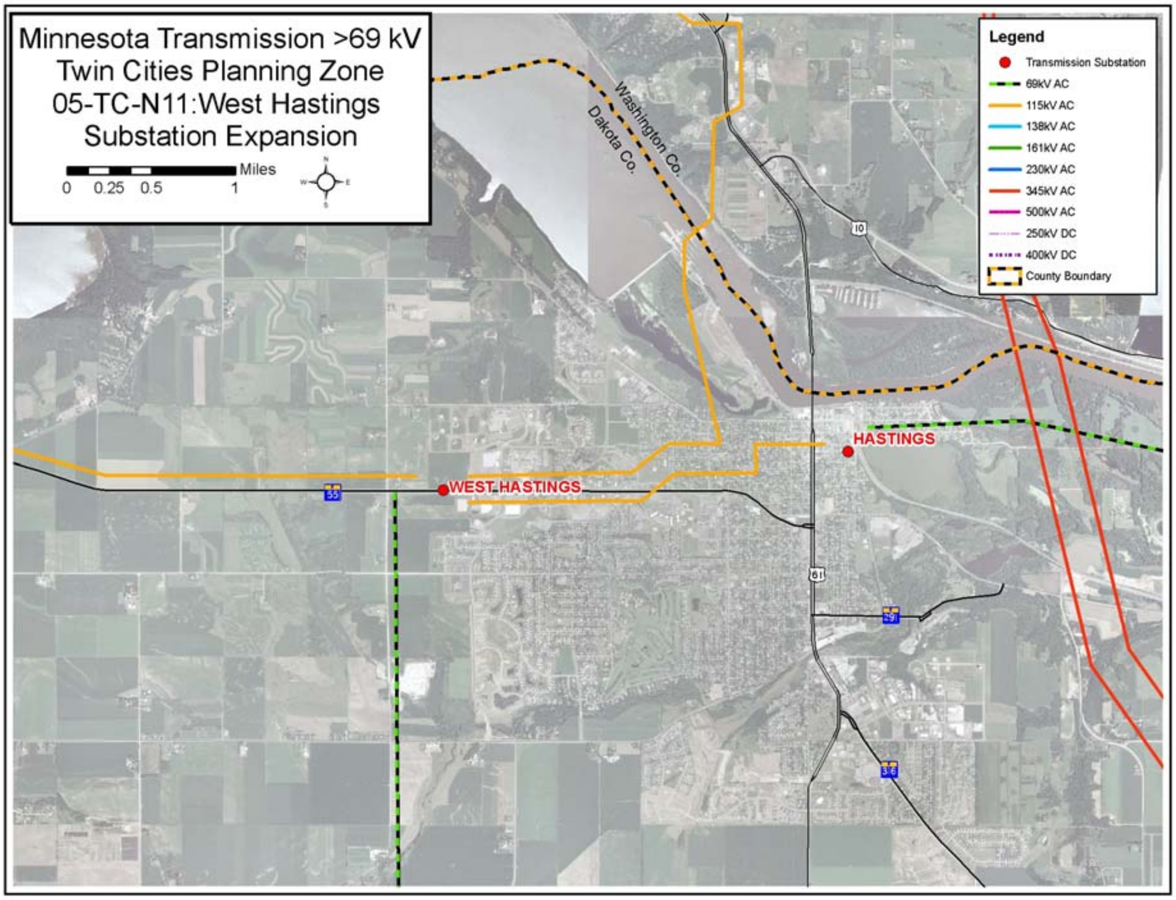
Inadequacy. West Hastings and Hastings substations are located in the southeastern part of the Twin Cities. The area is experiencing load growth and the transformers at the existing Hastings substation need to be relieved of some of their load.

A map of the area is shown on the following page.

Alternatives. Only one alternative was identified and that is to add a new distribution substation at the West Hastings substation site.

Analysis. The Hastings substation is physically restricted from any further expansion and the 69 kV transmission system cannot reliably support any further load growth. The West Hastings substation does have room for expansion. There should be minimal issues associated with this project. Other alternatives would be more expensive and would involve more environmental and social impacts.

Schedule. The anticipated in service date for this project is 2006.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N11:West Hastings
Substation Expansion
Miles
0 0.25 0.5 1
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
Washington Co.
Dakota Co.
HASTINGS
WEST HASTINGS

8.5.25 Dakota County Generation

Tracking Number: 2005-TC-N12

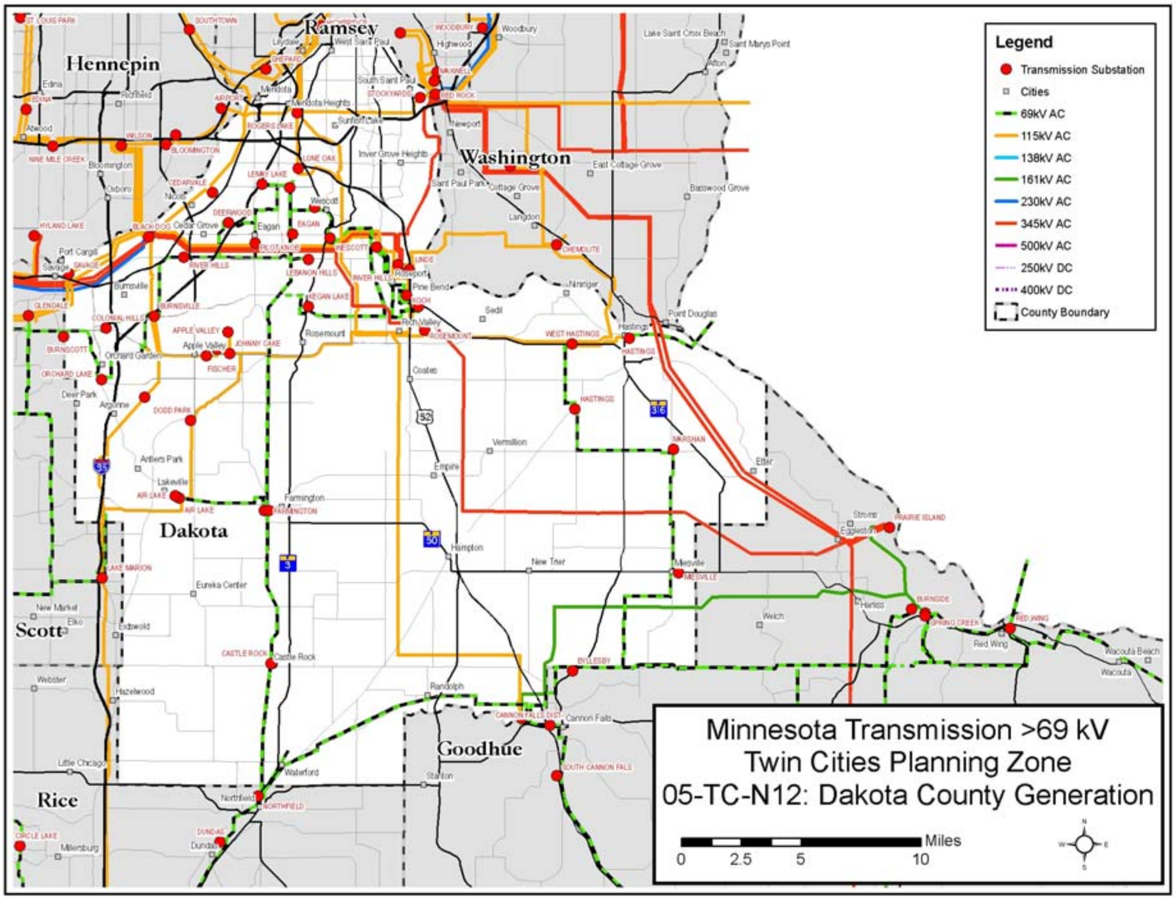
Inadequacy. MISO has two-200 MW generators in their Generation Interconnection Queue.

A map of the area is shown on the following page.

Alternatives. The Interconnection Evaluation Study showed that the most likely interconnection option involved a new 345 kV line. An alternative interconnection option involved a new 115 kV generation substation with a 115 kV transmission line to the Rosemount Substation and several other line rebuilds or upgrades.

Analysis. The proposed generation facility is to be located in Dakota County, Minnesota, just south and east of the Xcel Energy Rosemount Substation. The plant site is in Xcel Energy's transmission control area, however the transmission facilities that are in close proximity to the proposed site are owned by GRE and Xcel Energy.

Schedule. The schedule depends on the generator owner.


Minnesota Transmission >69 kV
Twin Cities Planning Zone
05-TC-N12: Dakota County Generation
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
Miles
0
2.5
5
10
Hennepin
Ramsey
Washington
Dakota
Scott
Rice
Goodhue

8.5.26 CapX 2020 Vision Plan

Buffalo Ridge - Metro 345 kV

Tracking Number: 2005-CX-1

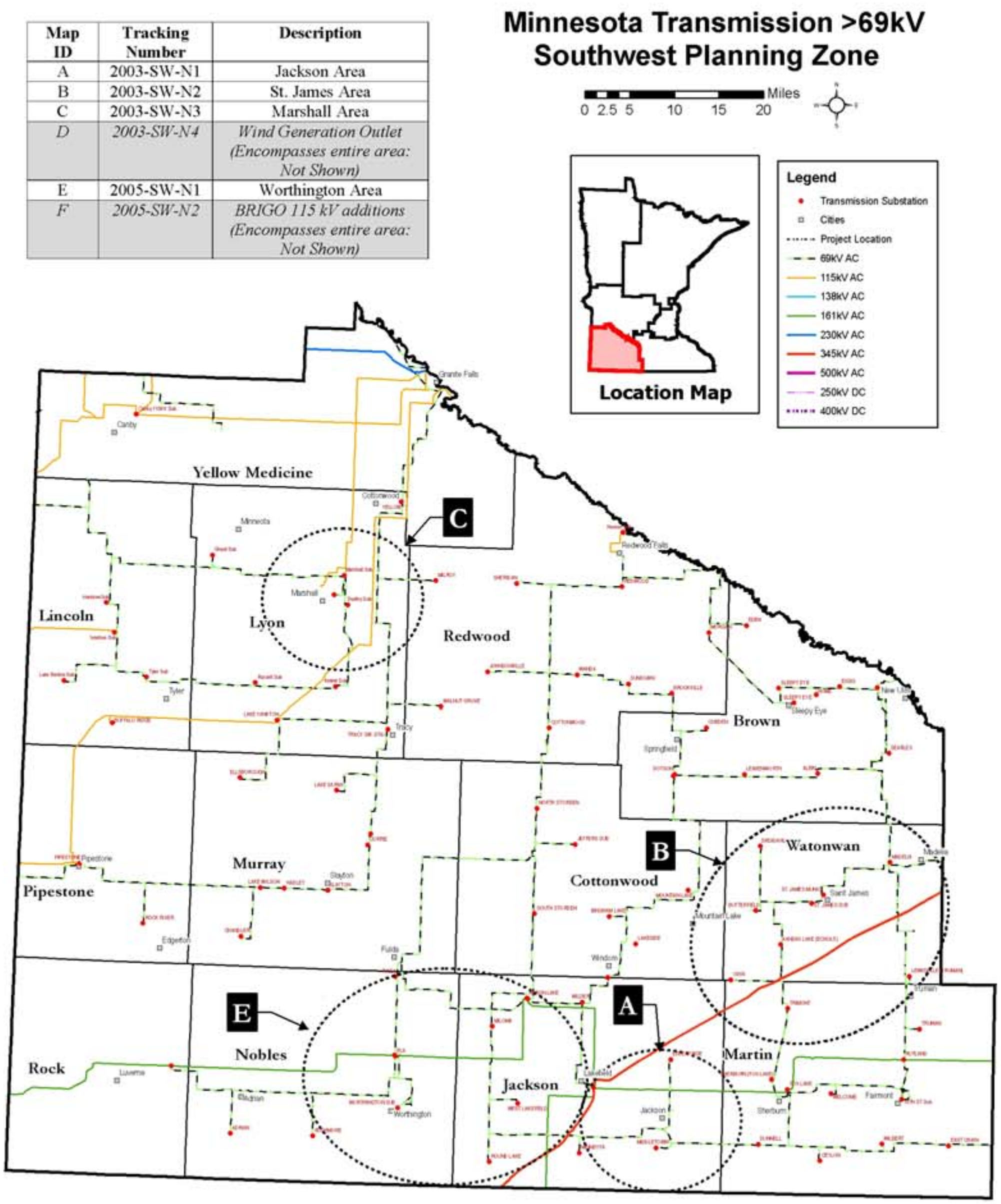
Discussion. The CapX 2020 Vision Plan is discussed in detail in Section 6. As part of the CapX work, a 345 kV line from Buffalo Ridge to the Twin Cities metropolitan area is being proposed. See Section 6 for discussion about that proposed transmission line.

