

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. The 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/M PC	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)

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

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 Schuster 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-weigh 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