2015 Biennial Transmission Projects Report

American Transmission Company, LLC
Dairyland Power Cooperative
East River Electric Power Cooperative
Great River Energy
Hutchinson Utilities Commission
ITC Midwest LLC
L&O Power Cooperative
Marshall Municipal Utilities
Minnesota Power
Minnkota Power Cooperative
Missouri River Energy Services
Northern States Power Company
Otter Tail Power Company
Rochester Public Utilities
Southern Minnesota Municipal Power Agency
Willmar Municipal Utilities

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TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 Executive Summary

The 2015 Biennial Transmission Projects Report is the eighth such report prepared since the requirement to prepare this report was established by the Minnesota Legislature in 2001. All of the previous Biennial Reports are available for review on a webpage maintained by the utilities preparing the report. That webpage is:

http://www.minnelectrans.com

The requirement is found in Minn. Stat. § 216B.2425. That law 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 identifying possible solutions to anticipated inadequacies in the transmission system. The MTO has consistently defined an "inadequacy" as essentially a situation where the present transmission infrastructure is unable or likely to be unable in the foreseeable future to perform in a consistently reliable fashion and in compliance with regulatory standards.

The Minnesota Public Utilities Commission established six transmission planning zones across the state in 2003. Those six transmission planning zones are the Northwest Zone, the Northeast Zone, the West Central Zone, the Twin Cities Zone, the Southwest Zone, and the Southeast Zone. Information about transmission facilities in each of the zones is included in the report.

The 2015 Biennial Report identifies the present and reasonably foreseeable transmission "inadequacies" in the transmission system that exist in each of these six transmission planning zones. Each inadequacy has been assigned a Tracking Number. Information about each inadequacy identified by a Tracking Number is provided. Projects that were identified in earlier reports and assigned a Tracking Number but which have been completed or withdrawn in the past two years are also identified.

This 2015 Biennial Report, as were the previous reports, is a joint effort of the Minnesota Transmission Owners – those 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	ITC Midwest LLC
L&O Power Cooperative	Marshall Municipal Utilities
Minnesota Power	Minnkota Power Cooperative
Missouri River Energy Services	Northern States Power Company
Otter Tail Power Company	Rochester Public Utilities
Southern Minnesota Municipal Power Agency	Willmar Municipal Utilities

Information about each of these utilities, including their transmission assets in the various zones, is provided in the Report.

As required by the statute, the Biennial Report also provides an update on the status of the utilities' efforts to meet state Renewable Energy Standard deadlines.

In 2015, the Legislature established a new reporting requirement for certain utilities. Minn. Laws 2015, 1Sp2015, ch. 1, art 3, s 22, codified at Minn. Stat. § 216B.2425, subds. 2(e) and 8. This new reporting requirement is explained in further detail in Chapter 2, subsection 2.6. Pursuant to that requirement, Xcel Energy, the only utility to which it applies, has submitted a separate report entitled Grid Modernization Report to the Minnesota Public Utilities Commission under the same docket as the Biennial Report.

The following is a summary of each subsequent chapter of the 2015 Biennial Report.

Chapter 2 describes the biennial reporting requirements. This includes a discussion of the specific information the Public Utilities Commission directed the utilities to include in the 2015 Biennial Report.

Chapter 3 is entitled Transmission Studies. This chapter includes a table listing a number of studies that have been completed over the past two years. In addition, a number of ongoing regional studies are described in some detail, and several more local, load-serving studies are identified in a separate table. A description of the MISO Transmission Expansion Plan (MTEP) Report is included since most planning is now conducted by the Midcontinent Independent Transmission System Operator (MISO) and the MTEP Reports are where most of the information about the pending projects can be found.

Chapter 4 is the Public Participation chapter. Several recent examples are provided regarding how utilities have provided opportunities for the general public and local government to learn about and participate in the development of new transmission projects. This chapter summarizes the evolution of MPUC requirements relating to transmission planning and the preparation and submission of the Biennial Report. A section is included describing the webpage the Minnesota Transmission Owners maintain (www.minnelectrans.com) that is available to the public to learn about ongoing transmission projects.

Chapter 5 provides general information about the six Transmission Planning Zones in the state.

Chapter 6 is where all the Transmission Needs are identified. The Report identifies well over 100 separate transmission inadequacies across the state, including more than 40 new ones identified in the 2015 Biennial Report.

Each inadequacy is assigned a Tracking Number. The Tracking Number reflects the year the inadequacy was identified and the zone in which it is located. A brief description of each project is provided in the Report, and a reference is provided for each one to where detailed information can be found in the applicable MISO Transmission Expansion Plan (MTEP) Report. The 2015 MTEP Report, for example, would be called MTEP15. In addition, information about each pending project, by Tracking Number, is provided. This information addresses issues like alternatives considered, a schedule, and the general impacts on the environment and the area if the project were constructed.

The MTEP Report referenced in the table for each Tracking Number will contain detailed information about the project, including alternatives, costs, and a schedule. Chapter 6 also presents comprehensive instructions on how to find on the Internet the appropriate MTEP Report containing the desired information. The utilities have also attempted to indicate whether a

Certificate of Need (CON) from the Public Utilities Commission might be required for a particular project selected to address a named inadequacy.

Certain projects have been completed since the 2013 Report was filed two years ago or are no longer necessary because of a change in demand or some other factor. These completed or cancelled projects are listed in a table for each zone in Chapter 6.

Chapter 7 focuses on the 16 utilities that are jointly filing this report. A brief description of each utility and the name and address of a contact person are provided. Information about the number of miles of transmission lines in Minnesota is also provided for each utility.

Chapter 8 provides an analysis of the utilities' progress toward compliance with state Renewable Energy Standards. Not all utilities that own transmission lines are subject to the state Renewable Energy Standards, and some utilities that are not required to participate in the Biennial Report must meet the RES milestones. All utilities subject to the RES participated in providing information for this part of the report.

For the past several reporting periods, and again this year at the direction of the MPUC, the utilities subject to the RES have provided a Gap Analysis. A Gap Analysis is an estimate of how many more megawatts of renewable generating capacity a utility will require beyond what is presently available to meet an upcoming RES milestone of a certain percentage of retail sales from renewables. Generally, the Gap Analysis shows that the utilities are in compliance with present standards and expect to have enough generation and transmission to meet RES milestones through 2016, although demands of neighboring states for renewable energy will undoubtedly affect what resources will be required.

Chapter 8 also provides a brief summary of the information a number of the utilities just submitted to the MPUC pursuant to a statute that requires annual reporting regarding compliance with upcoming solar energy standards.

MPUC Process. Upon receipt of this Report, the Minnesota Public Utilities Commission will solicit comments from the Department of Commerce, interested parties, and the general public about the Report. Any person interested in commenting on the Report or following the comments of others should check the efiling docket for this matter or in some other manner contact the Public Utilities Commission. The Docket Number is E999/M-15-439. The precise schedule for filing comments is established by the MPUC rules relating to the biennial reporting process. Minn. Rules Chapter 7848. It is anticipated that the MPUC will make a final decision on the 2015 Biennial Transmission Projects Report in May 2016.

2.0 Biennial Report Requirements

2.1 Generally

This is the eighth Biennial Transmission Projects Report to be filed by those utilities that own or operate electric transmission lines in Minnesota. The obligation to file such a report was created by the Minnesota Legislature in 2001. Minn. Stat. § 216B.2425. The statute requires the utilities to file their transmission report by November 1 of each odd-numbered year.

All eight reports are all available on the Minnesota Public Utilities Commission's eDockets webpage using the Docket Number from the table below. At least the past five reports are also available on the webpage maintained by the utilities: http://www.minnelectrans.com/

Biennial Report	MPUC Docket Number	MPUC Order
2015	E999/M-15-439	
2013	E999/M-13-402	May 12, 2014
2011	E999/M-11-445	May 18, 2012
2009	E999/M-09-602	May 28, 2010
2007	E999/M-07-1028	May 30, 2008
2005	E999/TL-05-1739	May 31, 2006
2003	E999/TL-03-1752	June 24, 2004
2001	E999/TL-01-961	August 29, 2002

Minn. Stat. § 216B.2425 requires the utilities to list in the report specific present and reasonably foreseeable future inadequacies in the transmission system in Minnesota. The term "inadequacy" was not defined by the Legislature or by the Commission. The utilities have consistently stated that the term "inadequacy" is interpreted to be a situation where the present transmission infrastructure is unable or likely to be unable in the foreseeable future to perform in a consistently reliable fashion and in compliance with regulatory standards. This definition has been accepted by the Commission and others in past dockets.

The statute spells out certain categories of information that should be included in the report for each inadequacy, and the Commission has adopted rules that expand and clarify what is expected to be in the report (Minn. Rules Chapter 7848). These laws generally require not only an identification of present and foreseeable inadequacies but also a discussion of alternative ways of addressing each inadequacy and the potential issues and impacts associated with possible solutions to the situation. The utilities are also required to provide opportunities for public input in the planning and development of solutions to the various inadequacies and to describe in the report what efforts were undertaken to involve the public. The utilities discuss in Chapter 4 various efforts that have been undertaken to involve the public in transmission planning.

Over the years, in response to experiences with the rule requirements and to other developments in transmission planning, the MPUC has modified the application of the rules in a number of significant ways. One important modification recognizes that most transmission planning is now done through the Midcontinent Independent Transmission System Operator (MISO). MISO prepares a report each year, called the MISO Transmission Expansion Plan (MTEP) Report. MISO transmission planning is conducted in public forums and the MTEP Report is publically available on the Internet. Unlike this state report, which is prepared every other year and focuses only on Minnesota, the MTEP Report is updated yearly and describes in detail transmission planning needs throughout the entire jurisdictional area of MISO, and not just in Minnesota.

Consequently, for the past two biennial reports – 2011 and 2013 – the Minnesota Public Utilities Commission has allowed the utilities to reference the latest MTEP Report to provide information about the identified inadequacies in Minnesota. The 2015 Report, with the Commission's concurrence, also relies on the latest MTEP Report to identify upcoming transmission needs and to provide the necessary information about the possible alternatives to addressing each inadequacy. The utilities explain in section 6.1 how to find the pertinent information about each inadequacy in the MTEP Report.

The MPUC has also recognized that holding public meetings around the state and holding a webinar to describe ongoing transmission planning and needs has not resulted in any substantial participation by the public. The MPUC has granted the utilities a variance for the past several years from the requirement in the rules to hold yearly planning meetings in each transmission planning zone. For 2015, the MPUC has continued this variance and even exempted the utilities from holding a webinar. However, the utilities continue to conduct transmission planning in a manner that is open to the public and opportunities are provided for the public to participate in such planning and in the discussion of alternative solutions to the transmission needs under review.

In its May 12, 2014, Order accepting the 2013 biennial report the Commission did raise one caveat regarding the 2015 Report. The Commission stated that in the 2015 Report the utilities should include a discussion addressing Minn. Stat. § 216B.2425, subd. 2(c)(3). This statute provides that in the biennial report the utilities must "identify general economic, environmental, and social issues associated with each alternative." The utilities address in section 2.4 how this matter is addressed in this report.

2.2 Reporting Utilities

Minn. Stat. § 216B.2425 applies to those utilities that own or operate electric transmission lines in Minnesota. The MPUC has defined the term "high voltage transmission line" in its rules governing the Biennial Report to be any line with a capacity of 200 kilovolts or more and any line with a capacity of 100 kilovolts or more and that is either longer than ten miles or that crosses a state line. Minn. Rule part 7848.0100, subp. 5. Each of the entities that is filing this report owns and operates a transmission line that meets the MPUC definition. Information about the utility and transmission lines owned by each utility is provided in Chapter 7 of this Report. In addition, a contact person for each utility is included in Chapter 7.

The statute allows the entities owning and operating transmission lines to file this report jointly. The Minnesota Transmission Owners (MTO) has elected each filing year to submit a joint report and does so again with this report. The utilities jointly filing this report are:

American Transmission Company, LLC
Dairyland Power Cooperative
East River Electric Power Cooperative (will become part of Southwest Power Pool October 1, 2015)
Great River Energy
Hutchinson Utilities Commission
ITC Midwest LLC
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

Of the above utilities, East River Electric Power Cooperative, L&O Power Cooperative, Marshall Municipal Utilities, Minnkota Power Cooperative, Rochester Public Utilities and Willmar Municipal Utilities are not members of MISO; all the others are.

With the upcoming dissolution of MAPPCOR, MISO has agreed to perform planning coordination for Minnkota Power Cooperative. Many of the roles that MAPP performed for Minnkota Power Cooperative in the past will now be assumed by MISO.

2.3 Certification Requests

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

On June 1, 2015, the MTO advised the Commission that there would be no certification requests included with the 2015 Biennial Report.

2.4 General Impacts

In its May 12, 2014, Order approving the 2013 Biennial Report, the Commission recognized that reference to the latest MTEP Report was an appropriate way to provide useful information about the inadequacies identified in the Biennial Report, but that the MTEP Report did not provide general information about the potential environmental, social, and economic impacts of possible alternatives to address the inadequacy, as required by Minn. Stat. § 216B.2425, subd. 2(c)(3). The Commission stated in its Order at page 6 that "in the future the information [in the MTEP Report] must be supplemented with a fuller discussion of economic, environmental, and social issues related to proposed alternative solutions to inadequacies listed in the report."

The utilities and the Department of Commerce staff did not object to providing a fuller discussion of the general economic, environmental and social issues associated with each alternative in the 2015 Biennial Report. However, the MTO would like to address here the manner in which the utilities approach this requirement to provide a fuller discussion of potential issues and impacts.

First of all, it is difficult to provide significant information about a transmission need that is several years in the future. The MPUC rules require the utilities to identify inadequacies that might affect reliability over the next ten years. Minn. Rules part 7848.1300, subpart D. A transmission planner is often not able to identify possible alternatives, let alone the impacts of the alternatives, for projects that are ten years in the future. Moreover, it is not uncommon for a potential reliability issue that may be looming several years in the future to subsequently be delayed for several more years or even indefinitely because of unforeseen events such as an economic recession or the closing of a large industrial user or even a change in government policy or tax provisions. Also, more pressing problems may develop that take precedence over more minor concerns and transmission planners may have to focus their attention on other projects.

Importantly, the statute says that the utilities are to identify general economic, environmental, and social issues associated with each alternative. This is a recognition that it is not always possible to know during the planning stage what issues may evolve when a particular project is developed in more detail. It is sufficient to address potential issues in a general way, and that is what the utilities have done here.

Thus, it is not possible for the utilities to provide specific discussion of potential impacts for each and every Tracking Number that is identified in this Biennial Report. There are over 100 separate Tracking Numbers, for one thing. Transmission planners and utility staff are well aware of the kind of issues that arise with any large energy facility, whether a transmission line or a generating plant. For example, they know that a transmission line may cross a wetland, or run through an agricultural field, or follow a residential street. They are well versed that a new generating plant has a certain footprint, and may result in the emission of various pollutants, and may require the transport of fuel. The utilities are aware that a large energy project has tax consequences for local government. They know that jobs will be created by the construction of a new facility and that the local area will be disrupted for a time while construction is ongoing. These are the kind of general impacts that can be addressed for projects that have not developed to the point where specific alternatives have been identified.

The time to provide an indepth analysis of potential impacts of a proposed project and the identified alternatives is when the utility has determined that a need for new infrastructure is certain enough and imminent enough that a project must be pursued. This is the time when the public begins to take notice of the need for a project and to participate in the analysis of alternatives. And this is when the utility must begin to pull together the information that is required to complete applications for a Certificate of Need and for a permit. These applications, and any environmental review that is conducted as part of the application process, will examine potential economic, environmental, and social issues in depth, with ample opportunities for public involvement and input.

The MTO can provide in this Biennial Report only a general discussion of the kind of impacts that are associated with certain types of energy projects, like transmission lines and substation upgrades and generating facilities. When a project is far enough along that a specific project has been identified and alternatives considered, a more detailed discussion is possible but that discussion more appropriately belongs in the docket for the permits required for the project.

An example of projects that have moved though the planning process are the CapX group projects. These projects started out as concepts for planning study purposes without any defined route or termination ends. Through the planning process preferred options and alternatives were identified and Certificates of Need and Route Permits were applied for. At this stage a more detailed analysis of routing impacts, environmental impacts, economic impacts, and social issues were more closely identified.

2.5 Renewable Energy Standards

The utilities are required to include in the Biennial Report a discussion of necessary transmission upgrades required to meet upcoming renewable energy standards. Minn. Stat. § 216B.2425, subd. 7. As with previous reports, this discussion is included in a separate Chapter 8.

2.6 Distribution Report/Grid Modernization

In 2015 the Legislature added new requirements for what is required to be submitted at the same time as the Biennial Report. Minn. Laws 2015, 1Sp2015, ch. 1, art 3, s 22, codified at Minn. Stat. § 216B.2425, Subdivision 2(e) of that statute now requires a utility operating under an approved multiyear rate plan to identify in its Biennial Transmission and Distribution Plan:

> *investments that it considers necessary to modernize the transmission and distribution system by enhancing reliability, improving security against cyber and physical threats, and by increasing energy conservation opportunities by facilitating communication between the utility and its customers through the use of two-way meters, control technologies, energy storage and microgrids, technologies to enable demand response, and other innovative technologies.*

Subdivision 8, which is also new language, provides:

> *Each entity subject to this section that is operating under a multiyear rate plan approved under section 216B.16, subdivision 19, shall conduct a distribution study to identify interconnection points on its distribution system for small-scale distributed generation resources and shall identify necessary distribution upgrades to support the continued development of distributed generation resources, and shall include the study in its report required under subdivision 2.*

These new reporting requirements apply only to utilities operating under an approved multiyear rate plan approved by the MPUC under section 216B.16, subd. 19. Xcel Energy is the only utility currently operating under such a plan and the only utility required to file a distribution study/grid modernization plan. Accordingly, Xcel Energy has submitted its report simultaneously with this biennial report under the same MPUC Docket Number but under separate cover.

3.0 Transmission Studies

3.1 Introduction

The Minnesota Public Utilities Commission requires that the utilities include in each Biennial Report a "list of studies that have been completed, are in progress, or are planned that are relevant to each of the inadequacies identified" in the Report. Minn. Rules part 7848.1300, item F. Since the 2011 Biennial Report, the utilities have broken this chapter up into several subsections, each addressing different types of studies. The same arrangement for reporting the studies is continued in this 2015 Report.

Section 3.2 describes a number of studies that have been completed that either address expansion of the transmission network to provide for generation expansion, in particular renewable energy, or address local inadequacy issues (noted with a Tracking Number). Section 3.3 describes ongoing regional studies that focus on expansion of the bulk electric system to address broad regional reliability issues and support expansion of renewable in the upper Midwest. Section 3.4 focuses on ongoing load serving studies that are attempting to resolve local inadequacy issues. Section 3.6 is a new section describing certain studies at the national level that are underway.

The MPUC rules state that the utilities must include in the Biennial Report a copy of "the most recent regional load and capability report of the Mid-Continent Area Power Pool" (MAPP). Minn. Rule part 7848.1300, item B. As the utilities reported in the 2011 Report, however, the Midcontinent Independent Transmission Operator (MISO) has taken over most of the planning that occurs in this part of the country. MAPP has not prepared a Load & Capability Report since May 2009. MAPP, in fact, discontinued its existence in October 2015.

3.2 Completed Studies

The following studies were completed since the last Biennial Report was submitted in November 2013. Previously completed studies can be found in previous Biennial Reports and are not repeated here. Where specific transmission projects have been identified, a Tracking Number is provided. The Tracking Number identifies the year the project was first considered for inclusion in a Biennial Report and the zone where the project is located.

Study Title	Year Completed	Utility Lead	Description
Austin Area Load Serving Study	2013	SMP	An Austin Area Transmission Study was conducted to investigate different alternatives for increasing load serving capability in the Austin area. The study identified two alternatives as the best options for increasing load serving capability and for satisfying reliability requirements. The preferred option is the construction of a new 161/69 kV substation in northwest Austin, MN. Tracking Number 2011-SE-N5.
Magnetation Plant 4 System Impact Study	2013	MP	System impact of Magnetation Plant 4; Canisteo Project (2013-NE-N5)
Polymet System Impact Study	2013	MP	System impact of new Polymet loads; Dunka Road Substation (2011-NE-N5) & Hoyt Lakes Substation Modernization (2013-NE-N19)
Buffalo Transformer Sizing Study	2014	OTP	The Buffalo 345 kV transformer is in need of more capacity due to N-1 contingencies in the area and has been approved as part of MTEP project 3481. This study was performed to identify the appropriate transformer size at Buffalo.
Otter Tail Power Ten Year Plan	2014	OTP	The Otter Tail Power Ten Year Plan summarizes the limitations to the OTP system within the next ten years and is intended to be refreshed biennially. This study refreshed project need dates and is based from conclusions of past completed group of Long Range Plans and the OTP High Voltage study.
Twin Cities Fault Current Analysis	2014	XEL	A study was performed around the Twin Cities metro area to determine fault current levels for existing substations. Black and Veatch were hired as a consultant to perform the work under NSP Transmission Planning staff supervision. Several substation deficiencies were identified in the Twin Cities Metro Area. These issues have identified fixes that will be implemented to reduce the amount of available fault current.

Study Title	Year Completed	Utility Lead	Description
Out-Year Interconnection System Impact Study of MPC01200	2014	MPC	Minnkota performed the Out-Year Interconnection System Impact Study of MPC01200. It was completed on December 26, 2014. Minor thermal and voltage upgrades were required to increase the capacity of the interconnection facilities, and one third party transformer upgrade was identified. The System Impact Study report is posted at www.minnkota.com.
Zemple 230 kV Substation Study Update	2014	MP	Evaluate the performance of the MP 115 kV system and the GRE 69 kV system during various outages associated with the new Zemple 230/115 kV Substation; Zemple 230 kV Project (2009-NE-N2)
New Tie Line Loop Flow Impact Study	2014	MP	Study Intended to capture and compare the impact of a new 500 kV Manitoba - United States tie line on the North Dakota - Manitoba loop flow phenomenon; Great Northern Transmission Line (2013-NE-N13)
GNTL Series Compensation and Reactive Resource Optimization	2014	MP	Joint study between MP and Manitoba Hydro intended to identify the recommended location and percentage of the proposed series compensation station as well as the location and size of shunt reactive devices required to control system voltages; Great Northern Transmission Line (2013-NE-N13)
System Impact Study of TSR #81022904	2015	MPC	Minnkota performed the System Impact Study of TSR #81022904. It was completed on April 21, 2015. Two Minnkota transmission lines were impacted in the study and must be uprated in order to grant the request Transmission Service, including the Jamestown – Buffalo 345 kV line and the Square Butte – Center 230 kV line. Facilities Studies are underway. A third party constraint was also identified, but was subsequently dismissed due to an incorrect rating assumption. The System Impact Study report is posted on Minnkota's OASIS site.

Study Title	Year Completed	Utility Lead	Description
Minnesota Transmission Assessment and Compliance Team 2015 Transmission Assessment (2015 – 2025)	2015	MTO	This report is an annual transmission assessment investigating near-term, mid-term, and long-term transmission conditions. This purpose of this study is to develop an understanding of the transmission system topology, behavior, and operations to determine if existing and planned facility improvements meet NERC Transmission Planning Standards TPL-001 through TPL-004.
Clearbrook Area Transmission Study ("Clearbrook Looped Service Study")	2015	OTP/MPC	Minnkota participated in a study that evaluated the current load serving capabilities and future transmission needs in the area around Clearbrook, MN. The study was prompted by three things: pending load growth within the area, a neighboring utility's initiative for looped service, and opportunities created by planned transmission lines out of Clearbrook. A new 230/115 kV substation near Bagley (referred to as Bagley West) and 115 kV transmission line to a location sixteen miles away (referred to as Clearbrook West) was evaluated against some alternatives. It ultimately was the favored option for meeting the stated needs. Additional details can be found in Forms 1 and 2 or in the study report ("Clearbrook Looped Service Study" written by Otter Tail Power Company).
GNTL Analysis	2015	MP	Joint study between MP and Manitoba Hydro intended to evaluate the steady state and dynamic performance of the GNTL under a variety of system conditions; Great Northern Transmission Line (2013-NE-N13)

Study Title	Year Completed	Utility Lead	Description
Shutdown of Taconite Harbor Generation System Impact Study	2015	MP	System impact of shutting down Taconite Harbor units 1 and 2 and evaluation of transmission solutions for maintaining and improving the reliability of the system should it become necessary or preferable to shut down Taconite Harbor units 1 and 2; the following projects were evaluated (or re-evaluated) as part of the study: Dunka Road Substation (2011-NE-N5); Embarrass Transformer (2013-NE-N8); Hoyt Lakes Substation Modernization (2013-NE-N19); Hat Trick 115 kV Project (2015-NE-N8); Minntac 230 kV Bus Reconfiguration (2015-NE-N10); Forbes 230/115 kV Transformer Addition (2015-NE-N11)

3.3 Regional Studies

While every study that is undertaken adds to the knowledge of the transmission engineers and helps to determine what transmission will be required to address long-term reliability and to transport renewable energy from various parts of the state to the customers, some studies are intentionally designed to take a broader look at overall transmission needs. Regional studies analyze the limitation of the regional transmission system and develop transmission alternatives that support multiple generation interconnect requests, regional load growth, and the elimination of transmission constraints that adversely affect utilities' ability to deliver energy to the market in a cost effective manner. Many of these studies are especially important for focusing on transmission needs for complying with upcoming Renewable Energy Standards.

3.3.1 MISO Transmission Expansion Plans

The Midcontinent Independent System Operator (MISO) engages in annual regional transmission planning and documents the results of its planning activities in the MISO Transmission Expansion Plan (MTEP). The MTEP process is explained in detail in chapter 6 since the latest MTEP reports are being relied on to provide information about the transmission inadequacies identified in this Report. Earlier MTEP Reports were summarized in past Biennial Reports. For convenience, the following brief description of the latest MTEP reports is presented here. The MISO Expansion Plans are available on the MISO webpage. Visit http://www.misoenergy.org and click on "Planning."

MTEP13 Report

The 2013 MISO Transmission Expansion Plan was approved by the MISO Board of Directors in December 2013. The MTEP13 Report identifies those projects required to maintain reliability for the ten year period through the year 2023 and provides a preliminary evaluation of projects that may be required for economic benefit up to twenty years in the future.

On the first page in the Executive Summary, MISO states that MTEP13 recommends 317 new projects totaling $1.48 billion of investment in transmission. Since the first MTEP cycle that closed in 2003, transmission investment totaling $17.9 billion has been approved, $6.2 billion of which is associated with projects already in-service.

MTEP14 Report

The 2014 MISO Transmission Expansion Plan was approved by the MISO Board of Directors in December 10, 2014. The MTEP14 Report identifies those projects required to maintain reliability for the ten year period through the year 2024 and provides a preliminary evaluation of projects that may be required for economic benefit up to twenty years in the future.

On the first page in the Executive Summary, MISO states that MTEP14 recommends 369 new projects totaling $2.5 billion of investment in transmission. Since the first MTEP cycle that closed in 2003, $7.4 billion of projects have been completed.

The MISO Expansion Plans are available on the MISO webpage. Visit http://www.misoenergy.org and click on “Planning.”

MTEP15 Report

The 2015 MTEP report will be the 12th edition of this publication. The report exists in draft form now but should be formally approved by MISO by the end of the calendar year.

According to the MTEP15 Executive Summary, the MISO staff is recommending approval of 2.6 billion dollars of new transmission expansion projects through 2024, comprising 357 new projects. The projects identified in the MTEP15 Report will support both reliability needs and congestion relief of the transmission system throughout the MISO system.

3.3.2 Manitoba Hydro-Electric Board Transmission Service Request

MISO continues to process generation interconnection requests and transmission service requests (TSRs) on the transmission system that they operate. One group of these TSRs that involves the construction of new transmission in Minnesota consists of an increase in the ability to transfer power from Manitoba to the United States. The original Manitoba Hydro TSRs requested delivery totaling 1,100 MW from Manitoba Hydro to four TSR customers in the United States (north to south) and 1,100 MW from utilities in the United States to Manitoba Hydro (south to north). An initial System Impact Study was completed in June 2009 for Firm Point-to-Point Transmission Service between Manitoba Hydro and the TSR customers. The initial study considered several 500 kV transmission options for increasing the capability of the Manitoba – United States interface by 1,100 MW flowing north or south. A follow-up System Impact Study completed in April 2010 specifically evaluated the impact of a new 500 kV interconnection from the Winnipeg area to the planned CapX Bison Substation near Fargo, North Dakota.

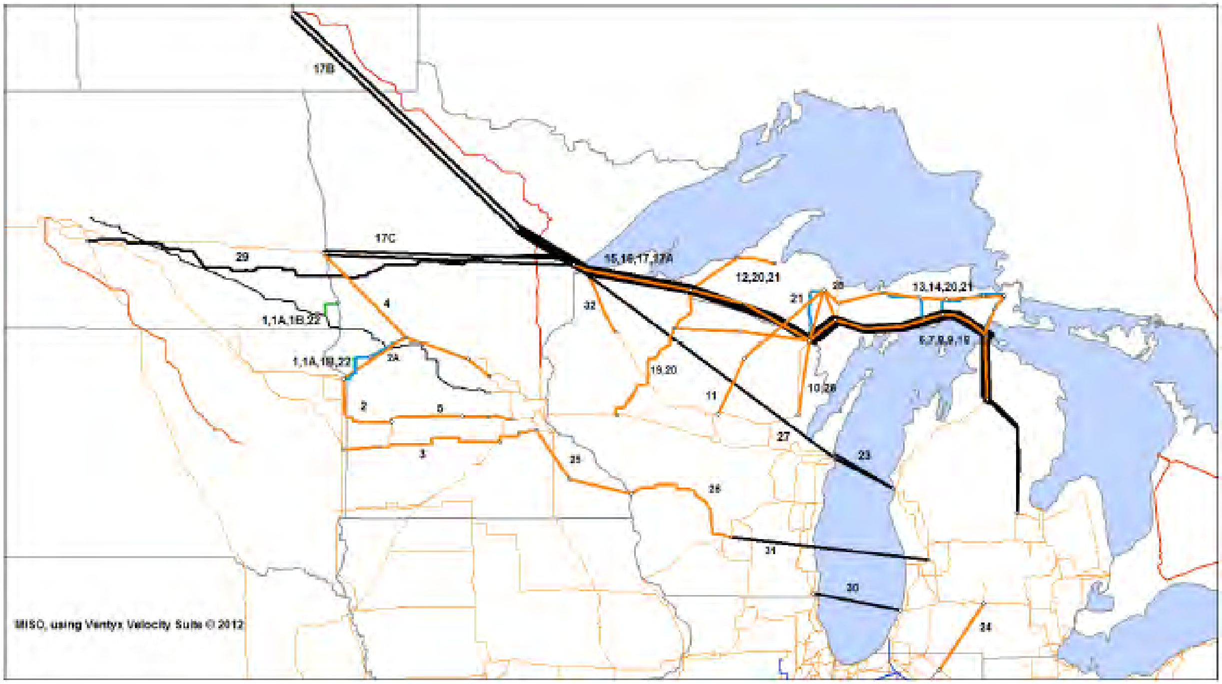
More recently, MISO conducted a series of sensitivities on the Bison option to evaluate alternative transmission scenarios for achieving 250 MW, 750 MW, or 1,100 MW of increased transfer capability from Manitoba to the United States. The initial MH-US TSR Sensitivity studies included a “Western Option” extending new 500 kV transmission to the Fargo-Moorhead area in western Minnesota, an “Eastern Option” extending new 500 kV transmission to the Iron Range in northeastern Minnesota, and a “230 kV Option” extending new 230 kV transmission to the Iron Range. These initial sensitivity studies were completed in July 2013, but no action was taken upon them by the TSR customers at that time.

The final MH-US TSR Sensitivity Analysis evaluated the impact of building new 500 kV transmission from Winnipeg to the Iron Range in order to facilitate up to 883 MW of increased Manitoba to United States transfer capability. After completion of this study by MISO in May 2014, the remaining TSR customers and MISO executed a Facilities Construction Agreement (FCA) for the “Great Northern Transmission Line,” setting forth the ownership and financial responsibilities for the Project, among other terms. Upon approval of the FCA by the FERC on November 25, 2014 in FERC Docket No. ER14-2950, MISO considered the Project an approved project under the MISO tariff and moved the Great Northern Transmission Line Project to Appendix A of the MISO Transmission Expansion Plan 2014 (MTEP14). More information about the Great Northern Transmission Line Project can be found in Section 6 under project 2013-NE-N13 (MTEP ID #3831) and in MPUC Docket No. E015/TL-14-21.

3.3.3 MISO Northern Area Study

The Northern Area Study found that large-scale regional transmission expansion in MISO’s northern footprint (North Dakota, Minnesota, Northern Wisconsin, Michigan Upper Peninsula, and lower Michigan) is not cost-effective based on production cost savings, under current business as usual conditions. Economic benefits for MISO from new potential Manitoba Hydro to MISO tie-lines could be realized with minimal incremental transmission investment. The Northern Area Study identified a *Hankinson – Wahpeton 230 kV* & *Big Stone – Morris 115 kV* upgrade as a cost-effective option to mitigate the remaining out-year congestion from wind on the Dakotas – Minnesota border (resultant benefit to cost ratio B/C ratio 3.46 – 14.74 depending on scenario assumption). The *Hankinson – Wahpeton 230 kV* & *Big Stone – Morris 115 kV* option is being further analyzed in the Market Efficiency Planning Study. The Northern Area Study makes no conclusions regarding the broader multi-value benefits that might be achieved, or the need for future localized reliability upgrades.

