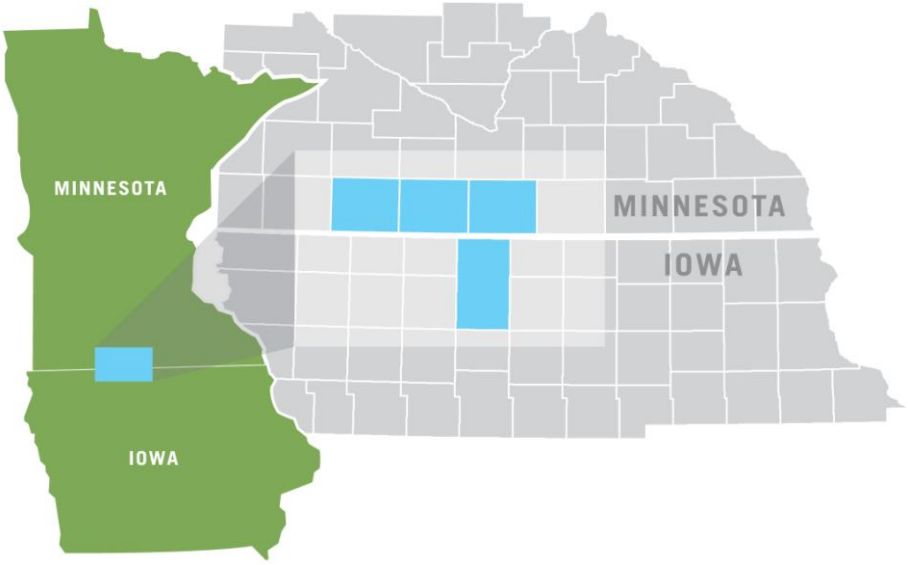
ITC Midwest LLC

Application to the Minnesota Public Utilities Commission for a Certificate of Need

Minnesota – Iowa 345 kV Transmission Project in Jackson, Martin, and Faribault Counties



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LIST OF ACRONYMS

161 kV Rebuild Alternative	Fox Lake – Rutland – Winnebago Junction 161 kV Rebuild
AC	Alternating Current
ACSR	Aluminum Conductor Steel Reinforced
ACSS	Aluminum Conductor Steel Supported
AIMP	Agriculture Impact Mitigation Plan
ALP	Airport Layout Plan
Brookings Project	Brookings County – Hampton 345 kV Project
CARP	Cost Allocation and Regional Planning Group
Commission	Minnesota Public Utilities Commission
DC	Direct Current Lines
DIR	Dispatchable Intermittent Resources designation
DPP	Definitive Planning Phase
DRG	Dispersed Renewable Generation
EFP	Minnesota Department of Commerce, Energy Facility Permitting
EFs	Electric Fields
EHV	Extra High Voltage
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMF	Electromagnetic Fields

END	Endangered Species
EPAct 2005	Energy Policy Act of 2005
ERO	Electric Reliability Organization
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FAA	Federal Aviation Administration
GBCA	Grassland Bird Conservation Areas
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronic Engineers
IPL	Interstate Power & Light Company
ITC Midwest	ITC Midwest LLC
ITC Midwest Project Planning Study	ITC Midwest's MVP Project 3 Planning Study
kV	Kilovolts
kV/m	Kilovolts per Meter
L Level Descriptors	Statistical Sound Levels
Lakefield to Border 161 kV line	161 kV transmission line connecting Lakefield Junction – Fox Lake – Rutland – Winnebago Junction – Faribault and continuing onto the Iowa Border
LGS	Lakefield Generating Station
LMP	Locational Marginal Pricing
LSE	Load-Serving Entity

MCBS	Minnesota County Biological Survey
MFs	Magnetic fields
mG	milliGauss
MidAmerican	MidAmerican Energy Company
Minnesota NCA	Southeast Minnesota, Northern Iowa, and Southwest Wisconsin Narrowly Constrained Area
MISO	Midwest Independent Transmission System Operator, Inc.
MN-IA Project	Minnesota – Iowa 345 kV Transmission Project
MnDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MRO	Midwest Reliability Organization
MTEP	Midwest ISO Transmission Expansion Plan
MVP	Multi-Value Projects
MW	Megawatts
MWh	Megawatt hours
NAC	Noise Area Classification
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NHIS	Natural Heritage Information System
NLCD	USGS National Land Cover Database

NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWRs	National Wildlife Refuges
OATT	Open Access Transmission Tariff
OMS	Organization of MISO States
PEM	Palustrine Emergent
PFO	Palustrine Forested
Project	Minnesota – Iowa 345 kV Transmission Project
PSS	Palustrine Shrub/Scrub
PUB	Palustrine Unconsolidated Bottom
PWI	Public Waters Inventory
Res	Regional Entities
RGOS	Regional Generator Outlet Study
RIM	Reinvest in Minnesota
RPS	State Renewable Portfolio Standards, including Renewable Energy Standards

RTO	Regional Transmission Organization
SF_6	Sulfur Hexafluoride
SHPO	Minnesota State Historic Preservation Office
SNA	Scientific and Natural Area
SPA	System Planning & Analysis Phase
SPC	Species Special Concern
SPCC	Spill Prevention, Control and Countermeasure
SPSs	Special Protection Systems
SWPPP	Stormwater Pollution Prevention Plan
TEMT	Open Access Transmission and Energy Markets Tariff
THR	Threatened Species
UMTDI	Upper Midwest Transmission Development Initiative
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
WHO	World Health Organization
WMA	Wildlife Management Area
Working Group	Minnesota Interagency Working Group
WPA	Waterfowl Production Area

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

ITC Midwest LLC ("ITC Midwest"), a Michigan limited liability company, proposes to construct its Minnesota – Iowa 345 kilovolt ("kV") Transmission Project ("Project" or "MN-IA Project"), creating a new 345 kV transmission tie line between Minnesota and Iowa, that will enhance the regional electrical system and relieve a constrained 161 kV line in Minnesota. The Project will also contribute to a portfolio of regional projects with significant reliability, economic, and public policy benefits in Minnesota and the greater region. ITC Midwest submits this Application for a Certificate of Need for the Project pursuant to Minnesota Statutes Section 216B.243 and Minnesota Rules Chapter 7849.[1] In a companion filing, ITC Midwest is applying for a Route Permit for the Project (MPUC Docket No. ET6675/TL-12-1337). ITC Midwest requests that the Minnesota Public Utilities Commission ("Commission") order that the two proceedings be coordinated pursuant to Minnesota Statutes Section 216B.243, subdivision 4.