8.6 Southwest Zone

The following table provides a list of transmission needs identified in the Southwest Zone and the map on the following page shows the location of each item in the table:

Southwest Zone				
Tracking Number	Description	Projected In-Service Year	Need Driver	Section No.
2003-SW-N1	Jackson Area	2006	Jackson low voltage	8.6.1
2003-SW-N2	St. James Area	2009	St. James low voltage	8.6.2
2003-SW-N3	Marshall Area	2010	Marshall low voltage	8.6.3
2003-SW-N4	Wind Generation Outlet	2007	825 MW wind generation	8.6.4
	Canby Area (referenced in 2004 Compliance Filing: Exhibit No.1) (2005 Report: See WC Zone Section: 2003-WC-N10: Appleton-Canby Area)		Not applicable to this zone	8.6.5
2005-SW-N1	Worthington Area	2007	Reliability; Line overloads	8.6.6
2005-SW-N2	BRIGO 115 kV additions		Wind outlet	8.6.7
2005-CX-1	CapX 2020 Vision Plan Buffalo Ridge – Metro 345 kV			8.6.8

Map ID	Tracking Number	Description
A	2003-SW-N1	Jackson Area
B	2003-SW-N2	St. James Area
C	2003-SW-N3	Marshall Area
D	*2003-SW-N4*	*Wind Generation Outlet (Encompasses entire area: Not Shown)*
E	2005-SW-N1	Worthington Area
F	*2005-SW-N2*	*BRIGO 115 kV additions (Encompasses entire area: Not Shown)*



8.6.1 Jackson Area

Tracking Number: 2003-SW-N1

Inadequacy. This area is served by a 69 kV transmission system with sources at Fox Lake and Heron Lake. Some of these transmission lines have very low thermal ratings, resulting in voltage violations even with the system intact. During contingency situations, thermal overloads would occur and the voltages would fall off even more.

Alternatives. Four alternatives to the Jackson area load serving situation were identified in the 2003 Report, all of which involved tapping into either an existing 161 kV line between Lakefield Junction and Fox Lake or tapping into a second new 161 kV line to be built by Xcel Energy as part of Xcel Energy's efforts to increase the wind generation outlet capability. Each alternative would bring a new transmission source into the Jackson area, resulting in two 69 kV sources to the Jackson area. Each would involve construction of a new substation in the Jackson proximity. The four alternatives are:

Alternative 1: Tap the new 161 kV line and run a new 69 kV line from the Lakefield Junction substation to the new Jackson substation.

Alternative 2: Tap the existing 161 kV line and run a new 69 kV line from the Lakefield Junction substation to the new Jackson substation.

Alternative 3: Tap the new 161 kV line and install two 161/69 kV transformers at the new Jackson substation instead of running a new 69 kV line to Jackson.

Alternative 4: Tap the existing line and install two transformers at the new Jackson substation instead of running a new 69 kV line to Jackson.

In September, 2004, the Minnesota Environmental Quality Board issued a route permit to Xcel Energy for the new 161 kV line between Lakefield Junction and Fox Lake, and the approved route was a route through the City of Jackson, making the new line much closer to the affected area than the existing line north of the City. Therefore, a fifth alternative has been identified:

Alternative 5: Connect the City of Jackson load directly to the new 161 kV line running through the city and remove Jackson from the 69 kV system.

Analysis. The analysis of the first four alternatives described above was included in the 2003 Report. The costs for the alternatives ranged from about $5 million to $12 million. It was not possible to select the best alternative at that time because the route for the new 161 kV line had not been selected. Now that the route for the new 161 kV line has been established through the city of Jackson, it appears that a less expensive, short-term solution is Alternative 5. Removal of the Jackson municipal load from the 69 kV transmission system will delay the need for an additional 69 kV source into the GRE system for five to seven years. The 161 kV source will provide a strong energy foundation for the addition of new loads within the municipal service area. Additionally, several of the 69 kV transmission lines have been re-surveyed and with minor modifications, have been found to be capable of operating at higher ratings, allowing more power to be transported into the area.

Schedule. The new 161 kV line between Lakefield Junction and Fox Lake is under construction and scheduled to be placed in service in April, 2006. The city of Jackson load is presently scheduled to be converted to 161 kV in the fall of 2006. The existing 69 kV line upgrades are complete.

8.6.2 St. James Area

Tracking Number: 2003-SW-N2

Inadequacy. The St. James area is characterized by a relatively large municipal load located a long distance (electrically) from the 69 kV lines that serve the area. A map of the St. James area is shown below. There are two concerns: (1) low voltages, even with the system intact, and (2) line overloads beginning in 2006, which are exacerbated in contingency situations.

A map of the area is shown on the following page.

Alternatives. Two long-term alternatives were identified in the 2003 Report. Both involved tapping into the 345 kV line from the Lakefield Junction generating plant to the Wilmarth substation in Mankato and building new 115 kV lines into the St. James area.

Several different alternatives have since been identified.

Alternative 3: A new 115 kV line from Fieldon Township to Madelia switching station.

Alternative 4: A new 115 kV line from the Lakefield Junction generating station to Watonwan Junction substation.

Alternative 5: A new 115 kV line from Nobles substation to Watonwan Junction.

Alternative 6: A new 115 kV line from Fieldon Township to Watonwan Junction.

Alternative 7: A new 115 kV line from Fox Lake substation to Watonwan Junction.

Alternative 8: A new 115 kV line from Ft. Ridgely to Watonwan Junction.

Alternative 9: Rebuild the existing 69 kV line from Watonwan Junction to St. James to Madelia to Wilmarth using a higher rated conductor.

Alternative 10: Install distributed generation in the St. James area.

Alternative 11: A new 115 kV line from Wilmarth to Madelia Switching Station.

Analysis. While the 2003 *Southwest Minnesota Load Serving Study* identified several long-term problems with load serving in the St. James area, leading to the selection of the above options, several system changes have been implemented recently and several others are planned that must be evaluated before an appropriate option can be recommended. The utilities began a study of the situation in 2005 to reevaluate the 2003 study and to account for these system changes. Preliminary results indicate that while a long-term solution will ultimately be required, these changes have delayed the need for a long-term solution in the area until the 2009 timeframe.

The following changes have been implemented or are planned:

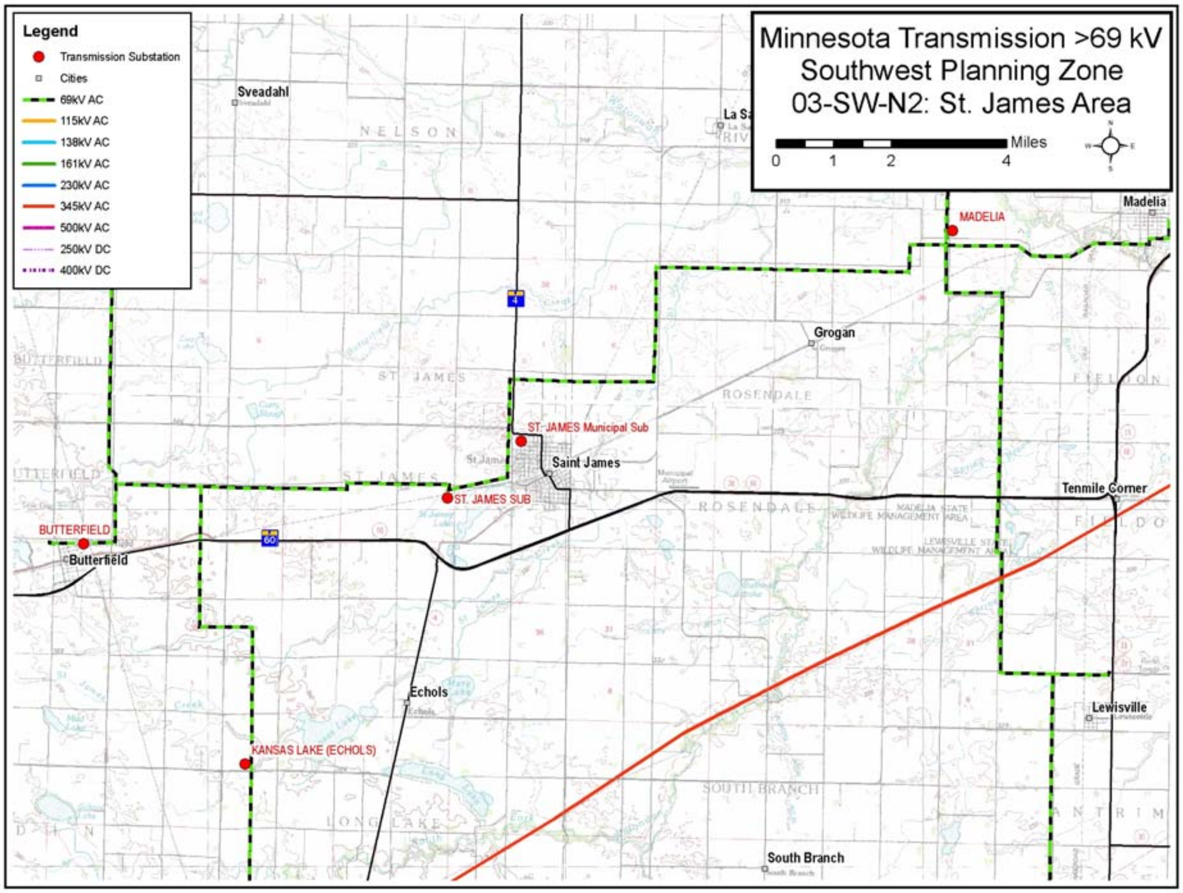
The Watonwan Switching Station was placed into service in September 2005. The Switching Station has a capacitor bank that helps mitigate low voltage problems. In April 2005 the operation of the St. James system was changed by opening the St. James East circuit and closing the St. James West circuit, which makes St. James less susceptible to low voltage under certain contingencies.

In 2006, the St. James West circuit will also be closed to further protect St. James form contingency low voltages.

Long-term solutions in the St. James area are still being studied and will be affected by other transmission decisions that are made to increase outlet capacity from Buffalo Ridge and southwest Minnesota. A 115 kV line into St. James will still be required. Considering the work that has been done by the utilities in the Southwest Minnesota --> Twin Cities EHV Study and the CapX 2020 Vision Plan, the utilities have determined that Alternatives 3, 5, 6, and 8 are not prudent. The 115 kV options involving Nobles substation (Alternative 5) and Fort Ridgely substation (Alternative 8) do not provide good voltage support for the area. The 115 kV options from Fieldon Township (Alternatives 3 and 6) present technical complications with accommodating both the line and the 345 kV series capacitor at the site.

The environmental impacts and the costs for the long-term alternatives have not yet been completed.

Schedule. This area is presently being restudied. The study should be completed by the end of 2005. A Certificate of Need for a new 115 kV line or lines will be filed before the end of 2006.