Northern Area Study Transmission Options



For the complete report please use the following link and go to the section called Northern Area Study.

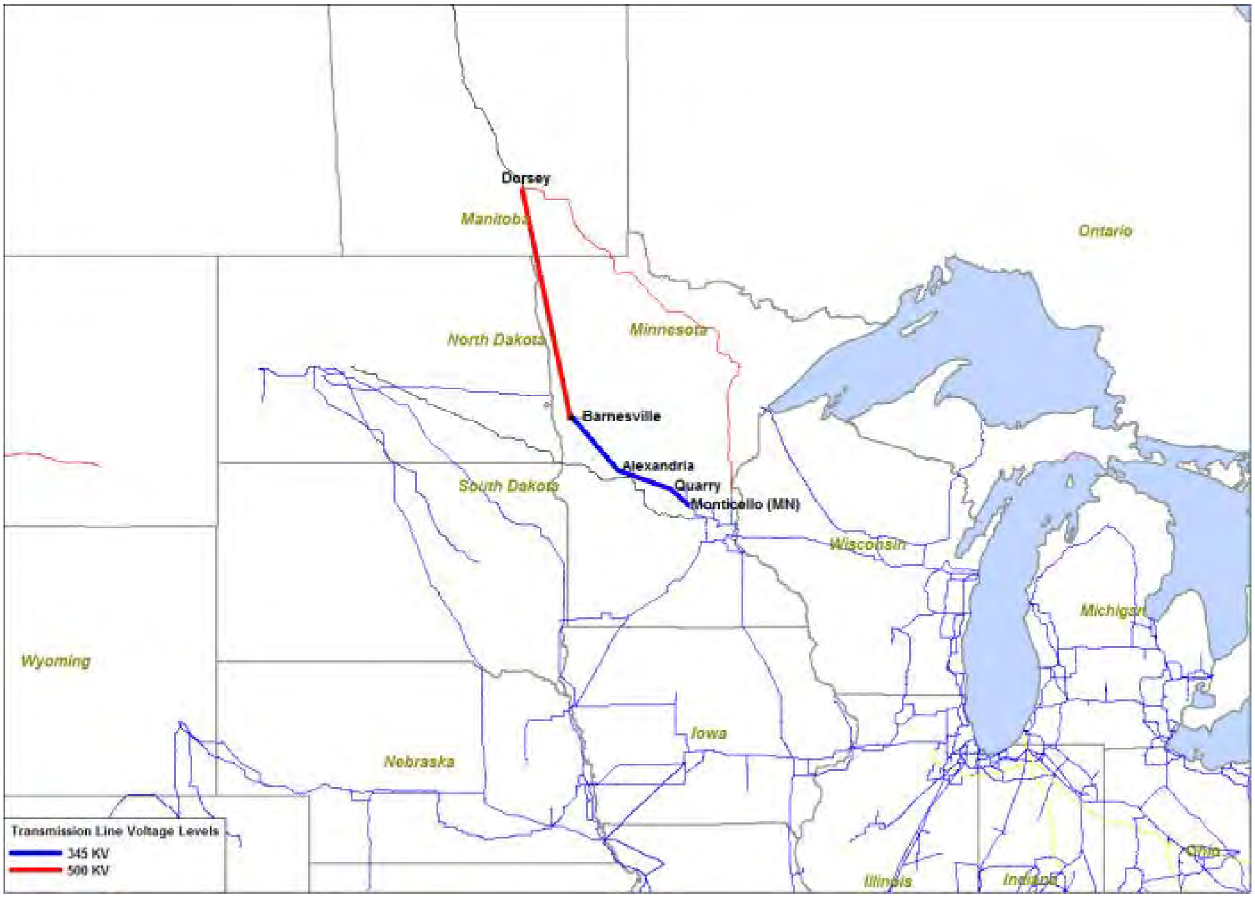
https://www.misoenergy.org/Planning/TransmissionExpansionPlanning/Pages/MTEPStudies.aspx

3.3.4 Manitoba Hydro Wind Synergy Study

The variable and non-peak nature of wind creates integration challenges within MISO. Manitoba Hydro, with its large and flexible system, offers potential solutions for meeting these challenges. At the prompting of Manitoba Hydro and the potential customers of output from their new hydroelectric dams, MISO conducted the Manitoba Hydro Wind Synergy Study to evaluate whether the cost of expanding the transmission capacity between Manitoba and MISO would enable greater wind participation in the MISO market. The study, which was done under full MISO stakeholder review, was completed in 2013. The Manitoba Hydro Wind Synergy Study found significant benefits can be realized from the addition of either an eastern 500 kV line between Winnipeg, Manitoba, and Duluth, Minnesota, or a western 500 kV line between Winnipeg, Manitoba, and Barnesville, Minnesota. Maps of the two alternative routes for a 500 kV line from Winnipeg are shown below. The study also found that expanding the External Asynchronous Resource (EAR) structure from unidirectional to bidirectional would provide near-term benefits as well as long-term benefits. Below is a link to the study:

https://www.misoenergy.org/Library/Pages/Results.aspx?q=manitoba hydro wind synergy

East Option: Dorsey to Blackberry
- 500kV line from Winnipeg to Grand Rapids
- 345kV double circuit line from Grand Rapids to Duluth



West Option: Dorsey to Fargo/Moorhead Area
- 500kV line from Winnipeg to Fargo/Moorhead Area
- 345kV line from Fargo/Moorhead to Monticello

3.3.5 Market Efficiency Planning Study

As described in the 2013 Biennial Report, MISO conducts a Market Efficiency Planning Study (MEPS) as part of its ongoing planning process. The purpose of the MEPS is to determine whether there are transmission projects that could remove transmission constraints and thus more efficiently use available generation resources. The MEPS results are reported as part of the annual MTEP report.

During the MEPS process, projected economic and power flow models are developed which, when analyzed, determine the total production costs that are incurred to provide energy to the MISO load. Transmission constraints, which are the transmission elements that limit the amount of power that can be transferred between the unused, lower-cost generation and the load, are identified.

Through a stakeholder discussion, transmission projects are proposed which could mitigate the constraints. The costs for these proposed transmission projects are determined and compared to the amount of production cost savings that could be realized if those projects were in service. The resultant benefit to cost (B/C) ratio of the projects indicates whether the proposed solutions should be considered for further evaluation for constructability and reliability analysis. Stakeholder review and comments are compiled and a decision on whether to recommend a MEPS project be included in the upcoming MTEP report is made.

3.3.6 Minnesota Renewable Energy Integration and Transmission Study (MRITS)

In 2013 the Minnesota Legislature directed MN electric utilities and transmission companies and other load serving entities to "conduct an engineering study of the impacts on reliability and costs of, and to study and develop plans for the transmission network enhancements necessary to support increasing the renewable energy standard established in Minnesota Statutes § 216B.1691, subdivision 2a, to 40 percent by 2030, and to higher proportions thereafter, while maintaining system reliability." Minn. Laws 2013, chapter 85, article 12, section 4(a). The Minnesota electric utilities and transmission companies, in coordination with MISO, conducted the engineering study, which came to be called the Renewable Energy Integration and Transmission Study (MRITS). The Department of Commerce directed the study and appointed and led a Technical Review Committee (TRC). The final study includes: 1) A conceptual plan for transmission for generation interconnection and delivery and for access to regional geographic diversity and regional supply and demand side flexibility, and 2) Identification and development of potential solutions to any critical issues encountered. The MRITS Report was submitted to the MPUC by the Minnesota Department of Commerce on November 5, 2014, under Docket Number E999/CI-13-486. The Report is also available at the following link:

http://www.minnelectrans.com/reports.html

All utilities with Minnesota retail electric sales and all Minnesota transmission companies participated in the study. Eight Balancing Authorities were represented and over 85% of the Minnesota retail sales were in the four largest Balancing Authorities: Xcel Energy (NSP), Great River Energy, Minnesota Power, and Otter Tail Power. The study area is within the NERC reliability region Midwest Reliability Organization (MRO). Nearly all of the Minnesota retail sales are within the Midcontinent Independent System Operator (MISO). The Balancing Authorities within MISO, including the Minnesota BAs, are functionally consolidated.

The authors of the study describe the Study Objectives at page 1-2 of the Executive Summary as follows:

1. Evaluate the impacts on reliability and costs associated with increasing Renewable Energy to 40% of Minnesota retail electric energy sales by 2030, and to higher proportions thereafter;
2. Develop a conceptual plan for transmission necessary for access to regional geographic diversity and regional supply and demand side flexibility;
3. Identify and develop options to manage the impacts of the renewable energy resources;
4. Build upon prior wind integration studies and related technical work; coordinate with recent and current regional power system study work;
5. Produce meaningful, broadly supported results through a technically rigorous, inclusive study process.

The MRITS study, perhaps, provides the most pertinent information about the ability of the existing transmission grid to respond to increased levels of renewable energy and the challenges and costs involved in upgrading the grid going forward. The authors state "The study is focused on the reliability of increased levels of variable renewables (wind and solar generation) and the associated costs of those impacts." Executive Summary at p. 1-2.

3.3.7 MISO Clean Power Plan (CPP) Study

The study is designed to provide a robust and reasonably realistic representation of a world in which the EPA's draft Clean Power Plan (CPP) is fully implemented. Scenarios are derived and implemented to capture a wide range of compliance strategies without leaving the bounds of the draft rule. Implementation of the draft rule will take the form of capacity additions and retirements coupled with constraints representing the EPA's CO2 rate targets on state, sub-regional and regional levels. In order to account for the limitations and feedback from the natural gas industry a new gas model has been added to the more traditional electric model. This novel approach will provide unique insights into how the electric and gas systems will interact with each other under CPP implementation.

The study consists of both reliability analysis, using PSS/E, and production cost analysis, using PLEXOS. These models were chosen because of MISO's experience with them in past analyses, along with their ability to meet the needs of this study. The study endeavors to create similar representations of the underlying infrastructure and use similar regulatory and economic assumptions in both models.

There are six scenarios being studied.

1. Business-as-Usual (BAU)
2. CPP Constraints (CPP)
3. Coal-to-Gas Conversions (C2G)
4. Gas Build-Out (GBO)
5. Gas, Wind and Solar Build-Out (GWS)
6. Increased Energy Efficiency with Wind and Solar Build-Out (EWS)

3.3.8 Eastern Interconnection Planning Collaborative

The Eastern Interconnection Planning Collaborative was described in detail in both the 2011 and the 2013 Biennial Reports. In December 2011, the EIPC Phase 1 Report was completed. Phase 1 looked at the creation of a combined grid model for the Eastern Interconnection and the formation of a diverse Stakeholder Steering Committee.

This Stakeholder Steering Committee chose three future scenarios as the basis for the Phase 2 work. The three scenarios are:

1. A Nationally Implemented Federal Carbon Constraint with Increased Energy Efficiency/Demand Response,

2. A Regionally Implemented Renewable Portfolio Standard; and

3. Business as Usual

On July 2, 2015, the Phase 2 final report associated with this effort was submitted to the U.S. Department of Energy. That report is entitled *Phase 2 Report: Interregional Transmission Development and Analysis for Three Stakeholder Selected Scenarios and Gas-Electric System Interface Study*. It consists of 13 volumes. The following is quoted from

> Phase I of the project focused on developing the stakeholder processes, developing and specifying inputs for eight different futures and an additional seventy-two sensitivities, and identifying the generation resources (location, type and amount) and additional transfers needed to support the futures. This effort involved stakeholders in direct and detailed conversations developing the futures and sensitivities and the many inputs needed for analysis. Stakeholders were also directly involved in reviewing results and choosing the final three scenarios.
>
> . . . .
>
> The results of the Gas-Electric System Interface Study provide a comprehensive analysis across the region of the adequacy of the natural gas pipeline delivery system to meet the needs of gas-fired electric generation system under various conditions over a 10-year horizon. In addition, the study identified constraints on the natural gas pipeline system that may affect the delivery of gas to specific generators following a variety of postulated gas and electric system contingencies. The study also describes a number of mitigation measures that may be considered by gas and electric system operators to alleviate the impacts on the electric system under such conditions. The results of this study provide a wealth of information for consideration by the Participating Planning Authorities and regional stakeholders to inform their respective operational and planning analyses.

Phase 2 Report, Volume 2, at page 1-11. The entire Phase 2 Report is available on the Internet at www.eipconline.com.

3.4 Load Serving Studies

Load serving studies focus on addressing load serving needs in a particular area or community. Since many of the inadequacies in Chapter 6 are load serving situations, many of these studies relate to specific Tracking Numbers.

Study Title	Anticipated completion	Utility lead for Study	Description
Owatonna Area Study	2015	NSP/ GRE	Owatonna Area Study. This study is to evaluate the need for more voltage support under contingency. The early results are indicating an additional 161 kV line into the Owatonna area. This study is still ongoing.

Study Title	Anticipated completion	Utility lead for Study	Description
North Shore Loop Comprehensive Plan	2015	MP	Develop a comprehensive plan and staged approach for transmission expansion in the area between Duluth, Taconite Harbor, and Hoyt Lakes in light of future changes in generation and load; Projects *TBD*
Bear Creek 69/46 kV Transformer Addition	2015	MP	System impact of retiring Sandstone 69/46 kV source and establishing new Bear Creek 69/46 kV source; Bear Creek 69/46 kV Transformer (2015-NE-N13)

4.0 Public Participation

4.1 Public Involvement in Transmission Planning

Both the statute – Minn. Stat. § 216B.2425 – and the MPUC rules – Minn. Rule part 7848.0900 – emphasize the importance of providing the public and local government officials with an opportunity to participate in transmission planning. Over the years of filing biennial reports, the utilities have tried, in accordance with MPUC requirements, various methods of advising the public of opportunities to learn about and participate in transmission planning activities.

The MPUC adopted rules for public involvement in transmission planning as part of the biennial report requirements in 2003. Initially, in accordance with Minn. Rule part 7848.0900, the utilities held public meetings across the state in each transmission planning zone to advise the public of potential transmission projects and to solicit input regarding development of alternative solutions to various inadequacies. These public meetings were poorly attended, with little input being offered.

As a result, in May 2008 when the MPUC approved the 2007 Report, the MPUC granted a variance from the obligation to hold these zonal meetings, and that variance has been extended every time since, including in the May 12, 2014, Order regarding this year's Biennial Report. No public meetings were required in the transmission planning zones as part of this year's biennial report submission.

In lieu of the public meetings, beginning with the preparation of the 2009 Report, the utilities held six webinars, one for each transmission planning zone, to report on the transmission inadequacies identified in the Biennial Report for each zone. These webinars were not any better attended than the zonal meetings were in previous years. Few questions and comments were generated.

For the 2011 Report, with Commission approval, the utilities held one webinar. Despite widespread notice in a statewide newspaper of the webinar, only a few people participated, and most of those were utility or state employees. In 2013, after the 2013 Biennial Report was filed, the utilities held another webinar. Again, essentially nobody participated – only one person joined in the webinar.

As a result, the Commission has now determined that the utilities are not required to hold a webinar with regard to the 2015 Report.

4.2 MISO Transmission Planning

As has been described in previous biennial reports and again in this report, most transmission planning is now conducted through the Midcontinent Independent Transmission System Operator (MISO). MISO provides all kinds of opportunities for the public to be involved in transmission planning. The reality is, however, that not many members of the general public avail themselves of these opportunities. It is understandable, because transmission planning is an extremely technical endeavor.

4.3 MTO Website

The Minnesota Transmission Owners have maintained a website (www.minnelectrans.com) for several years now, on which interested persons can obtain various information about ongoing transmission planning efforts. Every Biennial Report, for example, is available on that website, as are many different transmission-related studies. There is a contact form on the webpage where visitors can ask questions of utilities about proposed projects. Only a handful of questions have ever been submitted using that method.

The Minnesota Transmission Owners have even developed two short videos detailing items of interest to the general public about transmission lines that are available on the webpage. One video describes generally how the transmission planning process is done at utilities in Minnesota. The second video describes how to read the Biennial Transmission Report and engage with transmission owning utilities.

The utilities will continue to post the biennial reports on the webpage and to monitor any questions that are submitted. The utilities are open to comments from the public about how to improve the webpage.

4.4 Efforts to Involve the General Public and Local Officials on Specific Projects

The MTO utilities are well aware of the importance of notifying the general public and local governmental officials of any potential large energy project in their area. The public may not get involved in esoteric transmission planning activities but it surely wants to be aware of projects that are under consideration in its locale. The utilities often engage local governmental officials and the public in public meetings to discuss upcoming projects.

Minn. Stat. § 216E.03, subds. 3a and 3b, requires any utility that is planning to file an application for a route permit with the Minnesota Public Utilities Commission for a new transmission project to notify local governmental officials within a possible route of the existence of the project and the opportunity for a preapplication meeting. The utilities do this, of course, and often local governmental bodies request a meeting with the utility.

In the 2013 Biennial Report, in Section 4.4, the utilities provided several examples of how certain utilities had undertaken specific methods of involving local government and the general public. These examples illustrate methods by which the public can be involved in ongoing transmission projects. The following examples are also indicative of the steps the utilities take to involve local government and the general public in specific projects.

4.4.1 Great Northern Transmission Line MPUC Tracking No. 2013-NE-N13

The Great Northern Transmission Line (Tracking No. 2013-NE-N13), now well into the regulatory review process, provides an excellent example of outreach efforts being undertaken by Minnesota Power to involve the public and local government. During the initial stages of the development of the Great Northern Transmission Line Project, Minnesota Power developed a strategic communication plan that identified stakeholders for the Project, along with communication tools, schedule, and approach to create an upfront, engaging, and transparent outreach program to engage those stakeholders early and often throughout the development of the Project. From August 2012 through November 2013, Minnesota Power organized more than 75 agency and public meetings and launched several communication tools to facilitate stakeholder engagement. During the route permit environmental review process, Minnesota Power also organized an additional set of 7 voluntary open house meetings in May 2015 to facilitate public involvement in the environmental review. Below is a brief overview of the key outreach tools and milestones in Minnesota Power's public engagement process for the Great Northern Transmission Line.

In August 2012, Minnesota Power hosted 11 "Stakeholder Workshops" throughout the study area for the Project. Stakeholder workshop invitees included federal, state, and local agencies, local officials, and tribal representatives. A total of 58 people attended the stakeholder workshops and through their feedback Minnesota Power gathered 142 mapping comments (geographically-based comments made on a large aerial maps at the meetings) and 37 surveys, which helped to understand local community needs and preferences. The information gathered at these workshops was used to narrow the original study area into broad corridors and plan the outreach and logistics for the subsequent series of public open house meetings.

To provide consistent and ongoing communication and opportunities for comment submittals, Minnesota Power launched a Project website and several additional public outreach tools early in the development of the Project. On September 30, 2012, Minnesota Power launched the Project website (http://www.greatnortherntransmissionline.com/). The interactive website provides updates on the Project and an interactive mapping tool as well as a wealth of information about the route development process, permitting process, what the Project will look like, and additional information about Minnesota Power. The website also gives users the ability to submit comments or questions, and provides contact information for the Project team. The website has been maintained and updated continuously since September 2012 in order to provide the interested public with the latest and greatest information at every stage of the development and permitting of the Project. Additional outreach tools employed by Minnesota Power include a Project email address (info@greatnortherntransmissionline.com), a Project comment hotline (877-657-9934), and a recurring Project newsletter distributed to individuals who had signed up to be on the Project mailing list.

From October 2012 through November 2013, Minnesota Power hosted five rounds of voluntary public open house meetings throughout the Project area. Invitations were mailed to more than 40,000 landowners, federal, state, and local agencies, tribes, elected officials, and non-governmental organizations to attend either an in-person or online open house meeting. The goal of each open house meeting was to introduce the Project, answer questions, gather input, and collect comments. These meetings are summarized below:

- October – November 2012: Eleven "Study Corridor" open house meetings
    - Outreach: Press releases sent to 25 media outlets; newspaper advertisements in 30 local papers; 278 stakeholder letters sent; 48,872 landowner postcard invitations

    - Engagement: 583 attendees, 80 online attendees, 16 comment forms & 154 mapping comments submitted
- April 2013: Fourteen “Preliminary Route Alternative” open house meetings
    - Outreach: Press releases sent to 71 media outlets; newspaper advertisements in 31 local papers; 2,021 stakeholder letters sent; 40,354 landowner postcard invitations
    - Engagement: 747 attendees, 269 online attendees, 53 comment forms, 38 online comment forms & 249 mapping comments submitted
- September 2013: Thirteen “Refined Route Alternative” open house meetings
    - Outreach: Press releases sent to 29 media outlets; newspaper advertisements in 31 local papers; 3,470 stakeholder letters sent; 40,982 landowner postcard invitations
    - Engagement: 683 attendees, 108 online attendees, 126 comment forms, 23 online comment forms & 91 mapping comments submitted
- November 2013: Three “Additional Route Alternative” open house meetings
    - Outreach: Newspaper advertisements in 3 local papers; 3,696 landowner and stakeholder letters sent
    - Engagement: 148 attendees, 27 comment forms, 6 mapping comments submitted

The feedback gathered from Minnesota Power’s public engagement program, along with countless additional in-person meetings, conference calls, and email correspondence with federal, state, and local government and non-governmental agencies throughout the Project area, culminated in Minnesota Power’s submittal of its proposed “Blue” and alternate “Orange” routes in a Route Permit Application (RPA) to the Commission on April 15, 2014 (MPUC Docket No. E015/TL-14-21) and a Presidential Permit application to the United States Department of Energy.

During the environmental review process for the RPA, Minnesota Power also hosted a series of seven in-person “Scoping Decision Route” voluntary open house meetings in May 2015. The purpose of these open house meetings was to inform local stakeholders and the public about alternative routes proposed during the scoping for the environmental impact statement (EIS) as well as to inform them on how and when to participate in the Draft EIS and the Contested Case hearings taking place in July and August 2015. There were 234 attendees for this final round of voluntary public open house meetings, and 10 comment forms and 12 mapping comments were submitted to Minnesota Power and later passed on to the Department of Commerce as comments on the Draft EIS.

Minnesota Power’s extensive and unprecedented voluntary public outreach on the Great Northern Transmission Line Project has allowed Minnesota Power to develop relationships with the agencies, local officials, and landowners potentially affected by the Project. The upfront and transparent process has generally been appreciated by stakeholders and the public regardless of their support or opposition to the Project. The information gathered through this engagement program and the relationships developed have been critical to the success of Project.

4.4.2 Elko-New Market-Cleary Lake Areas MPUC Tracking Number 2009-TC-N2

In June 2013, Great River Energy applied for a Certificate of Need and a Route Permit for a new 115 kV transmission line in Scott and Rice Counties. In its application, at page 1-9, GRE explained that it contacted several local governmental bodies and the Mdewakanton Sioux Community and invited them to meet prior to submitting the application. GRE ultimately did meet with several cities and townships and Scott County to explain the project and invite input. As part of its application, at pages 2-4 and 2-5, GRE explained that pursuant to Minn. Stat.§ 216B.03, subds. 3a and 3b, the following efforts were undertaken to inform the public about this project:

> The Applicant held public open house informational meetings on January 15, 2013, at the Scott County Library (Elko New Market Branch) and on January 16, 2013, at the Prior Lake High School. Approximately 85 members of the public, including governmental officials, attended the open houses.
>
> The meetings were publicized in several local papers approximately one week prior to the open houses, and landowners potentially impacted received a letter of invitation. Tribal and local government officials and resource agencies were also invited by letter. Minn. Stat. § 216E.03, subd. 3a. Large aerial maps of the proposed Project, photos of proposed transmission structures, fact sheets, information on the permitting process and need for the Project, right-of-way (ROW) information, and a post card for questions and comments were available at the open houses.

These are the kind of efforts that utilities follow prior to the time an application for a route permit for a new transmission line is filed with the Minnesota Public Utilities Commission.

5.0 Transmission Planning Zones

5.1 Introduction

The Minnesota Public Utilities Commission divided Minnesota geographically into the following six Transmission Planning Zones when it adopted the rules in chapter 7848 in 2003:

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

The map below shows the six Zones.

Chapter 5 of the 2015 Report describes each of the Transmission Planning Zones in the state. The zones have not changed over the years so the description below for each zone is essentially identical to what was provided in past reports, although any changes in the transmission system in a particular zone that occurred over the past two years are described in each section.

The discussion for each zone contains a list of the counties in the zone and the major population centers. The utilities that own high voltage transmission lines in the zone are also identified. A description of the major transmission lines in the zone is provided.

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.

Chapter 6 describes the needs for additional transmission facilities that have been identified for each zone. Chapter 7 contains additional information about each of the utilities filing this report, including their existing transmission lines.

5.2 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. 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.

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 the Northwest Planning Zone is located in eastern North Dakota. Four 230 kV lines and one 345 kV line reach from western North Dakota to substations in Drayton, Grand Forks, Fargo, and Wahpeton, North Dakota, along with a 230 kV line from Manitoba and a 230 kV line from South Dakota. Five 230 kV lines run from eastern North Dakota into Audubon, Moorhead, Fergus Falls, and Winger, Minnesota. These five lines then proceed through northwestern Minnesota and continue on to substations in west-central and northeastern Minnesota. Additionally, a 230 kV line from Manitoba to the Northeast Zone crosses the northeastern corner of this zone and provides power to local loads. The 230 kV system supports an extensive 115 kV, 69 kV, and 41.6 kV transmission system which delivers power to local loads.

The major change in the transmission system in the Northwest Zone since 2011 is the addition of a 230 kV line between Grand Rapids in the Northeast Zone and Bemidji in the Northwest Zone (a CapX2020 project). This line was energized in November 2012. This project has been referenced under Tracking Number 2005-NW-N2 and MPUC Docket No. E015,ET6,E017/TL-07-1327.

The MPC Center – Grand Forks 345 kV project was completed in early 2014 and will bring power from Center, North Dakota to Grand Forks, North Dakota. Also, the CapX Fargo – St. Cloud 345 kV project was completed in 2015 and will transfer power between Fargo, North Dakota and the St. Cloud area.

Continued load growth in the northern part of this zone has led to the development of plans for a new 230 kV line from Winger to Thief River Falls. This line is reported under Tracking Number 2007-NW-N3.

5.3 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.

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
- Minnkota Power Cooperative
- Minnesota Power
- Southern Minnesota Municipal Power Agency
- 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. American Transmission Company's 345 kV line runs between Duluth, Minnesota, and Wausau, Wisconsin. A +/- 250 kV DC line runs from Center, North Dakota to Duluth, which currently serves mainly as a generator outlet for renewable generation located in North Dakota. The CapX2020 230 kV line between the Bemidji area in the Northwest Zone and the Grand Rapids area in the Northeast Zone (the CapX2020 Bemidji-Grand Rapids project) has been completed. 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.

The new Great Northern Transmission Line Project will build approximately 220 miles of new 500 kV coming from Manitoba Hydro to the Grand Rapids, Minnesota area. This project will increase the amount of hydro renewables that can be imported to the state of Minnesota. This line is reported under Tracking Number 2013-NE-N13.

5.4 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 West Central Planning Zone includes the counties of Traverse, Big Stone, Lac qui Parle, Swift, Stevens, Grant, Douglas, Pope, Chippewa, Renville, Kandiyohi, Stearns, Meeker, McLeod, Wright, Sherburne, and Benton.

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
- Southern Minnesota Municipal Power Agency
- 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 transmission lines provide service 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.

Demand in the St. Cloud area continues to grow and several individual projects are being considered to address the need for more power into this area. The new CapX Quarry substation will provide significant relief to the St. Cloud area system deficiencies. The CapX Fargo – St.

Cloud 345 kV project was completed in 2015 and will transfer power between Fargo, North Dakota and the St. Cloud area. The CapX Brookings, South Dakota – Twin Cities 345 kV project was also completed in 2015.

Some of the 69 kV 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 kV transmission lines. Therefore, any discussion about the inadequacy of the existing system must include an analysis of parts of the existing 69 kV transmission system.

5.5 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

There are no major changes in the transmission facilities located in the Twin Cities Zone since 2013, although several projects are under review by the Minnesota Public Utilities Commission.

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.

The CapX Brookings– Twin Cities 345 kV project was completed in 2015 and will transfer power between the southwest corner of the Twin Cities and Brookings, South Dakota. The CapX 345 kV project between the southeast corner of the Twin Cities area, Rochester, and LaCrosse, Wisconsin, was also completed in 2015.

5.6 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:

- ITC Midwest LLC
- East River Electric Power Cooperative
- Great River Energy
- L&O Power Cooperative
- Marshall Municipal Utilities
- Missouri River Energy Services
- Otter Tail Power Company
- Southern Minnesota Municipal Power Agency
- Xcel Energy

The transmission system in the Southwest Zone consists mainly of two 345 kV transmission lines, one beginning at Split Rock Substation near Sioux Falls and traveling to Lakefield Junction and the second traveling from Mankato, through Lakefield Junction and south into Iowa. Lakefield Junction serves as a major hub for several 161 kV lines throughout the zone. A number of 115 kV lines also 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 transmission 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 occurring along Buffalo Ridge. The transmission system in this zone has changed significantly in recent years with new transmission additions to enable additional generation delivery. Continuing these changes, the system will soon be enhanced by the addition of the Twin Cities – Brookings 345 kV transmission line to provide additional outlet for the wind generation in the Southwest Zone which is scheduled to be completed by the end of 2015. In addition to enabling additional delivery of wind generation, these lines will provide opportunities for new transmission substations to improve the load serving capability of the underlying transmission system.

The CapX Brookings, South Dakota – Twin Cities 345 kV project was completed in 2015.

5.7 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
- ITC Midwest LLC
- Rochester Public Utilities
- Southern Minnesota Municipal Power Agency
- Xcel Energy

The major change in the Southeast Planning Zone is the completion of the CapX 345 kV line from the Hampton Corner substation to Lacrosse, Wisconsin. This line will help increase local reliability along with helping increase renewable generation transfer to the east.

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.

6.0 Needs

6.1 Introduction

Chapter 6 contains information on each of the present and reasonably foreseeable future inadequacies that have been identified in the six transmission zones. For each zone, a table of present inadequacies is first presented, in order of when the inadequacy was first identified, so the older inadequacies are listed first. Then a discussion of each pending project, by Tracking Number, is provided. Finally, a table of completed projects is included.

6.1.1 Needed Projects

For each transmission planning zone, the discussion begins with a table that looks like this.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility

The following describes what information is found in each of the columns.

MPUC Tracking Number

The first column in the table is labeled “MPUC Tracking Number.” Each inadequacy is assigned a Tracking Number. This numbering system was created in 2005 and has been utilized in every report since. The Tracking Number has three parts to it: the year the inadequacy was first reported, the zone in which it occurs, and a chronological number assigned in no particular order. Tracking Number 2013-NE-N1, for example, indicates that this matter is first reported in the 2013 Report and is an inadequacy in the Northeast Zone. An inadequacy with a Tracking Number beginning with 2007, on the other hand, was first identified in the 2007 Report.

MISO Project Name

The second column contains the MISO Project Name for each project. This is the name used in the pertinent MTEP Report for that project. In some cases, for projects that were first identified in earlier years and are still under development, the MISO Project Name may not be exactly the same as the name given in an earlier biennial report, but the project is the same.

MTEP Year/App

The third column contains a reference to a MISO Transmission Expansion Plan (MTEP) Report and an Appendix in the report. The MTEP Report is prepared annually by the Midcontinent Independent System Operator (MISO) and each utility that is a member of MISO must participate in the MTEP process. Each report is referred to by the year it is adopted. Thus, the most recent report is MTEP15, although it won’t be finally approved by MISO until the end of the year. Additional information about the MISO planning process and the MTEP reports is included in section 3.3.1 of this Biennial Report, and an explanation of how to find a particular MTEP Report and an Appendix is provided in subsection 6.2.

MTEP Project Number

The fourth column of the table provides a Project Number assigned by the Midcontinent Independent Transmission System Operator (MISO) for each project. This Project Number is important for finding a particular project in the appropriate MISO Transmission Expansion Plan (MTEP) Report. The only utility reporting transmission needs in this biennial report that is not a member of MISO is Minnkota Power Cooperative, and all the MPC projects are in the Northwest Zone. The other non-MISO utilities are East River Electric Power Cooperative (EREPC), Hutchinson Utilities Commission (HUC), L&O Power Cooperative (L&O), Marshall Municipal Utilities (MMU), and Willmar Municipal Utilities (WMU), but these utilities are not reporting any transmission needs in this report. There are several Minnkota projects reported for the Northwest Zone for which there is no link to a MISO Project Number of a MTEP Report. All other projects are being considered by utilities that are members of MISO and both a project number and a MTEP reference are provided.

CON

The MPUC rules (Minn. Rules part 7848.1300, item M) state that the biennial report shall contain an approximate timeframe for filing a certificate of need application for any projects identified that are large enough to require a certificate of need. This column provides a simple “Yes” or “No” indication of whether a CON is required. If a certificate of need has already been applied for, the MPUC Docket Number for that filing can be found in the discussion for that particular project. If a Docket Number is given, that docket can be checked to determine whether the CON has already been issued by the Commission.

Utility

This column simply identifies the utility or utilities that are involved in the project.

6.1.2 Description of Each Project by Tracking Number

In the 2005, 2007, and 2009 Biennial Reports, the utilities provided a separate subsection for each pending project by Tracking Number and included certain information about each project. In the 2011 and 2013 Report, those discussions were eliminated because the Commission had understandably authorized the utilities to rely on the MTEP Reports to provide all the necessary information regarding each project because transmission planning was being conducted by and through MISO.

In 2014, as part of its approval of the 2013 Biennial Report, the Commission determined that perhaps the MTEP Reports did not satisfy one requirement of the state statute to “identify [in the biennial report] general economic, environmental, and social issues associated with each alternative.” Minn. Stat. §216B.2425, subd. 2(c)(3). The utilities did not object to providing that information in the 2015 Report, but would raise the caveat that for many of the projects, particularly those that are several years into the future, detailed information is often not available at this stage of development of the project. Also, for many smaller projects, like replacing a transformer, there are no likely alternatives available and not much information is available.

To assist the Commission, and other readers of the report as well, the utilities have included in this Biennial Report a separate discussion of various matters relating to each project, even though nearly all that information can be found in the MTEP Reports. As part of this discussion, the utilities provide available information on the general impacts associated with the project. In those cases where a certificate of need or a routing permit or both have been applied for, or even granted, most of this type of information is available in the records created in those dockets, and a reference to the MPUC Docket Number is provided. Any reader desiring in-depth information about a project that has been approved or is being considered by the Commission can review the record in that matter for more detailed information.

6.1.3 Completed Projects

The table for Completed Projects is similar to the table for Needed Projects described above.

MPUC Tracking Number	Description	MTEP Year/App	MTEP Project Number	Utility	Date Completed

Most of the columns contain the same information that is provided for the ongoing projects. However, the last column provides the date the project was completed, and the second column contains a more precise description of the project than just the MISO title. If a certificate of need or a route permit was required from the Minnesota Public Utilities Commission, or both, the docket numbers are provided in the last column. While the last column is entitled “Date Completed,” in some cases the project is being removed from the list because the need that was once perceived is no longer present and the project is being withdrawn. Readers interested in more information about a completed project can consult earlier Biennial Reports, the MTEP Report, or the MPUC Docket, whichever are applicable.

6.2 The MISO Planning Process

6.2.1 The MISO Transmission Expansion Plan Report

Because nearly all of the projects identified in this Report are being undertaken by utilities that are members of the Midcontinent Independent Transmission System Operator (MISO), this subsection is provided to assist the reader in finding information about the MISO planning process and the annual MISO Transmission Expansion Plan (MTEP) Report that is prepared each year. Much of the information provided in this subsection was also available in the 2011 and 2013 Biennial Reports.

The latest MTEP Reports are available on the MISO webpage at:

http://www.misoenergy.org (Click on "Planning.")

The MTEP process is ongoing at all times at MISO. Generally utilities submit a list of their newly proposed projects in September. MISO staff evaluates these projects over the next several months, and prepares a draft of the annual MTEP Report around July of the following year. After review by utilities and other interested parties, the MISO board of directors usually approves the report in December. The process continues with another report finalized the following December. The MTEP 15 Report should be approved by the MISO Board of Directors in December of this year.

Each of the MTEP Reports separates transmission projects into three categories and lists them in Appendices as follows:

Appendix A – Projects recommended for approval,
Appendix B – Projects with documented need and effectiveness, and
Appendix C – Projects in review and conceptual projects.

Generally, when projects are first identified, they are listed in Appendix C, and then they move up to Appendix B and to Appendix A as they are further studied and ultimately brought forth for construction. Some projects never advance to the final stage of actually being approved and constructed.

The MTEP Report is an excellent source of information about ongoing transmission studies and projects in Minnesota and throughout a wide area of the country.

- The MTEP Report is prepared annually so it provides more timely information. The Biennial Report is prepared every other year.
- The MISO planning process is comprehensive. MISO considers all regional transmission issues, not just Minnesota transmission issues.
- MISO conducts an independent analysis of all projects to confirm the benefits stated by the project sponsor. This adds further verification of the benefits of projects.
- MISO holds various planning meetings during the year at which stakeholders can have input into the planning process so there are more frequent opportunities for input (see next paragraph.)
- All completed projects are listed on the MISO webpage.
- Not duplicating the MTEP Report will save ratepayers money. It is costly to require the utilities to redo all the information that is found in the MTEP Report.

6.2.2 Finding a Project in a MTEP Report

For each zone, a table is included that describes certain information about each project by Tracking Number. The table looks like this (MPUC Tracking Number 2015-WC-N4 is used for illustrative purposes):

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2015-WC-N4	Douglas County – West Union 69KV Line rebuild	2014/A	4693	No	XEL

MPUC Tracking Number 2015-WC-N4 is the Douglas County – West Union 69 kV Line Rebuild, an Xcel project in Douglas County. The project can be found in Appendix A of the MTEP14 Report by following these steps:

Step 1. Go to the MISO homepage at: https://www.misoenergy.org

Step 2. Click on "Planning" at the top of the page. Then click on the link on the left side of the page entitled "MISO Transmission Planning Expansion (MTEP)."

Step 3. Click on the link for the MTEP 14 Report.

Step 4. Click on the "MTEP14 Appendices ABC."

Step 5. Select the "Projects" tab at the bottom of the spreadsheet that was just downloaded. Hold down the "Ctrl" key and press the "F" key to bring up the "Find" dialog box. Enter the MTEP Project Number, which in this case is 4693, in the dialog box and select "Find Next." Information about the project can then be read from the row the MTEP Project was found during this search.

Similar steps can be followed for all other projects identified in Chapter 6, including those few that are not Appendix A projects (recommended by MISO for approval). If the MTEP Report you are seeking is an older one, probably earlier than 2011, you may have to click on Study Repositories to find these other reports at Step 2.

Project Facilities.

Appendices A, B and C also contain information on the specific facilities (such as transmission lines, substations, etc.) that are part of a particular project. The steps below show how to find this information for the example project.

Step 1: To find information on specific facilities (transmission lines, substations etc.) that are part of a project click on the "Facilities" tab located at the bottom of the spreadsheet that was downloaded at Step 5 in the above example.

Step 2: Hold down the "Ctrl" key and hit the "F" key to bring up the "Find" dialog box. Enter the MTEP Project Number, which is "4693" in this example, in the dialog box and then click on "Find Next." The "Find Next" link can be clicked until all rows containing information about Project Number 4693 have been found. There will usually be more than one row since most projects involve more than one transmission line or substation or other facility.

This same procedure can be used to find this kind of information for other projects and their associated facilities for the projects listed in the tables in Chapter 6 using the MTEP Report and the MTEP Project Number.

Detailed Project Information

Starting in 2008, if the project has been either approved or recommended for approval by the MISO board of directors (i.e., designated an Appendix A project), additional, more detailed information about the project can be found in Appendix D1 in the MTEP Report for the year the project was approved by MISO. For large projects, this information includes a project map, project justification and information about the system inadequacy that the project is intended to correct. For smaller projects, a subset of this information is included. Starting with the MTEP08 Report, projects located in Minnesota are contained in the "West Region Project Justifications" portion of Appendix D1 in the MTEP Report year that the project was approved or recommended for approval. For information on Minnesota projects approved by MISO prior to 2008, see the appropriate year Minnesota Biennial Transmission Projects Report for the appropriate year.

Continuing with our example of the Douglas County – West Union 69KV Line rebuild, Tracking Number 2015-WC-N4, which is an approved Appendix A project, this additional information can be found by going to Appendix D1 through the following steps.

Step 1. After following the first three steps described above to get to the appropriate MTEP report, click on the MTEP14 Appendices link.

Step 2. Select MTEP 14 Appendix D1 West.

Step 3. Once the desired Appendix D1 is downloaded, use the .pdf search tool to find Project Number 4693 and locate information about this project.

This same procedure can be used to find more detailed information on most projects shown in the tables in Sections 6.3 through 6.8 that have moved to MISO Appendix A since 2008. In addition, if you search for a specific utility's name, you can find information on projects that utility has submitted and have been or are being considered for approval by the MISO board of directors.

Specific Utility Projects

One additional useful tool with the MTEP Reports is the ability to find projects that an individual utility has submitted to MISO. Also, the Appendices can be sorted to show all projects for a particular utility, (or, depending on the version of Excel you are using, a group of utilities). To do this, from the Appendices ABC page, click on the down arrow located in the column C heading "Geographic Location by TO Member System," and then select the code for the individual utility you are interested in from the drop-down list. (NOTE: some versions of Excel will allow you to select multiple utilities).

Utility	MISO Geographic Code
American Transmission Company, LLC	ATC LLC
Dairyland Power Cooperative	DPC
Great River Energy	GRE
ITC Midwest LLC	ITCM
Minnesota Power	MP
Missouri River Energy Services	MRES
Otter Tail Power Company	OTP
Southern Minnesota Municipal Power Agency	SMP
Xcel Energy	XEL

It is also possible to sort other columns in the Appendices in a similar manner. For example only projects or facilities in Appendix A can be identified by clicking on the arrow in Column A and selecting the desired choice from the drop-down list.

6.3 Northwest Zone

6.3.1 Needed Projects

The following table provides a list of transmission needs in the Northwest Zone. Note that Minnkota Power Cooperative is not a member of MISO. The Minnkota projects are tracking numbers 2015-NW-N1 to 2015-NW-N6.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2007-NW-N3	Winger-Thief River Falls 230 kV Line	2014/B	4232	No	OTP/ MPC
2009-NW-N2	Frazee-Perham-Rush Lake Area	2010/A	2670	No	GRE
2015-NW-N1	Clearbrook West 115 kV- Bagley West 230 kV	2015/B 2016/A	4813	No	OTP/ MPC
2015-NW-N2	Donaldson 115 kV Breaker	2015/A	8281	No	OTP
2015-NW-N3	Clearbrook-Clearbrook West 115 kV Line (Load Interconnect)	Non-MISO		No	MPC
2015-NW-N4	Moranville 230/69 kV Transformer Replacement	Non-MISO		No	MPC

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2015-NW-N5	Ulrich 115/69 kV Transformer Replacement	Non-MISO		No	MPC
2015-NW-N6	Anderson/Thief River Falls Tap-New Thief River Falls Substation 115 kV Line (Load Tap/Transfer)	Non-MISO		No	MPC
2015-NW-N7	Mahnomen/Ulrich Tap-Existing White Earth Substation 115 kV Line (Load Tap/Transfer)	Non-MISO		No	MPC
2015-NW-N8	Thief River Falls 115 kV Capacitor Bank Addition	Non-MISO		No	MPC

Winger-Thief River Falls 230 kV Line

MPUC Tracking Number: 2007-NW-N3

Utilities: Minnkota Power Cooperative (MPC) and Otter Tail Power Company (OTP)

Project Description: The Winger-Thief River Falls 230 kV Line project consists of a Winger substation expansion, a Thief River Falls substation expansion, a new 47 mile 230 kV transmission line between Winger and Thief River Falls and a new 230/115 kV transformer at Thief River Falls.

Need Driver: The Northwestern Minnesota area is a developing hub of crude oil pipelines, and those pipelines require pumping stations. These pumping stations are served by a network of 115 kV lines with three 230 kV sources at Drayton, Grand Forks, and Winger. Loss of any one source forces the load to be served from the remaining two sources. Additionally, loss of any transmission between Drayton, Grand Forks, and Winger weakens the reliability of the Northwest Minnesota transmission system.

Alternatives: Several different transmission alternatives were developed as part of OTP's High Voltage Study to assess the ability of the transmission system to serve the Northwest Minnesota load. These included:

- a new Lake Ardoch substation (230 kV), a new substation at Thief River Falls (230 kV), and a new Lake Ardoch – Thief River Falls 230 kV line,
- a new Drayton – Kennedy – Donaldson 115 kV line,
- a new Lake Ardoch substation (230 kV and 115 kV), a new substation at Oslo (115 kV), and a new Lake Ardoch – Oslo 115 kV line, or

- a new Drayton – Kennedy – Donaldson 115 kV line, a new Winger – Plummer Pipe 115 kV line, and a second Winger 230/115 kV transformer.

The options above have been considered and compared with a new Winger–Thief River Falls 230 kV line (and the associated Thief River substation), and it was determined that the benefits of such a project are more robust and cost effective than the other options that were considered.

Analysis: Reliability improvements from the previously mentioned projects were evaluated in the "High Voltage Study," which was performed by OTP with support from MPC. The study showed that a fault on and of the 115 kV lines into Northwest Minnesota from the three 230 kV sources caused violations within Northwest Minnesota. The study demonstrated a final upgrade requirement of a new 230 kV source at Thief River Falls to be completed by 2023.

Schedule: The study efforts mentioned above determined that an upgrade to mitigate post-contingent service issues to the Northwest Minnesota area transmission must be completed by the winter of 2023. This date is a revised date from the initial draft of the "High Voltage Study" report, and the revised date came from the "Winger – Thief River Falls Timing Analysis." A more definitive schedule will be developed as definite mitigation plans are determined.

General Impacts: The area where this project will occur is almost entirely rural. There are no notable sites or locations along the route of any new transmission line between the endpoints. Any new transmission line will likely have to navigate through some wetlands and avoid some lakes along any route. There may be some impact on farmland from the location of a new transmission line, but assuming a one hundred and thirty foot right-of-way and some general estimates on electrical poles and farm equipment navigation, of a project area of 741 acres, only 65 acres will actually be impacted.

The economic and social impacts will be slight of any project to address this situation. The project may require a temporary project crew to construct the equipment, which could bring some business to the area in the form of room and board. Some landowners may receive a financial payment as a result of this project. Finally, the project will improve the reliability of the system in the area, although it is difficult to measure the importance of an improved system.

Frazee-Perham-Rush Lake Area

MPUC Tracking Number: 2009-NW-N2

Utility: Great River Energy (GRE)

Project Description: Voltage problems in the Frazee area are planned to be addressed by the addition of a new Schuster Lake 115/41.6 kV Substation near Frazee in Otter Tail County to support the 41.6 kV system in this area.

Need Driver: This area is served by two 115/41.6 kV sources from Frazee and Rush Lake. The loss of the Frazee 115/41.6 kV transformer or Frazee to Perham 41.6 kV line causes low voltage issues at multiple substations in the area including LREC‘s Dent and Dora distribution substations.

There are eight GRE-LREC distribution substations and four OTP distribution substations served in the area between Frazee and Rush Lake. The loss the Frazee 115/41.6 kV transformer causes low voltage problems at the Dora and Dent distribution substation.

Alternatives: Leaving the transmission system in the Frazee to Rush Lake area as it is now presents severe undervoltage problems at LREC’s distribution substation. The transmission line overload problems will continue to be critical in the area. Two other alternatives were considered to address the voltage and loading issues in the area. One of the alternatives recommends adding a second transformer at Frazee and rebuilding the 9 mile, 2/0 A Tap line to Dent Sub with 477 ACSR conductor. The other alternative converts 41.6 kV loads to 115 kV system in the near term and establishes a 115/41.6 kV source at the North Perham Jct in the long term. These alternatives were not found being the least cost plan to address the needs of the area for a long term.

Analysis: The Shuster Lake substation, at system intact, will serve the Dent and Perham loads which are now served from the Frazee and Rush Lake sources, respectively. The project is the least cost plan that will address the low voltage problems in the 41.6 kV system during critical contingencies in the system, the loss of the Frazee 115/41.6 kV system and loss of the Frazee to Perham 41.6 kV line. It also ensures a better load serving reliability in the area as it will provide contingency back up to the Frazee and Rush Lake sources in the area while increasing capacity in the system to serve future load growth in the transmission system.

Schedule: The Schuster Lake project is currently planned for a 2020 completion.

General Impacts: Installation of a new transformer at an existing substation is not expected to have any significant effects.

Clearbrook West 115 kV-Bagley West 230 kV

MPUC Tracking Number: 2015-NW-N1

Utilities: Minnkota Power Cooperative (MPC) and Otter Tail Power Company (OTP)

Project Description: The option selected from the Coordinated Clearbrook Looped Service Study (performed primarily by OTP) was to develop a substation near Bagley (about 4.5 miles southwest) that taps the Winger to Wilton 230 kV line, as well as a 16 mile line from the newly developed substation to the Clearbrook West 115 kV substation (as identified in 2015-NW-N3).

Need Driver: The Clearbrook area is a developing hub of crude oil pipelines, and those pipelines require pumping stations. These pumping stations are served by a network of 115 kV lines with two 230 kV sources at Wilton and Winger. Loss of any one source forces the load to be served from a single source. Additionally, loss of any transmission between Bagley and

Clearbrook threatens a substantial amount of existing and future load service. The proposed transmission facilities include a 16 mile transmission line and a new substation.

Alternatives: Several different transmission alternatives were developed as part of a Clearbrook Looped Service Study to assess the ability of the transmission system to serve the anticipated load increase for the Clearbrook area. These included:

- a new Clearbrook – Solway 115 kV line,
- a new Clearbrook – Plummer 115 kV line, or
- a capacitor bank / system rebuild alternative.

The options above have been considered and compared with a new 230 kV / 115 kV tap line, and it was determined that the benefits of such a project heavily out-weight the added investment (determined in coordinated efforts that followed the initial report).

Analysis: The option selected from the Coordinated Clearbrook Looped Service Study (performed primarily by OTP) was to develop a substation near Bagley (about 4.5 miles southwest) that taps the Winger to Wilton 230 kV line, as well as a 16 mile line from the newly developed substation to the Clearbrook West 115 kV substation (as identified in 2015-NW-N3). The newly developed substation, referred to as Bagley West, has a 230/115 kV transformer, breakers for the high and low side of the transformer, switches, relaying, and all other associated bus work. The Bagley West 230/115 kV transformer was identified as an equivalent replacement for the previously repurposed Wilton transformer #1 (OTP), with the recognition that the Wilton 230/115 kV transformer would have needed to be replaced.

Looped service for the Clearbrook area loads was evaluated in the "Coordinated Clearbrook Looped Service Study," which was performed primarily by OTP. Of the options analyzed, the Clearbrook West 115 kV to Bagley West 230 kV option provided the best transmission option that met our transmission requirements. The study demonstrated a final upgrade requirement of looped service, to be completed by 2018.

Schedule: The study efforts mentioned above determined that an upgrade to mitigate post-contingent service issues on the Clearbrook area transmission must be completed by the winter of 2018. A schedule will be developed as definite mitigation plans are determined.

General Impacts: The area where this project will occur is almost entirely rural. There are no notable sites or locations along the route of any new transmission line between the endpoints. Any new transmission line will likely have to navigate through some wetlands and avoid some lakes along any route. There may be some impact on farmland from the location of a new transmission line, but assuming a one hundred and thirty foot right-of-way and some general estimates on electrical poles and farm equipment navigation, of a project area of 741 acres, only 65 acres will actually be impacted.

The economic and social impacts will be slight of any project to address this situation. The project may require a temporary project crew to construct the equipment, which could bring some business to the area in the form of room and board. Some landowners may receive a financial payment as a result of this project. Finally, the project will improve the reliability of the system in the area, although it is difficult to measure the importance of an improved system.

Donaldson 115 kV Breaker

MPUC Tracking Number: 2015-NW-N2

Utility: Otter Tail Power Company (OTP)

Project Description: The Donaldson 115 kV Breaker project consists of adding a new 115 kV breaker at Donaldson on the Donaldson to Drayton 115 kV line to improve reliability of area loads.

Need Driver: The addition of a new breaker at the Donaldson 115 kV substation on the Donaldson-Drayton 115 kV line will improve reliability in the area. This breaker will reduce fault exposure to Donaldson loads over 17 miles of transmission, improve operations, maintenance, and relaying flexibility at Donaldson.

Alternatives: Due to the low cost and benefits provided by the addition of the Donaldson breaker no other alternatives were considered.

Analysis: The addition of the breaker at Donaldson reduces fault exposure, improves operations, maintenance, and provides relaying flexibility at Donaldson. This breaker improves reliability to sensitive loads in the Donaldson area.

Schedule: The addition of the Donaldson 115 kV breaker is currently scheduled for July of 2016.

General Impacts: The addition of the Donaldson 115 kV breaker will reduce fault exposure to Donaldson while improving operations, maintenance and relaying flexibility at the Donaldson substation. This project is the most cost-effective and environmentally responsible project to address the reliability concerns in the area.

Clearbrook-Clearbrook West 115 kV Line (Load Interconnect)

MPUC Tracking Number: 2015-NW-N3

Utility: Minnkota Power Cooperative (MPC)

Project Description: Due to the development of a new pump station load near Clearbrook, a new load service needed to be established. Since the forecast provided by the customer was beyond the availability of existing transmission facilities (41.6 kV transmission), the load service was specified for 115 kV. This required a new transmission line from a nearby 115 kV substation at Clearbrook (about 6 miles of line to the southeast), as well as a newly developed substation for service to the Clearbrook West pump station load

Need Driver: The Clearbrook area is a developing hub of crude oil pipelines, and those pipelines require pumping stations. A new pumping station is developing northwest of Clearbrook, and the existing transmission/distribution system is insufficient for the customer's expected demand. As a result, a new load interconnection on the 115 kV system has been deemed necessary. The proposed interconnection facilities include a 6-mile transmission line and a new substation.

Alternatives: There was one transmission alternatives that was considered as part of this load interconnection, and that alternative involved interconnection on Ottertail's 41.6 kV system.

The 41.6 kV option was considered and compared with the 115 kV option, and it was determined that the 41.6 kV option would not be capable of the full customer demand after full development. Also, a 115 kV interconnection is more robust and energy efficient than the 41.6 kV option.

Analysis: Reliability impacts from the new load interconnection were evaluated in the "Study for New Pumping Station Load," which was performed by MPC. The study showed that a fault on one of the two 115 kV lines that serve the Clearbrook area caused overloads on the other 115 kV line during peak conditions (this also assumed that the Solway peaking generator is offline). The study demonstrated a final requirement of 150 MVA in line upgrades and 40 MVAR in capacitor bank additions, but those additional upgrades were later replaced by the MPUC project 2015-NW-N1, which includes a new 230 kV source at Clearbrook to be completed by 2018.

Schedule: The study efforts mentioned above determined that the new load interconnection must be completed by the fall of 2017. A schedule will be developed as definite plans are determined.

General Impacts: This project is primarily rural in location. The route will have to navigate around some lakes within the area. Assuming a one hundred foot right-of-way, the project area will be nearly 73 acres, but the affected farmland should only be about 4 acres, assuming some general estimates on electrical poles and farmland equipment navigation. The project may follow some nearby roads to some existing pump stations, farmsteads, and the Clearbrook–Gonvick School District. This project is still in its early stages of planning, so all of this information is subject to change.

This project may require a temporary project crew. If so, this may bring some business to the area in the form of room and board. In terms of local government benefits, it is possible that permit costs may be enforced on this project, but this is determined on a case-by-case basis. Also, some landowners may receive income as a result of this project, and the income may be taxable.

This project is the result of a new pump station development, but it will probably not have a substantial or lasting impact on the community in terms of population or other social characteristics. It will likely impact some farmland; however, it should only amount to about 4 acres, as stated in the environmental considerations.

Moranville 230/69 kV Transformer Replacement

MPUC Tracking Number: 2015-NW-N4

Utility: Minnkota Power Cooperative (MPC)

Project Description: To keep up with the customer's growing demand, a new 230/69 kV transformer, along with the corresponding breakers, is being proposed for installation at the Moranville substation.

Need Driver: Moranville area load is approaching the thermal limitations of the existing transformer. The existing transformer is also approaching its appropriate retirement age, and it has shown signs of slight deterioration

Alternatives: There are two transformers at the Moranville substation (comprised of two transformer pairs), however, thermal limitations on alternate service lines and the transformers prevent the current configuration from being fully effective during peak conditions following a contingency. An extensive uprate to the surrounding 69 kV system could serve as an alternative to the transformer replacement, but it would be a far more expensive approach to serving this load during a contingency. The transformer replacement is also a more robust and energy efficient option.

Analysis: There aren't any negative reliability impacts due to the transformer and breaker replacements. This is primarily a capacity uprate.

Schedule: The study efforts mentioned above determined that the transformer replacement must be completed by the winter of 2017. A schedule will be developed as that timeframe approaches.

General Impacts: This project is entirely at the Moranville substation location. There is no new transmission area for this project. No notable sites or locations are near the site of this project. This project is still in its early stages of planning, but all of this information is relatively inconsequential to the nearby environment.

This project may require a short-term project crew. If so, this may bring some business to the area in the form of room and/or board. In terms of local government benefits, little is expected as a result of the substation modifications.

This project is the result of update requirements and capacity needs, and it will probably not have an impact on the community in terms of population or other social characteristics.

Ulrich 115/69 kV Transformer Replacement

MPUC Tracking Number: 2015-NW-N5

Utility: Minnkota Power Cooperative (MPC)

Project Description: To keep up with the changes on this substations native demand, a new 115/69 kV transformer, as well as a new capacitor bank, is being proposed for installation at the Ulrich substation.

Need Driver: The Ulrich area load is approaching the thermal limitations of the existing transformer. In additions to the current load topology, a load that is currently served by a neighboring utility will soon be transferred to the Ulrich source. To keep up with the changes on this substations native demand, a new 115/69 kV transformer, as well as a new capacitor bank, is being proposed for installation at the Ulrich substation.

Alternatives: There is a single transformer at Ulrich that serves two 69 kV transmission lines. These lines are well loaded under peak conditions, and alternate service is somewhat restricted to these transmission lines due to radial configuration or thermal limitations during peak conditions following a contingency. Future transmission upgrades and ensuing load transfers also create some concerns during system intact conditions. An extensive uprate to the surrounding 69 kV system could serve as an alternative to the transformer replacement, but it would be a far more expensive approach to serving this load during system intact conditions or a contingency. The transformer replacement is also a more robust and energy efficient option.

Analysis: There aren't any negative reliability impacts due to the transformer replacement and capacitor bank addition. This is primarily a capacity uprate.

Schedule: The study efforts mentioned above determined that the transformer replacement must be completed by the winter of 2018. A schedule will be developed as that timeframe approaches.

General Impacts: This project is entirely at the Ulrich substation location. There is no new transmission area for this project. No notable sites or locations are near the site of this project. This project is still in its early stages of planning, but all of this information is relatively inconsequential to the nearby environment.

This project may require a short-term project crew. If so, this may bring some business to the area in the form of room and/or board. In terms of local government benefits, little is expected as a result of the substation modifications.

This project is the result of update requirements and capacity needs, and it will probably not have an impact on the community in terms of population or other social characteristics.

Anderson/Thief River Falls Tap-New Thief River Falls Substation 115 kV Line (Load Tap/Transfer)

MPUC Tracking Number: 2015-NW-N6

Utility: Minnkota Power Cooperative (MPC)

Project Description: A new load tap on the 115 kV system has been deemed necessary to meet the demand for more power from a member utility. The proposed load tap facilities include a 1.5 mile transmission line and a new substation.

Need Driver: One of MPC's utility members has reported that a new load tap is being planned for the Thief River Falls area. According to this report, the existing source is expected to be insufficient for the customer's expected demand.

Alternatives: There is a transmission alternative being considered as part of this load tap, and the alternative involves further investigation of the existing substation at Thief River Falls. The investigation is ongoing, and it will be compared with the 115 kV load tap option. To properly address this transmission request, a 115 kV load tap is the current transmission plan, but it may be changed if the investigation provides an equally cost effective project that is robust.

Analysis: Reliability impacts from the new load tap are currently evaluated in the annual TPL assessments (in terms of forecasting the existing Thief River Falls area loads). Impacts to the bulk power system are not the reason for this transmission project. Limitations of the existing substation are the reason for this transmission project. The load tap is to be completed by 2019.

Schedule: The study efforts mentioned above determined that the new load tap must be completed by the winter of 2019. A schedule will be developed as definite plans are determined.

General Impacts: This project is almost entirely urban in location. The route will have to avoid the nearby river within the area. Assuming a one hundred foot right-of-way, the project area will be nearly 18 acres, but the affected city area should only be about one acre, assuming some general estimates on electrical poles and clearance for navigation, similar to the farmland navigation. The project may follow some nearby roads to existing industrial locations and/or residences. This project is still in its early stages of planning, so all of this information is subject to change.

This project may require a short-term project crew. If so, this may bring some business to the area in the form of room and/or board. In terms of local government benefits, it is possible that permit costs may be enforced on this project, but this is determined on a case-by-case basis. Also, some landowners may receive income as a result of this project, and the income may be taxable.

This project is the result of a recent hospital development, but it will probably not have any additional impact on the community in terms of population or other social characteristics. It will likely impact some city area; however, it should only amount to about one acre, as stated in the environmental considerations.

Mahnomen/Ulrich Tap-Existing White Earth Substation 115 kV Line (Load Tap/Transfer)

MPUC Tracking Number: 2015-NW-N7

Utility: Minnkota Power Cooperative (MPC)

Project Description: A new transmission line and substation modifications are being planned for the White Earth substation. A new load tap on the 115 kV (or 69 kV) system has been deemed necessary. The proposed load tap facilities include a 6-9 mile transmission line (only 3-6 miles of it will be completely new) and substation modifications to the existing White Earth substation.

Need Driver: In response to a neighboring system's request, a new transmission line and substation modifications are being planned for the White Earth substation. According to this request, the existing source is expected to be insufficient for the customer's expected demand during a contingency. As a result, a new load tap on the 115 kV (or 69 kV) system has been deemed necessary. The proposed load tap facilities include a 6-9 mile transmission line (only 3-6 miles of it will be completely new) and substation modifications to the existing White Earth substation.

Alternatives: There is a transmission alternative being considered as part of this load tap, and the alternative involves further investigation of a 69 kV load tap. The investigation is ongoing, and it will be compared with the 115 kV load tap option. To properly address this transmission request, a 115 kV load tap is the current transmission plan, but it may be changed if the investigation provides an equally cost effective project that is robust.

Analysis: Reliability impacts from the new load tap are currently evaluated in the annual TPL assessments (in terms of forecasting the existing White Earth area loads). Impacts to the bulk power system are not the reason for this transmission project. Limitations of the 41.6 kV transmission are the reason for this transmission project. The load tap is to be completed by 2019.

Schedule: The study efforts mentioned above determined that the new load tap must be completed by the winter of 2019. A schedule will be developed as definite plans are determined.

General Impacts: This project is primarily rural in location. The route will have to navigate around some lakes, forested areas, and potentially some reservation land within the area. Assuming a one hundred foot right-of-way, the project area will be nearly 42 additional acres (some existing transmission may be used for the project), but the affected farmland should only be about 2 acres, assuming some general estimates on electrical poles and farmland equipment navigation. No notable sites or locations are near the site of this project. This project is still in its early stages of planning, so all of this information is subject to change.

This project may require a short-term project crew. If so, this may bring some business to the area in the form of room and/or board. In terms of local government benefits, it is possible that permit costs may be enforced on this project, but this is determined on a case-by-case basis. Also, some landowners may receive income as a result of this project, and the income may be taxable.

This project is the result of a reliability measure, and will probably not have a substantial or lasting impact on the community in terms of population or other social characteristics. It will likely impact some farmland; however, it should only amount to about 2 acres, as stated in the environmental considerations.

Thief River Falls 115 kV Capacitor Bank Addition

MPUC Tracking Number: 2015-NW-N8

Utility: Minnkota Power Cooperative (MPC)

Project Description: An additional capacitor in the existing capacitor bank is being planned for the Thief River Falls substation. Due to the steady growth of area loads, some voltage support to the system has been deemed necessary. The proposed capacitor addition includes 15 MVAR of capacitors and any necessary modifications to the existing Thief River Falls substation.

Need Driver: The Northwestern Minnesota area is a developing hub of crude oil pipelines, and those pipelines require pumping stations. These pumping stations are served by a network of 115 kV lines with three 230 kV sources at Drayton, Grand Forks, and Winger. Loss of any one source forces the load to be served from the remaining two sources. Additionally, loss of any transmission between Drayton, Grand Forks, and Winger weakens the reliability of the Northwest Minnesota transmission system. To sustain reliability in years leading to new transmission upgrades, a new capacitor bank addition is being proposed for installation at the Thief River Falls substation.

Alternatives: In years prior to 2021, automatic undervoltage load shedding has been identified as the most cost effective mitigation for voltage violations following a contingency. However, new compliance standards come into effect after that time, and non-consequential load loss is no longer permitted. That led to the alternative of capacitor bank additions at Thief River Falls (15 MVAR). This will sufficiently support the system until the in-service date of the Winger-Thief River Falls 230 kV line (2023).

Analysis: Reliability improvements from the previously mentioned projects were evaluated in the "High Voltage Study," which was performed by OTP with support from MPC. The study showed that a fault on and of the 115 kV lines into Northwest Minnesota from the three 230 kV sources caused violations within Northwest Minnesota. The study demonstrated a final upgrade requirement of a new 230 kV source at Thief River Falls to be completed by 2023. However, the timeframe between 2021 and 2023 required further mitigations for the loss of automatic undervoltage load shedding (per TPL-001-4). To mitigate the resulting voltage violations, Thief River Falls capacitor bank additions have been planned to be in-service in 2020.