Minnesota Transmission >69 kV
Southwest Planning Zone
03-SW-N2: St. James Area
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Miles
0 1 2 4
MADELIA
ST. JAMES Municipal Sub
ST. JAMES SUB
BUTTERFIELD
KANSAS LAKE (ECHOLS)
Sveadahl
Madelia
Grogan
Saint James
Tenmile Corner
Butterfield
Echols
Lewisville
South Branch

8.6.3 Marshall Area

Tracking Number: 2003-SW-N3

Inadequacy. Marshall Municipal Utilities ("MMU") owns and operates a 115 kV loop around the City of Marshall for load serving. There are two existing sources serving Marshall – one from the Lyon County substation and the other from the Granite Falls substation. Both of these 115 kV lines are relatively close together. One storm event could possibly take out both lines.

Even under normal conditions, MMU has experienced operating conditions that have been less than ideal over the past several years. These operating conditions have ranged from dynamic voltage dips due to transmission switching on the Buffalo Ridge, to low voltage due to the outage of one of the 115 kV lines into Marshall, to overload conditions under other contingencies. Typically, MMU internal voltage regulation has been able to adjust for these situations, however, the situation is becoming more critical as load grows. Some of these operating issues have caused retail load customers within MMU to drop load.

A map of the area is shown on the following page.

Alternatives. Three system alternatives were identified in a study performed by Missouri River Energy Services. Each alternative involves the addition of a new 115 kV line tied into the existing MMU transmission loop with the goal of improving the voltages in Marshall during contingencies. Each of the options would likely terminate in a new Southwest Substation that MMU is building for load serving purposes.

Alternative 1: New Ivanhoe to Marshall 115 kV line and reconductor the existing Marshall to Lyon County line. This line would be approximately 25 miles in length and would terminate at the East River Electric Power Cooperative Ivanhoe Substation on one end and a new MMU Southwest Substation on the other.

Alternative 2: New Lake Yankton to Marshall 115 kV line and reconductor the existing Marshall to Lyon County line. This line would be approximately 16 miles in length and would terminate at the Xcel Energy Lake Yankton Substation on one end and a new MMU Southwest Substation on the other.

Alternative 3: New Lyon County to Marshall 115 kV line. This line would be between three and fourteen miles in length, depending on the termination points, and would be a second line between Marshall and Lyon County. The 14-mile option would terminate at the Xcel Energy Lyon County substation on one end and the new MMU Southwest substation at the other. Shorter routes are possible, but the terminations would not be in substations with breakers and other such equipment, but would rather include the use of three-way switches which would greatly reduce reliability and increases exposure to outages.

Analysis. Each of the three options performed similarly in the study and all addressed the deficiencies at Marshall. Alternatives 1 and 2 would both require some reconductoring of the existing Marshall 115 kV lines as more wind is added to the Ridge. The additional facilities that would require reconductoring will be identified in future wind interconnection and delivery studies. Alternatives 1 and 2 give better source diversity for Marshall and limit the exposure to a single event taking out multiple sources than does Alternative 3.

Below is a table showing the estimated costs for each alternative. The main difference in the alternative costs is the length of the new line as each alternative assumes similar terminal work would be needed in the substations to connect the lines.

Alternative	Description	Base Cost
1	Marshall to Ivanhoe	$10,400.000
2	Marshall to Lake Yankton (1)	$7,400,000
3	Marshall to Lyon County (2)	$6,100,000

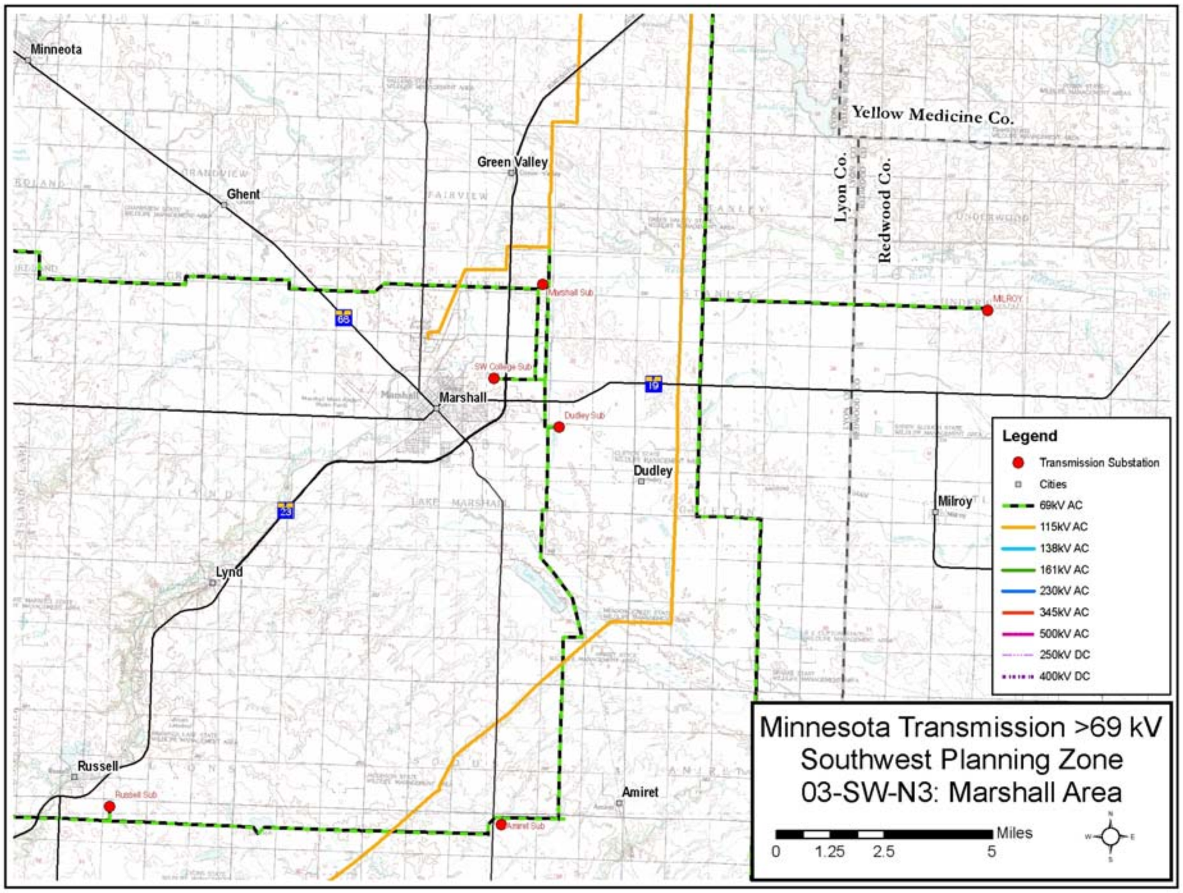
Alternative 1: Includes $1M for reconductoring MMU to Lyon Co.

Alternative 2: This alternative could be completed for less, if a shorter route and three-way switches are used.

Also related to the Marshall area, Xcel Energy has recently completed the BRIGO study (discussed in Section 4.5.3), which looked at the need for more wind outlet. The recommendation of that study included a 115 kV line from Lake Yankton to Marshall to assist in wind outlet as well as fix the load serving issues at Marshall. By fixing the load serving issues at Marshall, commercial customers in Marshall are at less risk of lost product due to voltage fluctuations which have happened in the past.

Schedule. Due to the results of the Xcel Energy BRIGO study, it is likely that a 115 kV line between Lake Yankton and the new Marshall Southwest Substation (Alternative 2) will be pursued. All of the options involve a 115 kV line in excess of ten miles so a Certificate of Need will be required for construction of any of the lines and for the new substation. A Certificate of Need is likely to be applied for in 2006.

If it is determined that load growth is greater than anticipated and a new line is needed before Alternative 2 can be built, one of the shorter Alternative 3 options should be pursued as it is assumed that this could be put into service much quicker.


Minneota
Yellow Medicine Co.
Green Valley
Ghent
Lyon Co.
Redwood Co.
Marshall Sub
MILROY
SW College Sub
Marshall
Dudley Sub
Dudley
Milroy
Lynd
Russell
Russell Sub
Amiret
Amiret Sub
Legend
Transmission Substation
Cities
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Minnesota Transmission >69 kV
Southwest Planning Zone
03-SW-N3: Marshall Area
Miles
0
1.25
2.5
5

8.6.4 Wind Generation Outlet

Tracking Number: 2003-SW-N4

Inadequacy. The 2003 Report described a need for additional transmission infrastructure to provide outlet capacity for 825 MW of wind energy off Buffalo Ridge.

Implementation.. Xcel Energy has route permits from the Environmental Quality Board for four new lines:

1. 161 kV line from the Lakefield Junction substation to the Fox Lake substation – EQB Docket No. 03-64-TR-Xcel.

2. 345 kV line from the Split Rock substation in South Dakota to the Lakefield Junction substation – EQB Docket No. 03-73-TR-Xcel.

3. 115 kV line from a new Nobles County substation to the Chanarambie substation – EQB Docket No. 03-73-TR-Xcel.

4. 115 kV line from the Buffalo substation to the White substation in South Dakota – EQB Docket No. 04-84-TR-Xcel.

Further information about these transmission lines is available at:

http://energyfacilities.puc.state.mn.us/

Schedule. The 161 kV line from Lakefield Junction to Fox Lake is expected to be placed in service in April 2006. The other three lines will be completed in 2007.

8.6.5 Canby Area

(See West Central Zone Section 8.4.10 – 2003-WC-N10: Appleton-Canby Area)

8.6.6 Worthington Area

Tracking Number: 2005-SW-N1

Inadequacy. Worthington is located in southwestern Minnesota, about 42 miles from the South Dakota – Minnesota border. The city is served from the Elk 161/69 substation north of the city. During an outage of either of two transformers at the Elk substation, or of the 161 kV lines leading to the Elk substation, switching can be performed to serve Worthinton from a 69 kV system through Fulda, but low voltage has been observed when that occurs. Moreover, the summer peak load in Worthington has been growing and is expected to continue to grow, which will exacerbate the situation.

A map of the area is shown on the following page.

Alternatives. The system has not been studied in enough detail to identify specific alternatives for addressing the concern, but some possible transmission solutions have been identified by the local utilities and the Midwest ISO as worthy of further study. These conceptual solutions are:

Alternative 1: Build new transmission lines from Xcel Energy's planned Nobles County substation to Worthington. (The Nobles County substation is scheduled to be on line in July of 2007).

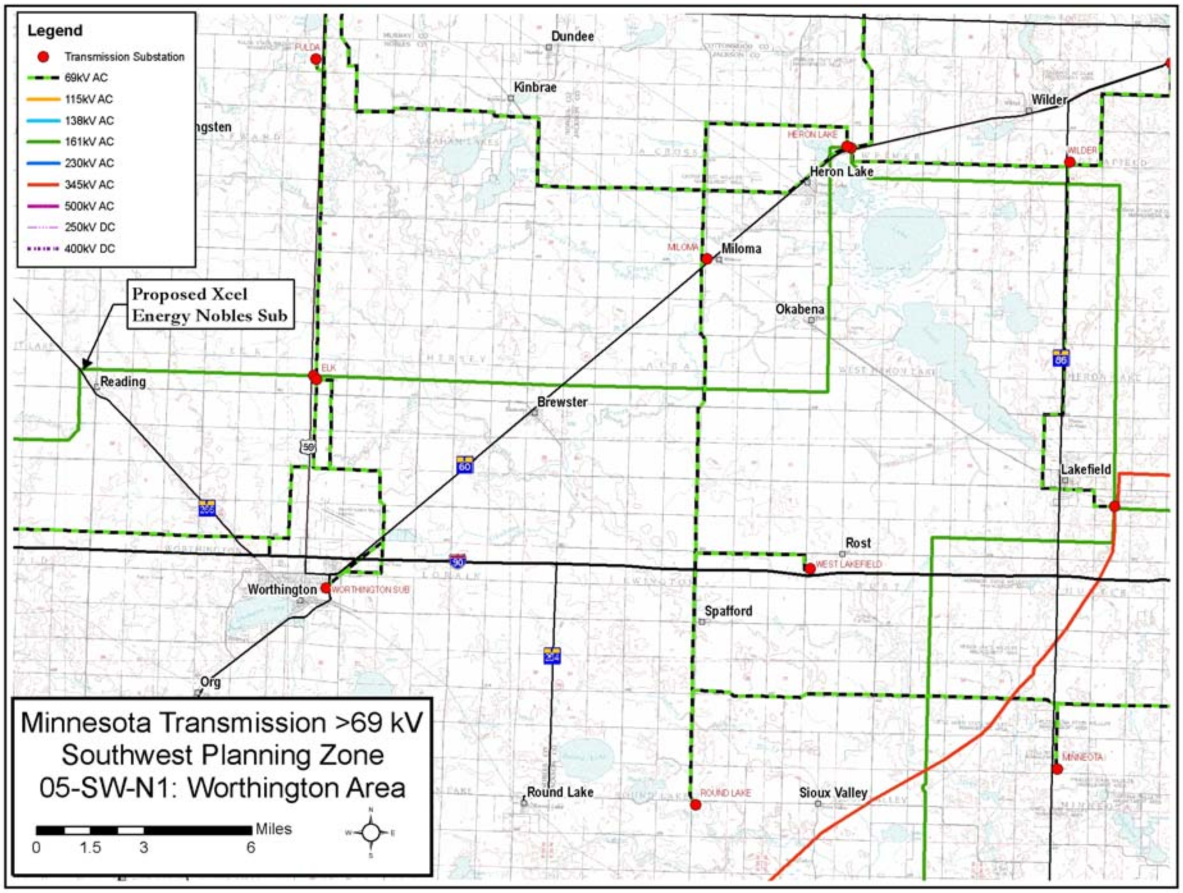
Alternative 2: Build new 161 or 69 kV connections to the Lakefield Jct. 161/69 substation.