Schedule: The study efforts mentioned above determined that an upgrade to mitigate post-contingent service issues to the Northwest Minnesota area transmission must be completed by the winter of 2023 (this date is a revised date from the initial draft of the “High Voltage Study” report, and the revised date came from the “Winger – Thief River Falls Timing Analysis”). A schedule will be developed as definite mitigation plans are determined.

General Impacts: This project is entirely at the Thief River Falls substation location. There is no new transmission area for this project. No notable sites or locations are near the site of this project. This project is still in its early stages of planning, but all of this information is relatively inconsequential to the nearby environment.

This project may require a short-term project crew. If so, this may bring some business to the area in the form of room and/or board. In terms of local government benefits, little is expected as a result of the substation modifications.

This project is the result of update requirements, and it will probably not have an impact on the community in terms of population or other social characteristics.

6.3.2 Completed Projects

The table below identifies those projects by Tracking Number in the Northwest Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Minnesota Public Utilities Commission in November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MTEP Year/App	METP Project Number	Utility	Date Completed
2003-NW-N3	Add new Silver Lake 230/41.6 kV Substation along Fergus Falls – Henning 230 kV Line in Otter Tail County to support 41.6 kV system in the area. Convert existing 41.6/12.5 kV Substation in Pelican Rapids (Otter Tail County) to 115/12.5 kV Substation to mitigate 41.6 kV system issues	2008/A 2012/A	1033 585	GRE/ OTP	August 2014
2005-CX-1	Add new 345 kV Line between Monticello and Fargo	2008/A	286	CapX	April 2, 2015
2007-NW-N3	Enbridge Load Expansion Support - Project 2826 was completed except for the withdrawal of one of the proposed capacitor bank facilities (Facility ID 4966).	2010/A	2826	OTP/ MPC	Clearbrook February 28, 2011 Karlstad November 30, 2012 Thief River Withdrawn
2011-NW-N5	Richer-Roseau-Moranville 230 kV Line Uprate - Withdrawn due to decelerated load growth. It allows it to bridge a gap of time when load-carrying capacity was insufficient.			MPC	Withdrawn
2013-NW-N1	Gentilly Creek Load Addition.	2013/A	4238	MPC/ OTP	September 17, 2013

6.4 Northeast Zone

6.4.1 Needed Projects

The following table provides a list of transmission needs identified in the Northeast Zone by MISO utilities. There were no projects identified in this zone by non-MISO utilities.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON ?	Utility
2003-NE-N2	Cromwell-Wrenshall-Mahtowa-Floodwood Area	2011/A	2634	Yes	MP/GRE
2007-NE-N1	Duluth Area 230 kV	2014/B	2548	Yes	MP
2007-NE-N2	Essar 230 kV Project	2010/A	2547	No	MP
2007-NE-N6	Ongium Area	2012/B	2632	No	GRE
2009-NE-N2	Deer River Area	2013/A	3531	No	MP
2011-NE-N2	15 Line Upgrade	2016/A	7996	No	MP
2011-NE-N5	Dunka Road Substation	2010/A	2761	No	MP
2011-NE-N10	Laskin Transformer	2009/A	2759	No	MP
2011-NE-N12	Wrenshall Substation	2013/B	3756	No	MP
2013-NE-N7	Canosia Road Substation	2014/A	4044	No	MP
2013-NE-N8	Embarrass Transformer	2014/A	4045	No	MP
2013-NE-N13	Great Northern Transmission Line	2014/A	3831	Yes	MP
2013-NE-N14	NERC Facility Ratings Alert Low Priority	2013/A	4294	No	MP
2013-NE-N16	HVDC Valve Hall Replacement	2013/B	4295	No	MP
2013-NE-N17	HVDC 750 MW Upgrade	2014/B	3856	No	MP
2013-NE-N19	Hoyt Lakes Sub Modernization	2014/A	4426	No	MP
2013-NE-N21	Menahga Area 115 kV Project	2015/A 2016/A	7999 4378	Yes	MP GRE
2013-NE-N22	Elisha 115 kV Project	2014/B	8920	Yes	GRE
2015-NE-N1	5 Line Upgrade	2016/A	7910	No	MP
2015-NE-N2	868 Line Upgrade	2015/B	7913	No	MP
2015-NE-N3	Maturi 115/23 kV Transformer	2015/A	7995	No	MP
2015-NE-N4	15th Avenue West Modernization	2016/A	7997	No	MP
2015-NE-N5	16 Line Relocation	2015/A	8000	No	MP
2015-NE-N6	Motley Area 115 kV Project	2015/A 2016/A	7998 7896	Yes	MP GRE
2015-NE-N7	Maturi 115/34.5 kV Transformer Replacement	2015/A	9062	No	MP
2015-NE-N8	Hat Trick 115 kV Project	2015/A	9063	No	MP
2015-NE-N9	Arrowhead 115 kV Bus Reconfiguration	2016/A	9064	No	MP
2015-NE-N10	Minntac 230 kV Bus Reconfiguration	2015/A	9061	No	MP

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON ?	Utility
2015-NE-N11	Forbes 230/115 kV Transformer Addition	2015/A	9060	No	MP
2015-NE-N12	Iron Range – Arrowhead 345 kV Project	2014/B	3832	Yes	MP
2015-NE-N13	Bear Creek 69/46 kV Transformer	2016/A	9624	No	MP
2015-NE-N14	83 Line Upgrade	2016/A	9622	No	MP
2015-NE-N15	95 Line Upgrade	2016/A	9623	No	MP
2015-NE-N16	Two Inlets Pumping Station (X1A)	2016/C (seeking A)	9200	No	GRE
2015-NE-N17	Backus Pumping Station (X2A)	2016/C (seeking A)	9201	No	GRE
2015-NE-N18	Palisade Pumping Station (X3A)	2016/C (seeking A)	9202	Yes	GRE
2015-NE-N19	Cromwell Pumping Station (X4A)	2016/C (seeking A)	9203	No	GRE

Cromwell-Wrenshall-Mahtowa-Floodwood Area (Savanna 115 kV Project)

MPUC Tracking Number: 2003-NE-N2

MPUC Docket Number: ET2,E015/CN-10-973 and ET2,E015/TL-10-1307

Utilities: Minnesota Power (MP) & Great River Energy (GRE)

Project Description: Construct new Savanna 115 kV Switching Station near Floodwood, Minnesota, and rebuild approximately 37 total miles of existing 69 kV line to 115 kV specifications between Lake Country Power's existing Cedar Valley Substation, the new Savanna Switching Station, Lake Country Power's existing Gowan Substation, and Great River Energy's existing Cromwell Substation. The project also includes a capacity upgrade of approximately 10 miles of existing 115 kV line from the Savanna Switching Station to Minnesota Power's 9 Line "Floodwood Tap."

Need Driver: General historical load growth in the areas between Duluth, Grand Rapids, and Brainerd as well as expected industrial expansion near Floodwood have exacerbated electrical reliability concerns on the existing 69 kV and 115 kV systems that serve the area and could potentially lead to line overloads and inability to maintain adequate voltage.

Alternatives: Several alternatives were considered, including: 1) a new local generation alternative; 2) various transmission solutions, including upgrading other existing facilities, different voltage levels and different endpoints; and 3) a no-build alternative focusing on reactive power supply improvements and demand side management.

Analysis: A solution that solves the identified inadequacies in three neighboring areas of the system (the Cromwell-Wrenshall-Mahtowa 115 kV system, the Cromwell-Four Corners 69 kV system, and the Floodwood 115 kV system) with one new transmission line provides an effective and efficient solution while minimizing social and environmental impacts. Making use of existing corridors and double-circuiting where practical with existing lines adds practicality and reduces social and environmental impacts.

Schedule: Great River Energy and Minnesota Power held a voluntary open house meeting in October 2010 to provide information about the Savanna 115 kV Project to the public. Subsequently, GRE and MP applied for both a Certificate of Need and a Route Permit for the Project in February 2011, culminating in the Commission's granting of both a CON and a Route Permit in February 2012 (MPUC Docket Nos. ET2,E015/CN-10-973 and ET2,E015/TL-10-1307). Since then, the majority of the components of the Savanna 115 kV Project have been constructed and are in-service, including the Savanna Switching Station, Savanna – Cedar Valley 115 kV Line, and Savanna – Cromwell 115 kV Line. Remaining work required to upgrade Minnesota Power's existing Savanna – Floodwood Tap 115 kV Line is expected to be completed in early 2016.

General Impacts: The Savanna 115 kV Project is a baseline reliability project that will ensure a continuous supply of secure and reliable electric energy to the project area while at the same time minimizing cost and impacts to the environment by utilizing existing utility corridors to the greatest reasonable extent.

Duluth 230 kV Project

MPUC Tracking Number: 2007-NE-N1

Utility: Minnesota Power (MP)

Project Description: Add a second 230/115 kV transformer at the Hilltop Substation and upgrade an existing line from 115 kV to 230 kV between the Arrowhead and Hilltop substations.

Need Driver: Reliability and load growth in the Duluth area. Maintaining sufficient 230/115 kV transformer capacity for load serving in the Duluth area during a maintenance outage of one of the existing Arrowhead 230/115 kV transformers.

Alternatives: Build a new 230/115 kV substation in the Duluth area.

Analysis: In 1993, Minnesota Power constructed a new 230 kV substation (the Hilltop Substation) in Duluth. This project involved the rebuilding of existing 115 kV lines for 230 kV operation in order to provide a single 230 kV source to the Hilltop Substation and upgrades of several unshielded 115 kV lines to improve reliability. As part of the application for the Hilltop project MP laid out long range plans which identified the future need for a second 230 kV source to the Hilltop substation once Duluth load dictated its need. The Commission recognized this future need and approved rebuilding of portions of the unshielded 115 kV lines as part of the Hilltop Project for future 230 kV operation.

Because Minnesota Power anticipated this future need, only approximately three miles of line construction will be required to provide a second 230 kV source to the Hilltop Substation. The majority of this construction will involve rebuilding an existing 115 kV line. Due to the configuration of the existing Duluth area transmission system and anticipated need to provide a second 230 kV source to the Hilltop Substation, no other alternative to this project will provide a cost effective or reasonable solution to this pending inadequacy. Other transmission alternatives would require longer 230 kV line construction and increase both social and economic impacts associated with construction of such a line, and distributed generation is not preferable from either a cost or operational standpoint to the preferred project.

Minnesota Power is continuing to monitor line loading, voltage support and load growth in the Duluth area.

Schedule: Slower than anticipated load growth and external system improvements such as the Arrowhead – Stone Lake – Gardner Park 345 kV Line have delayed the need for this project. Recent study indicates that this project is not needed until the mid-2020 timeframe at the earliest. Therefore, the earliest that Minnesota Power currently anticipates initiating public outreach or permitting activities for this project would be in the early 2020s.

General Impacts: When it becomes needed, the Duluth 230 kV Project will make optimal use of existing transmission infrastructure in the area to provide the needed system improvements, supporting load growth and economic development in the Duluth area in the most cost-effective and least environmentally impactful manner possible by utilizing existing utility infrastructure to the greatest extent possible.

Essar 230 kV Project

MPUC Tracking Number: 2007-NE-N2

MPUC Docket Number: E280/TL-09-512

Utility: Minnesota Power (MP)

Project Description: Transmission to serve Essar Steel, including development of two 230/13.8 kV substations (Calumet and McCarthy Lake) and approximately 27 miles of new 230 kV transmission lines. Future expansion could necessitate the addition of a third 230 kV source to the area from the existing Blackberry Substation.

Need Driver: New industrial customer load consisting of taconite mine and pellet plant. Possible future expansion could include a steel mill.

Alternatives: Several alternatives to connect Essar Steel Minnesota were studied, including: 500 kV to the site from the Forbes Substation; a single 230 kV source to the site; a 230/115 kV source to the site.

Analysis: Studies have shown that the 230 kV solution provides the best alternative to deliver the electric power from the Minnesota Power system to the Essar facility. See section 7.3.13 of the 2007 Minnesota Biennial Transmission Report for additional details.

Schedule: Minnesota Power held a voluntary open house meeting in February 2009 to provide information about the Essar 230 kV Project to the public and solicit the public's feedback on the routing of the 230 kV lines. Subsequently, MP submitted a Route Permit Application for the Project in June 2009, culminating in the Commission's granting of the Route Permit in August 2010. Phase 1, including three 230 kV lines and two 230 kV substations was completed in April 2013. There are no current plans to construct Phase 2 (the 230 kV line from Blackberry), which would only be required if Essar expanded to include a steel mill on the site.

General Impacts: The Essar 230 kV Project was the most efficient and least environmentally impactful viable solution for meeting the near-term and long-term needs at the new mine site. The Project supports industrial expansion on the Iron Range and the attendant social and economic benefits that such expansion brings to the local area and the State.

Onigum 115 kV Conversion

MPUC Tracking Number: 2007-NE-N6

Utility: Great River Energy (GRE)

Project Description: Construct a new, 115 kV line from Great River Energy's (GRE) existing Birch Lake substation to Lake Country Power's (LCP) Onigum substation. LCP will rebuild their substation adjacent to the existing site to receive 115 kV electric service.

Need Driver: LCP's Onigum substation is served by a 34.5 kV system that is sourced by the 115/69/34.5 kV Birch Lake substation and the 115/34.5 kV Akeley substation. Due to the aging condition and lack of capacity, GRE is planning to rebuild the existing 34.5 kV to 115 kV.

Alternatives: An alternative considered was rebuilding the 34.5 kV system with a like-for-like replacement.

Analysis: The 2008 GRE Long Range Plan indicated that the conversion of the Onigum substation to 115 kV operation will unload the 34.5 kV service and extend the useful life of this system. MP and GRE will need to monitor the growth of the Walker area electric system to see when further conversion may be required.

Schedule: The timing of the Onigum conversion will be driven by the anticipated load growth in the area or if structural issues arise.

General Impacts: The Onigum 115 kV Conversion Project is the most efficient and least environmentally impactful viable solution for meeting the near term and long term needs in the Onigum area. The Onigum area will be served by a transmission grade source that will have less disruption resulting in greater reliability and also will also have less system losses.

Deer River Area (Zemple 230 kV Project)

MPUC Tracking Number: 2009-NE-N2

MPUC Docket Number: E015/TL-13-68

Utility: Minnesota Power (MP)

Project Description: Construct the new Zemple 230/115/23 kV Substation just east of Deer River, MN along U.S. Highway 2. To feed the new substation, a new segment of double circuit 230 kV line will be extended from the Boswell – Cass Lake 230 kV Line to the new substation. With the development of the new substation, Minnesota Power's existing 115/23 kV Deer River Substation will be retired and a new 115/23 kV transformer will be incorporated into the Zemple Substation. The 115 kV system in the Deer River area, which is currently fed from a single 115 kV line originating in Cohassett, will be interconnected to the new substation. A new segment of 115 kV line will be built to provide construction and maintenance flexibility as well as redundancy in the Deer River area, and the existing 115 kV line to Cohassett will be removed.

Need Driver: The Deer River area is currently served by a single 7.5 mile long 115 kV line (the Deer River Tap). This tap has multiple load-serving taps on it. Because all the power required to serve these customers must flow on the Deer River Tap, the line experiences high power flows under certain system conditions. Because of its age and condition, MP has reason to believe that this line may be approaching or exceeding its thermal capability at times. Anticipated expansion at a large industrial facility will further load the line, exacerbating this issue. Due to the radial arrangement of the Deer River Tap and the outage restrictions associated with this industrial facility, performing maintenance or upgrades on the line is very difficult and generally must be done while the line is energized. As an alternative to rebuilding the Deer River Tap, the Zemple 230 kV Project provides significantly improved reliability, constructability, and long-term load-serving capability. The Project will also enhance MP's ability to operate and maintain the transmission system in the Deer River area for the foreseeable future.

Alternatives: Because high voltage transmission is limited in the Deer River area, the only feasible alternative to the development of a new 230 kV source is to rebuild the radial 115 kV line that currently serves the Deer River area.

Analysis: In the past, MP proposed to add a 115 kV exit to the Boswell 115 kV substation and move the 28L Deer River tap to this new position. This would require construction of less than one mile of 115 kV transmission and split 28L into two separate lines, thus improving operating performance and reducing maintenance issues. However, since the Bemidji-Grand Rapids 230 kV line (Tracking Number 2005-NW-N2) was constructed through the Deer River area, the construction of a Deer River 230/115 kV substation is now possible. The establishment of this new 230/115 kV source will significantly improve reliability, redundancy, and load-serving capacity in the Deer River area.

Schedule: Minnesota Power held a voluntary public open house meeting in January 2013 to provide information about the Zemple 230 kV Project to the public. Subsequently, MP submitted a Route Permit Application for the Project in April 2013, culminating in the Commission's granting of the Route Permit in June 2014 (MPUC Docket No. E015/TL-13-68). Construction of the new 115 kV transmission line was completed in March 2015. Construction of the 230 kV transmission line and the Zemple 230/115 kV Substation are expected to be ongoing through the end of 2015. Removal of the existing 115 kV Deer River Tap is expected to occur in late 2016 or early 2017.

General Impacts: The Zemple 230 kV Project provides the most efficient long-term solution for the Deer River area and the surrounding transmission system while minimizing environmental and social impacts through the utilization of an existing substation site, as well as the removal of 7.5 miles of existing 115 kV line. In addition, the Zemple 230 kV Project supports the expansion of existing industrial facilities in the Deer River area and the attendant social and economic benefits that such an expansion will bring to the local area and the State.

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15 Line Upgrade

MPUC Tracking Number: 2011-NE-N2

Utility: Minnesota Power (MP)

Project Description: Rebuild and reconductor existing Fond du Lac – Hibbard 115 kV Line (MP "15 Line").

Need Driver: The existing Fond du Lac – Hibbard 115 kV Line needs to be rebuilt with a larger conductor due to its age and condition, lack of shield wire resulting in elevated risk to nearby sensitive industrial loads, and identified pre- and post-contingent overloads on the line.

Alternatives: A previously-preferred alternative (MISO MTEP Project #2549) involved reconfiguring 15 Line with an existing 115 kV line and substation to allow for removal of approximately half of the 11-mile line. Further analysis of constructability, particularly with regard to the location where 15 Line would be reconfigured to interconnect with the existing 115 kV line, as well as further analysis of the long-term transmission system needs in the area identified that an in-place rebuild of 15 Line was a preferable solution.

Analysis: Reconductoring 15 Line provides the best solution for maintaining the reliability of the Duluth-area 115 kV system in view of current needs (to deliver hydroelectric generation from

Thomson and Fond du Lac, to support current load levels) and long-term needs (projected load growth and transmission system modifications such as the Duluth 230 kV Project).

Schedule: MISO and Minnesota Power studies indicate that a need for the 15 Line Upgrade develops in 2017. The earliest MP would begin construction of the Project would be in the spring or summer of 2017.

General Impacts: The 15 Line Upgrade project will provide necessary system improvements in the Duluth area without requiring the establishment of additional transmission line corridors, which will minimize any potential environmental impacts.

Dunka Road Substation

MPUC Tracking Number: 2011-NE-N5

Utility: Minnesota Power

Project Description: Add a new 138/13.8 kV substation interconnected to the existing Taconite Harbor – Hoyt Lakes 138 kV Line (MP "1 Line").

Need Driver: Development of the proposed Polymet mine.

Alternatives: There are no viable alternatives to this project since the project is needed to provide transmission-level electric service at a specific proposed mine site.

Analysis: The Dunka Road Substation will be designed to provide redundant electric service and meet the projected near-term and long-term needs of the proposed Polymet mine site and the surrounding transmission system.

Schedule: The schedule for construction of the Dunka Road Substation is dependent on the schedule for the development of the Polymet mine.

General Impacts: The Dunka Road Substation is the most efficient and least environmentally impactful viable solution for meeting the near-term and long-term needs at the new mine site. The Project supports industrial expansion in northeastern Minnesota and the attendant social and economic benefits that such expansion brings to the local area and the State.

Laskin Transformer

MPUC Tracking Number: 2011-NE-N10

Utility: Minnesota Power (MP)

Project Description: Replace existing 115/46 kV transformers with a newer 115/46 kV transformer at the Laskin Substation.

Need Driver: Load growth, age & condition.

Alternatives: Develop a new 115/46 kV substation and retire the Laskin 115/46 kV transformer and 46 kV distribution equipment.

Analysis: There is no compelling need to relocate the 115/46 kV source presently located at the Laskin Substation. Replacement of the existing 115/46 kV transformers with a single newer, higher-capacity transformer in the same location will reduce the risk of outages caused by transformer failure and support the long-term capacity needs of the 46 kV system served from Laskin.

Schedule: The Laskin Transformer replacement project has been delayed due to budgetary constraints. At this time, Minnesota Power expects that the earliest possible in-service date for the Project would be in 2018.

General Impacts: The Laskin Transformer project will ensure a continuous and reliable power supply for continued load growth in the area between Virginia and Hoyt Lakes in the most cost-effective and least environmentally impactful manner possible.

Wrenshall Substation

MPUC Tracking Number: 2011-NE-N12

Utility: Minnesota Power (MP) & Great River Energy (GRE)

Project Description: Add 115/69 kV transformer and breakers at existing Wrenshall Substation site. Extend 69 kV to Military Road and interconnect to existing GRE 69 kV line originating at MP Stinson Substation.

Need Driver: Retirement of existing 46 kV line and equipment at Thomson Substation due to age and condition.

Alternatives: Rebuild existing radial 46 kV circuit from Thomson to Military Road.

Analysis: The Wrenshall 115/69 kV source to the Fond du Lac area will provide load serving capability that the 46 kV system previously served over very lengthy lines that are hard to reach for outage restoration. This area will rely on a more robust system after the Wrenshall project is built.

Schedule: The Wrenshall Substation project has been delayed due to budgetary constraints. At this time, Minnesota Power and Great River Energy expect that the earliest possible in-service date for the Project would be in 2020.

General Impacts: The Wrenshall Substation project will ensure a continuous and reliable power supply to Wrenshall and the surrounding area, while eliminating an aged segment of 46 kV line that is difficult to maintain due to its location and the surrounding terrain.

Canosia Road Substation

MPUC Tracking Number: 2013-NE-N7

Utility: Minnesota Power (MP)

Project Description: Construct new 115/13.8 kV substation on existing Arrowhead – Cloquet 115 kV Line (MP "22 Line").

Need Driver: Load growth and reliability concerns for customers served out of the existing Cloquet and Midway substations. Canosia Road will unload these two existing substations.

Alternatives: Develop a new 115/13.8 kV substation at a different site, such as the existing Midway tap.

Analysis: The proposed Canosia Road Substation is optimally located to resolve the reliability concerns associated with the Cloquet Substation. Other existing sites, such as the Midway Substation, would not provide the same level of benefit to the Cloquet-Esko area. The Canosia Road Substation will be designed to meet the projected near-term and long-term needs of the area.

Schedule: Expected to be placed in-service in mid-2016.

General Impacts: The Canosia Road Substation will enhance reliability of service to the Cloquet and Esko areas and support future load growth in the areas by shifting customers off of the Cloquet and Midway substations and providing a redundant source to the area.

Embarrass Transformer

MPUC Tracking Number: 2013-NE-N8

Utility: Minnesota Power (MP)

Project Description: Expand existing Embarrass Switching Station to include a new 115/23 kV transformer.

Alternatives: Develop a new 115/23 kV substation tapped into the Laskin – Embarrass 115 kV Line.

Analysis: Locating the new 115/23 kV source at the existing Embarrass Switching Station makes the best use of existing infrastructure in the area and provides superior reliability to the alternative involving a single tapped feed from the Laskin – Embarrass 115 kV Line. The project is part of a larger plan to provide sufficient capacity, reliability, and redundancy of 115/23 kV sources for the area between Virginia and Hoyt Lakes.

Need Driver: Unload the 46 kV system between Virginia and Hoyt Lakes and establish a redundant backup source for the 23 kV system between Eveleth and Hoyt Lakes.

Schedule: Expected to be placed in-service in October 2016.

General Impacts: The Embarrass Transformer addition project will provide needed load-serving capacity and redundancy to the area between Eveleth and Hoyt Lakes. Utilizing the existing Embarrass Switching Station site for the new 115/23 kV source meets these needs in the most cost-effective and least environmentally impactful manner possible.

Great Northern Transmission Line

MPUC Tracking Number: 2013-NE-N13

MPUC Docket Numbers: E015/CN-12-1163 and E015/TL-14-21

Utility: Minnesota Power (MP)

Project Description: The Great Northern Transmission Line Project includes approximately 220 miles of 500 kV transmission line between a point on the Minnesota-Manitoba border northwest of Roseau, Minnesota, and Minnesota Power's existing Blackberry Substation near Grand Rapids, Minnesota. The Project also includes the development of a new substation (Iron Range 500/230 kV Substation) located on the same site as the existing Blackberry Substation as well as a 500 kV midline series compensation station (Warroad River Series Compensation Station) located near Warroad, Minnesota.

Need Driver: The purpose of the Great Northern Transmission Line Project is to efficiently provide Minnesota Power's customers and the Midwest region with clean, emission-free energy that will help meet the region's growing long-term energy demands, advance Minnesota Power's EnergyForward strategy to increase its generation diversity and renewable portfolio, strengthen system reliability, and fulfill Minnesota Power's obligations under its power purchase agreements with Manitoba Hydro, all in a manner that is consistent with Minnesota Power's commitment to making a positive impact on the communities where it does business.

Alternatives: Riel – Shannon 230 kV Line.

Analysis: The Great Northern Transmission Line provides the most effective and efficient long-term solution for supporting incremental power transfers on the Manitoba – United States interface.

Schedule: In anticipation of the Great Northern Transmission Line Project's aggressive schedule and needing to meet a June 1, 2020, in-service date, Minnesota Power initiated a proactive public outreach program to key agency stakeholders and the public that started in August 2012 and continued through May 2015. Through this program, thousands of landowners, the public, and federal, state, and local agency stakeholders were engaged through a variety of means, including five rounds of voluntary public open house meetings held throughout the Project area.

On October 21, 2013, Minnesota Power submitted an Application for a Certificate of Need to construct the 500 kV Great Northern Transmission Line and associated facilities to the Minnesota Public Utilities Commission (MPUC Docket No. E015/CN-12-1163). This was the first major step in the regulatory review process. Subsequently, on April 15, 2014, Minnesota Power simultaneously filed a Route Permit Application (MPUC Docket No. E015/TL-14-21) and a Presidential Permit Application (DOE Docket No. PP-398), to the Minnesota Public Utilities Commission and the United States Department of Energy, respectively. On May 14, 2015, the Minnesota Public Utilities Commission granted Minnesota Power a Certificate of Need to construct the Great Northern Transmission Line. Decisions on the Route Permit Application and Presidential Permit Application are expected in early 2016.

On September 23, 2014, Minnesota Power, Manitoba Hydro, and the Midcontinent Independent System Operator (MISO) executed a Facilities Construction Agreement (FCA) for the Great Northern Transmission Line Project, setting forth the ownership and financial responsibilities for the Project, among other terms. Upon approval of the FCA by the Federal Energy Regulatory Commission (FERC) on November 25, 2014, MISO considered the Project an approved project under the MISO tariff and moved the Great Northern Transmission Line Project to Appendix A of the MISO Transmission Expansion Plan 2014 (MTEP14).

Pending the applicable regulatory approvals, Minnesota Power expects to begin construction of the Great Northern Transmission Line Project in 2017 in order to meet the required in-service date of June 1, 2020 in satisfaction of the contractual arrangements between Minnesota Power and Manitoba Hydro.

General Impacts: The Manitoba Hydro hydropower purchases made possible by the Great Northern Transmission Line will provide Minnesota Power and other utilities in the Upper Midwest access to a predominantly emission-free energy supply that has a unique combination of baseload supply characteristics, price certainty, and resource optimization flexibility not available in comparable alternatives for meeting customer requirements. Minnesota Power has maintained its commitment to making a positive impact in the communities throughout the Project area through a multiyear proactive public outreach program and through designing its routes to utilize existing transmission line corridors to the greatest reasonable extent when considering all human, environmental, and engineering constraints. The Project is also expected to have a significant impact on local property taxes in the counties where it will be located.

NERC Facility Ratings Alert Low Priority

MPUC Tracking Number: 2013-NE-N14

Utility: Minnesota Power (MP)

Project Description: Transmission line derates (i.e. capacity reductions) and physical mitigation of low priority lines on the MP and Superior Water, Light, and Power (SWLP) systems include the 115 kV, 138 kV and 161 kV systems.

Need Driver: NERC Facility Ratings Alert (Compliance Recommendation)

Alternatives: There are no alternatives to this project as it was a matter of compliance with a NERC Alert.

Analysis: Minnesota Power's approach to the NERC Alert attempts to strike a right balance between transmission line derates – which reduce the capacity of the transmission system – and costly physical mitigation. Failure to comply with the NERC Alert may result in non-compliance with NERC Standards.

Schedule: The deadline for mitigation of discrepancies identified on Low Priority lines, as set forth in the original NERC Facility Ratings Alert Recommendation, was December 31, 2014. On February 27, 2014, Minnesota Power submitted a progress update to the Midwest Reliability Organization (MRO) with the findings of the completed analysis of its Low priority lines. By late December 2014, Minnesota Power had only mitigated approximately 29 percent of all discrepancies requiring physical construction on its Low Priority facilities. In early 2015, Minnesota Power requested and was granted an extension of the deadline for completing remediation of its Low priority facilities from December 31, 2014 to December 31, 2016. The mitigation work is currently progressing on schedule with all discrepancies expected to be mitigated by December 31, 2016. Minnesota Power will reassess its progress periodically to determine if more time is required for specific situations due to construction access constraints, outage constraints, or the type and complexity of mitigation.

General Impacts: The NERC Facility Ratings Alert projects represent tens of millions of dollars of investment in the transmission system, including many hours of construction labor. Because discrepancies have been identified on nearly every transmission line in the Minnesota Power system, the impact is felt throughout northeastern Minnesota. Minnesota Power is making an effort, within the time constraints imposed by NERC, to minimize the environmental impact and cost of construction by leveraging frozen ground conditions where possible for performing the NERC Facility Ratings Alert mitigation construction.

HVDC Valve Hall Replacement

MPUC Tracking Number: 2013-NE-N16

Utility: Minnesota Power (MP)

Project Description: Replace thyristor valve halls with modern equipment on Square Butte – Arrowhead HVDC line.

Need Driver: The HVDC terminals were designed by General Electric (GE) for a 30 year operating lifetime and as of 2015 they have been operating reliably for over 38 years. The main components of the HVDC terminals include the thyristor valves and cooling, converter transformers, and smoothing reactors to complete the energy conversion. The original vendor, GE, left the HVDC business in the 1980s and over the past few years it has been increasingly difficult to procure spare parts as the technology is becoming obsolete and the original designers are well into retirement. Minnesota Power has researched reverse engineering solutions to this technology issue, but has had limited results and thus spare and replacement parts for the HVDC system remain limited. By taking action to modernize the thyristor equipment, Minnesota Power will greatly reduce the likelihood of a line failure. Minnesota Power is evaluating a series of modernization activities for each of the major components of the HVDC system. Along with the thyristor valves, Minnesota Power can reduce the likelihood of forced outages of the 465 mile transmission line by planning replacement of transformers and smoothing reactors. Minnesota Power continues to evaluate the timing and priority for modernizing each of these components.

Alternatives: There are two alternatives. "Do Nothing" (risk of extended outage due to equipment failure) or implement the HVDC 750 MW Upgrade (*2013-NE-N17*).

Analysis: Replacement of the existing thyristor valves with modern equipment is the minimum necessary project to maintain the reliability of Minnesota Power's HVDC line and reduce the risk of extended outages due to equipment failure.

Schedule: The timing of the HVDC Valve Hall Replacement Project will be identified based on Minnesota Power's reliability and economic evaluations, Minnesota Power is actively monitoring the project and looking for an opportunity to execute it while balancing system reliability needs with costs to customers and prioritization of all capital projects. The earliest expected in-service date for the Project is 2020.

General Impacts: The modernization of the HVDC equipment is a prudent and necessary activity to ensure the ongoing operation of this critical piece of transmission for Minnesota Power's customers, including the reliable delivery of Minnesota Power's substantial North Dakota wind generation assets.

HVDC 750 MW Upgrade

MPUC Tracking Number: 2013-NE-N17

Utility: Minnesota Power (MP)

Project Description: Upgrade existing Square Butte – Arrowhead HVDC line and terminal equipment to 750 MW capacity.

Need Driver: With new equipment such as what would be necessary to complete the HVDC Valve Hall Replacement Project (*2013-NE-N16*) there is opportunity to consider new designs, technology capabilities and system enhancements. Specifically with the thyristor valves, Minnesota Power has the opportunity to design a system capable for up to 750 MW while utilizing the existing building and real estate. The new valves provide advantages of life extension (of at least 30 years) and the option to allow energy to flow in both west to east and east to west directions that would add a new and positive dynamic to the regional transmission system. Additional equipment upgrades beyond replacement of the thyristor valves would be necessary to upgrade the capacity of the HVDC line to 750 MW. The converter transformers, AC filter banks, and transmission line capability would all need to be studied and either replaced or increased in size. The 230 kV system connecting the Arrowhead Substation to power sources on the Iron Range would also need to be evaluated to determine if additional 230 kV transmission line capacity would be necessary to enable east to west scheduling of the HVDC line. The decision to size the system for 750 MW operation will need additional study and be determined during the final design phase for the modernization activities.

Alternatives: HVDC Valve Hall Replacement (*2013-NE-N16*)

Analysis: Replacement of the existing thyristor valves with modern equipment is the minimum necessary project to maintain the reliability of Minnesota Power's HVDC line and reduce the risk of extended outages due to equipment failure. Additional modifications to the HVDC system enabling higher transfer capability on the line would potentially provide an even better long-term solution, assuming that the additional costs can be justified.

Schedule: The timing of the HVDC 750 MW Upgrade Project will be identified based on Minnesota Power's reliability and economic evaluations, Minnesota Power is actively monitoring the project and looking for an opportunity to execute it while balancing system reliability needs with costs to customers and prioritization of all capital projects. The earliest expected in-service date for the Project is 2020.

General Impacts: The modernization of the HVDC equipment is a prudent and necessary activity to ensure the ongoing operation of this critical piece of transmission for Minnesota Power's customers, including the reliable delivery of Minnesota Power's substantial North Dakota wind generation assets. The additional capacity facilitated by the HVDC 750 MW Upgrade Project has the potential to facilitate increased wind development in North Dakota, more efficient market operation, and system reliability enhancements for both North Dakota and Minnesota.

Hoyt Lakes Substation Modernization

MPUC Tracking Number: 2013-NE-N19

Utility: Minnesota Power (MP)

Project Description: Rebuild and reconfigure the existing Hoyt Lakes Substation by replacing end-of-life equipment, adding a bus-tie breaker to sectionalize transmission lines, and adding a new 20 MVAr capacitor bank to support voltage.

Need Driver: Development of the Polymet mine.

Alternatives: There are no viable alternatives to this project since the project is needed to provide transmission-level electric service at a specific proposed mineral processing plant site.

Analysis: Much of the existing equipment in the Hoyt Lakes Substation is at end-of-life, and its replacement is a prudent and necessary step in establishing reliable electric service for the proposed Polymet plant. Replacement of this equipment also provides an opportunity for making improvements to the electrical configuration of the substation to support improved redundancy and provide necessary reactive power support for the proposed plant.

Schedule: The schedule for construction of the Hoyt Lakes Substation Modernization Project is dependent on the schedule for the development of the Polymet mine.

General Impacts: The Hoyt Lakes Substation Modernization Project is the most efficient and least environmentally impactful viable solution for meeting the near-term and long-term needs at the Polymet plant site and makes good use of an existing substation site for a new customer.

Menahga Area 115 kV Project

MPUC Tracking Number: 2013-NE-N21

MPUC Docket Numbers: ET2,E015/CN-14-787 and ET2,E015/TL-14-797

Utilities: Great River Energy (GRE) and Minnesota Power (MP)

Project Description: The Menahga Area 115 kV Project consists of approximately 22.5 miles of new 115 kV transmission line between Great River Energy's existing Hubbard Substation and a new Minnesota Pipeline pumping station, as well as the construction of three new substations (Minnesota Power "Straight River," Great River Energy "Blueberry," and Todd-Wadena Electric Cooperative "Red Eye"), relocation and voltage conversion of the existing Todd-Wadena Menahga Substation, and modifications to the existing Great River Energy Hubbard Substation.

Need Driver: Identified capacity and voltage limitations on the 34.5 kV system between Verndale and Hubbard and a new Minnesota Pipeline pumping station located near Sebeka, Minnesota.

Alternatives: An alternative considered was rebuilding the 34.5 kV system with a like-for-like replacement.

Analysis: The Menahga area will receive redundant electric service with the addition of the 115/34.5 kV substation in this area. Simply rebuilding the 34.5 kV system would not provide the power redundancy and also is more prone to momentary outages. The Menahga area 115 kV project will greatly improve the electric service performance in the Menahga area.

Schedule: The Menahga project is planned to be fully in-service by April 1, 2017.

General Impacts: The Menahga Area 115 kV Project is the most efficient and least environmentally impactful viable solution for meeting the near term and long term needs in the Menahga area. Pumping stations requires a larger voltage than 34.5 kV to start motors and not cause voltage violations on the system. The Menahga area will be served by a transmission grade source that will have less disruption resulting in greater reliability and also will also have less system losses.

Elisha 115 kV Project

MPUC Tracking Number: 2013-NE-N22

Utility: Great River Energy (GRE)

Project Description: Construct a new, 16.5 mile, 115 kV transmission line between the existing Itasca-Mantrap Cooperative Electric Association's (IMCEA) Potato Lake Substation and the existing Great River Energy (GRE) Hubbard Substation. The Project involves adding a new 115/34.5 kV substation to the Hubbard-Potato Lake 115 kV line to be named Elisha. The proposed project includes construction of a proposed new, 8.0 mile, 34.5 kV sub-transmission line from the Elisha 115/34.5 kV Substation to the existing IMCEA Osage substation.

Need Driver: Provide a redundant, stronger source to the Osage load pocket to alleviate low voltage seen on the 12.47 kV end. Minimize the radial MW-Mile exposure on two line sections; the Long Lake – Mantrap – Potato Lake – Arago 115 kV line and the Hubbard – Osage – Shell Lake – Pine Point 34.5 kV line.

Alternatives: Development of a 115/34.5 kV substation near Potato Lake and build a 34.5 kV line from the new substation to the Osage substation.

Analysis: The Elisha substation will serve the Osage, Pine Point, and Shell Lake substations system intact while Long Lake will act as a backup source to these loads. The voltage profile in the Osage area will increase significantly with the proposed Elisha substation. A 115 kV loop (Hubbard – Mantrap – Potato Lake – Elisha – Hubbard) will be created providing two sources to the Elisha 115/34.5 kV substation.

Schedule: GRE anticipates initiating the project development in 2017.

General Impacts: The Elisha 115 kV Project is the most efficient and least environmentally impactful viable solution for meeting the near term and long term needs in the Osage area. The Osage area will be served by a transmission grade source that will have less disruption resulting in greater reliability and also will also have less system losses.

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5 Line Upgrade

MPUC Tracking Number: 2015-NE-N1

Utility: Minnesota Power (MP)

Project Description: Reconductor existing Brainerd – Mud Lake 115 kV Line (MP "5 Line") and replace limiting substation terminal equipment.

Need Driver: The capacity of the existing Brainerd – Mud Lake 115 kV Line needs to be increased due to identified post-contingent overloads for contingencies involving the parallel Mud Lake – Riverton 230 kV Line.

Alternatives: Build a new 115 kV or 230 kV line between Mud Lake and Riverton.

Analysis: Reconductoring 5 Line provides the best solution for maintaining the reliability of the Brainerd-area 115 kV system in view of currently-identified needs, and should defer or eliminate the need for additional transmission line development in the area based on current load projections.

Schedule: MISO and Minnesota Power studies first indicate a need for the 5 Line Upgrade prior to the 2019-20 winter season. The earliest MP anticipates being able to begin construction of the Project would be in 2018.

General Impacts: The 5 Line Upgrade project will provide necessary system improvements in the Brainerd area without requiring the establishment of additional transmission line corridors.

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868 Line Upgrade

MPUC Tracking Number: 2015-NE-N2

Utility: Minnesota Power (MP)

Project Description: Reconductor existing Little Falls – Langola Tap – St. Stephen Tap 115 kV Line (MP "868 Line") and replace limiting substation terminal equipment.

Need Driver: The capacity of the existing Little Falls – Langola Tap – St. Stephen Tap 115 kV Line needs to be increased due to identified post-contingent overloads for contingencies involving parallel 230 kV, 345 kV, and 500 kV transmission lines in the area.

Alternatives: Build a new 115 kV or 230 kV line between Mud Lake and the St. Cloud area.

Analysis: Reconductoring 868 Line provides the best solution for maintaining the reliability of the Little Falls-area 115 kV system in view of currently-identified needs, and should defer or eliminate the need for additional transmission line development in the area based on current load projections.

Schedule: MISO and Minnesota Power studies first indicated a need for the 868 Line Upgrade prior to the 2019-20 winter season. The earliest MP anticipates being able to begin construction of the Project would be in 2018.

General Impacts: The 868 Line Upgrade project will provide necessary system improvements in the area between Little Falls and St. Cloud without requiring the establishment of additional transmission line corridors.

Maturi 115/23 kV Transformer

MPUC Tracking Number: 2015-NE-N3

Utility: Minnesota Power (MP)

Project Description: Expand existing Maturi Substation to include a new 115/23 kV transformer.

Need Driver: Add load-serving capacity and improve redundancy for the 23 kV system between Hibbing and Virginia.

Alternatives: Develop a new 115/23 kV substation tapped into the Virginia – Hibbing 115 kV Line.

Analysis: Locating the new 115/23 kV source at the existing Maturi Substation makes the best use of existing infrastructure in the area and avoids the addition of another (third) load-serving tap on the Hibbing – Virginia 115 kV Line. The project is part of a plan to provide sufficient capacity, reliability, and redundancy of 115/23 kV sources for the area between Virginia and Hibbing.

Schedule: Expected to be placed in-service in December 2015.

General Impacts: The Maturi 115/23 kV Transformer addition project will provide needed load-serving capacity and redundancy to the area between Hibbing and Virginia. Utilizing the existing Maturi Substation site for the new 115/23 kV source meets these needs in the most cost-effective and least environmentally impactful manner possible.

15th Avenue West Substation Modernization

MPUC Tracking Number: 2015-NE-N4

Utility: Minnesota Power (MP)

Project Description: Rebuild & modernize existing 15th Avenue West Substation, including new 14 kV switchgear on adjacent property, one new 115/14 kV transformer, replacement of three 115 kV breakers and other 115 kV equipment, and miscellaneous site improvements.

Need Driver: The 15th Avenue West Substation is the largest single load-serving distribution substation in the Duluth area by total load, and serves one of Minnesota Power's most high profile load pockets: downtown and central Duluth. Many of the assets within the substation are nearing the end of their useful life, including particularly the 14 kV switchgear and some of the foundations. In addition to the risks posed by the possible failures of end-of-life equipment, there are parts of the substation that do not meet modern design and safety standards, causing safety concerns and limiting accessibility within the substation. The purpose of the 15th Avenue West Substation Modernization Project is to address aging equipment, potential reliability and safety concerns, and long-term system needs at the 15th Avenue West Substation.

Alternatives: Development of a new 115/14 kV substation in downtown Duluth and retirement of the existing 15th Avenue West Substation; utilization of gas insulated substation (GIS) equipment to minimize project footprint.

Analysis: Much of the existing equipment in the 15th Avenue West Substation is at end-of-life, and its replacement is a prudent and necessary step in maintaining reliable electric service for the downtown and central Duluth area. The cost associated with the development of an entirely new 115/13.8 kV substation adjacent to the existing site – and subsequent retirement of the existing site – was not justified based on the fact that the reliability, accessibility, and safety needs on the site could largely be addressed by relocation the distribution equipment and remaining equipment on the site as necessary.

Schedule: Construction of the 15th Avenue West Substation Modernization Project is expected to begin in 2016 and continue in stages through 2018.

General Impacts: The 15th Avenue West Substation Modernization Project will ensure a continuous and reliable power supply for the downtown and central Duluth area in the most cost-effective and least environmentally impactful manner possible.

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16 Line Relocation

MPUC Tracking Number: 2015-NE-N5

MPUC Docket Numbers: E015/TL-14-977

Utility: Minnesota Power (MP)

Project Description: Reroute a segment of the existing Arrowhead – 16 Line Tap 115 kV Line around a proposed United Taconite tailings basin expansion.

Need Driver: United Taconite tailings basin expansion.

Alternatives: Remove the segment of existing line without rebuilding it.

Analysis: A fully-intact connection between Arrowhead and the 16 Line Tap is necessary for providing reliable electric service to the area between Duluth and Eveleth. Removal of the line off the proposed tailings basin expansion site without re-establishing this connection is not a viable solution.

Schedule: The 16 Line Relocation Project is expected to be completed by May of 2018 to meet United Taconite's schedule for the planned tailings basin expansion.

General Impacts: The 16 Line Relocation Project maintains an important source of power for the area between Virginia and Duluth while also enabling industrial expansion on the Iron Range.

Motley Area 115 kV Project

MPUC Tracking Number: 2015-NE-N6

Utility: Great River Energy (GRE)

Project Description: The Motley Area 115 kV Project consists of approximately 16 miles of new 115 kV transmission line between a point on Minnesota Power's existing Scearcyville – Dog Lake Tap 115 kV Line (MP "24 Line") and a new Minnesota Pipeline pumping station, as well as construction of one new substation at the pumping station site (Crow Wing Power "Fish Trap Lake"), conversion of the existing Crow Wing Power Motley Substation from 34.5 kV to 115 kV service, and expansion of the existing Minnesota Power Dog Lake Substation to a more reliable ring bus design. Expansion of the Dog Lake Substation would require an additional one-half mile of 115 kV transmission line between the existing Scearcyville – Dog Lake Tap 115 kV Line and the Dog Lake Substation.

Need Driver: The project is needed to provide electric service to Minnesota Pipeline's (MPL) Fish Trap pump station. Also the project is needed to address circuit overloads that currently exist on the Dog Lake-Baxter 34.5 kV system and alleviate capacity issues identified on the lines between Dog Lake and Baxter.

Alternatives: Many alternatives were looked at such as: peaking generation, distributed generation, renewable generation, upgrading of existing facilities, different conductor, alternative voltages, alternative endpoints, double circuiting, undergrounding, reactive power supply, demand side management and conservation, and no build alternative.

Analysis: There are two need drivers in the Motley area; native load growth (34.5 kV system) and a large pump station. The 115 kV line needed for the large pump station integrated well with correcting the native load serving issues by allowing for the Motley distribution substation to be transferred from the 34.5 kV system to the 115 kV system alleviating the capacity concerns on the 34.5 kV system. The other alternatives studied didn't provide both solutions or wasn't the least cost alternative to providing solutions to both needs.

Schedule: The project is planned to be in-service by August 31, 2017.

General Impacts: The Motley Area 115 kV Project was the most efficient way to provide electric service to MPL's pumping station and while addressing the issues on the neighboring 34.5 kV system.

Maturi 115/34.5 kV Transformer Replacement

MPUC Tracking Number: 2015-NE-N7

Utility: Minnesota Power (MP)

Project Description: Replace existing Maturi 10 MVA 115/34.5 kV transformer with a larger-capacity 18.6 MVA transformer of the same basic physical size. Move Maturi 10 MVA transformer to new Straight River Substation (MTEP Project #7999).

Need Driver: Load additions proposed by the sole industrial customer served from the Maturi 115/34.5 kV transformer are anticipated to exceed the 10 MVA capability of the transformer.

Alternatives: Do nothing; or add a second 115/34.5 kV transformer at the site for the industrial customer**.**

Analysis: Doing nothing risks accelerating the end-of-life of the existing transformer by continually loading it above its designed capability. Adding a second 115/34.5 kV transformer is not viable due to space constraints on the site, and does not make optimal use of the existing transformer or the new transformer. Replacing the existing transformer with a larger one and relocating the existing transformer to a new site provides the most efficient and effective long-term solution.

Schedule: Expected to be placed in-service in May 2015.

General Impacts: The Maturi 115/23 kV Transformer addition project will provide needed capacity for Minnesota Power's industrial customer in the most cost-effective and least environmentally impactful manner possible.

Hat Trick 115 kV Project

MPUC Tracking Number: 2015-NE-N8

Utility: Minnesota Power (MP)

Project Description: Construct a new 115/23 kV substation in Eveleth, Minnesota, adjacent to existing Laskin – 37 Line Tap 115 kV Line (MP "37 Line").

Need Driver: The Eveleth area is currently served by two 23 kV feeders from the Virginia Substation. These two feeders are currently located along U.S. Highway 53. When the United Taconite mining operation expands at the Thunderbird Mine, the land utilized for the current feeder route along the highway will be reclaimed for mining. A new source or route for the two feeders is required prior to the expansion of the United Taconite mine. Development of a new 115/23 kV source in Eveleth was determined to be the best long-term solution for re-establishing a source on the west side of the Eveleth area 23 kV system.

Alternatives: Rerouting the 23 kV feeders around the mine pit.

Analysis: Establishment of a new 115/23 kV source in the Eveleth area resolves the feeder relocation issue while also providing improved redundancy, reliability, and load-serving capability for the area between Hoyt Lakes and Virginia. Rerouting the 23 kV feeders around the mine pit proved to be uneconomical due to engineering constraints associated with either crossing the pit or rerouting a long distance around it.

Schedule: Expected to be placed in-service in late 2016.

General Impacts: The Hat Trick 115 kV Project will provide continued reliable service and increased long-term load-serving capability for the 23 kV system between Eveleth and Hoyt Lakes. The Project supports the expansion of the existing United Taconite mining operation in Eveleth, Minnesota, and the attendant social and economic benefits that the continued operation of the mine brings to the local area and the State.

Arrowhead 115 kV Bus Reconfiguration

MPUC Tracking Number: 2015-NE-N9

Utility: Minnesota Power (MP)

Project Description: Add a 115 kV breaker and reconfigure transmission line terminations at the existing Arrowhead Substation such that the Arrowhead – Colbyville 115 kV Line and Arrowhead – Haines Road 115 kV Line are not terminated on adjacent buses subject to a single breaker failure event.

Need Driver: Identified post-contingent voltage collapse in the "Duluth Loop" area (Haines Road – Swan Lake Road – Ridgeview – Colbyville substations) caused by internal fault or failure of Arrowhead "115MW" bus tie breaker.

Alternatives: Develop a new 115 kV transmission line into the Duluth Loop.

Analysis: Reconfiguration of the Arrowhead 115 kV bus is a low cost solution to the identified issue that can be implemented much more quickly than the development of a new 115 kV line.

Schedule: Expected to be placed in service in 2017.

General Impacts: The Arrowhead 115 kV Bus Reconfiguration will ensure continued reliable service and load-serving capacity for the Duluth area and position the Arrowhead 115 kV Substation for future modernization and reliability improvement, all without requiring any additional property for transmission line or substation development.

Minntac 230 kV Bus Reconfiguration

MPUC Tracking Number: 2015-NE-N10

Utility: Minnesota Power (MP)

Project Description: Expand the 230 kV bus at the existing Minntac 230 kV Substation and add three 230 kV circuit breakers to convert it to a four-position ring bus arrangement. Relocate one 230 kV line to an adjacent line entrance to facilitate separation of sources and loads within the new ring bus arrangement.

Need Driver: Identified post-contingent voltage violations and transmission line overloads in the Virginia area transmission system caused by internal fault or failure of Minntac "80-96LW" 230 kV bus tie breaker. The impact of this breaker failure event is exasperated by the idling of the three coal-fired generation units at the Taconite Harbor Energy Center.

Alternatives: Increase capacity of overloaded lines and add reactive power support (cap banks) in the area.

Analysis: Reconfiguration of the 230 kV bus at the Minntac Substation defers or eliminates the need for additional capacity on several 115 kV lines in the surrounding area, and also improves redundancy for Minnesota Power's largest customer and other customers in the Virginia area. It is the most effective solution for mitigating the identified inadequacies.

Schedule: In its evaluation of the impact of idling the Taconite Harbor generation, Minnesota Power determined that the Minntac 230 kV Bus Reconfiguration Project needed to be in place prior to shutting down the Taconite Harbor generators in the near-term. Therefore, the Project is expected to be in-service by October 2016 to facilitate the economic idling of Taconite Harbor units 1 and 2.

General Impacts: The Minntac 230 kV Bus Reconfiguration Project will ensure continued reliable service and load-serving capacity for the Virginia area without requiring any additional property for transmission line or substation development. The Project facilitates the shutdown of coal-fired generation at the Taconite Harbor Energy Center for economic and environmental reasons.

Forbes 230/115 kV Transformer Addition

MPUC Tracking Number: 2015-NE-N11

Utility: Minnesota Power (MP)

Project Description: Add a second 230/115 kV transformer with a top rate of 373 MVA at the existing Forbes 230/115 kV Substation ("2TR"). Replace Forbes "18L" 115 kV breaker due to increased short circuit interrupting current requirements associated with the transformer addition.

Need Driver: Widespread post-contingent voltage depression in the Hibbing-Virginia-Babbitt area and post-contingent overloads on existing Forbes 230/115 kV transformer caused by several contingencies, including internal fault or failure of Forbes "80L" 230 kV breaker. The impact of these events is exasperated by the idling of the three coal-fired generation units at the Taconite Harbor Energy Center.

Alternatives: Reconfigure bus connection of existing Forbes transformer to lessen the severity of the limiting contingencies and add local reactive power support (capacitor banks) at various locations throughout the eastern Iron Range.

Analysis: Adding a second transformer at the Forbes substation is the most effective long-term solution for the identified inadequacy, providing significant improvements in load-serving capacity and reactive power support for the surrounding area.

Schedule: In its evaluation of the impact of idling the Taconite Harbor generation, Minnesota Power determined that the Forbes 230/115 kV Transformer Addition Project needed to be in place prior to shutting down the Taconite Harbor generators in the near-term. Therefore, the Project is expected to be in-service by October 2016 to facilitate the economic idling of Taconite Harbor units 1 and 2.

General Impacts: The Forbes 230/115 kV Transformer Addition Project will ensure continued reliable service and load-serving capacity for the eastern Iron Range area without requiring any additional property for transmission line or substation development. The Project facilitates the shutdown of coal-fired generation at the Taconite Harbor Energy Center for economic and environmental reasons.

Iron Range – Arrowhead 345 kV Line

MPUC Tracking Number: 2015-NE-N12

Utility: Minnesota Power (MP)

Project Description: Expand planned Iron Range (f/k/a "Blackberry") 500 kV Substation to include two 1200 MVA 500/345 kV transformers and extend a double circuit 345 kV line from Iron Range to the existing Arrowhead 345 kV Substation. This project was formerly coupled together with the Great Northern Transmission Line (*2013-NE-N13*) but the two projects have since been decoupled due to the lack of sufficient transmission service requests to justify the 345 kV connection to Arrowhead.

Need Driver: When paired with the Great Northern Transmission Line, the Iron Range – Arrowhead 345 kV Line was found by MISO in the Manitoba Hydro Wind Synergy Study to facilitate significant regional benefits associated with the synergies between wind and hydroelectric generation resources. However, the currently-desired incremental export capability from Manitoba to the United States and the majority of the benefits of wind and hydro synergy can be realized by the development of the Great Northern Transmission Line Project alone, without a 345 kV extension to Arrowhead. Because there are not sufficient transmission service requests to justify the 345 kV connection to Arrowhead at this time, Minnesota Power has determined that it will not pursue construction of the Iron Range – Arrowhead 345 kV Project in the foreseeable future. Should the project become necessary in the future due to additional transmission service requests or other system reliability needs, it will be advanced at that time based on its own merits apart from the Great Northern Transmission Line Project.

Alternatives: No other alternatives are currently being considered.

Analysis: Minnesota Power and Manitoba Hydro's analysis of the transmission necessary to enable 883 MW of incremental Manitoba – United States transfer capability identified that the Iron Range – Arrowhead 345 kV Line is not needed or economically justified at this level of Manitoba Hydro export. MISO studies have confirmed this finding.

Schedule: Minnesota Power has no current plans to construct the Iron Range – Arrowhead 345 kV Project.

General Impacts: The optimization of the new Manitoba to United States interconnection that allowed for deferral of the Iron Range – Arrowhead 345 kV Line has provided benefit to Minnesota Power's ratepayers, local landowners, and the region by implementing a right-sized solution for the current need and avoiding extraneous transmission line construction. Should future additional transmission service requests justify the need for the Iron Range – Arrowhead 345 kV Line, the project could reasonably be expected to build upon the already-substantial social, economic, and environmental benefits provided by the Great Northern Transmission Line Project.

Bear Creek 69/46 kV Transformer

MPUC Tracking Number: 2015-NE-N13

Utility: Minnesota Power (MP)

Project Description: Install new 69/46 kV transformer at Great River Energy's existing Bear Creek Substation and remove existing Sandstone 69/46 kV distribution station.

Need Driver: Age and condition of Sandstone distribution station, as well as environmental concerns with the location of the Sandstone distribution station adjacent to the Kettle River.

Alternatives: Rebuild Sandstone Substation at the existing site.

Analysis: Relocating the 69/46 kV source from Sandstone to the nearby Bear Creek Substation will improve redundancy for Minnesota Power's customers while also utilizing an already-developed substation site in a more accessible and environmentally favorable location.

Schedule: Expected to be placed in-service in 2017.

General Impacts: The Bear Creek 69/46 kV Transformer Project will replace end-of-life equipment and provide increased load-serving capacity and reliability for Minnesota Power's customers along the Interstate 35 Corridor south of Duluth. Utilizing the existing Bear Creek Substation for the new 69/46 kV transformer and retiring the existing Sandstone distribution station site meets these needs in the most cost-effective and least environmentally impactful manner possible.

83 Line Upgrade

MPUC Tracking Number: 2015-NE-N14

Utility: Minnesota Power (MP)

Project Description: Replace limiting 230 kV terminal equipment at the Boswell and Blackberry substations to restore transmission line capacity.

Need Driver: The Boswell – Blackberry 230 kV lines (MP "83 Line" and "95 Line") were derated after a NERC-mandated equipment audit identified undersized terminal equipment at the Boswell and Blackberry substations. The 83 Line Upgrade Project is necessary to restore the capacity of 83 Line, a critical outlet for Boswell generation, to its original capacity.

Alternatives: Build a third Boswell – Blackberry 230 kV Line.

Analysis: There is no more economical or less impactful solution than replacing the limiting equipment to restore the capability of the existing line.

Schedule: Expected to be placed in-service in 2017.

General Impacts: The 83 Line Upgrade project will restore critical transmission outlet capability for the Boswell Energy Center without requiring the establishment of additional transmission line corridors.

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95 Line Upgrade

MPUC Tracking Number: 2015-NE-N15

Utility: Minnesota Power (MP)

Project Description: Replace limiting 230 kV terminal equipment at the Boswell and Blackberry substations to restore transmission line capacity.

Need Driver: The Boswell – Blackberry 230 kV lines (MP "83 Line" and "95 Line") were derated after a NERC-mandated equipment audit identified undersized terminal equipment at the Boswell and Blackberry substations. The 95 Line Upgrade Project is necessary to restore the capacity of 95 Line, a critical outlet for Boswell generation, to its original capacity.

Alternatives: Build a third Boswell – Blackberry 230 kV Line.

Analysis: There is no more economical or less impactful solution than replacing the limiting equipment to restore the capability of the existing line.

Schedule: Expected to be placed in-service in 2017.

General Impacts: The 95 Line Upgrade project will restore critical transmission outlet capability for the Boswell Energy Center without requiring the establishment of additional transmission line corridors.

Two Inlets Pumping Station (X1A)

MPUC Tracking Number: 2015-NE-N16

Utility: Great River Energy (GRE)

Project Description: Tap the Mantrap to Potato Lake line near Potato Lake substation and build approximately7.5 miles of 115kV transmission line to connect the future Two Inlets substation. The substation will supply power to the Enbridge Two Inlets pump station.

Need Driver: Enbridge Pipeline has proposed a new pumping station about 12 miles northwest of Park Rapids.

Alternatives: The nearby distribution systems would not support the large pumping station load. Other alternatives would require longer 115 kV or higher voltage transmission lines.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The nearest 115 kV source is the Potato Lake substation. A short, radial tap from the Potato Lake substation to the new Two Inlets substation will be constructed to provide electric service.

Schedule: The project is planned to be in-service by November 2017.

General Impacts: The Two Inlets Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

Backus Pumping Station (X2A)

MPUC Tracking Number: 2015-NE-N17

Utility: Great River Energy (GRE)

Project Description: Build a ~2.5 mile 115 kV transmission line from a new interconnection to the Minnesota Power 115 kV #142 line (Badoura to Pine River) to the Backus Pumping Station.

Need Driver: Enbridge Pipeline has proposed a new pumping station about 3 miles south of Backus.

Alternatives: The nearby distribution systems would not support the large pumping station load. Other alternatives would require longer 115 kV or higher transmission lines.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The nearest 115 kV source is the Badoura – Pine River (142 Line) 115 kV line. A short, radial tap from the 142 Line to the new Backus Pumping Station substation will be constructed to provide electric service.

Schedule: The project is planned to be in-service by May 2017.

General Impacts: The Backus Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

Palisade Pumping Station (X3A)

MPUC Tracking Number: 2015-NE-N18

MPUC Docket Number: ET2/TL-15-423

Utility: Great River Energy (GRE)

Project Description: Build a ~13 mile 115 kV transmission line from MP's 115 kV #13 line to the Enbridge Palisade Pumping Station.

Need Driver: Enbridge Pipeline has proposed a new pumping station about 5.5 miles northwest of the City of Palisade.

Alternatives: The nearby distribution systems would not support the large pumping station load. Other alternatives would require longer 115 kV or higher transmission lines.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The nearest 115 kV source is the Riverton – Cromwell (13 Line) 115 kV line. A radial tap from the 13 Line to the new Palisade Pumping Station substation will be constructed to provide electric service.

Schedule: The project is planned to be in-service by November 2017.

General Impacts: The Palisade Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

Cromwell Pumping Station (X4A)

MPUC Tracking Number: 2015-NE-N19

Utility: Great River Energy (GRE)

Project Description: Build an approximately 0.5 mile long 115 kV line from Cromwell City line to the Cromwell Pumping Station.

Need Driver: Enbridge Pipeline has proposed a new pumping station about 5.5 miles south of the City of Cromwell.

Alternatives: The nearby distribution systems would not support the large pumping station load. Other alternatives would require longer 115 kV or higher transmission lines.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The nearest 115 kV source is the Cromwell – Savanna (156 Line) 115 kV line. A short, radial tap from the 156 Line to the new Cromwell Pumping Station substation will be constructed to provide electric service.

Schedule: The project is planned to be in-service by November 2017.

General Impacts: The Cromwell Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

6.4.2 Completed Projects

The table below identifies those projects by Tracking Number in the Northeast Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Minnesota Public Utilities Commission in November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2003-NE-N6	Taconite-Harbor-Grand Marais Area	Not Required	GRE	This project has been delayed indefinitely, due to drop in load growth.
2009-NE-N1	Skibo - Hoyt Lakes 138 kV	Not Required	MP	Cancelled due to lack of industrial load growth.
2009-NE-N2	28 Line Tap Reconfiguration	Not Required	MP	Cancelled and replaced with MTEP Project #3531.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2009-NE-N4	Brainerd Lakes–Remer -Deer River Area	Not Required	GRE	This project has been delayed indefinitely, due to drop in load. growth.
2009-NE-N5	Ortman (formerly Effie) 230/69 kV Source.	Not Required	GRE	July 2015
2009-NE-N6	Staples-Motley-Long Prairie Area	Not Required	GRE	This project has been delayed indefinitely, due to drop in load growth.
2009-NE-N7	Park Rapids Area	Not Required	GRE	Cancelled; 2013-NE-N22 accomplished the need.
2009-NE-N8	Barrows Area	Not Required	GRE	This project has been delayed indefinitely, due to drop in load growth.
2009-NE-N9	Shell Lake Area.	Not Required	GRE	December 2014
2009-NE-N10	Iron Hub	Not Required	GRE	This project has been delayed indefinitely, due to drop in load growth.
2009-NE-N11	Rush City-Cambridge-Princeton-Milaca Area	Not Required	GRE	This project has been delayed indefinitely, due to drop in load growth.
2011-NE-N1	9 Line Upgrade.	Not Required	MP	March 2015
2011-NE-N2	15 Line Reconfiguration	Not Required	MP	Cancelled and replaced with MTEP Project #7996.
2011-NE-N8	18 Line Upgrade	Not Required	MP	Cancelled and incorporated into MTEP Project #4294 (2013-NE-N15).

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2011-NE-N9	Verndale Transformer	Not Required	MP	Cancelled due to lack of load growth
2011-NE-N11	Savanna 230 kV Expansion	Not Required	MP	Cancelled and replaced with MTEP Project #3373.
2011-NE-N13	MH-MP 230 kV Line	Not Required	MP	Cancelled and replaced with MTEP Project #3831.
2013-NE-N1	39 Line Reconfiguration.	E015/TL-12-1123	MP	May 2014
2013-NE-N2	North Shore Switching Station.	Not Required	MP	Cancelled by the customer in favor of a more economical alternative
2013-NE-N3	Two Harbors Transformer.	Not Required	MP	March 2014
2013-NE-N4	Mesabi 115 kV Project.	Not Required	MP	Cancelled due to lack of industrial load growth.
2013-NE-N5	Canisteo Project.	E015/TL-13-805	MP	November 2014
2013-NE-N6	Panasa Project.	Not Required	MP	Cancelled due to lack of industrial load growth
2013-NE-N9	15th Avenue West Transformer.	Not Required	MP	Cancelled and replaced with MTEP Project #7997(2015-NE-N4)
2013-NE-N10	Graham Mine Substation.	Not Required	MP	Cancelled due to lack of industrial load growth
2013-NE-N11	Arrowhead 230 kV Cap Bank	Not Required	MP	2013
2013-NE-N12	Bison 230 kV Cap Bank	Not Required	MP	2013

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2013-NE-N14	NERC Facility Ratings Alert Medium Priority	Not Required	MP	2014
2013-NE-N18	44 Line Upgrade.	Not Required	MP	Cancelled and incorporated into MTEP Project #4294 (2013-NE-N15).
2013-NE-N20	Haines Road Capacitor Bank.	Not Required	MP	Cancelled. Underlying distribution system upgrades have alleviated the need for the project.
2013-NE-N23	39 Line & 16 Line Reconfiguration.	Not Required	MP	Cancelled and replaced with MTEP Project #4039(2013-NE-N15).