Alternative 3: Reinforce the existing connections to the 161/69 system in the Elk and Brewster area (north of Worthington).

Common to all alternatives will be the concept of creating a loop around the city. System voltage of such a loop could be either 161 kV, 115 kV or 69 kV. There may be various combinations of alternatives that could be pursued as well.

Analysis. A load serving study will be done to identify potential problems with staying with the existing system and looking at what system enhancements can help solve any problems there might be. The goal is to ensure N-1 reliability for Worthington load. This will provide a good energy foundation for the addition of new loads in the municipal service area, enhancing their ability to locate new businesses.

Schedule. The Worthington load serving study is currently scheduled for completion in the winter of 2006. All activities will be coordinated with regional utilities, the Midwest ISO, and the Northern MAPP sub-regional planning group.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Proposed Xcel Energy Nobles Sub
Minnesota Transmission >69 kV
Southwest Planning Zone
05-SW-N1: Worthington Area
Miles
0 1.5 3 6
Dundee
Kinbrae
Wilder
Heron Lake
Miloma
Okabena
Reading
Brewster
Lakefield
Rost
Worthington
Spafford
Org
Round Lake
Sioux Valley

8.6.7 BRIGO 115 kV Additions

Tracking Number: 2005-SW-N2

Inadequacy. Xcel Energy is in the process of installing four new transmission lines in Southwestern Minnesota. See Tracking Number 2003-SW-N4. These new transmission lines, along with certain other upgrades, will provide outlet capacity for 825 MW of wind. Continued development of wind generation on Buffalo Ridge will require additional major transmission facilities to enable reliable and efficient transport of large blocks of power to load centers in the east. See the CapX 2020 discussion in Section 6.

However, there is a need to determine what smaller scale, localized improvements might be made to provide additional outlet capacity for smaller increments of wind.

Alternatives. In the recently completed *Buffalo Ridge Incremental Generation Outlet (BRIGO) Study*, the following alternatives were identified:

Alternative 1: "Nobles Co-Chanarambie 115 kV."

This option establishes a second Nobles Co-Chanarambie 115 kV line and installs a second 345/115 kV transformer at the Nobles Co Substation.

Alternative 1A: "Nobles Co-Fenton 115 kV."

This option establishes a second Nobles Co-Fenton 115 kV line and installs a second 345/115 kV transformer at the Nobles Co Substation.

Alternative 2: "Lyon Co-Minn Valley 115 kV."

This option establishes a second 115 kV line from the Lyon Co Sub to Minn Valley. This is achieved by rebuilding the existing Lyon Co-Yellow Medicine-Minn Valley 69 kV line at 115 kV.

Alternative 3: "Lake Yankton-Marshall 115 kV."

This option establishes a new Lake Yankton-Marshall SW 115 kV line. Marshall SW is a new 115 kV substation proposed to be added in southwest Marshall by Marshall Municipal to address future distribution system supply needs. It is envisioned to be connected to an extension of the existing Marshall 115 kV loop between the existing Saratoga and Southeast substations.

Alternative 4: "Lyon Co-Franklin 115 kV."

This option establishes a new outlet line from the Marshall area eastward to the Redwood Falls/New Ulm vicinity by constructing a new Lyon Co-Franklin 115 kV circuit. All but eight miles of this 44-mile route would consist of a rebuild of an existing 69 kV to 115 kV or double-circuit 115/69 kV configuration.

Alternative 5: "Chanarambie-Watonwan Jct 115 kV."

This option constructs a new Chanarambie-Watonwan Jct 115 kV line. This development presumes the Lakefield-Watonwan Jct 115 kV line (presently proposed for 2007 in service) has already been installed for load-serving purposes. If not already installed, it would need to be added (at additional cost) to this option's facilities.

Alternative 6: "Yankee-White-Toronto 115 kV."

This option upgrades establishes a second Yankee-White 115 kV line, and adds a White-Toronto 115 kV line.

Alternative 7: "Yankee-Lyon Co 115 kV."

This option establishes a new Yankee-Marshall SW-Lyon Co 115 kV line.

Alternative 8: "Yankee-Lyon Co-Franklin 115 kV."

This option establishes a new Yankee-Marshall SW-Lyon Co-Franklin 115 kV line.

Alternative 9: "Reconductors only."

This option upgrades all existing facilities as necessary to alleviate overload conditions. This tactic consists of reconductoring any overloaded lines and addressing any transformer overloads by replacement with a higher-capacity unit, or installation of an additional unit.

Some 69 kV lines may also have to be rebuilt and some switching facilities may have to be replaced.

In addition, in order to alleviate a constraint in the east Nebraska area, a capacitor addition to the Wilmarth-Lakefield 345 kV line is necessary to shift additional flows from the constraint area.

Analysis. The BRIGO Study contains the analysis of the alternatives that have been identified. The BRIGO Study concludes that the best alternative is a combination of Alternatives 1A and 3, referred to in the Study as Alternative 31A. This alternative involves construction of the following facilities to provide an outlet for an additional 400 MW of power beyond the initial 825 MW.

- Nobles Co-Fenton 115 kV line #2 line.
- Nobles Co 345/115 transformer #2.
- Lake Yankton-Marshall SW 115 kV line.
- Shunt capacitors at Panther, Lake Yankton, and Winnebago Jct.

The plan also includes some 69 kV rebuilds and replacement of some switches.

Option 31A appears to offer the best overall results with respect to:

- power system performance (system intact & contingent loadings & voltages)
- power and energy losses (MW and MWh)

- practicality (logistics of construction and operation)
- price (cumulative present worth cost)

This BRIGO Study further identified that it may also be advantageous to add the Alternative No. 6 facilities (Yankee-White 115 kV line #2 and White-Toronto 115 kV line), particularly if more than 400 MW of incremental outlet were desired. These facilities create additional Buffalo Ridge outlet capability, and also

- effectively address the Yankee voltage stability limitation;
- yield a beneficial reduction in power system losses;
- "open up" more of the northern portion of the Buffalo Ridge to generation development;
- provide some incidental load-serving benefit to the Toronto/Hetland Jct area; and
- reduce Buffalo Ridge area generation power injection into the Western Area Power Administration 345 kV system.

If the Alternative No. 6 facilities are not implemented, a separate "Yankee fix" is needed if the total demand for Yankee generation outlet exceeds approximately 250 MW.

The BRIGO Study was performed before the results of the CAPX 2020 Vision Plan were known. With the Vision Plan identifying the need for a 345 kV line passing through the Buffalo Ridge area, a detailed design study was initiated to integrate that vision into a detailed transmission proposal for the Buffalo Ridge area. This study is presently under way and will incorporate the results of the BRIGO Study and CapX Vision Plan.

Schedule. The utilities anticipate that a Certificate of Need application for a 345 kV line and several 115 kV lines will be submitted to the Public Utilities Commission in 2006.

8.6.8 CapX 2020 Vision Plan

Buffalo Ridge - Metro 345 kV

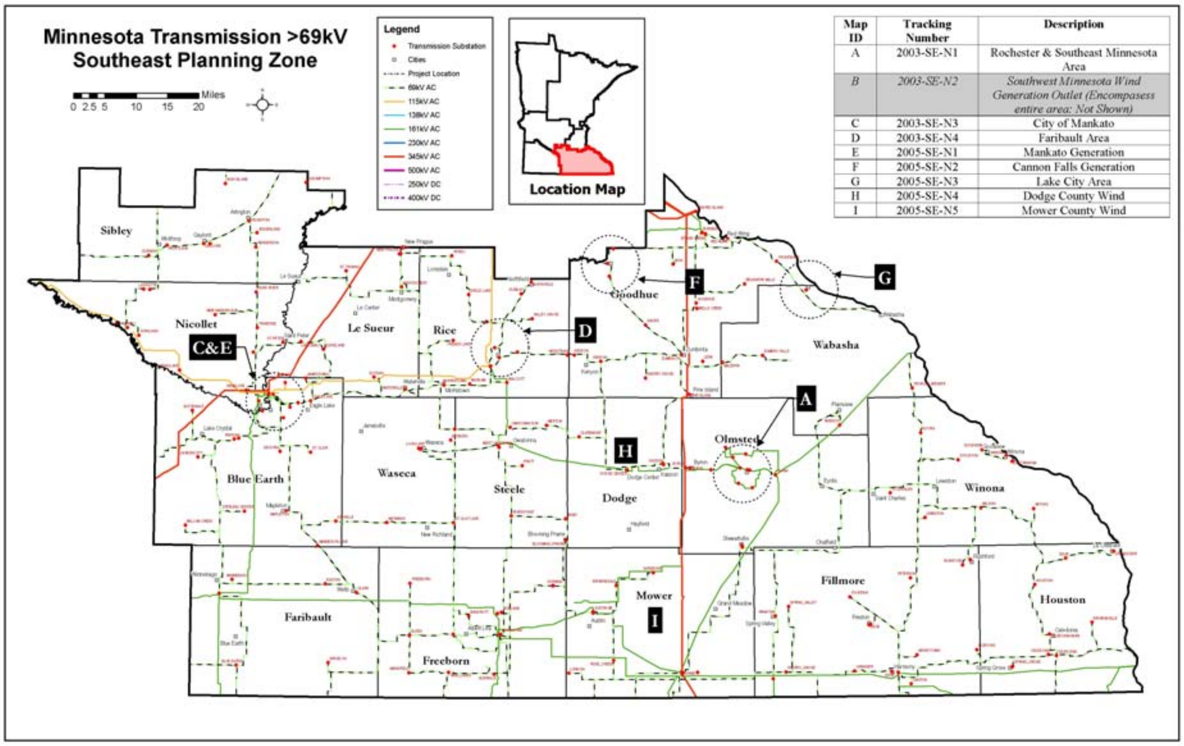
Tracking Number: 2005-CX-1

Discussion. The CapX 2020 Vision Plan is discussed in detail in Section 6. As part of the CapX work, a 345 kV line from Buffalo Ridge to the Twin Cities metropolitan area is being proposed. See Section 6 for discussion about that proposed transmission line.