6.5 West Central Zone

6.5.1 Needed Projects

The following table provides a list of transmission needs identified in the West Central Zone by MISO utilities. There were no projects identified in this zone by non-MISO utilities.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2003-WC-N7	Panther Area	N/A	NA	Yes	GRE
2009-WC-N4	Sartell Distribution Substation	2010/A	2564	No	GRE
2009-WC-N6	Elk River – Becker Area	2012/C	2691	No	GRE
2011-WC-N4	Convert Minn Valley - Panther - McLeod - Blue Lake 230 kV line to Double circuit 345 kV from Hazel to McLeod to West Waconia to Blue Lake.	C	2177	Yes	XEL

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2013-WC-N1	Upgrade St. Stephen Substation	2014/A	4014	No	GRE/XEL
2013-WC-N2	Quarry – West St. Cloud 115 kV Line	2014/A	4379	No	GRE/XEL
2013-WC-N3	Priam Substation	2014/A	4380	No	WMU/GRE
2015-WC-N1	Quarry Breaker and half expansion.	2014/A	4379	No	XEL
2015-WC-N2	Douglas County – West Union 69KV Line rebuild	2014/A	4693	No	XEL
2015-WC-N3	Ortonville 115/41.6 kV Transformer	2015/B	4236	No	OTP
2015-WC-N4	Riverview Road 345/115/69 kV Project	2016/C (seeking A)	7884	No	GRE
2015-WC-N5	Stockade Pumping Station	2015/C (seeking A)	7894	No	GRE

Panther Area

MPUC Tracking Number: 2003-WC-N7

Utility: Great River Energy (GRE)

Project Description: Construct a 115 kV line from Brownton to McLeod 115 kV.

Need Driver: The Panther area is characterized by long 69 kV transmission lines from remote 115/69 kV sources with one 230/69 kV source (Panther) in the middle of the system. Although load growth in this area is slow, several relatively large spot loads are present (near Danube and Olivia). During the loss of the Panther 230/69 kV source or one of the 69 kV lines emanating from Panther, bus low voltage and line overloads occur.

The following are typical of the deficiencies in this area that could be expected based on the summer peak conditions.

- 2021: Hector bus voltage at 87.3% for the outage of the Bird Island—Hector 69 kV line
- 2021: Panther 230/69 kV transformer loading at 103% during system intact
- 2021: Panther 230/69 kV transformer loading at 123% for the outage of the Birch—Franklin 69 kV line (could be reduced by switching)
- 2021: Melville Tap—Panther 69 kV line at 103 %

Alternatives: The following two alternatives were considered to address the low voltage and overload concerns in the area:

- Alternative 1: Install a second 230/69 kV transformer at Panther

- Alternative 2: Construct a 115 kV line from McLeod to Brownton and establish a 115/69 kV source at Brownton.

The first alternative will address the transformer overload concern, but will not address the low voltage problems at Hector. Alternative 2 is the preferred plan to address both the low voltage and overload concerns in the Panther area for a long-term.

Analysis: Doubling the Panther 230/69 kV transformer will only address the transformer overload, but it will not address low voltage problems. The Brownton 115/69 kV source instead will provide significant load serving reliability improvement by addressing both low voltage and overload problems in the system. It will also relieve loading from the Panther 230/69 kV and Franklin 115/69 kV transformers, sectionalize the extensive 69 kV system and make capacity available for future load growth in the 69 kV system.

Schedule: This project has been delayed indefinitely due to a drop in load growth.

General Impacts: The Panther Area project is the most efficient solution that will address both the low voltage and transformer overload concerns in the area. The project also increases the overall load serving reliability of the 69 kV system.

Sartell Distribution Substation

MPUC Tracking Number: 2009-WC-N4

Utilities: Great River Energy (GRE)

Project Description: Construct approximately 2 miles of 115 kV transmission line from the LeSauk distribution substation to the new Sartell distribution substation.

Need Driver: The Sartell distribution substation is required by Stearns Electric Association to accommodate present and future residential/commercial growth in the City of Sartell. The sub will also relieve loading from the Le Sauk, Fischer Hill and Westwood distribution substations as well as provide backfeed capability in the surrounding area.

Alternatives: The alternative to the Sartell distribution substation plan is to continue serving the growing load in the area with the existing distribution substations in the area. However, load growth in the area has reached to the level that this is not possible. The best value plan to reliably serve customers in the area is to establish the Sartell distribution substation.

Analysis: The Sartell project will provide service to customers in the area of Sartell and provide contingency back up customers served from LeSauk, Fisher Hills and Westwood distribution substations. The project will make capacity available to serve expected commercial and residential load growth in the area while serving existing customers that are now served on long distribution feeders from LeSauk, Fisher Hills and Westwood distribution substations.

Schedule: This project is currently expected to be complete by summer 2016 but may be delayed depending on load growth in the area.

General Impacts: The Sartell distribution substation project will provide a long-term reliable service to customers in the area.

Elk River – Becker Area

MPUC Tracking Number: 2009-WC-N6

Utilities: Great River Energy (GRE)

Project Description: Build the Orrock 345/115 kV substation northwest of Elk River. Build 115 kV lines from Orrock to Liberty & Enterprise Park.

Need Driver: This project is needed to address load growth and thermal overloading during a two overlapping single contingency event (NERC TPL-001-4 P6).

Alternatives: Reconductor the Crooked Lake-Parkwood line to ACSS conductor and add a second 345/115 kV transformer at Elm Creek.

Analysis: The project is proposing a double circuit 115/69 kV line that would provide more capacity to a narrow transmission corridor than either a single circuit 115 or 69 kV line could offer. Furthermore, the Waco breaker station was designed to accept a 115/69 kV transformation and such a transformer would offload the Elk River 230/69 kV transformers. An Elk River Area 345/115 kV source would also offer a termination point for a 115 kV line going east towards the Crooked Lake substation.

Schedule: This project is expected to be completed in 2023.

General Impacts: The Elk River – Becker Area project is the most efficient and least environmentally impactful viable solution for meeting the near term and long term needs in the area.

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230 kV Corridor Study

MPUC Tracking Number: 2011-WC-N4

Utility: Xcel Energy (XEL)

Project Description: Convert Minn Valley - Panther - McLeod - Blue Lake 230 kV line to Double circuit 345 kV from Hazel to McLeod to West Waconia to Blue Lake.

Need Driver: In 2015, there is no current identified need for this project, but with EPA 111d and the Clean Power Plan on the near term horizon, States and utilities will be working together to determine the best way to manage the transition from existing generation resources to new generation resources. Xcel Energy believes that it is important to keep this project as one to be considered in future transmission build out scenarios. This project includes the conversion of an existing Minn Valley – Blue Lake 230 kV transmission line corridor to accommodate a double circuit 345 kV transmission line (aka “Corridor Project”). The Corridor Project would allow additional wind power to be transferred from the wind rich areas in southwest Minnesota to the Minneapolis/St Paul metro area load pocket. This project would be a potential candidate to be built after the wind zones around southwest Minnesota exceed the transmission capabilities of the CapX and MISO MVP lines.

Alternatives: Building a new line on new Right Of Way to increase the transfer capability from wind rich areas in SW MN and the Dakotas would have an increased impact on land use, so rebuilding the existing line is considered preferred.

Analysis: The Corridor conversion of the existing 230 kV to 345 kV has been studied multiple times over the past number of years. While there is currently no need for this line in 2015, Xcel Energy believe it is an important option to keep open and in consideration in future studies to increase transfer capability of the grid to deliver renewables to customers.

Upgrade St. Stephen Substation

MPUC Tracking Number: 2013-WC-N1

Utility: Great River Energy (GRE)

Project Description: Convert 69 kV St. Stephen substation to 115 kV service. This will include converting approximately 1 mile of existing 69 kV transmission line to 115 kV.

Need Driver: The West St. Cloud transformer overloads during n-1 outages. This project will move some of the 69 kV load to the 115 kV system.

Alternatives: Replace the West St. Cloud 115/69 kV transformer.

Analysis: The project relieves loading from the West St. Cloud 115/69 kV transformer as St. Stephen will be served from the 115 kV system. SEA’s Brockway and St. Stephen substations are now served from an old and radial 69 kV transmission line. A fault on the radial line would take both substations out-of-service. The conversion of the St. Stephen to 115 kV will increase system reliability in the area as only the Brockway substation is a shorter radial line. As St. Stephen will provide contingency back up to the Brockway substation, customers served from the Brockway substation will also see improved service reliability.

Schedule: This project is expected to be complete by summer 2016.

General Impacts: The conversion of the St. Stephen distribution substation will bring better reliability to customers who are served from this substation. In addition, it would provide a longer life to the existing West St. Could transformer and West St. Cloud to St. John 69 kV line.

Quarry – West St. Cloud 115 kV Line

MPUC Tracking Number: 2013-WC-N2

Utility: Great River Energy (GRE)

Project Description: Build approximately 2½ miles of 115 kV line between Quarry 345/115 kV Substation to West St. Cloud 115/69 kV substation.

Need Driver: A two overlapping single contingency event (NERC TPL-001-4 P6) results in significant loadshed in the area northwest of St. Cloud. Potential cascade tripping in a confined area may occur.

Alternatives: The alternative to this project is to construct the Quarry to West St. Cloud 115 kV line along a route that is not in parallel with the existing West St. Cloud – Quarry line.

Analysis: The Quarry – West St. Cloud 115 kV line will ensure potential cascading outage in the system will not occur during critical contingencies in the area. This project will keep loads that would otherwise have to be shed in-service during critical contingencies in the system.

Schedule: This project is expected to be complete by summer 2017.

General Impacts: This project is the best value plan and will address the concern of an outage that result in wide ranging reliability impact.

Priam Substation

MPUC Tracking Number: 2013-WC-N3

Utility: Great River Energy (GRE)

Project Description: Build a 115/69 kV substation to be named Priam three miles west of Willmar. Move the existing Willmar 115/69 kV transformer to the new Priam substation.

Need Driver: This project provides a second delivery location to the City of Willmar.

Alternatives:

- Alternative 1: Establish a new 230/69 kV substation in the Spicer area and construct about 1 mile double circuit 69kV line from the substation to the Kandiyohi to Green Lake 69 kV line

- Alternative 2: Establish a new 115/69 kV substation at Kerkhoven Tap by moving the Willmar 115/69 kV transformer to the new substation and convert the Kerkhoven Tap to Willmar 115 kV line to 69 kV.

These two options were not found to be the best value plan to Priam Substation plan.

Analysis: The project will move 115/69 kV transformer from the Willmar substation to a new substation location about 3 miles west of Willmar, at the Priam Substation. The transformer will serve the same load that it now serves while at the Willmar Substation site. The separation of the two substations, however, provides better reliability to the system in such a way that a major outage causing event at Willmar Sub will not put both the 230/69 kV and 115/69 kV transformer out-of-service.

Schedule: This project is expected to be complete by summer 2017.

General Impacts: This project is the best value plan that will increase the reliability of the area served currently from the Willmar substation

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Quarry breaker and half expansion

MPUC Tracking Number: 2015-WC-N1

Utility: Xcel Energy (XEL)

Project Description: Install breaker and half layout at existing Quarry substation to allow new interconnection to West St. Cloud substation.

Need Driver: Great River Energy is building a new 115 kV Transmission line between NSP's Quarry substation and GRE's West St. Cloud substation to increase capacity and reliability of the 115 kV Transmission system in the St. Cloud area. This project will expand the Quarry substation to enable the new 115 kV connection.

Alternatives: Expand the Quarry substation to enable a new 115 kV termination to the West St. Cloud substation.

Analysis: This project will increase the transmission reliability in the St. Cloud area by allowing a new 115 kV circuit to be installed between Quarry and West St. Cloud.

Schedule: This project is scheduled to begin early in 2017 and be completed by May 2017.

General Impacts: This project is required to complete the project that is adding a 115KV line between Quarry substation and West St Cloud substation. The scope of this project is entirely within the existing Quarry substation and has no additional environmental impacts.

Douglas County – West Union 69KV Line Rebuild

MPUC Tracking Number: 2015-WC-N2

Utility: Xcel Energy (XEL)

Project Description: Rebuild the Douglas County – West Union 69 kV line to 477 ACSR and transfer Osakis substation load to Douglas County

Need Driver: This 69 kV Transmission line is overloading for single contingency in high load scenarios.

Alternatives: Reconductor the 69 kV line to 477ACSR conductor which will increase the capacity.

Analysis: This section of 69 kV Transmission line has seen capacity increase over the years and it is no longer to reliably serve the area.

Schedule: This project will start early in 2016 and is projected to be complete by April 30, 2016.

General Impacts: This Transmission Line rebuild is the most efficient and least environmentally impactful solution to serve the increased load in the area. Any other solution would involve building new 69KV or 115KV transmission lines.

Ortonville 115/41.6 kV Transformer

MPUC Tracking Number: 2015-WC-N3

Utility: Otter Tail Power Company

Project Description: Replace existing Ortonville 115/41.6 kV transformer with a new 40 MVA 115/41.6 kV transformer.

Need Driver: This area is experiencing local load growth and continual growth will cause the current 115/41.6 kV Ortonville transformer to become overloaded and created reliability concerns.

Alternatives: Due to the small size of the project, little impact and low cost no alternatives were considered.

Analysis: The replacement of the Ortonville 115/41.6 kV transformer with a larger transformer will address the local load growth that this area is experiencing and will provide reliable service to the customers in the area. This project is the most cost-effective and environmentally responsible project to address the local needs in the Ortonville area.

Schedule: Currently the new Ortonville 115/41.6 kV transformer is scheduled to be replaced in the year 2020. However, faster or slower load growth could cause the date of the project to change.

General Impacts: The new transformer would replace the existing transformer and would require no additional new land or expansion. Since it will replace the existing transformer, there likely would be no major environmental impacts. This project may require a temporary project crew. If so, this may bring some business to the area in the form of room and board. This is an existing substation and would likely not require any permits or fees from the local government. This project is the product of a reliability measure, and will probably not have a substantial or lasting impact on the community in terms of population or other social characteristics.

Riverview Road 345/115/69 kV Project

MPUC Tracking Number: 2015-WC-N4

Utility: Great River Energy (GRE)

Project Description: Build a new 345/115/69 kV substation near Melrose, Minnesota.

Need Driver: This project is needed to address contingency low voltage issues as well as transformer and 69 kV line overload concerns in the system.

Alternatives: The following are the alternatives considered in the study of this matter:

1. Replace West St. Cloud transformer and rebuild overloaded lines,
2. Roscoe to Millwood 69 kV line with new West St. Cloud transformer,
3. St. Stephen to Albany 115 kV line with Albany 115/69 kV substation,
4. Rockville to Albany 115 kV line with Albany 115/69 kV substation,
5. Riverview Rd 345/115/69 kV station with Millwood to Melrose 69 kV line rebuild,
6. Rockville to Millwood 115 kV transmission line with Riverview Rd 115/69 kV substation

7. Munson to Albany 115 kV line and Roscoe to Albany 69 kV line with Albany 115/69 kV substation

Analysis: The Riverview Road substation will relieve system intact and contingency overloads in the 69 kV system. The project also addresses low voltage problems during critical contingencies in the system. As the project relieves loading from the Douglas County, Wakefield, Paynesville and West St. Cloud 115/69 kV transformers and it is directly sourced from a stiff 345 kV system, additional capacity will be available for reliable service to future load growth in the system.

Schedule: This project is expected to be complete by fall 2017.
General Impacts: The Riverview Rd 345/115/69 kV substation project is the best value plan that will address the load serving problems in the 69 kV systems (bounded by Douglas County, Paynesville, Wakefield and West St. Cloud) for the long-term.

Stockade Pumping Station

MPUC Tracking Number: 2015-WC-N5

Utilities: Great River Energy (GRE)

Project Description: Build approximately 6.5 miles of 115 kV transmission line to serve a new Koch Pipeline pumping station load.

Need Driver: Koch Pipeline has proposed a new pumping station about 7 miles northeast of the City of Litchfield.

Alternatives: The 69 kV system nearby would not support the large pumping station load. Given the nature of the load it is prudent to serve it from the 115 kV system. Other alternatives would require longer 115 kV or higher transmission lines.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The nearest 115 kV source is the Swan Lake – Wakefield line. A 6.5 mile radial tap will be constructed to the new Stockade substation to provide electric service.

Schedule: The project is planned to be in-service by May 2018.

General Impacts: The Stockade Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

6.5.2 Completed Projects

The table below identifies those projects by Tracking Number in the West Central Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Minnesota Public Utilities Commission in

November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2003-**WC**-N8	Douglas County-Paynesville-Wakefield-West St. Cloud	None	GRE	This project has been delayed indefinitely, due to drop in load growth. CapX may alter this project significantly.
2005-CX-1	Add new 345 kV Line between Monticello and Fargo.	Yes	CapX	2014
2005-CX-2	Add new 345 kV line between Brookings, South Dakota, and Southeast corner of Twin Cities.	Yes	CapX	2015
2009-WC-N3	Rebuild Maynard – Kerkhoven 115KV line.	Not Required	XEL	2014
2009-WC-N5	Paynesville – Wakefield – Maple Lake Area.	NA	GRE	Cancelled due to drop in load growth.
2009-WC-N7	Brooten-Lowery	NA	NA	2014
2011-WC-N1	Highway 212 Corridor Upgrade 69KV to 115KV.	Not Required	XEL	2015
2011-WC-N2	Minnesota Valley – Maynard – Kerkhoven Tap 115KV Line Upgrade.	Not Required	XEL	2014
2011-WC-N3	New 69KV line from Brownton to GRE (Winthrop - Hassen) Line.	Not Required	XEL	2013
2011-WC-N5	Maple Lake – Annandale 69KV line rebuild	Not Required	XEL	2015
2011-WC-N7	St. Cloud Loop.	Not Required	XEL	Project withdrawn

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2013-WC-N4	Replace 41.6 kV line Herman-Nashua	Not Required	OTP	2013
2015-WC-N6	Install new distribution substation on 115 kV line between Monticello and Lake Pulaski.	Not Required	XEL	2015
2015-WC-N7	Install new Wobegon Trail substation on 69KV line between Albany and Melrose.	Not Required	XEL	2014

6.6 Twin Cities Zone

6.6.1 Needed Projects

The following table provides a list of transmission needs identified in the Twin Cities Zone by MISO utilities. There were no projects identified in this zone by non-MISO utilities.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2009-TC-N2	New Market & Cleary Lake Area Projects	20213/A	4008	Yes	GRE
2015-TC-N1	Bailey Road Substation	2015/C	8780	Maybe	XEL
2015-TC-N2	Cedar Lake Pumping Station	2015/C (seeking A)	7899	No	GRE
2015-TC-N3	SW Twin Cities Project	2015/C	3311	Maybe	XEL

New Market & Cleary Lake Area Projects

MPUC Tracking Number: 2009-TC-N2

MPUC Docket Number: ET2/CN-12-1235 and ET2/TL-12-1245

Utility: Great River Energy (GRE)

Project Description: Establish 69 kV breaker stations at Jordan and Veseli, construct 5.4 mile double circuit 69 kV line (built to 115 kV standard) from New Market to Veseli, and rebuild existing 4/0A 69 kV lines (Prior Lake – Cleary Lake – Credit River Tap 69 kV line and Lake Marion Tap – Elko – New Market 69 kV line) to 115 kV standard with 795ACSS conductor.

Need Driver: The drivers for the Elko-New Market and Cleary Lake area projects are load serving concerns (low voltage and line overload) in the extensive 69 kV network that is bounded by the Carver County, Scott County, Faribault and Owatonna 115/69 kV sources. Substations along the Scott County – Jordan – New Prague 69 kV line experience low voltage problems for the loss of the Scott County – Gifford Lake 69 kV line. This contingency causes low voltage problems at Gifford Lake, Merriam Junction, Jordan, Sand Creek and New Prague distribution substations.

The Scott County – Gifford Lake 69 kV line outage also causes transmission line overload on the Carver County – Assumption and Assumption – Belle Plaine 69 kV lines in the near-term. Other contingencies, such as the loss of the Lake Marion – Lake Marion Tap 69 kV line, Lake Marion Tap – Elko and Lake Marion – New Market 69 kV lines, cause transmission line overload concerns in the near-term. These transmission line outages would overload the Prior Lake Junction – Credit River Junction 69 kV line, Credit River Junction – Cleary Lake 69 kV line and Cleary Lake – Credit River (NSP) 69 kV line.

Alternatives: The following are the alternatives considered to address the load serving issues in the area:

Alternative 1: Sheas Lake – New Prague 69 kV line
Alternative 2: Chub Lake – New Market – Veseli 115 kV line and Veseli 115/69 kV Substation
Alternative 3: Lake Marion Breaker Station – Veseli 115 kV line and Veseli 115/69 kV Substation
Alternative 4: Scott County – Assumption – Sheas Lake 115 kV line with Sheas Lake – New Prague 69 kV line.

These alternatives include rebuild of existing transmission lines to 115 kV standard. Alternative 1, Alternative 2 and Alternative 3 include the rebuild of Carver County – Assumption – Belle Plaine 69 kV line. Alternative 1 also includes the rebuild of the Faribault – Circle Lake 69 kV line.

Alternative 2 includes the rebuild of the Chub Lake – Lake Marion Tap – Elko- New Market 69 line with 795 ACSS conductor that is constructed for 115 kV standard. Prior Lake Junction – Credit River Junction – Cleary Lake – Credit River (NSP) 69 kV lines will also be rebuilt with 795 ACSS conductor to 115 kV standard as part of Alternative 2. New breaker stations, at Jordan and Veseli, are part of the preferred alternative that will address the near-term load serving concerns in the area. As part of the out year recommendation of Alternative2 for system reinforcement, the rebuild of the Carver County – Assumption – Belle Plaine 69 kV line to 115 kV standard and a 115/69 kV source at Veseli are recommended.

Analysis: Alternative 2 is the preferred alternative and in 2012 a certificate of need and a route permit were applied for to authorize this project. MPUC Docket Nos. ET2/CN-12-1235 and ET2/TL-12-1245.

Schedule: On August 5, 2014, the MPUC granted a Certificate of Need and a Route Permit for the project. This project is scheduled to be in service by spring 2016.

General Impacts: The New Market & Cleary Lake Area Projects are the most efficient and least environmentally impactful viable solutions for meeting the near term and long term needs in the area.

Bailey Road Substation

MPUC Tracking Number: 2015-TC-N1

Utility: Xcel Energy (XEL)

Project Description: Add a new Bailey 345/115 kV substation located east of the Red Rock substation on the existing Red Rock-Allen S. King 345 kV line. Install two 345/115 kV, 448 MVA transformers. Reterminate four existing 115 kV lines from Red Rock to Bailey Road. Add 115/34.5 kV, 70 MVA distribution to the substation.

Need Driver: There are several transmission issues associated with the Red Rock substation. The available fault current level at Red Rock is currently projected to exceed 56 kA for the summer peak in 2019 with Twin Cities generation running. In addition for 2019 summer peak the 448 MVA transformers at Red Rock are exceeding their emergency rating. Distribution planning is projecting a total load growth for the Woodbury and surrounding areas at approximately 290 MW which is stressing the existing distribution system.

Alternatives:

1. Expanding the existing Afton substation and installing a new 70 MVA transformer and two new feeders would help address the distribution deficiencies and need for support for continued load growth in the Woodbury area.
2. Expanding the existing Red Rock substation to accommodate another 115 kV yard so that the existing 115 kV lines can be reterminated and additional 345/115 kV transformation can be added. This will prevent future overloads on the existing 448 MVA transformers at Red Rock and reduce the amount of available fault current at Red Rock.

Analysis: This project will increase the distribution reliability in the southern Woodbury area. The preferred substation site location is south of an existing high school in Woodbury, due to existing infrastructure located in the area. This project combines several needs for distribution load serving and transmission thermal overloads and fault current issues. Expanding the Red Rock substation would be difficult due to its proximity to the Mississippi River. By building a new Bailey Road substation located in south Woodbury it will allow distribution to expand and feed the load from the south as well as address the transmission deficiencies at Red Rock.

Currently the preferred substation site is farmland. The substation is expected to require 15 acres of land, entirely converting the existing land use. Siting will be coordinated with the appropriate local, state, and federal authorities. The work could be completed in approximately two years and would likely be constructed by Xcel Energy employees. The estimated cost is approximately $29M and would have a targeted in-service date of 2019.

Schedule: The work could be completed in approximately two years and would likely be constructed by Xcel Energy employees.

General Impacts: Currently the preferred substation site is farmland. The substation is expected to require 15 acres of land, entirely converting the existing land use. Siting will be coordinated with the appropriate local, state, and federal authorities. The estimated cost is approximately $29M and would have a targeted in-service date of 2019.

Cedar Lake Pumping Station

MPUC Tracking Number: 2015-TC-N2

Utility: Great River Energy (GRE)

Project Description: Install an approximately 6 mile long transmission line to connect to Minnesota Valley Electric Cooperative's Cedar Lake pump station sub. Line is to be built to 115 kV specs but initially energized at 69 kV.

Need Driver: Koch Pipeline has proposed a new pumping station about 2 miles northeast of the City of New Prague.

Alternatives: Build 115 kV line to Chub Lake.

Analysis: Large pumping stations with large electric motors require a robust voltage like 115 kV. The New Market – Veseli 69 kV system will be converted to 115 kV in the future. A radial line to Cedar Lake substation will be constructed at 115 kV standards in anticipation of the 115 kV conversion.

Schedule: The project is planned to be in-service by December 2017.

General Impacts: The Cedar Lake Pumping Station project is the most efficient and least environmentally impactful viable solution to serve the new pumping station load.

SW Twin Cities Project

MPUC Tracking Number: 2015-TC-N3

Utility: Xcel Energy (XEL)

Project Description: Rebuild existing 69 kV lines around the Chaska area to 115 kV and rebuild a single circuit 115 kV line in Chanhassen to a double circuit 115 kV line. This project also includes substation work at multiple substations throughout the area surrounding Eden Prairie, Chanhassen, and Chaska. This project also includes the new Scott County 345/115 kV substation and the Bluff Creek 115 kV substation.

Need Driver: The worst contingency in the SW Twin Cities project area is loss of the Eden Prairie – Westgate double circuit 115 kV line. This outage isolates the largest load in the area from the best source in the area at the Eden Prairie 345 kV.

Alternatives: Rebuilding Westgate – Deephaven – Excelsior – Scott County 69 kV line to 115 kV.

Analysis: This project is needed due to load growth in the region under contingency conditions causing both low voltages and line overloads. The series of projects associated with the SW Twin Cities project will be built using existing right of way whenever possible. After the completion of these projects, the study area will no longer have any low voltages or overloads and allow for future load growth. The majority of the SW Twin Cities projects are already in service, with the remaining projects to be completed by end of 2016.

Schedule: The work could be completed in approximately two years and would likely be constructed by Xcel Energy employees.

General Impacts: This project is rebuilding the existing 69 kV line to 115 kV using the same right of way. Siting will be coordinated with the appropriate local, state, and federal authorities. The estimated cost is approximately $8M and would have a targeted in-service date of 2016.

6.6.2 Completed Projects

The table below identifies those projects by Tracking Number in the Twin Cities Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Public Utilities Commission in November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2003-TC-N1	Aldrich to St. Louis Park	NA	XEL	Upgrade not necessary
2003-TC-N12	Enterprise Park	ET2/TL-11-915	GRE	December 22, 2014
2003-TC-N13	No project resulted following study.	Not Required	Several	Withdrawn
2005-TC-N7	No specific needs have been identified at this time.		XEL	Withdrawn
2005-CX-2	Add new 345 kV line between Brookings, South Dakota, and Southeast corner of Twin Cities.	E002,ET2/CN-06-1115 and ET2/TL-08-1474.	CapX	2015
2005-CX-3	SE Twin Cities - Rochester, MN - LaCrosse, WI 345 kV project	E002,ET2/CN-06-1115 and E002/TL-09-1448.	CapX	2014
2007-TC-N1	Augusta and Victoria conversion. This project is coordinated with the Xcel Scott County-West Waconia project.	E002/CN-09-1390 E002/TL-10-249	XEL/ GRE	May 20, 2014
2007-TC-N4	Load serving infrastructure investments needed to meet growth in area demand	Not Required	XEL	Withdrawn
2009-TC-N5	Scott County – Carver County – New Prague	Not Required	GRE	Cancelled. The New Market & Cleary Lake Area Projects will address the low voltage and overload concerns in the area.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2009-TC-N6	Rebuild 69 kV to 115 kV in cities of Plymouth and Medina.	E002/TL-11-52	XEL	Cancelled. This project will be replaced in the future but is currently in the public outreach stage.
2011-TC-N1	This project is to convert the Kohlman Lake - Long Lake 115 kV bifurcated line to double circuit with separate line terminations at Kohlman Lake and Long Lake.	Not Required	XEL	2015
2011-TC-N2	This project is to install a 2nd 345/115 kV transformer at Chisago County.	Not Required	XEL	2014
2011-TC-N3	Riverside - Apache line upgrade.	Not Required	XEL	2015
2011-TC-N4	This project is to convert the single circuit line between Goose Lake and Kohlman Lake to double circuit.	Not Required	XEL	2015
2011-TC-N5	This project replaces some of the 115 kV breakers at Parkers Lake with 63 kA rated breakers.	Not Required	XEL	2015
2011-TC-N8	This line will rebuild the 115 kV line from Black Dog to Savage to 795 ACSS conductor.	Not Required	XEL	2014
2011-TC-N9	This project will upgrade the 69 kV line from GRE’s Medina to Plymouth substations.	Not Required	XEL	Cancelled. This project will be replaced in the future but is currently in the public outreach stage.
2011-TC-N10	Install 30 MVAR reactor at Kohlman Lake substation.	Not Required	XEL	2015

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2011-TC-N11	Install 40 MVAR reactor at Chisago County substation.	Not Required	XEL	2015
2011-TC-N12	Install 30 MVAR reactor at Red Rock substation.	Not Required	XEL	2015
2011-TC-N13	Upgrade 13 miles of 115 kV line between Lake Marion and Burnsville to higher capacity.	Not Required	XEL	2013
2011-TC-N14	New 115 kV distribution substation with four terminations tapping the Elliot Park - Southtown line, 1.25 new miles of double circuit 795 SAC to a new 115 kV distribution substation.	Not Required	XEL	2015
2011-TC-N15	Rebuild Westgate to Scott County 69 kV to 115 kV.	Not Required	XEL	Withdrawn

6.7 Southwest Zone

6.7.1 Needed Projects

The following table provides a list of transmission needs identified in the Southwest Zone by MISO utilities. There were no projects identified in this zone by non-MISO utilities.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2013-SW-N1	Heron Lake Capacitors	2012/A	3528	No	ITCM
2013-SW-N4	MVP #3	2011/A	3205	Yes	ITCM 2017 In Service
2015-SW-N1	Yankee Reactor	2013/A	4305	No	XEL
2015-SW-N2	Fenton Reactor	2013/A	4305	No	XEL
2015-SW-N3	Buffalo Ridge Cutover	2015/A	8017	No	XEL

<u>**Yankee Reactor**</u>

MPUC Tracking Number: 2015-SW-N1

Utility: Xcel Energy (XEL)

Project Description: This project is to install a 25 MVAR switched reactor at the existing Yankee substation in Southwest Minnesota.

Need Driver: The 115 kV transmission system between the Nobles County and Brooking County substations in southwest Minnesota are experiencing high voltages during no-wind conditions. The reactor will help bring the voltages back within equipment limits.

Alternatives: An alternative proposal was to install single 25 MVAR fixed reactors at Yankee and Fenton and installing a +/-60 MVAR SVC near the Pipestone substation

Analysis: Transmission studies and real-time operating data has identified that the 115 kV system in Southwest Minnesota is susceptible to high voltage issues. This area has added many large wind farms and the addition of the CapX Brookings will further enable continued wind growth. The high voltages in the area are due to lack of electrical load in the localized area and the reactive power produced from the wind farm feeder networks under no-wind conditions. The study results have identified that reactor installations at the existing Yankee and Fenton will help mitigate the high voltage issues. The work will be done in two separate projects, at the Yankee substation first and then at the Fenton substation, and would likely be constructed by Xcel Energy employees.

Schedule: Construction is expected to begin in 2015 with a completion date of fall of 2016.

General Impacts: This reactor instillation will be contained in the existing Yankee substation and will not require expanding the substation site. Xcel Energy construction crews are expected to perform the work.

Fenton Reactor

MPUC Tracking Number: 2015-SW-N2

Utility: Xcel Energy (XEL)

Project Description: This project is to install a 25 MVAR switched reactor at the existing Fenton substation in Southwest Minnesota.

Need Driver: The 115 kV transmission system between the Nobles County and Brooking County substations in southwest Minnesota are experiencing high voltages during no-wind conditions. The reactor will help bring the voltages back within equipment limits.