8.7 Southeast Zone

The following table provides a list of transmission needs identified in the Southeast Zone and the map on the following page shows the location of each item in the table:

Southeast Zone				
Tracking Number	**Description**	**Projected In-Service Year**	**Need Driver**	**Section No**
2003-SE-N1	Rochester & Southeast Minnesota Areas (Rochester Area in 2003 report); includes Rochester load serving study and Rochester new transmission tie	2011	Load serving in Rochester and the Greater La Crosse Area	8.7.1
2003-SE-N2	Southwest Minnesota Wind Generation Outlet	2007	Wind generation outlet	8.7.2
2003-SE-N3	City of Mankato	2006	Load serving issues; low voltage, line overloads, transformer overloads	8.7.3
2003-SE-N4	Faribault Area	2006	Generation outlet	8.7.4
2005-SE-N1	Mankato Generation	2006	Generation outlet	8.7.5
2005-SE-N2	Cannon Falls Generation	2008	Generation outlet	8.7.6
2005-SE-N3	Lake City Area	2008	Load serving; low voltages	8.7.7
2005-SE-N4	Dodge County Wind	To be Determined	Generation outlet	8.7.8
2005-SE-N5	Mower County Wind		Generation outlet	8.7.9
2005-CX-1	CapX 2020 Vision Plan Prairie Island – Rochester – La Crosse 345 kV			8.7.10


Minnesota Transmission >69kV
Southeast Planning Zone
Miles
0 2.5 5 10 15 20
Legend
Transmission Substation
Cities
Project Location
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Location Map
Map ID | Tracking Number | Description
A | 2003-SE-N1 | Rochester & Southeast Minnesota Area
B | 2003-SE-N2 | Southwest Minnesota Wind Generation Outlet (Encompasess entire area: Not Shown)
C | 2003-SE-N3 | City of Mankato
D | 2003-SE-N4 | Faribault Area
E | 2005-SE-N1 | Mankato Generation
F | 2005-SE-N2 | Cannon Falls Generation
G | 2005-SE-N3 | Lake City Area
H | 2005-SE-N4 | Dodge County Wind
I | 2005-SE-N5 | Mower County Wind
Sibley
Nicollet
C&E
Le Sueur
Rice
D
Goodhue
F
G
Wabasha
A
Olmsted
H
Blue Earth
Waseca
Steele
Dodge
Winona
Fillmore
Houston
Mower
I
Faribault
Freeborn

8.7.1 Rochester and Southeast Minnesota Areas

Tracking Number: 2003-SE-N1

Inadequacy. Five different issues have been identified that require attention in the southeast Minnesota area. These include:

1. *Rochester load.* The loss of the Byron-Maple Leaf 161 kV line would limit the input into the Rochester area to about 160 MW, when the summer peak demand is 300 MW. And load growth is projected to require even more power in the area.

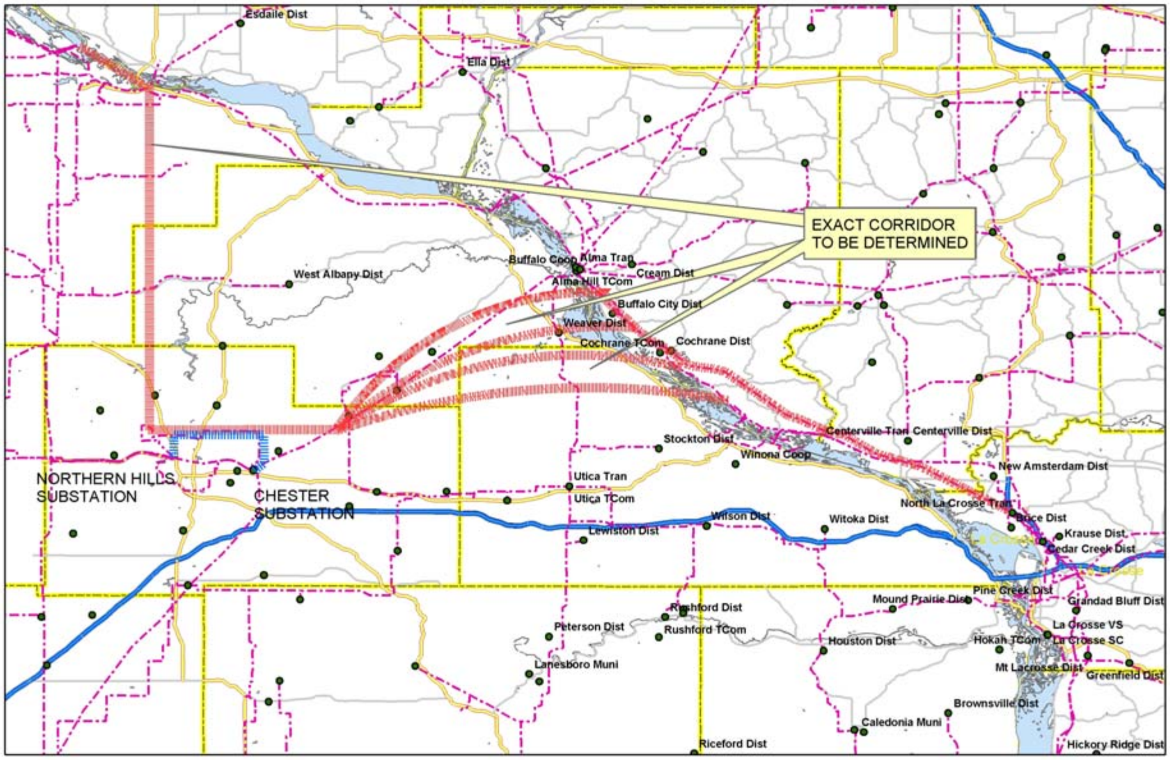
2. *Transfer limit.* The capacity of the Byron-Maple Leaf 161 kV line is a limiting factor in setting the available transfer capability for Minnesota to Wisconsin transfers.

3. *Load serving the greater La Crosse area*. The Greater La Crosse Area, electrically, includes Winona, La Crescent, and Caledonia as well as a significant area surrounding La Crosse on the Wisconsin side of the Mississippi. The loss of the Genoa-La Crosse-Marshland 161 kV line creates an overload on the Genoa-Coulee 161 kV line. This overload is exacerbated by an outage of the generator at the Alma site.

4. *Serving regional baseload*. Over the past several summers the utilities in southeast Minnesota have had difficulty obtaining transmission services under the MISO Open Access Transmission Tariff to deliver firm generation purchases from outside the area to serve regional base load. Higher priced natural gas peaking units were run to supplement the loss of the purchased energy. Likewise, utilities in southeast Minnesota were at times unable to sell excess generation to utilities outside the area due to the same transmission limitations. Congestion of this type is expected to escalate in both magnitude and frequency.

5. *CapX 2020 Vision Plan*. In order to serve projected new load in Minnesota, major additions to the 345 kV system in the state are required with access to regions outside of Minnesota. One of the vision projects identified is the need for a 345 kV line from the south side of the Twin Cities to eastern Wisconsin. For further discussion about CapX see Section 6.

A map of the area is shown on the following page.



Alternatives. Although the local load serving issues could be addressed with shorter term 161 kV developments, the utilities have elected to pursue long term 345 kV solutions that will not only address the local issues but will enhance the regional transmission capabilities as well. This approach is enhanced by the identification of the need for a 345 kV line south and east from the Twin Cities in the CAPX 2020 Vision Plan.

A number of 345 kV alternatives have been considered.

Alternative 1: New Prairie Island-Rochester-North La Crosse 345 kV Transmission Line

Inadequacies 1 through 4 can be eliminated with the addition of a new transmission tie into the Rochester Area and continuing on to the La Crosse area. This line could extend further into Wisconsin at a later date, which fits in with the CAPX 2020 Vision. The following is a list of the facilities on the Minnesota side of the Mississippi River required for this project:

Length (Mi)	Description
50	Prairie Island-Rochester 345 kV
100	Rochester-North La Crosse 345 kV
2	North Rochester-Northern Hills 161 kV
18	North Rochester-Chester 161 kV
N/A	North Rochester 345/161 kV Substation

Alternative 2: New Hampton- Rochester- North La Crosse 345 kV Transmission Line

Alternative 2 is similar to Alternative 1 except it terminates on the north end at Hampton rather than at Prairie Island, so the Hamption to Rochester stretch is 60 miles in length.

Alternative 3: New Prairie Island-Rochester-Salem 345 kV Transmission Line

This line is similar to Alternative 1 but it terminates on the south end at Salem and does not run to La Crosse.

Distributed generation is also an alternative that is being evaluated.

Analysis. The major study effort to date, *Southeastern Minnesota-Southwestern Wisconsin Reliability Enhancement Study*, is still in draft form. This study examined a wide range of solutions to the load serving needs of southeast Minnesota to include: traditional baseline generation, renewable generation, demand side management, 161 kV transmission, and 345 kV transmission.

There are limited corridor-sharing opportunities available for any line from Prairie Island to Rochester due to the hilly and wooded terrain. There are tribal lands, state parks and large expanses of state forest in this area that create siting issues. Siting issues around the Rochester area could be reduced by placing the 345 kV connection outside the more populated areas of the community. For the Rochester to La Crosse section of the project, there are more corridor sharing opportunities, including I-90. There will be significant siting issues associated with a crossing of the Mississippi River. Issues that will need to be addressed include avoiding the major population centers, terrain, Mississippi Flyway issues and wetland impacts. Significant agency consultation will be required to determine the crossing locations to propose.

Alternative 2 proposes a different terminus on the northern portion of the 345 kV line, near Hampton, Minnesota. This is in part to address the siting issues associated with tying the line into Prairie Island. For the Hampton to Rochester section of Alternative 2, the terrain is less hilly, and there are corridor-sharing opportunities, including Highway 52. Special consideration would need to be made for the area around Cannon Falls and other small communities.

Alternative 3 has similar siting issues but since it does not provide load serving relief to the La Crosse area (Winona, La Crescent, and Caledonia), additional transmission lines in either Minnesota or Wisconsin would be required. While the Mississippi River crossing would also be located in a different area, the siting issues would be similar.

Impacts of 345 kV transmission alternatives are usually considered to be greater than 161 kV alternatives. However, some 161 kV solutions would need to include additional generation in order to provide the power supply equivalent to the 345 kV solutions. Generation projects carry certain environmental consequences of their own.

Schedule. The utilities are studying in depth Alternatives 1 and 2. Alternative 3 will be dropped. The utilities expect to file a Certificate of Need application for a new 345 kV transmission line in 2006.

8.7.2 Southwest Minnesota Wind Generation Outlet

Tracking Number: 2003-SE-N2

Inadequacy. Even though the Buffalo Ridge area in southwestern Minnesota provides the best opportunities for development of renewable wind energy in the state, transmission upgrades are going to be necessary in southeastern Minnesota to enhance transfer of the wind power. In addition, some development of wind energy has occurred in southeastern Minnesota and additional development will continue in the future and certain transmission upgrades may be necessary for that development as well.

Alternatives. Two specific projects have been identified to enhance outlet for Buffalo Ridge wind power. One is a reconductor of 35 miles of a 115 KV line from the Summit substation near Mankato to West Faribault. The other is a rebuild of the 161 kV line from the Fox Lake substation to the Winnebago substation, about 34 miles.

Analysis. A number of studies have identified these two projects as necessary and appropriate.

Schedule. The Summit/West Faribault line has been reconductored except for less than ½ mile of underground replacement scheduled for 2006. The Fox Lake/Winnebago line will be rebuilt in 2007.

8.7.3 City of Mankato

Tracking Number: 2003-SE-N3

Inadequacy. The City of Mankato is supplied by the Wilmarth 345/115/69 kV substation on the north side of the city and a 69 kV transmission line loop around the city. Two separate transmission issues have been identified: (1) outage of the Wilmarth-Eastwood-Pohl Road tap results in an overload of the Rutland-Truman 69 kV line and low voltages in the Decoria area, and (2) the loss of any of the three 115/69 transformers at the Wilmarth substation results in the overloading of the remaining two.

A map of the area is shown on the following page.

Alternatives. There are two alternatives for the Wilmarth- Eastwood Pohl Road Tap outage.

Alternative 1: Build Pohl Road 69 kV Breaker station. This approach adds a breaker station at Pohl Road tap (now called Hungry Hollow) and a new source from Sibley Park by rebuilding the 69 kV line the from the new breaker station to the Ballard Corner tap to Sibley Park as a double circuit. This would allow the normally open tap to be closed. This has the added benefit of reducing the amount of line that would be affected at one time during an outage.