Alternatives: An alternative proposal was to install single 25 MVAR fixed reactors at Yankee and Fenton and installing a +/-60 MVAR SVC near Pipestone substation.

Analysis: Transmission studies and real-time operating data have identified that the 115 kV system in Southwest Minnesota is susceptible to high voltage issues. This area has added many large wind farms and the addition of the CapX Brookings 345 kV line will further enable continued wind growth. The high voltages in the area are due to lack of electrical load in the localized area and the reactive power produced from the wind farm feeder networks under no-wind conditions. The study results have identified that reactor installations at the existing Yankee and Fenton will help mitigate the high voltage issues. The work will be done in two separate projects, at the Yankee substation first and then at the Fenton substation, and would likely be constructed by Xcel Energy employees.

Schedule: Construction is expected to begin in 2018 with a completion date of summer of 2019.

General Impacts: This reactor instillation will be contained in the existing Fenton substation and will not require expanding the substation site. Xcel Energy construction crews are expected to perform the work.

Buffalo Ridge Cutover

MPUC Tracking Number: 2015-SW-N3

Utility: Xcel Energy (XEL)

Project Description: Plan is to cutover the existing Buffalo Ridge feeder 321 to Yankee by building 2 miles of new 34.5 kV line. Will require installation of a 3rd 115/34.5 kV transformer and 115 kV breaker addition/s at Yankee.

Need Driver: Existing Feeder 321 is susceptible to voltage instability during high wind output from the Alpha and Zulu wind farms. Additionally the Buffalo Ridge 115/34.5 kV transformer #2 could overload during high wind conditions under contingency.

Alternatives: An alternative proposal was to install a 25 MVAR STATCOM at the end of the 321 feeder and curtail wind under contingency.

Analysis: This project will decrease the wind farm feeder length from approximately twenty miles to approximately seven miles by tying into the Yankee substation. Shortening the feeder length will correct the voltage instability issue at the Alpha and Zulu wind farms and the reduction of wind output on the Buffalo Ridge feeders will fix the overloading issue. This project will likely be constructed by Xcel Energy employees.

Schedule: This project is scheduled to begin in 2016 with a completion date of early 2017.

General Impacts: The substation portion of the project will be contained in the existing Yankee substation and will not require expanding the substation site. This project will require some new 34.5 kV line extension to complete the cutover to from Buffalo Ridge to Yankee. Xcel Energy construction crews are expected to perform the work.

6.7.2 Completed Projects

The table below identifies those projects by Tracking Number in the Southwest Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Minnesota Public Utilities Commission in November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2005-SW-N1	Worthington Area.	Not Required	GRE/ ITCM	December 10, 2014
2005-CX-2	Add new 345 kV line between Brookings, South Dakota, and Southeast corner of Twin Cities.	ET2,E002 /CN-06-1115 and ET2/TL-08-1474.	CapX	2015
2007-SW-N1	MISO Project G517 Storden Wind Interconnection - Withdrawn. Project to re-enter study process to determine required upgrades.	Not Required	ITCM	Withdrawn
2009-SW-N1	Fenton 69 kV Interconnection to serve several towns between Pipestone and Marshall.	Not Required	XEL	Withdrawn, new project 2011-SW-N5
2011-SW-N1	Build new Cedar Mountain-Franklin 115 kV line. Install 2 115/69 kV transformers at Franklin.	Yes	XEL/ GRE	2014
2011-SW-N2	Upgrade the wave traps and line switches at Buffalo Ridge to 2000 A going to Lake Yankton and Pipestone. Retap the Pipestone CTs to 2000 A going to Buffalo Ridge.	Not Required	XEL	2014
2011-SW-N3	This project replaces some of the 115 kV breakers at Split Rock with 63 kA rated breakers.	Not Required	XEL	2015
2011-SW-N4	This project is needed to replace the failed 50 MVAR Split Rock reactor and associated breaker.	Not Required	XEL	2014

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2011-SW-N5	This project is to install a new 115/69 kV transformer at Fenton substation. Break the existing 69 kV line between Chandler Tap and Lake Wilson to create an in and out to the Fenton substation.	Not Required	XEL	2013
2011-SW-N6	G520 wind interconnection has been terminated by MISO	Not Required	XEL	Withdrawn
2011-SW-N8	G349 wind interconnection	Not Required	XEL	Withdrawn
2011-SW-N11	Upgrade 115/69 kV Franklin transformers to 112 MVA.	Not Required	XEL	2013
2013-SW-N2	Heron Lake to Lakefield 161 kV - Rebuild to higher capacity.	Not Required	ITCM	2014
2013-SW-N3	The Freeborn to Glenworth 161 kV line project was replaced by the rebuild of the Freeborn to Winnebago Jct 161 kV line. That line rebuild was required for MISO project G870, and the rebuild was completed in 2015. The project was incorrectly identified in the SW zone in the 2013 Biennial Report.	Not Required	ITCM	2015
2013-SW-N5	Install 25 MVAR reactors at Yankee and Fenton.	Not Required	XEL	Project changed to 2015-SW-N1 and 2015-SW-N2
2013-SW-N6	Install breaker station at Veseli 4 breakers straight bus interconnect with new double circuit 69kVGRE line from New Market. This project will align with GRE's New Market & Cleary lake projects	Not Required	XEL	Project moved to 2015-SE-N2
2013-SW-N8	Expand Fort Ridgley Capacitor bank to 21 MVAR.	Not Required	XEL	2014
2015-SW-N4	Rebuild 1 mile of Pipestone-Buffalo Ridge 115 kV line.	Not Required	XEL	September 2013

6.8 Southeast Zone

6.8.1 Needed Projects

The following table provides a list of transmission needs identified in the Southeast Zone by MISO utilities. There were no projects identified in this zone by non-MISO utilities.

MPUC Tracking Number	MISO Project Name	MTEP Year/App	MTEP Project Number	CON?	Utility
2011-SE-N5	Arlington – Green Isle 69 kV	2012/A		No	XEL
2015-SE-N1	Lake Bavaria	2015/C	8075	No	XEL
2015-SE-N2	Veseli Substation	2013/A	4227	No	XEL
2015-SE-N3	Jordan Substation	2013/A	4228	No	XEL
2015-SE-N4	Line 0714 Rebuild	2015/A	8079	No	XEL
2015-SE-N5	Alden-Mansfield 69 kV Rebuild	N/A	N/A	No	DPC
2015-SE-N6	Waseca Junction to Montgomery 69 kV rebuild	2013/A	4101	No	ITCM
2015-SE-N7	Ellendale to Owatonna 69 kV Rebuild	2013/A	4108	No	ITCM

Arlington – Green Isle 69 kV

MPUC Tracking Number: 2011-SE-N5

Utility: Xcel Energy (XEL)

Project Description: Re-build 13 miles of 69 kV line from Arlington – Green Isle in existing right of way.

Need Driver: This line was flagged during the CapX study as an underlying facility that needed upgrading. With the loss of the CapX lines under high transfers this 69 kV line will overload.

Alternatives: Adding additional transmission lines would mitigate this issue but would require far greater cost and land usage.

Analysis: This project will have the associated construction projects by Xcel employees. This project will help maintain local reliability and uses existing right of way to minimize impact.

Schedule: The line rebuild was not a part of the 2015, five-year budget. The rebuild of the line expected to occur within approximately 6-7 years.

General Impacts: Replacement of the line will provide for additional system capacity and reduce maintenance cost on the existing, aging infrastructure.

Lake Bavaria

MPUC Tracking Number: 2015-SE-N1

Utility: Xcel Energy (XEL)

Project Description: Build new substations to feed load growth in the Victoria/Chaska area. A single distribution transformer will be installed with an "in and out" configuration on the 115 kV

Need Driver: This is a distribution driven project. The existing distribution system in the area has reached its limits and requires an additional source. This new substation will offload West Waconia and Westgate substations.

Alternatives: Many locations were considered for this new substation. Adding this load onto the existing 69 kV in the area will not work as the line cannot handle that amount of load growth. Additional 115 kV locations were found to work from a transmission perspective, but the selected location minimizes feeder lengths.

Analysis: This project will have the associated construction projects by Xcel Energy and GRE employees. This will help enable local load growth. Our team worked closely with local community to minimize substation footprint.

Schedule: Planned in service date will be early 2017.

General Impacts: This project will have the associated construction conducted by Xcel Energy and GRE employees. This will help enable local load growth. The team will work closely with local community to minimize substation footprint.

Veseli Substation

MPUC Tracking Number: 2015-SE-N2

Utility: Xcel Energy (XEL)

Project Description: Install four 69 kV breakers and provisions for 115 kV terminations. Future plan is to upgrade two GRE owned 69 kV lines to 115 kV lines.

Need Driver: GRE has been rebuilding transmission facilities north of Veseli substation and the project allows these transmission lines to terminate into the substation. This creates a much more reliable source for the area and allows for future load growth.

Alternatives: The alternative was to construct a new substation.

Analysis: This project will have the associated construction projects by Xcel Energy and GRE employees. This project will increase local reliability and allow for future load growth.

Schedule: Project is currently underway. Planned in service date is December 31, 2015.

General Impacts: Expansion of the existing substation will minimize future land impact. Alternatives would have been more costly and more environmentally impactful. Construction of a new substation would have required additional land.

Jordan Substation

MPUC Tracking Number: 2015-SE-N3

Utility: Xcel Energy (XEL)

MISO Project Description: Install 3 new 69 kV breakers at the Jordan Substation.

Need Driver: This project ties closely with the Veseli Substation project. By adding breakers at the Jordan substation it allows for far greater reliability in the area. Previously a single element contingency would result in large amount of load loss, this solution mitigates that.

Alternatives: Alternatives would have been more costly and environmentally impactful. Such alternatives include construction of a new substation which would have required additional land.

Analysis: By expanding the existing substation there will be minimal land impact. This will also increase local reliability and will allow for future load growth.

Schedule: Project is currently underway. Planned in service date is December 31, 2015.

General Impacts: Expansion of the existing substation will minimize future land impact. Alternatives would have been more costly and more environmentally impactful. Construction of a new substation would have required additional land.

0714 Line Rebuild

MPUC Tracking Number: 2015-SE-N4

Utility: Xcel Energy (XEL)

Project Description: Rebuild 3.6 miles of 0714 69 kV line from Madelia Switching Station to Village of Madelia to 336 ACSR

Need Driver: With the loss of both 345kV lines heading into Wilmarth, this line will overload. Rebuilding it to a higher ampacity mitigates the issue.

Alternatives: Alternatives would have been more costly and environmentally impactful. Such alternatives include construction of a new transmission line which would have required additional land and right of way.

Analysis: This project will have associated construction jobs. This project will help maintain local reliability and uses existing right of way to minimize impact.

Schedule: Project is currently underway. Planned in service date is June 1, 2019.

General Impacts: This project will have associated construction jobs. This project will help maintain local reliability and uses existing right of way to minimize impact.

Alden-Mansfield 69 kV Rebuild

MPUC Tracking Number: 2015-SE-N5

Utility: Dairyland Power Cooperative (DPC)

Project Description: Rebuild 5.3 miles of DPC's Twin Lakes-Freeborn 69 kV line between DPC's Alden and Mansfield distribution substations, improving reliability to all three distribution substations on this line which was originally constructed in 1951.

Need Driver: This 69 kV line was built in 1951 and increased maintenance costs have required that this line be rebuilt due to age and condition. The line also has some long spans that can be prone to galloping due to high winds.

Alternatives: The primary need driver is age and condition issues resulting in reliability concerns. Because of this need, the only alternative that was considered is a rebuild of the existing line. An alternative on new right-of-way was not considered as this line serves several distribution substations and new right-of-way would present routing difficulties and a higher cost

Analysis: The plan to replace the existing 64-year-old transmission line with new poles, conductor and shield wire will solve the reliability concern caused be the age and condition of the existing transmission line serving Mansfield, Alden and Freeborn distribution substations. The estimated cost is approximately $1.5M and has a targeted in-service date of 2018.

Schedule: Construction would occur September-November 2018.

General Impacts: Dairyland construction crews will rebuild this line in 2018 requiring approximately ten weeks to construct. This 69 kV line follows a road, resulting in minimal impacts to the local right-of-way.

Waseca Jct to Montgomery 69 kV Rebuild

MPUC Tracking Number: 2015-SE-N6

Utility: ITC Midwest (ITCM)

Project Description: The 29.6 mile-long Waseca Junction to Montgomery 69 kV line will be reconstructed on the existing Right of Way.

Need Driver: This 69 kV line was built in 1946 and increased maintenance costs have required that this line be rebuilt due to age and condition.

Alternatives: A rebuild on existing ROW was the sole alternative considered to solve the age and condition issue.

Analysis: The plan to replace the approximately 70-year-old transmission line with new poles, conductor and shield wire will solve the reliability concern caused be the age and condition of the 69 kV line. The line work is expected to be completed by the end of 2019.

Schedule: Construction of the line is expected to be completed by the end of 2019.

General Impacts: The line is near the end of its useful life. The capacity of the line will be increased to approximately 77 MVA with the rebuild.

Ellendale to West Owatonna 69 kV Rebuild

MPUC Tracking Number: 2015-SE-N7

Utility: ITC Midwest (ITCM)

Project Description: The 13.2 miles-long Ellendale to West Owatonna 69 kV line will be reconstructed on the existing Right of Way.

Need Driver: This 69 kV line is a known, real-time system constraint. The line is also nearing the end of its useful life.

Alternatives: Rebuilding the line to a greater capacity on existing ROW was the sole alternative considered to alleviate the system capacity constraint.

Analysis: Replacement of the 69 kV transmission line with new poles, conductor and shield wire addresses a capacity constraint and provides for needed upgrade of the 50-year-old 69 kV line.

Schedule: The line rebuild was not a part of the 2015, five-year budget. The rebuild of the line expected to occur within approximately 6-7 years.

General Impacts: Replacement of the line will provide for additional system capacity and reduce maintenance cost on the existing, aging infrastructure.

6.8.2 Completed Projects

The table below identifies those projects by Tracking Number in the Southeast Zone that were listed as ongoing projects in the 2013 Biennial Report but have been completed or withdrawn since the 2013 Report was filed with the Minnesota Public Utilities Commission in November 2013. Information about each of the completed projects is summarized briefly in the table below. More information about these projects and inadequacies can be found in earlier reports. Projects that were listed as being complete in the 2011 and the 2013 Reports are not repeated here, but more information about those projects can be found in these earlier reports.

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2005-SE-N4	Dodge County Wind	Not Required	TBD	Withdrawn
2005-CX-3	SE Twin Cities - Rochester, MN - LaCrosse, WI 345 kV project	E002,ET2/CN-06-1115 and E002/TL-09-1448.	CapX	2014
2011-SE-N1	New Prague Substation	Not Required	XEL	2013
2011-SE-N3	Murphy Creek 161/69kV Substation.	Not Required	SMP	2013

MPUC Tracking Number	Description	MPUC Docket	Utility	Date Completed
2011-SE-N6	New 5.4 MVAR capacitor bank at Crystal Foods.	Not Required	XEL	Withdrawn
2011-SE-N7	Add North Rochester - N. Hills 161 kV line. Add North Rochester-Chester 161 kV line. Add 345/161 kV transformers at Hampton Corner, North Rochester, and North Lacrosse.		XEL/ SMP/ Non-MISO	2014
2013-SE-N1	Byron TR9 345/161Transformer failed Aug 2012 and is now being replaced by a Non-LTC transformer.	Not Required	SMP	2014

7.0 Transmission-Owning Utilities

7.1 Introduction

In this chapter in the 2015 Report, the utilities have provided the following information.

Background Information and Contact Person

For ease of reference, the utilities have provided much of the same background information that was provided in the 2013 Report. This information relates to the history of the utility and the extent of its service territory and operations. An Internet link is provided where additional information about each utility can be found. In addition, a Contact Person is identified for each utility.

Transmission Line Ownership

In the 2007 Biennial Report, the utilities reported on the miles of transmission lines each utility owned in Minnesota. The MTO updated that information in subsequent biennial reports in 2009, 2011, and 2013, and they are updating it again in this report. The table below is the latest information on the transmission lines in Minnesota owned by each utility. In addition, information specific to each utility is included in the discussion for that utility.

Miles of Transmission

Utility	<100 kV	100-199 kV	200-299 kV	> 300 kV	DC
American Transmission Company, LLC	0	0	0	12	0
Dairyland Power Cooperative	423.8	148	0	0	0
East River Electric Power Cooperative	168.22	45.74	0	0	0
Great River Energy	3,044	517	533	166	436
Hutchinson Utilities Commission	8	9	0	0	0
ITC Midwest LLC	698.69	304.47	0	19.77	0
L&O Power Cooperative	44.52	8.32	0	0	0
Marshall Municipal Utilities	0	18.1	0	0	0
Minnesota Power	0.22	1,326.72	617.01	12.02	231.6
Minnkota Power Cooperative	998.19	143.8	268.09	0	0

Utility	<100 kV	100-199 kV	200-299 kV	> 300 kV	DC
Missouri River Energy Services	0	212.22	10.97	0	0
Northern States Power Company d/b/a Xcel Energy	1,685.06	1,690.78	435.39	1,491.36	0
Otter Tail Power Company	1,023.51	542.86	181.16	614.44	0
Rochester Public Utilities	0	42.42	0	0	0
Southern Minnesota Municipal Power Agency	138.32	135.48	17.09	0	0
Willmar Municipal Utilities	24.16	0	13.05	0	0
Totals:	8256.69	5144.91	2075.76	2315.59	667.6

7.2 American Transmission Company, LLC

Background information. American Transmission Company (ATC) began operations on January 1, 2001, the first multi-state electric transmission-only utility in the country. The company is head-quartered in Pewaukee, Wisconsin, with more than 600 employees working in Wisconsin and Michigan.

At least 28 utilities, municipalities, municipal electric companies, and electric cooperatives from Wisconsin, Michigan, and Illinois have invested transmission assets or money for an ownership stake in the company. ATC is responsible for operating and maintaining the transmission lines of its equity owners. It owns more than 9,480 circuit miles of transmission lines and 529 substations in Wisconsin, Michigan, Illinois, and Minnesota. ATC has $3.3 billion in total assets.

ATC is a transmission-owning member of the Midcontinent Independent System Operator and its transmission system is located in both the Midwest Reliability Organization and ReliabilityFirst Corporation.

More information about the company is available on its website at:

http://www.atcllc.com

Contact Person: Joe Dunn
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American Transmission Co.
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Waukesha, WI 53187-0047
Phone: (262) 832-8660
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e-mail: jdunn@atcllc.com

Transmission lines. ATC owns more than 9,480 miles of transmission lines, including 12 miles in Minnesota. The transmission line segment in Minnesota extends from the Arrowhead Substation in the Duluth area to the St. Louis River and is part of the 220-mile 345-kV Arrowhead-Weston line that extends from the Arrowhead Substation to the Gardner Park Substation in Wausau, Wisconsin. The Arrowhead-Weston line, which cost $439 million to construct, was energized in January 2008. Arrowhead-Weston provides such benefits as improving reliability, enhancing transfer capacity between Minnesota and Wisconsin, and providing ATC and other utilities greater opportunities to perform maintenance on other parts of the electric system, which reduces operating costs.

7.3 Dairyland Power Cooperative

Background Information. Dairyland Power Cooperative (DPC), a Touchstone Energy Cooperative, was formed in December 1941. A generation and transmission cooperative, Dairyland provides the wholesale electrical requirements to 25 member distribution cooperatives and 17 municipal utilities in Wisconsin, Minnesota, Iowa and Illinois. Today, the cooperative's generating resources include coal, hydro, wind, natural gas, landfill gas and animal waste. In 2010, Dairyland Power Cooperative joined a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information about Dairyland Power Cooperative is available at:

http://www.dairynet.com

Contact Person: Steve Porter
Planning Engineer III
Dairyland Power Cooperative
3200 East Avenue South
La Crosse, WI 54601
Phone: (608) 780-2827
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e-mail: scp@dairynet.com

Transmission Lines. Dairyland delivers electricity via more than 3,100 miles of transmission lines and nearly 300 substations located throughout the system's 44,500 square mile service area. Dairyland has the following transmission facilities in Minnesota:

Dairyland Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
423.80	148.0	0	0	0

7.4 East River Electric Power Cooperative

Background Information. East River Electric Power Cooperative (East River), headquartered in Madison, South Dakota, is a wholesale electric power supply and transmission cooperative serving 20 rural distribution electric cooperatives and one municipally-owned electric system, which in turn serve more than 86,000 homes and businesses. East River's 36,000 square mile service area covers the rural areas of 41 counties in eastern South Dakota and nine counties in western Minnesota.

Two of East River's member systems have service areas entirely in western Minnesota and one member system has service areas in both eastern South Dakota and western Minnesota, The remaining nineteen member systems have service areas entirely in eastern South Dakota. Approximately 7,600 of the 86,000 homes and businesses served by East River's 21 member systems are located in Minnesota.

More information about East River Electric Power Cooperative is available at:

http://www.eastriver.coop

Contact Person: Mark Hoffman
Engineering Services Manager
East River Electric Power Cooperative
P.O. Box 227
211 South Harth Avenue
Madison, SD 57042
Phone: (605) 256-4536
Fax: (605) 256-8058
e-mail: mhoffman@eastriver.coop

Transmission Lines. East River delivers electricity via approximately 2,900 miles of transmission lines and 213 substations located throughout the system's 36,000 square mile service area in eastern South Dakota and western Minnesota. East River has the following transmission facilities in Minnesota:

East River Electric Power Cooperative Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
168.22	45.74	0	0	0

7.5 Great River Energy

Background Information. Great River Energy (GRE) is a not-for-profit electric cooperative owned by 28 member distribution cooperatives. The organization generates and transmits electricity for those members, which are located from the outer-ring suburbs of the Twin Cities, up to the Arrowhead region of Minnesota and down to the farming communities in the southwest part of the state. Great River Energy's largest distribution cooperative serves more than 125,000 member-consumers, while the smallest serves approximately 2,500. Collectively, Great River Energy's member cooperatives distribute electricity to approximately 655,000 member accounts, or about 1.7 million people. In addition, Great River Energy is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information about Great River Energy is available at:

http://www.greatriverenergy.com

Contact Person: Gordon Pietsch
Director, Transmission Planning & Operations
Great River Energy
12300 Elm Creek Blvd
Maple Grove, MN 55369-4718
Ph: (888) 521-0130, ext. (763) 445-5050
Fax: (763) 445-5050
e-mail: gpietsch@grenergy.com

Transmission Lines. Great River Energy has the following transmission lines:

GRE Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
3,044	517	533	166	436

7.6 Hutchinson Utilities Commission

Background Information. The City of Hutchinson is located 55 miles west of Minneapolis in McLeod County and has a population of approximately 14,000 people. The area is expected to continue to grow over the next decade. The Hutchinson Utilities Commission (HUC) was established in 1936 by the City of Hutchinson as a municipal public utilities commission under Minn. Stat. § 412.321 et seq., and added a municipal natural gas operation in 1960. HUC provides electricity and natural-gas services to commercial and residential customers in Hutchinson. Its largest commercial customers are 3M and Hutchinson Technologies, Inc. HUC transmission facilities are under the functional control of the Midcontinent Independent System Operator (MISO).

Additional information is available at:

http://www.hutchinsonutilities.com/aboutus.htm

Contact Person: Jeremy Carter
Hutchinson Utilities Commission
225 Michigan Street SE
Hutchinson, MN 55350
Phone: (320) 587-4746
Fax: (320) 587-4721
e-mail: jcarter@ci.hutchinson.mn.us

Transmission Lines. Hutchinson Utilities Commission owns 8 miles of a 69 kV transmission line and 9 miles of a 115 kV line in McLeod County.

7.7 ITC Midwest LLC

Background Information: ITC Midwest LLC (ITC Midwest) is an independent transmission company subsidiary of ITC Holdings Corp. ITC Midwest purchased the transmission assets of Interstate Power and Light, a subsidiary of Alliant Energy, in December 2007. The Minnesota Public Utilities Commission approved the sale in an Order dated February 7, 2008. MPUC Docket No. E001/PA-07-540.

ITC Midwest has headquarters in Cedar Rapids, Iowa, and ITC Holdings Corp. is headquartered in Novi, Michigan. ITC Midwest also has offices in Dubuque and Des Moines, Iowa, and in St. Paul, Minnesota. Minnesota warehouses are located in Albert Lea and Lakefield, Minnesota. In addition, ITC Midwest's transmission system is part of a larger regional transmission system called the Midcontinent Independent System Operator (MISO.)

More information about ITC Midwest and ITC Holdings Corp. can be found at:

http://www.itctransco.com

Contact Person: David Grover
Director, RTO Affairs
ITC Midwest, LLC
901 Marquette Avenue, Suite 1950
Minneapolis, MN 55402
Phone: 651-222-1000 extension 2308
Fax: 651-222-5544
e-mail: DGrover@itctransco.com

Transmission Lines. The ITC Midwest system includes approximately 6,600 miles of transmission lines, operating at voltages from 34.5 kV to 345 kV in Minnesota, Iowa, Illinois, and Missouri.

ITC Midwest owns approximately 1,023 miles of transmission line in the state of Minnesota, operating at voltages of 345 kV, 161 kV and 69 kV. The total miles of these transmission lines are listed by voltage class in the table below.

ITC Midwest Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
698.69	304.47	0	19.77	0

7.8 L&O Power Cooperative

Background Information. L & O Power Cooperative (L&O), headquartered in Rock Rapids, Iowa, is a wholesale electric power supply and transmission cooperative serving three rural distribution electric cooperatives. These member cooperatives in turn serve more than 5,600 homes and businesses across Rock and Pipestone counties in southwest Minnesota, and Lyon and Osceola counties in northwest Iowa. Approximately 2,700 of the total 5,600 total consumers served are located in Minnesota.

Additional information about L&O is available at:

http://www.landopowercoop.com

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Manager
L&O Power Cooperative
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Rock Rapids, IA 51246
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e-mail: CDieren@dgrnet.com

Transmission Lines. L&O delivers wholesale electricity via approximately 193 miles of transmission lines and 16 substations located throughout the system's four county service area in southwestern Minnesota and northwestern Iowa. L&O has the following transmission facilities in Minnesota:

L&O Power Cooperative Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
44.52	8.32	0	0	0

7.9 Marshall Municipal Utilities

Background Information. Marshall Municipal Utilities (MMU) has been providing electric and water utility services to the City of Marshall for over 120 years. Marshall is a community of approximately 13,680 people located in Lyon County in Southwest Minnesota approximately 30 miles east of the South Dakota border and 50 miles north of the Iowa border. MMU is the second largest municipal utility in the state in terms of retail energy sales at over 604,000 MWhs sold in 2013. MMU serves over 6,500 customers and has a peak demand of just under 85 megawatts.

More information about MMU is available at:

http://www.marshallutilities.com/about

Contact Person: Brad Roos
Marshall Municipal Utilities
113 4th Street South
Marshall, MN 56258-1223
Phone: (507) 537-7005
Fax: (507) 537-6836
e-mail: bradr@marshallutilities.com

Transmission Lines. Marshall Municipal Utilities owns 18.1 miles of 115 kV transmission line.

7.10 Minnesota Power

Background Information. Minnesota Power (MP), a division of ALLETE, is an investor-owned utility headquartered in Duluth, Minnesota. Minnesota Power provides electricity in a 26,000-square-mile electric service territory located in northeastern Minnesota. Minnesota Power supplies retail electric service to 144,000 retail customers and wholesale electric service to 16 municipalities. MP's transmission and distribution components include 8,742 miles of lines and 164 substations. Minnesota Power's transmission network is interconnected with the transmission grid to promote reliability and is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information is available on the company's web page at:

http://www.mnpower.com

Contact Person: Christian Winter
Minnesota Power
30 West Superior Street
Duluth, MN 55802
Phone: (218) 355-2908
e-mail: cwinter@mnpower.com

Transmission Lines. The number of miles of transmission in Minnesota owned by Minnesota Power is shown in the following table.

Minnesota Power Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
0.22	1,326.72	617.01	43.34	231.56

7.11 Minnkota Power Cooperative

Background Information. Minnkota Power Cooperative, Inc. (Minnkota, or MPC) is a regional generation and transmission cooperative serving 11 member-owner distribution cooperatives in eastern and northwestern Minnesota and northeastern North Dakota. Minnkota's service area is approximately 34,500 square miles over the two states. Minnkota is also the operating agent for the Northern Municipal Power Agency (NMPA), an association of 12 municipal utilities in the same service region. Together Minnkota and the NMPA comprise the Joint System and serve more than 135,000 consumers.

Additional information about Minnkota is available at:

http://www.minnkota.com

Contact Person: Tim Bartel
Senior Manager, Transmission Planning
Minnkota Power Cooperative, Inc.
P.O. Box 13200
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Phone: (701) 795-4314
Fax: (701) 795-4333
e-mail: tbartel@minnkota.com

Transmission Lines. The Joint System owns 1,410.08 miles of transmission line in Minnesota and 1930.16 miles in North Dakota. The miles of Minnesota transmission lines are shown in the following table:

Joint System Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
998.19	143.80	268.09	0	0

7.12 Missouri River Energy Services

Background Information. Missouri River Energy Services (MRES) began in the early 1960s as an informal association of northwest Iowa municipalities with their own electric systems that decided to coordinate their efforts in negotiating the purchase of power and energy from the United States Bureau of Reclamation of the United States Department of the Interior (USBR). MRES was established as a body corporate and politic organized in 1965 under Chapter 28E of the Iowa Code and existing under the intergovernmental cooperation laws of the states of Iowa, Minnesota, North Dakota, and South Dakota. Municipalities in Minnesota, North Dakota and South Dakota subsequently joined MRES pursuant to compatible enabling legislation in each state.

MRES is comprised of 60 municipally owned electric utilities in the States of Iowa, Minnesota, North Dakota, and South Dakota. The MRES member cities' service territories roughly coincide with the boundaries of the respective incorporated cities. MRES has no retail load, and all of its firm sales are made to municipal or other wholesale utilities. MRES acts as an agent for the Western Minnesota Municipal Power Agency (WMMPA), which itself was incorporated as a municipal corporation and political subdivision of the State of Minnesota. WMMPA provides a means for its members to secure, by individual or joint action among themselves or by contract with other public or private entities within or outside the State of Minnesota, an adequate, economical and reliable supply of electric energy. Current membership in WMMPA consists of 23 municipalities located in Minnesota, each of which owns and operates a utility for the local distribution of electricity. In addition, MRES is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information about Minnesota River Energy can be found at:

http://www.mrenergy.com

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Missouri River Energy Services
3724 West Avera Drive
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Sioux Falls, SD 57108-8920
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e-mail: brianz@mrenergy.com

Transmission Lines. Missouri River Energy Services has 212.22 miles of 115 kV transmission lines and 10.97 miles of 230 kV transmission line in Minnesota.

7.13 Northern States Power Company

Background Information. Northern States Power Company, a Minnesota corporation (NSP), is a public utility organized under the laws of the State of Minnesota, and is a wholly-owned subsidiary of Xcel Energy Inc., a publicly-traded company listed on the New York Stock Exchange. NSP is headquartered in Minneapolis, Minnesota. Xcel Energy Inc.'s other utility subsidiaries are Northern States Power Company, a Wisconsin corporation (NSPW), headquartered in Eau Claire, Wisconsin, Public Service Company of Colorado, headquartered in Denver, Colorado, and Southwestern Public Service Company, headquartered in Amarillo, Texas. NSP provides electricity and natural gas to customers in a service territory that encompasses the Twin Cities, many mid-size and small towns throughout Minnesota, and also to portions of South Dakota and North Dakota. NSP and NSPW operate an integrated generation and transmission system (the NSP System). In addition, Northern States Power Company is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information can be found on Xcel Energy's web page at:

http://www.xcelenergy.com

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Transmission Lines. Northern States Power Company owns about 5,300 miles of transmission lines in Minnesota. The miles of Minnesota transmission lines are shown in the following table.

NSP Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
1,685.06	1,690.78	435.39	1,491.36	0

7.14 Otter Tail Power Company

Background Information. Otter Tail Power Company (OTP) is an investor-owned electric utility headquartered in Fergus Falls, Minnesota, and a subsidiary of Otter Tail Corporation (NASDAQ Global Select Market: OTTR). It provides electricity and energy services to more than 130,000 residential, commercial, and industrial customers in a service territory of 70,000 square miles that cover over 400 communities throughout Minnesota, South Dakota, and North Dakota, with approximately 60,700 customers in Minnesota. The company was originally incorporated in 1907, and first delivered electricity in 1909 from the Dayton Hollow Dam on the Otter Tail River. In addition, Otter Tail Power Company is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

To learn more about Otter Tail Power Company visit www.otpco.com. To learn more about Otter Tail Corporation visit www.ottertail.com.

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Transmission Lines. OTP has the following transmission lines in Minnesota:

OTP Transmission Lines

<100 kV	**100-199 kV**	**200-299 kV**	**>300 kV**	**DC**
1023.51	542.86	181.16	614.44	0

7.15 Rochester Public Utilities

Background Information. Rochester Public Utilities (RPU), a department of the City of Rochester, Minnesota, is the largest municipal utility in the state of Minnesota. RPU serves roughly 48,219 electric customers. In 1978, Rochester joined the Southern Minnesota Municipal Power Agency (SMMPA) with City Council approval. Initially, RPU was a full-requirements member with SMMPA controlling all of Rochester's electric power. Today, RPU is a partial requirements member of SMMPA and retains control over its own generating units. All of RPU's load and generation are serviced by the Midwest Independent Transmission System Operator (MISO) through its market function. RPU's Planning Coordinator for transmission is the Mid-Continent Area Power Pool (MAPP). MISO is RPU's Reliability Coordinator via contract.