The double circuit would likely be built for 115 kV construction reflecting a vision of someday converting the Mankato 69 kV loop to 115 kV. However, this would occur well beyond the present planning horizon.

Alternative 2: Add a new 69 kV Circuit from Wilmarth. This option would rebuild the existing Wilmarth-Sibley Park 69 kV line as a double circuit. Again consideration would be given to constructing the new line at 115 kV since the long-term vision for the Mankato 69 kV loop is to upgrade to 115 kV.

Two alternatives have also been identified for the transformer overload at the Wilmarth substation.

Alternative 1: Convert the load to 115 kV. This option reduces the loading on the 115/69 kV transformers by reconnecting the Wilmarth distribution load to 115 kV and expanding the Summit substation. The Eastwood substation is also converted to 115 kV to remove a significant load from the 69 kV system.

Alternative 2: Upgrade the Wilmarth 115/69 kV transformers. This option calls for replacing the three 115/69 kV transformers at the Wilmarth substation with bigger units. This would require a rebuild of much of the 69 kV Wilmarth substation due to higher fault currents. This option is expected to be adequate until about 2009 when the transformer loading again becomes an issue.

Analysis. Certain environmental issues were identified in the 2003 Report and are not repeated here. There were no significant environmental constraints or differences in the various alternatives.

The installation of a breaker station at the Pohl Road tap provides more flexibility for future use than does construction of a second circuit. There are also concerns with the feasibility of the double circuit to Sibley Park in Alternative 2.

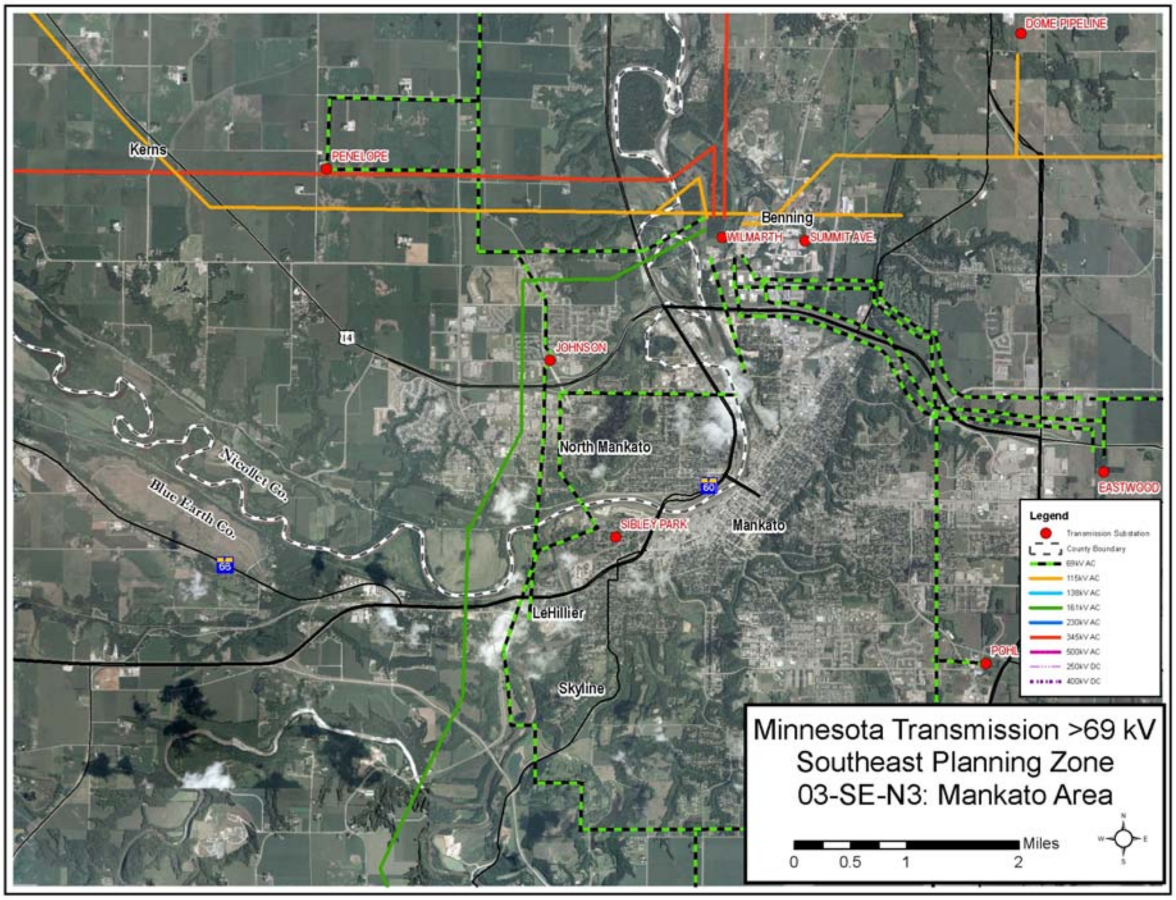
With regard to the transformer concern at the Wilmarth substation, converting the Wilmarth and Eastwood 69 kV loads to 115 kV was cheaper than the alternative and fits in with the vision that the Mankato 69 kV loop will be converted to 115kV.

More information about this project is available at:

http://energyfacilities/pus.state.mn.us/Docket.html?Id=17001

Schedule. A Route Permit application is before the Commission for the new double circuit 115 kV transmission line to Eastwood from the Summit to Loon 115 kV transmission line. This line has a planned in-service date of June 2006.

The new breaker station at Pohl Road (Hungry Hollow) was scheduled for completion in 2006, however, Mankato township has denied Great River Energy a conditional use permit to build the breaker station. GRE has investigated alternatives and the results still conclude that the Hungary Hollow breaker station is still the preferred alternative.


DOME PIPELINE
Kerns
PENELOPE
Benning
WILMARTH
SUMMIT AVE
JOHNSON
North Mankato
Nicollet Co.
Blue Earth Co.
EASTWOOD
SIBLEY PARK
Mankato
LeHillier
POHL
Skyline
Minnesota Transmission >69 kV
Southeast Planning Zone
03-SE-N3: Mankato Area
0 0.5 1 2 Miles

8.7.4 Faribault Area

Tracking Number: 2003-SE-N4

Inadequacy. A new 300 MW generating plant is under construction just north of the City of Faribault near the existing 115 kV line from Lake Marion to West Faribault. A 150 MW has already been connected to the transmission grid. Interconnection of this generation source creates or aggravates the following loading inadequacies of the following transmission facilities:

- 115/69 kV transformers at West Faribault
- Lake Marion – West Faribault 115 kV transmission line
- Fair Park – Northfield 69 kV transmission line
- Fair Park – Faribault 69 kV transmission line
- West Faribault to Faribault to Nerstrand 69 kV transmission line
- West Faribault to Fair Park 69 kV transmission line
- 115/69 kV transformer at Loon Lake

Alternatives. There are two options under investigation for providing the transmission outlet requirements for the new plant.

Alternative 1: Interconnect the generation with a new three-breaker station off the 115 kV line and rebuild the entire 23-mile Lake Marion – West Faribault 115 kV line. The following 69kV facilities will also have to be upgraded:

- Rebuild Fair Park – Northfield 69 kV transmission line
- Rebuild Fair Park – Faribault 69 kV transmission line
- Rebuild West Faribault to Faribault 69 kV transmission line to double 69 kV
- Rebuild West Faribault to Fair Park 69 kV transmission line
- Upgrade existing 115/69 kV transformer at Loon Lake

Alternative 2: Interconnect the generation with an in-and-out transmission line to a new 4-breaker station off the 115 kV line and construct a new 161 kV line from the new breaker station to the South Faribault substation. This alternative alleviates the necessity of rebuilding the entire 23-mile 115 kV line from Lake Marion to West Faribault. The following 69 kV facilities will also have to be upgraded:

- Rebuild Fair Park – Northfield 69 kV transmission line
- Rebuild Fair Park – Faribault 69 kV transmission line
- Rebuild West Faribault to Faribault 69 kV transmission line to double circuit 69 kV
- Rebuild West Faribault to Fair Park 69 kV transmission line
- Upgrade existing 115/69 kV transformer at Loon Lake

Analysis. Alternative 1 requiring a breaker station near the new plant and rebuilding an existing 115 kV line was chosen and construction is complete. This alternative was deemed to have minimal new environmental impacts. Option 2 has the potential to route the new 161 kV line along an existing 115 kV or 69 kV corridor to the South Faribault substations. Both routes go through the city of Faribault, and the 69 kV line currently goes through the downtown area along a recreational trail. The Cannon River would have to be crossed by either option.

Two studies of the situation have been completed:

MISO Steady State and Stability results for an interconnection study for 300 MW of generation north of Faribault, Minnesota in Rice County, March 24 2003.

MISO Steady State and Stability results for a facility study for 300 MW of generation north of Faribault, Minnesota in Rice County, November 11, 2004.

More information about this Faribault generating plant is available at:

http://energyfacilities/pus.state.mn.us/Docket.html?Id=3217

EQB Docket No. 02-48-PPS-FEP

Schedule. The interconnection study completed in 2004 recommended that Alternative No. 1 be pursued. The Alternative 1 upgrades are under construction. The generator has already interconnected 150 MW. The full 300 MW of power from the Faribault generating plant will be online in 2006.

8.7.5 Mankato Generation

Tracking Number: 2005-SE-N1

Inadequacy. A new generating plant is under construction just east of Xcel Energy's Wilmarth substation in the city of Mankato. The plant, two short 115 kV lines and one short 345 kV line, and substation reconstruction have all received a Certificate of Need and Site/Route Permits and are under construction. The in-service date is June 1, 2006.

Connection of this new plant to the transmission grid raised three primary issues.

1. Outage of the Blue Lake- Wilmarth 345 kV line will load the Johnson-Traverse 69 kV line above acceptable limits in 2006 and do the same to the Wilmarth-Johnson section in 2009.

2. Outage of the Blue Lake to Wilmarth 345 kV line will load the 0.4 mile underground cable on the Loon Lake- Eastwood 115 kV line above acceptable limits in 2006. This is a pre-existing issue that needs to be addressed.

3. Outage of the double circuit Blue Lake-Inver Hills 345 kV line and the Inver Hills-Red Rock 345 kV line will load the Black Dog-Wilson Circuit # 2 above acceptable limits in 2009.

Alternatives. Two alternatives have been identified:

Alternative 1: Rebuild the Wilmarth-Traverse 69 kV line to 84 MVA, and replace the 0.4 mile underground cable on the Loon Lake–Eastwood 115 kV to higher capacity. In 2009 reconductor the Black Dog-Wilson circuit with a high capacity high temperature conductor.

Alternative 2: Construct a new 115 kV line from Wilmarth to the Twin Cities.

Analysis. Alternative 1 only affects existing facilities; no new facilities are required. Alternative 2 requires the routing of a new 115 kV transmission line. While there are potential corridor-sharing opportunities between Wilmarth and the Twin Cities, new right-of-way is likely. New construction will be more expensive than upgrades of existing facilities. Alternative No. 1 can be implemented much more quickly.

More information about this Mankato generating plant is available at:

http://energyfacilities/pus.state.mn.us/Docket.html?Id=3217

EQB Docket No. 04-76-PPS-Calpine

Schedule. The rebuild of the Wilmarth/Traverse 69 kV line is scheduled to be completed in 2006. The Black Dog/Wilson circuit will be reconductored with a high capacity, high temperature conductor.

8.7.6 Cannon Falls Generation

Tracking Number: 2005-SE-N2

Inadequacy. A new 350 MW natural gas-fired generating plant has been proposed near Cannon Falls, near the existing 161 kV transmission line from Cannon Falls to Spring Creek, two miles north of Cannon Falls substation. The new facility will have to interconnect with the transmission grid.

MISO has completed an interconnection study that identified several facilities that could overload from connection of a new 350 MW source in Cannon Falls. These facilities include:

1. Cannon Falls - Spring Creek 161 kV transmission line
2. Cannon Falls 161/115 kV transformer
3. Cannon Falls 115/69 kV transformer
4. Cannon Falls – Empire 115 kV transmission line
5. Spring Creek 161/69 kV transformer
6. Spring Creek –Burnside 69 kV transmission line
7. Miesville – Miesville Tap 69 kV transmission line – upgrade plan in place
8. Prairie Island - Red Rock 345 kV #2 transmission line – upgrade plan in place
9. Prairie Island to Byron 345 kV transmission line flow gate may limit output of plant to 297.2 MW

Not all issues identified in an interconnection study are required to be addressed by a generator in the interconnection phase of the MISO study process. In this case the 69 kV concerns were not addressed in the 2005 Interconnection Study, but will be addressed in the transmission service study if necessary.

Alternatives. Five alternatives were investigated to resolve the interconnection problems that were found in the Interconnection Study.

Alternative 1:

- Move Cannon Falls 161/115 kV transformer to generator site
- Operate transmission line from generator site to Cannon Falls at 115 kV
- New 115 kV line from generator site to Empire

Alternative 2:

- New 161/115 kV transformer at generator site
- New 115 kV transmission line from generator site to Empire

Alternative 3:

- Alternative 1 and new 115 kV line from generator site to tap to Blue Lake to Prairie Island 345 kV transmission line
- New 345/115 kV transformer at Blue Lake to Prairie Island 345 kV Tap

Alternative 4:

- Alternative 1 facilities
- New 115 kV line from generator site to West Hastings

Alternative 5:

- Move Cannon Falls 161/115 kV transformer to generator site
- Operate transmission line from generator site to Cannon Falls at 115 kV
- Create an in-and-out transmission line on Cannon Falls to Empire 115 kV that connects to the generation site. Replace the existing 115/69 kV transformer at Cannon Falls with two 112 MVA units

Analysis. MISO completed an Interconnection Study in July 2005 (G405 Generation Interconnection System Impact Study, Project # 38349 July 19 2005). That study found that Alternatives 2 and 5 were the only viable options to move forward and were screened for environmental and siting issues. Alternative 2 requires a new line into the Twin Cities Metro Area and it is likely there would be siting issues around the Empire substation. Alternative 5 requires less transmission line work and reduces the amount of new transmission line construction required for the project.

Option 5 was chosen as the recommended plan because even though the preliminary cost estimates of Option 2 and 5 were found to be nearly the same, Option 5 was found to be a better option when other factors such as feasibility, construction time, and uncertainties were taken into account.

More information about the Cannon Falls generating plant is available at:

http://energyfacilities/pus.state.mn.us/Docket.html?Id=7679

EQB Docket No. 04-85-PPS-Cannon Falls Energy Center

Schedule. At this time, detailed design of this recommendation is underway and a detailed cost estimate will be produced. The customer will then decide if it should proceed with this project. The planned commercial operation date for the new plant is May 1, 2008.

8.7.7 Lake City Area

Tracking Number: 2005-SE-N3

Inadequacy. Lake City is the largest load on the Red Wing-Alma 69 kV line, with a present peak load of approximately 29.5 MW. This system is located in southeastern Minnesota and Western Wisconsin and is shown in the map below. This area is supplied from two sources, the Alma 161/69 kV and Spring Creek 161/69 kV substations. Steady-state (thermal and voltage) limitations have been identified. In addition, a major business in the Lake City area is expected to expand and will require additional load.

The existing system configuration is marginal under first contingency (N-1) load serving capability under the year 2005 condition that was studied. Low voltage may occur along the existing line under loss of either the Alma or the Red Wing 69 kV source.

A map of the area is shown on the following page.

Alternatives. The following alternatives have been considered:

Alternative 1: Complete rebuild of the existing 69 kV line from Red Wing to Alma to 161 kV, bypassing Red Wing and extending it to the existing Spring Creek 161 kV.

Alternative 2: Build new 69 kV line from Zumbro Falls to Lake City.

Alternative 3: Tap DPC's existing 69 kV line from Alma to Weaver and build new 69 kV line to Wabasha.

Alternative 4: Build new switching station at Nelson and normally close (NC) the 69 kV line from Naples to Gilmanton Tap.

Alternative 5: Rebuild the existing 69 kV line from Red Wing to Alma to 161 kV and continue to operate at 69 kV.

Analysis. The economic analysis of the five options assumed the eventual rebuild of the existing Red Wing-Alma 69 kV line in about fifteen years time to either 69 kV or 161 kV. Option 1 rebuilds this line to 161 kV immediately. Options 2, 3, 4 and 5 defer the cost of this large investment and change the decision point to determine whether the replacement lines should be 69 kV or 161 kV construction. Option 2 is the lowest cost option when compared against Options 3, 4 and 5 that defer the cost of rebuilding the 69 kV to 161 kV in 2008 timeframe**.** Options 2, 3, and 4 require only 69 kV construction in the initial stages and would not require a Certificate of Need. Options 1 and 5 would require a Certificate of Need for the initial stage of development.

It is important to note that Alternatives 1 and 2 were the only two alternatives that solved all the area's issues. Alternative 2 has the significant advantage over Alternative 1 in that it provides a third transmission source to Lake City. This makes it possible to obtain the construction outages required for the future rebuild of the Red Wing-Wabasha section of the Red Wing-Alma 69 kV system. It also makes it likely that N-2 (double contingency) coverage is achieved at no additional cost, at least under some off-peak load conditions.

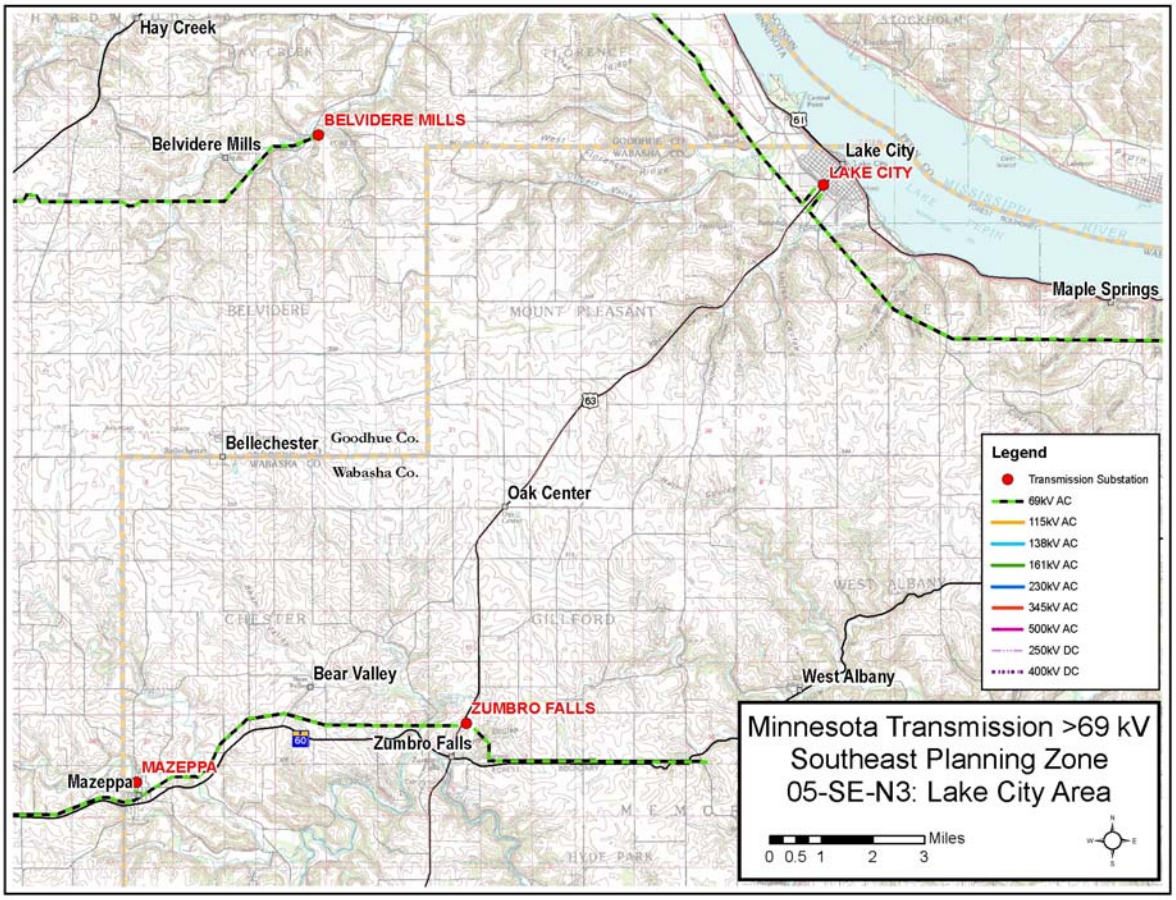
Alternative 2, following the 161 kV rebuild of Red Wing-Alma, provides a new 69 kV source to the Zumbrota area 69 kV system, provided that a 161/69 kV transformer is installed at Lake City. This is a load-serving benefit not offered by the other alternatives.

There should be limited environmental impacts from Alternative 1 since the 161 kV line would replace an existing 161 kV line. General siting and construction issues would need to be mitigated. Alternative 2 requires a new 16 mile 69 kV line from Zumbro Falls to Lake City. While it requires new right-of-way, there are existing roads that would be available for corridor sharing. There will be issues to address during construction to minimize impacts, but those are similar to Alternative 1. Since Alternatives 1 and 2 were considered the final choices to address the area needs, analysis of Alternatives 3 through 5 was not pursued.

Schedule. Alternative 2 is the preferred alternative. A new 69 kV line between Zumbro Falls and Lake City (16 miles) will be constructed in the 2008 timeframe. Since the line is under 100 kV, no Certificate of Need and no Route Permit is required from the Public Utilities Commission.

Alternative 2 also calls for the following equipment installations in addition to the new line:

- 69 kV breaker at Zumbrota
- Zumbrota to Lena Tap 69 kV line (0.8 mile)
- Shunt capacitors at Lake City and Nelson
- Long range – rebuild Red Wing-Lake City-Alma to 161 kV


Hay Creek
BELVIDERE MILLS
Belvidere Mills
Lake City
LAKE CITY
Maple Springs
Bellechester
Goodhue Co.
Wabasha Co.
Oak Center
Bear Valley
ZUMBRO FALLS
Zumbro Falls
MAZEPPA
Mazeppa
West Albany
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Minnesota Transmission >69 kV
Southeast Planning Zone
05-SE-N3: Lake City Area
Miles
0 0.5 1 2 3