More information about Rochester Public Utilities is available at:

http://www.rpu.org/about

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Transmission Lines. Rochester Public Utilities owns 42.42 miles of 161 kV transmission line in Minnesota. Rochester Public Utilities is one of the eleven members of the CapX group, and is one of the five investors in the Hampton-Rochester-La Crosse CapX project. Beyond this CapX project, Rochester Public Utilities has no immediate plans for future transmission expansion.

7.16 Southern Minnesota Municipal Power Agency

Background Information. Southern Minnesota Municipal Power Agency (SMMPA) is a not-for-profit municipal corporation and political subdivision of the State of Minnesota, headquartered in Rochester, Minnesota. SMMPA was created in 1977, and has eighteen municipally owned utilities as members, located predominantly in south-central and southeastern Minnesota. SMMPA serves approximately 112,100 retail customers. In addition, SMMPA is part of a larger regional transmission organization called the Midcontinent Independent System Operator (MISO).

More information about SMMPA is available at:

http://www.smmpa.com

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Transmission Lines. Southern Minnesota Municipal Power Agency has the following transmission lines in Minnesota:

SMMPA Transmission Lines

<100 kV	100-199 kV	200-299 kV	>300 kV	DC
138.32	135.48	17.09	0	0

7.17 Willmar Municipal Utilities

Background Information. Willmar, a regional center for West Central Minnesota, is located 100 miles west of the Twin Cities. It is the Kandiyohi County Seat with a population of 19,000. Willmar Municipal Utilities maintains an electric system that currently has four substations with 190 miles of distribution lines and 35 miles of transmission lines.

Additional information is available at:

http://wmu.willmar.mn.us

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Transmission Lines. Willmar Municipal Utilities owns 24.16 miles of 69 kV transmission line and 13.

8.0 Renewable Energy Standards

8.1 Introduction

Minn. Stat. § 216B.2425, subd. 7, states that in the Biennial Report the utilities shall address necessary transmission upgrades to support development of renewable energy resources required to meet upcoming Renewable Energy Standard milestones. In its May 30, 2008, Order approving the 2007 Biennial Report and Renewable Energy Standards Report, the Commission said, "Future biennial transmission projects reports shall incorporate and address transmission issues related to meeting the standards and milestones of the new renewable energy standards enacted at Minn. Laws 2007, ch. 3." In its May 12, 2014, Order approving the 2013 Report, the Commission said that the 2015 Report should include content similar to the 2013 Report.

Accordingly, in this Report, as in past years, the utilities are reporting on their best estimates for how much renewable generation will be required in future years and what efforts are underway to ensure that adequate transmission will be available to transmit that energy to the necessary market areas. A Gap Analysis is provided to illustrate the amount of renewable generation that is already available and how much will be required in the future to meet the standard. The narrative in this chapter is identical in many respects to the narrative and explanations provided in the 2013 Report but all figures and charts and tables have been updated since those provided two years ago.

8.2 Reporting Utilities

It should be pointed out, as was done in previous reports, that the utilities that are required to submit the Biennial Transmission Projects Report are not identical to those that are required to meet the Renewable Energy Standards. The information in this chapter reflects the work of all the utilities that are required to meet RES milestones, regardless of whether they own transmission lines and are required to participate in the Biennial Report. A list of those utilities participating in the Biennial Transmission Projects Report can be found in Chapter 2.0. The utilities participating in this part of the 2015 Biennial Report on renewable energy are the following.

Investor-owned Utilities

- Interstate Power and Light Company
- Minnesota Power
- Northern States Power Company
- Otter Tail Power Company

Generation and Transmission Cooperative Electric Associations

- Basin Electric Power Cooperative
- Dairyland Power Cooperative
- East River Electric Power Cooperative
- Great River Energy
- L&O Power Cooperative
- Minnkota Power Cooperative

Municipal Power Agencies

Central Minnesota Municipal Power Agency
Minnesota Municipal Power Agency
Southern Minnesota Municipal Power Agency
Western Minnesota Municipal Power Agency/Missouri River Energy Services

Power District

Heartland Consumers Power District

8.3 Compliance Summary

The utilities have continued to make substantial progress with respect to meeting future RES milestones. The present analysis shows that the utilities are on course to meet the RES milestone for 2016. The analysis continues to show that the CapX Group 1 projects are crucial to meeting the 2016 Minnesota RES and non-Minnesota RES milestones. The utilities recognize that additional transmission and generation will be necessary for 2020 and beyond in Minnesota, and that other demands for renewable energy will impact Minnesota's compliance status. In addition, the utilities have provided a Gap Analysis regarding compliance with the upcoming 2020 Solar Energy Standard in Section 8.6 as well.

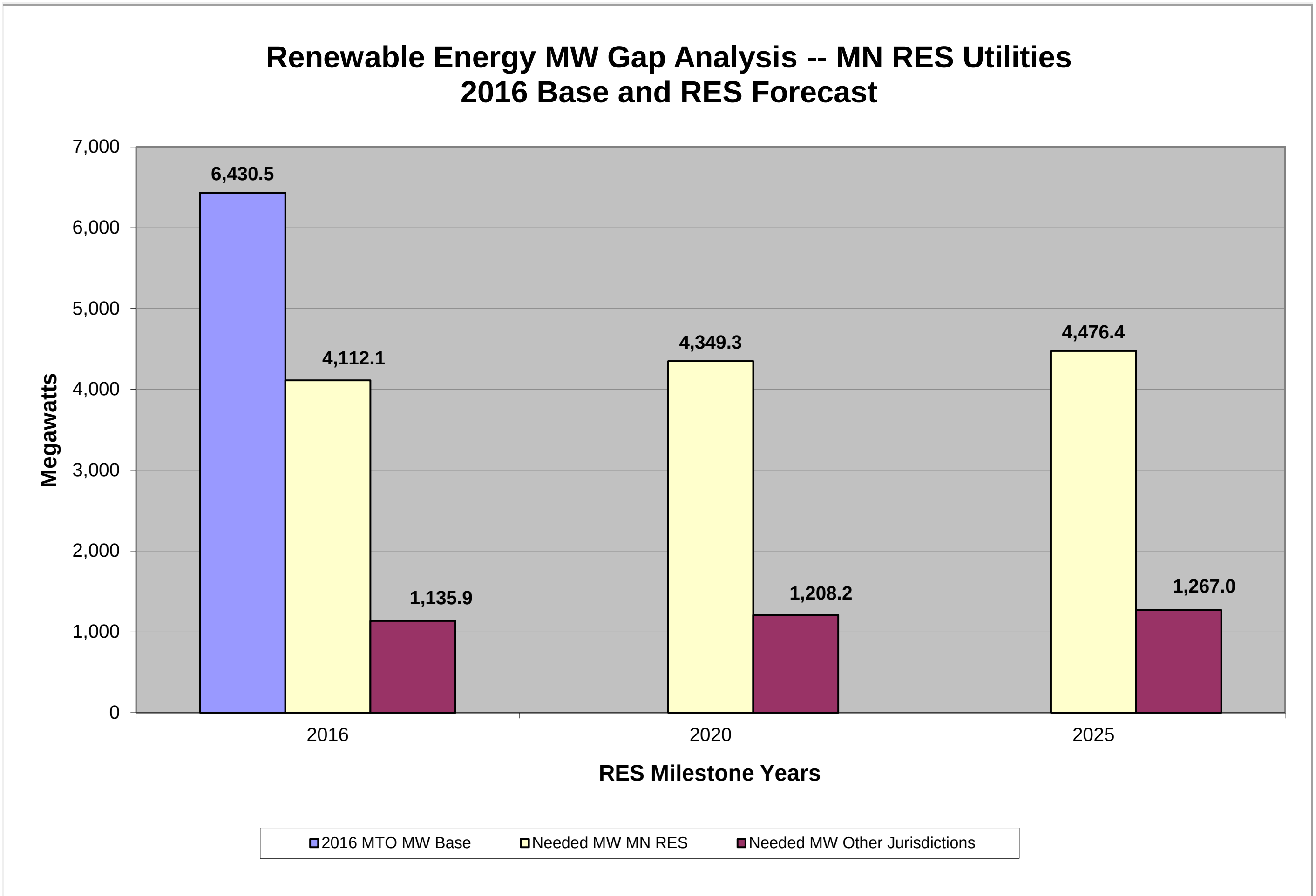
8.4 Gap Analysis

A Gap Analysis is an estimate of how many more megawatts of renewable generating capacity a utility expects to need beyond what is presently available to obtain the required amount of renewable energy that must come from renewable sources at a particular time in the future. A Gap Analysis is not an exercise intended to verify the validity of forecasted energy sales and associated capacity needs. It is done for transmission planning purposes only. This is the fifth time the utilities have prepared a Gap Analysis; a Gap Analysis was prepared for the 2007, 2009, 2011 and 2013 Biennial Reports also.

8.5 Base Capacity and RES/REO Forecast

The chart below presents a system-wide overview of existing capacity in 2016 (used as a base figure throughout the various milestone periods) and forecasted renewable capacity requirements to meet Minnesota RES as well as non-Minnesota RES/REO needs. Each utility provided its own forecast of Minnesota RES and non-Minnesota RES/REO renewable energy needs, and converted such estimates into capacity based on their own mix of renewable resources (wind, biomass, hydropower) using the most appropriate capacity factors unique to their specific generating resources.

Table 1 on the following page shows a more specific breakdown of each utility's Minnesota RES and non-Minnesota RES/REO needed capacity forecast.



2016 MTO MW Base: RES capacity acquired, actually installed and operational ("in the ground and running") regardless of geographic location. Does not include projects under contract but not yet under construction, and it does not include projects under construction but not yet completed.
Needed MW MN RES: Renewable capacity required to meet the RES energy goals for each utility serving customers in Minnesota.
Needed MW Other Jurisdictions: Gross non-MN renewable capacity required to meet RES requirements or REO goals in states served by the reporting utility other than Minnesota.

Table 1. MN & Non-MN RES Forecast (MW)[1]						
Utility	**2016**		**2020**		**2025**	
	MN RES	Non-MN RES	MN RES	Non-MN RES	MN RES	Non-MN RES
Basin Electric [2]	58.5	426.1	86.9	539.3	125.4	621.8
CMMPA	19.0	-	27.1	-	36.6	-
Dairyland	34.7	69.9	41.8	71.9	54.0	74.5
GRE	499.4	1.8	499.4	1.8	496.2	1.8
Heartland	12.7	5.5	3.7	5.7	4.7	6.0
IPL	46.6	49.8	55.7	49.8	72.7	49.8
Minnkota	91.9	72.4	112.5	78.5	149.3	84.8
MMPA	73.0	-	106.0	-	140.0	-
MN Power	504.1	17.4	628.8	18.9	800.4	19.7
Otter Tail	118.0	63.0	140.0	65.0	178.0	66.0
SMMPA	156.8	-	201.3	-	273.2	-
WMMPA/MRES	71.7	24.3	97.7	25.0	121.2	26.1
Xcel Energy	2,425.7	405.7	2,348.5	352.3	2,024.6	316.6
TOTAL	4,112.1	1,135.9	4,349.3	1,208.2	4,476.4	1,267.0

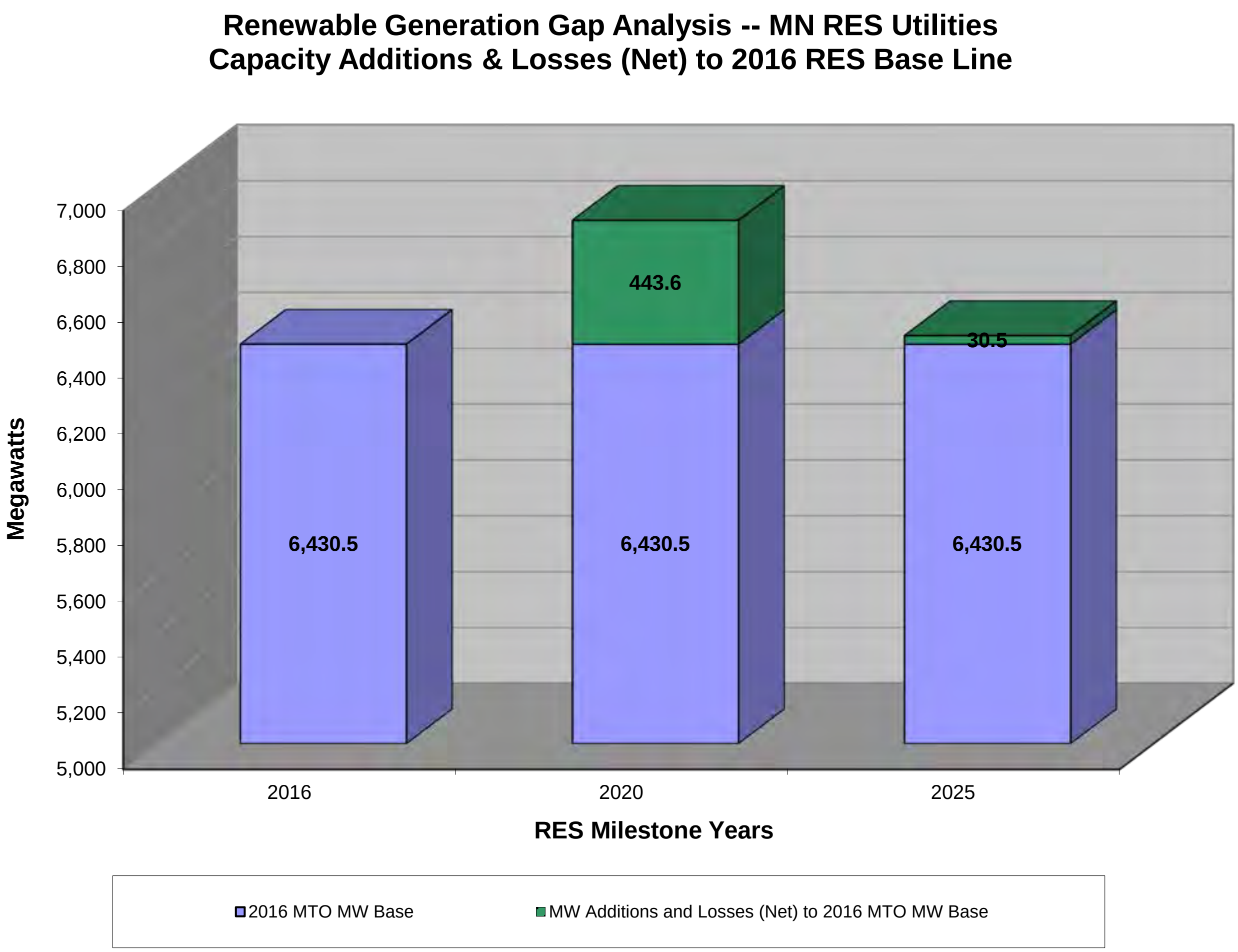
Note:

1. Capacity factor assumptions established by each utility

2. These quantities include Basin Electric Power Cooperative, L&O Power Cooperative, and East River Electric Power Cooperative

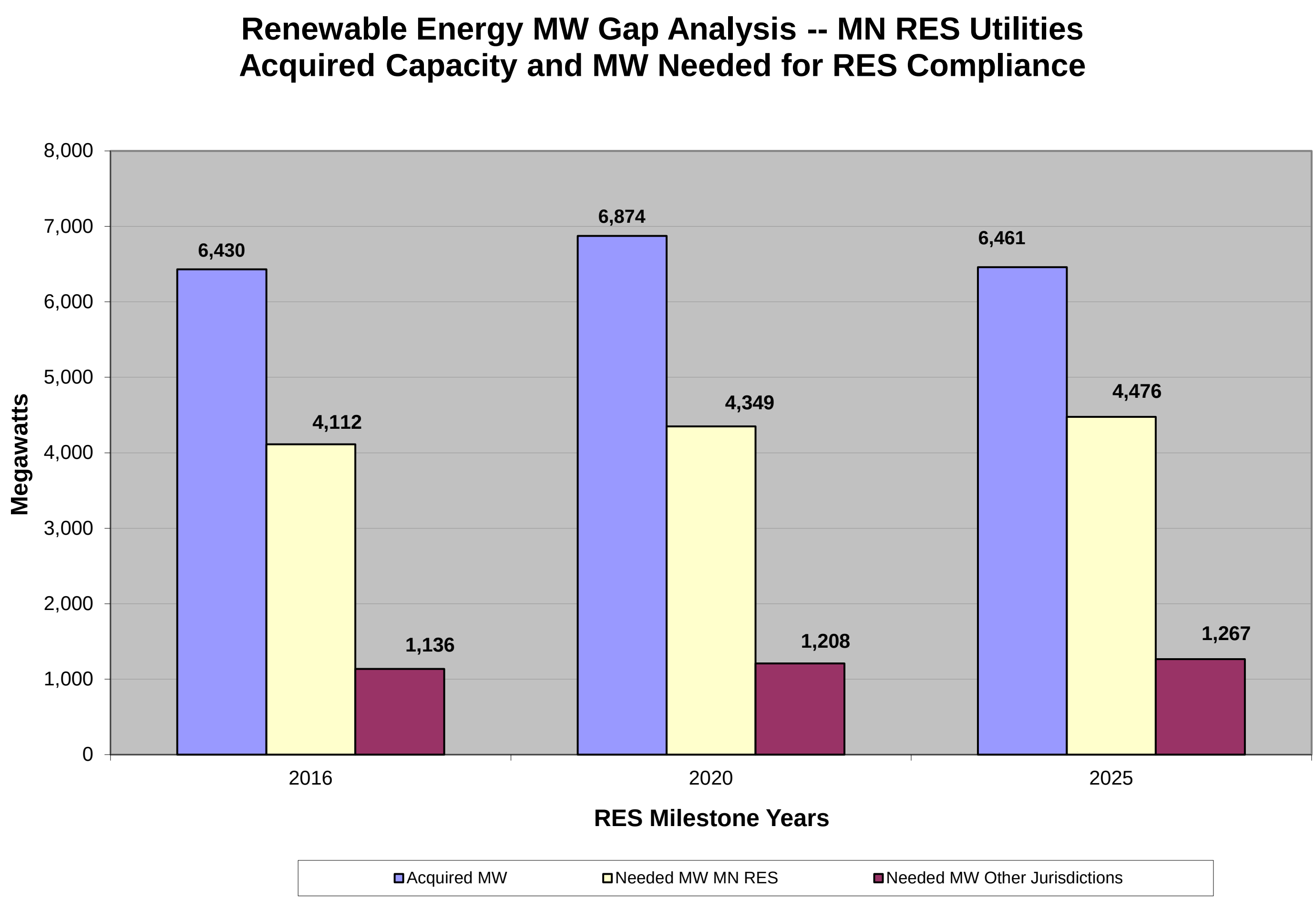
8.5.1 Capacity Acquisitions & Expirations

This chart presents a system-wide overview of additional renewable capacity that will be acquired by individual utilities beginning in 2016 and capacity that will expire between 2020 and 2025. Such losses are attributable primarily to the expiration of various power purchase agreements for renewable energy generation.



8.5.2 RES Capacity Acquired and Net RES/REO Need

This chart represents the total renewable capacity system-wide that will be acquired and lost between 2016 and 2025, as well as the total Minnesota RES and non-Minnesota RES/REO needs between 2016 and 2025.



As can be seen, the Minnesota RES utilities have sufficient capacity acquired to meet the Minnesota RES needs through 2025. When considering the RES needs, including other jurisdictions outside of Minnesota, the Minnesota RES utilities have enough capacity to meet RES needs beyond 2020. In addition, some utilities with less than sufficient capacity to meet the Minnesota RES need may use renewable energy credits to fulfill their requirement.

Focusing back on just Minnesota RES needs, Table 2 below provides a more specific breakdown of each utility's forecast.

Table 2. RES Capacity Acquired & Net MN RES Capacity Need (MW)[1]						
Utility	2016		2020		2025	
	RES Cap Acq.	MN RES Net	RES Cap Acq.	MN RES Net	RES Cap Acq.	MN RES Net
Basin Electric [2]	836.3	-	1,414.3	-	1,407.0	-
CMMPA	33.3	-	33.3	-	24.7	11.9
Dairyland	139.9	-	139.9	-	139.9	-
GRE	501.2	-	501.2	-	498.0	-
Heartland	32.0	-	30.0	-	30.0	-
IPL	25.3	(21.4)	23.6	(32.1)	21.4	(51.3)
Minnkota	358.8	-	358.8	-	358.8	-
MMPA	109.4	-	109.4	-	109.4	30.6
MN Power	846.6	-	835.3	-	835.3	-
Otter Tail	254.0	-	254.0	-	254.0	-
SMMPA	119.6	37.2	119.6	81.7	119.6	153.6
WMMPA/MRES	85.7	9.0	142.0	1.2	142.0	5.5
Xcel Energy	3,088.5	-	2,912.8	-	2,521.0	-
TOTAL[4]	6,430.5	24.8	6,874.1	50.8	6,461.0	150.3

Note:
1. Capacity factor assumptions established by each utility
2. These quantities include Basin Electric Power Cooperative, L&O Power Cooperative, and East River Electric Power Cooperative
3. Some Utilityes with less than sufficient capacity to meet the MN RES need may use renewable energy credits to fulfill their requirement.

Note that the "Needed MW MN RES" bar in the bar chart in this section represents the total level of RES need in Minnesota. Conversely, the column in Table 2 that is labeled "MN RES Net" represents the additional RES capacity that is presently identified to meet RES need (a negative value means the utility has a surplus of RES capacity). The shortfall, or "gap", between MN RES need and the additional RES capacity identified points to the need for some utilities to seek additional renewable capacity and when they need to do so. Alternatively, some utilities may use renewable energy credits to fulfill their RES requirements.

8.6 Solar Energy Standard

In 2013, the Minnesota Legislature established a separate solar standard for public utilities, effective by the end of 2020. Minn. Laws 2013, Ch. 85, § 3, codified at Minn. Stat. § 216B.1691, subd. 2f (Solar energy standard). That statute requires public utilities subject to the solar standard to report to the Public Utilities Commission on July 1, 2014, and each July thereafter, on progress in achieving the standard. In the 2013 Biennial Report, even though the first report was not due until 2014, Northern States Power Company provided a brief analysis of its anticipated needs for solar energy in future years.

The first solar energy reports required under the statute were filed in May or June 2014 and the Public Utilities Commission accepted these filings in an Order dated October 23, 2014. MPUC

Docket No. E999/M-14-321. The second reports were filed in summer 2015 and were approved by the Commission on October 28, 2015. MPUC Docket No. E999/M-15-462. Readers are referred to those dockets for more information about the utilities' progress in meeting the upcoming Solar Energy Standard.

Because this Chapter 8 of the Biennial Report discusses utilities' compliance with Minnesota Renewable Energy Standards, however, a brief summary regarding the status of compliance with the 2020 Solar Energy Standard is included below. Utilities will continue to file annual reports until 2020 as required by the statute and directed by the Commission.

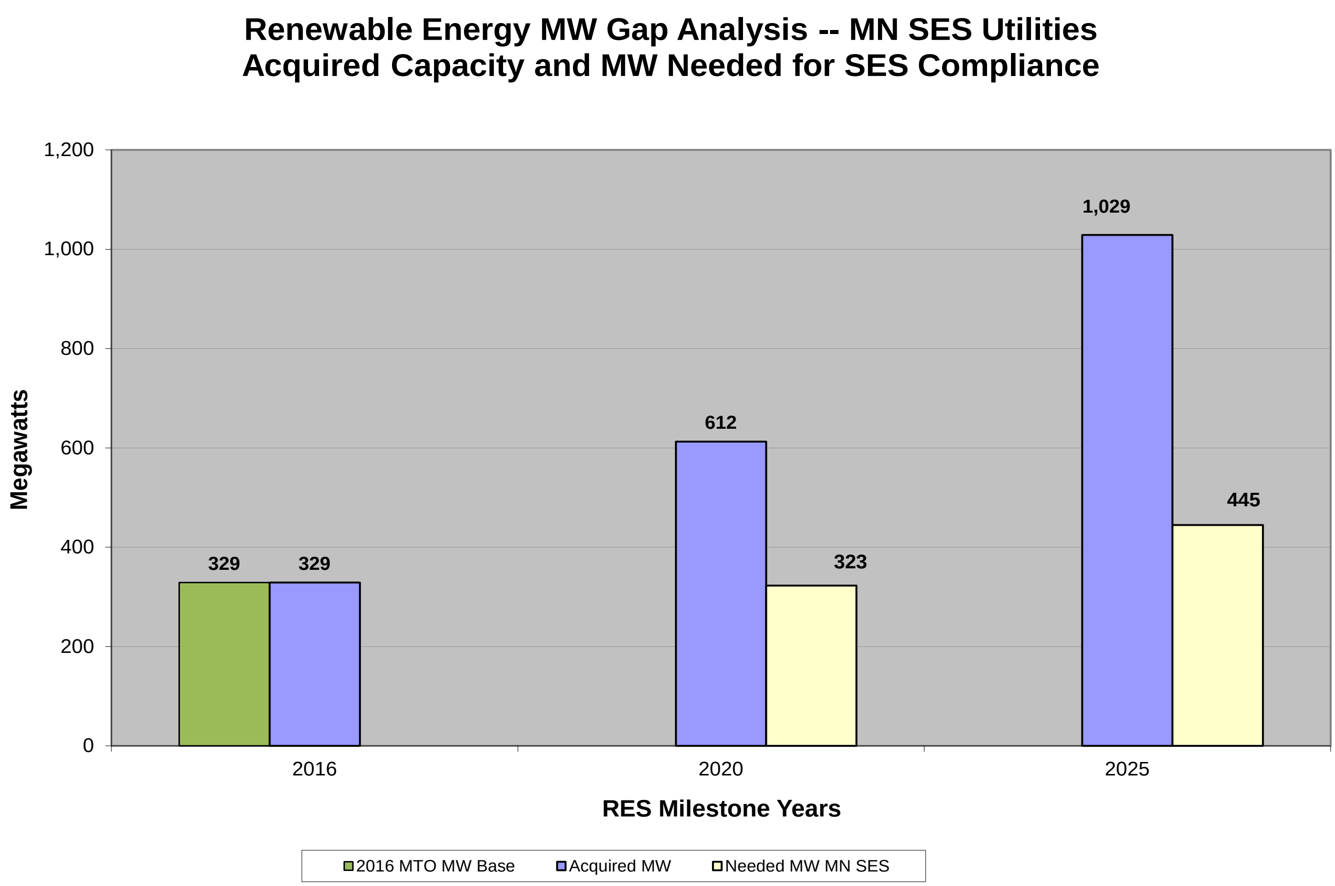


Table 3 shows a more specific breakdown of each utility's Minnesota SES and non-Minnesota SES needed capacity forecast.

Table 3. MN & Non-MN SES Forecast (MW)						
Utility	**2016**		**2020**		**2025**	
	MN SES	Non-MN SES	MN SES	Non-MN SES	MN SES	Non-MN SES
Heartland	-	-	0.3	-	0.3	-
MN Power	-	-	32.4	-	33.4	-
Otter Tail	-	-	28.0	-	28.0	-
Xcel Energy	-	-	262.3	-	382.8	-
TOTAL	-	-	322.9	-	444.5	-

Note:
SES is the MN Solar Energy Standard which will require additional solar beyond the MN RES

This chart presents a system-wide overview of additional renewable capacity that will be acquired by individual utilities beginning in 2016 and capacity that will expire between 2020 and 2025. Such losses are attributable primarily to the expiration of various power purchase agreements for renewable energy generation.

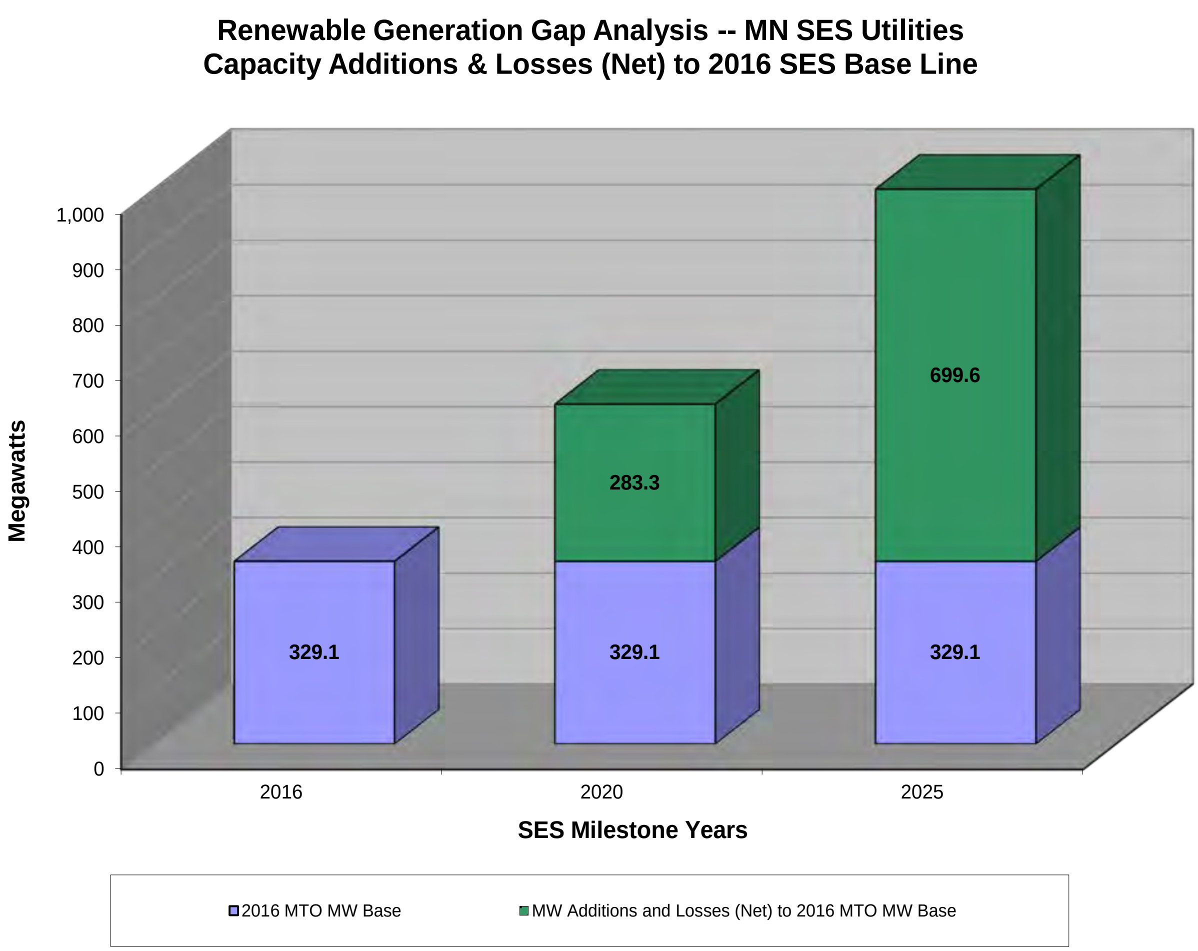


Table 4 below Provides MN Utilities planned level of solar capacity additions.

Table 4. SES Capacity Acquired & Net MN SES Capacity Need (MW)						
Utility	**2016**		**2020**		**2025**	
	SES Cap Acq.	MN SES Net	SES Cap Acq.	MN SES Net	SES Cap Acq.	MN SES Net
Dairyland	1.0	-	1.0	-	1.0	-
Heartland	-	-	-	0.3	-	0.3
MN Power	1.8	-	23.0	9.4	33.0	0.4
Otter Tail	-	-	-	28.0	-	28.0
SMMPA	5.0	-	5.0	-	5.0	-
Xcel Energy	321.3	-	583.4	-	989.7	-
TOTAL	329.1	-	612.4	37.7	1,028.7	28.7
Note:						
SES is the MN Solar Energy Standard which will require additional solar beyond the MN RES						

8.7 Corridor Upgrade Project

In both 2010 and 2012, in its Orders approving the 2009 and 2011 Biennial Reports respectively, the Minnesota Public Utilities Commission directed the utilities to provide an update in the 2011 and 2013 Biennial Reports on the Corridor Upgrade Project, and the utilities did so in this chapter. The Corridor Upgrade Project is an upgrade of the 230 kV line between Hazel Creek Substation near Granite Falls, Minnesota, and the Blue Lake Substation near Shakopee, Minnesota to a double circuit 345 kV system. The utilities reported in the 2013 Biennial Report that the timeframe for the Corridor Upgrade Project, which was at one time expected to be needed in the 2016-2018 period, was now well beyond 2018.

As a result, in its May 12, 2014, Order approving the 2013 Report, the Commission recognized that the schedule for the Corridor Upgrade Project had been extended beyond 2018 and did not require the utilities to report on the status of the project in the 2015 Report. However, just to ensure that the Commission has the latest information, the utilities can advise that the project is presently not under development and is still not expected to be needed until well after 2018.