8.7.8 Dodge County Wind

Tracking Number: 2005-SE-N4

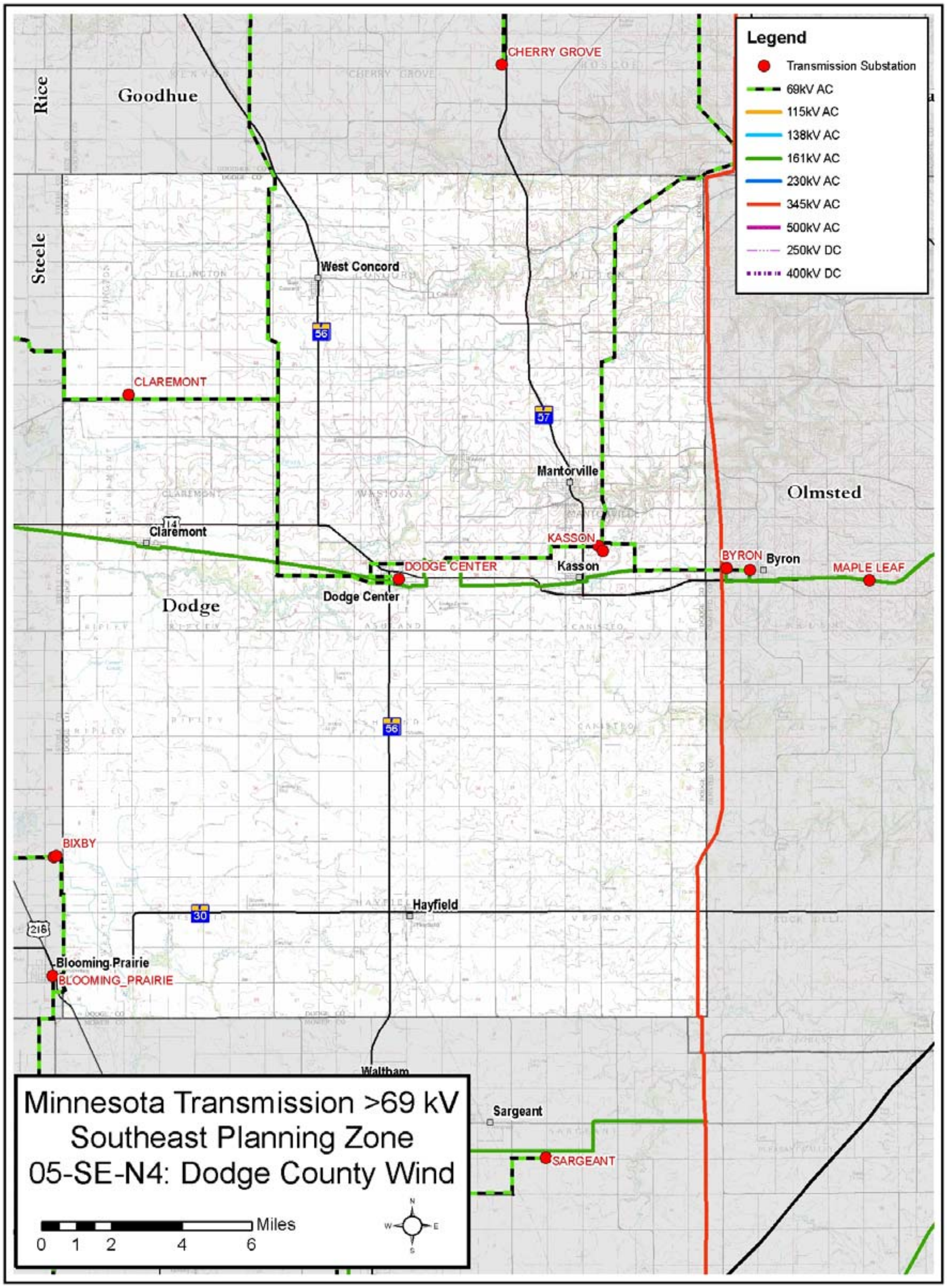
Inadequacy. An independent power producer has connected 49 MW of wind generation to the 69 kV transmission system near Dodge Center. There is a proposal to connect an additional 23 MW for a total of 72 MW. Both protection and service quality issues require that the wind project only be allowed to operate with the Byron source in-service. Voltage fluctuations that exceed Xcel Energy's voltage flicker criteria were identified at generation levels of greater than 49 MW. The other issue identified was line capacity – the capacity limit of the 69 kV line from Dodge Center to Kasson is reached when the output of the wind generation exceeds 56 MW.

A map of the area is shown on the following page.

Alternatives. One alternative identified to address protection and service quality issues is to install breakers at Kasson and Kenyon. A solution to address capacity issues is to upgrade the 69 kV line from Dodge Center to Kasson (approximately seven miles).

Analysis. A number of studies have been conducted. The studies show that upgrading the Dodge Center to Kasson line is preferable to building a new line, which would have greater environmental issues and be more expensive.

Schedule. Two new breakers have been installed at Kasson. Construction has begun on a new breaker at Kenyon. The rebuild of the Dodge Center/Kasson line to a higher voltage has been temporarily deferred until the wind developer indicates an intent to proceed. If the line is upgraded to 115 kV, a Route Permit will be required. A Certificate of Need will not be required because the line is under ten miles in length.


Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Rice
Goodhue
Steele
Dodge
Olmsted
CHERRY GROVE
West Concord
CLAREMONT
Claremont
Mantorville
KASSON
Kasson
DODGE CENTER
Dodge Center
BYRON
Byron
MAPLE LEAF
BIXBY
Hayfield
Blooming Prairie
BLOOMING_PRAIRIE
Waltham
Sargeant
SARGEANT
56
57
14
30
218
Minnesota Transmission >69 kV
Southeast Planning Zone
05-SE-N4: Dodge County Wind
Miles
0 1 2 4 6

8.7.9 Mower County Wind

Tracking Number: 2005-SE-N5

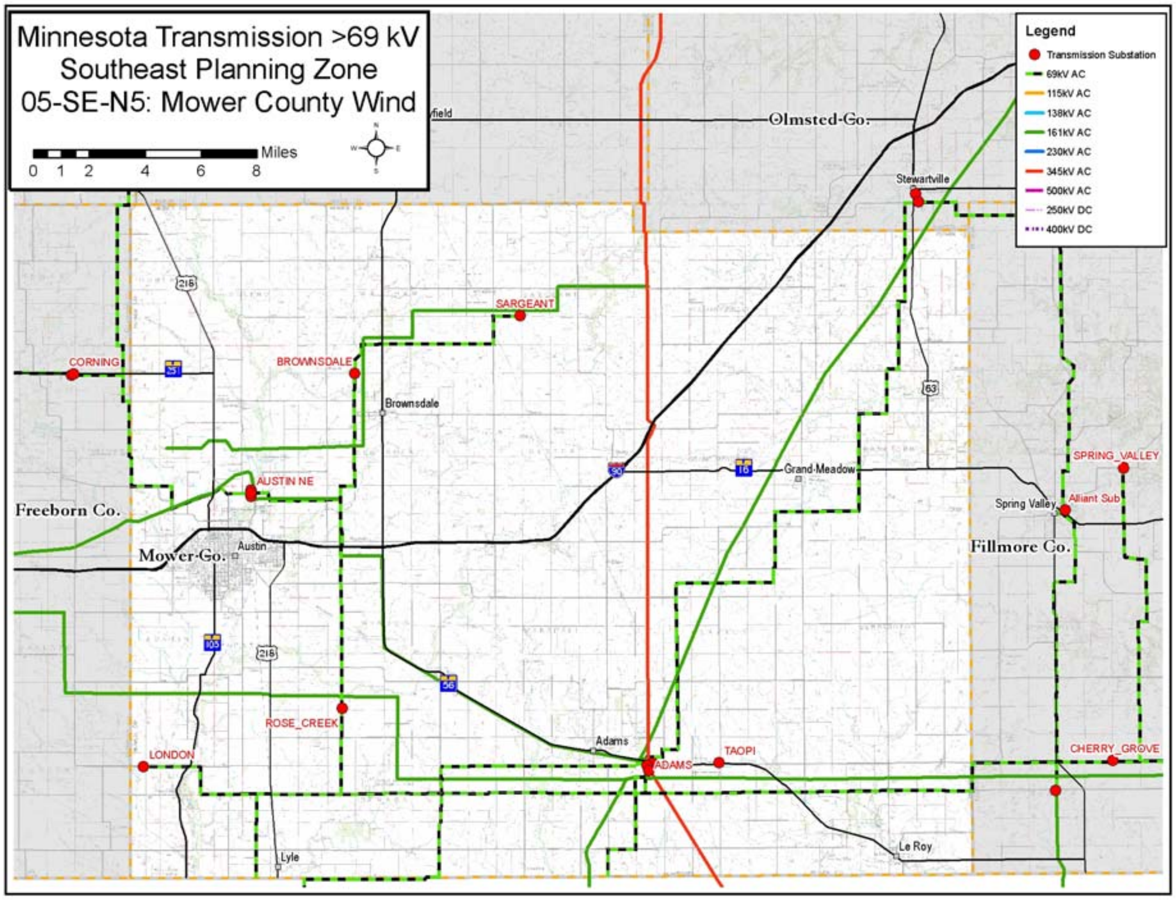
Inadequacy. An independent power producer has proposed connecting 200 MW of wind generation at the Adams substation in southeast Minnesota. It must be determined whether any transmission upgrades are necessary to accommodate the interconnection.

A map of the area is shown on the following page.

Alternatives. The Adams substation is served by both a 345 kV line and a 161 kV line. The interconnection could be made to either side.

Analysis. The requested in-service date was December 2003. MISO actually completed two studies in 2003: Interconnection Evaluation Study, Project G113 – 200 MW wind generating facility at Adams substation, April 2003, and MISO delivery study. The studies showed that no local thermal or voltage issues needed would result from interconnection of up to 40 MW.

Schedule. The wind project has been delayed. Up to 40 MW can be delivered to the Adams substation without any transmission system improvements. Further study to determine what would be necessary to interconnect 200 MW remains to be done.


Minnesota Transmission >69 kV
Southeast Planning Zone
05-SE-N5: Mower County Wind
Miles
0 1 2 4 6 8
Legend
Transmission Substation
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
Olmsted Co.
Stewartville
SARGEANT
CORNING
BROWNSDALE
Brownsdale
AUSTIN NE
Freeborn Co.
Mower Co.
Austin
Grand Meadow
SPRING_VALLEY
Alliant Sub
Spring Valley
Fillmore Co.
ROSE_CREEK
LONDON
Adams
ADAMS
TAOPI
CHERRY_GROVE
Le Roy
Lyle

8.7.10 CapX 2020 Vision Plan

Prairie Island – Rochester – La Crosse 345 kV

Tracking Number: 2005-CX-1

Discussion. The CapX 2020 Vision Plan is discussed in detail in Section 6. As part of the CapX work, a 345 kV line from the Twin Cities to Rochester to La Crosse is being proposed. See Section 6 for discussion about that proposed transmission line.

9. Certification Requests

Minnesota Rules part 7848.1300, item M., requires the utilities to state in the Biennial Transmission Projects Report whether any utilities are seeking certification of specific projects as part of the Commission's review of the Report. In 2005 there are two projects for which utilities are seeking certification.

Tower-Ely-Babbitt 115 kV Transmission Line. (Tracking Number 2003-NE-N1). One project for which Commission certification is sought is a 115 kV transmission line in St. Louis County, to be built between the cities of Tower and Ely. The utilities seeking the certification are Minnesota Power and Great River Energy. Minnesota Power and Great River Energy intend to file a separate certification application on November 1, 2005.

Long Lake-Badoura-Pequot Lakes 115 kV Transmission Line. (Tracking Number 2003-NE-N3). A second project for which Commission certification is sought is a 115 kV transmission line between the cities of Pequot Lakes and Badoura, with taps to Birch Lake and Pine River, and a 115 kV line between Badoura and Long Lake. The utilities seeking the certification are Minnesota Power and Great River Energy. Minnesota Power and Great River Energy intend to file a separate certification application on November 1, 2005.

Both of the certification requests are available on the Internet at:

www.minnelectrans.com

10. Conclusion

The 2005 Biennial Transmission Projects Report identifies more than 75 areas where additional transmission infrastructure will be needed in the next ten years to address a growing demand for power including more renewable energy. A number of significant studies have recently been completed and others are presently underway to determine the best manner in which to address Minnesota's need for new transmission.

Minnesota will require several new large transmission lines before the end of the decade. Two new 345 kV transmission lines from western and southwestern Minnesota into the Twin Cities will be an important backbone of the transmission system. Another 345 kV line is needed from the Twin Cities to Rochester and on to La Crosse. A number of smaller voltage lines are required across the state.

Two certification requests are being filed with this Report. A certificate of need application for two high voltage transmission lines from the proposed Big Stone Unit II power plant in South Dakota into Minnesota was just filed with the Commission in October. Several more certificate of need applications will be filed in 2006. Route permits will be sought for all these lines in the near future. It is a busy time for Minnesota utilities, and for the Public Utilities Commission, the Minnesota Department of Commerce, local officials, and the general public.

The utilities that own and operate electric transmission in Minnesota, through the Minnesota Transmission Owners, have submitted this Report in accordance with applicable state law and past guidance from the Public Utilities Commission and the Department of Commerce. The MTO utilities look forward to continued discussions concerning the state's and region's transmission needs.