1.2 PROJECT DESCRIPTION

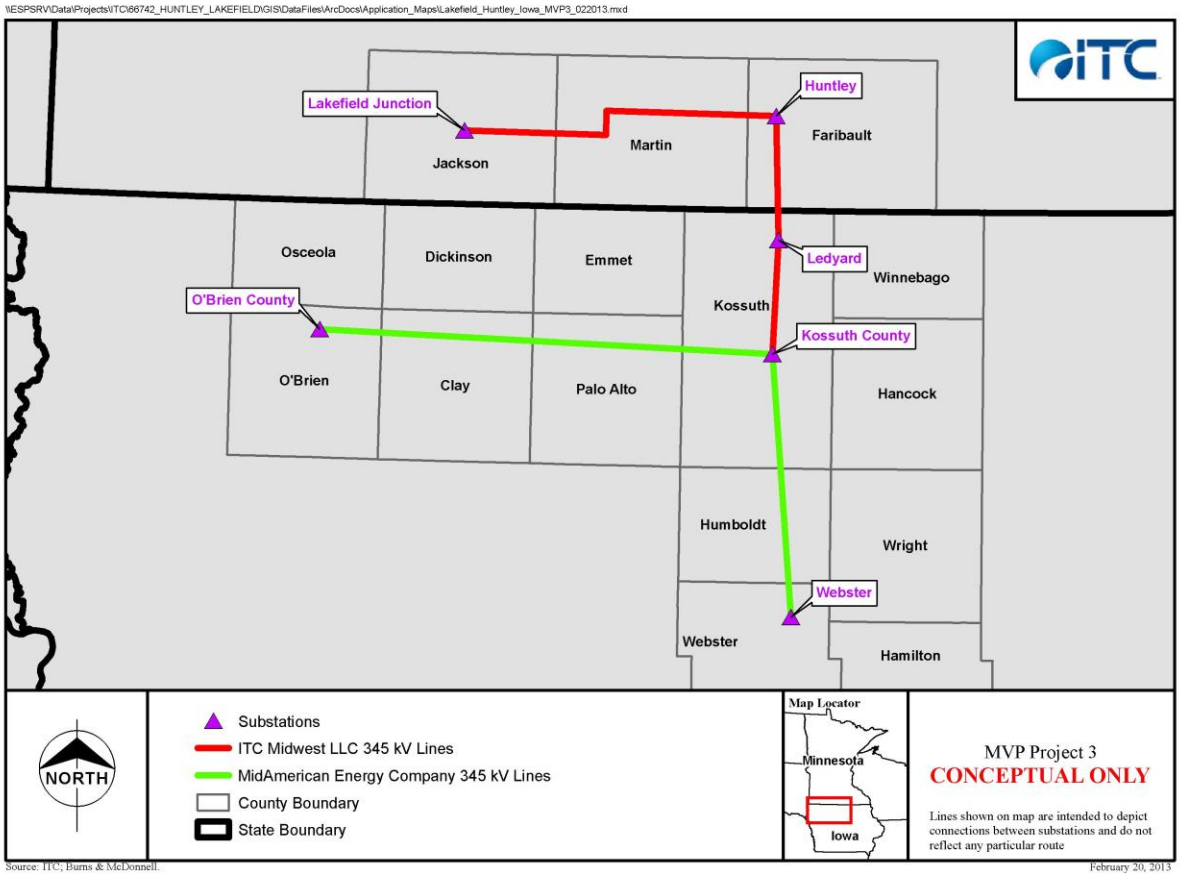
The MN-IA Project consists of a 345 kV transmission line and associated facilities located in Jackson, Martin, and Faribault counties in Minnesota, and Kossuth County in Iowa. In Minnesota, ITC Midwest's existing Lakefield Junction Substation will be expanded for a new 345 kV line to be constructed between the substation and a new Huntley Substation, proposed to be located south of the existing Winnebago Junction Substation. The Winnebago Junction Substation will be removed and the four existing 161 kV lines connecting to Winnebago Junction will be re-connected to the Huntley Substation. From Huntley, the 345 kV transmission line will run south to cross the Minnesota/Iowa border and connect first to a new ITC Midwest Ledyard Substation, and then to a new Kossuth County Substation owned by MidAmerican Energy Company ("MidAmerican"), both in Kossuth County, Iowa.

From the Kossuth County Substation, MidAmerican proposes to construct a 345 kV connection south to its existing Webster Substation, near Fort Dodge, Iowa. MidAmerican also proposes to construct a 345 kV line running west from

[1] A Completeness Checklist identifying the informational requirements for a Certificate of Need Application and where those requirements are addressed in this Application is included in **Appendix A**.

the Kossuth County Substation to its new O'Brien Substation, near Sanborn, Iowa. ITC Midwest's Project and MidAmerican's proposed 345 kV facilities are part of the Multi-Value Projects ("MVP") Portfolio of the Midwest Independent Transmission System Operator, Inc. ("MISO"), and are collectively called "MVP Project 3." In this application, the following terms will be used to describe portions of MVP Project 3. MVP Project 3 refers to all facilities included in MVP Project 3 shown in **Figure 1** below. The "MN-IA Project" or "Project" refer to all facilities that ITC Midwest will construct and own in Minnesota and Iowa. The "Minnesota portion of the Project" refers to those portions of the MN-IA Project to be constructed in Minnesota.

Figure 1. MVP Project 3



ITC Midwest will construct and own the 345 kV transmission line from the Lakefield Junction Substation in Minnesota to the Kossuth County Substation in Iowa, as well as the Lakefield Junction, Huntley, and Ledyard substations.

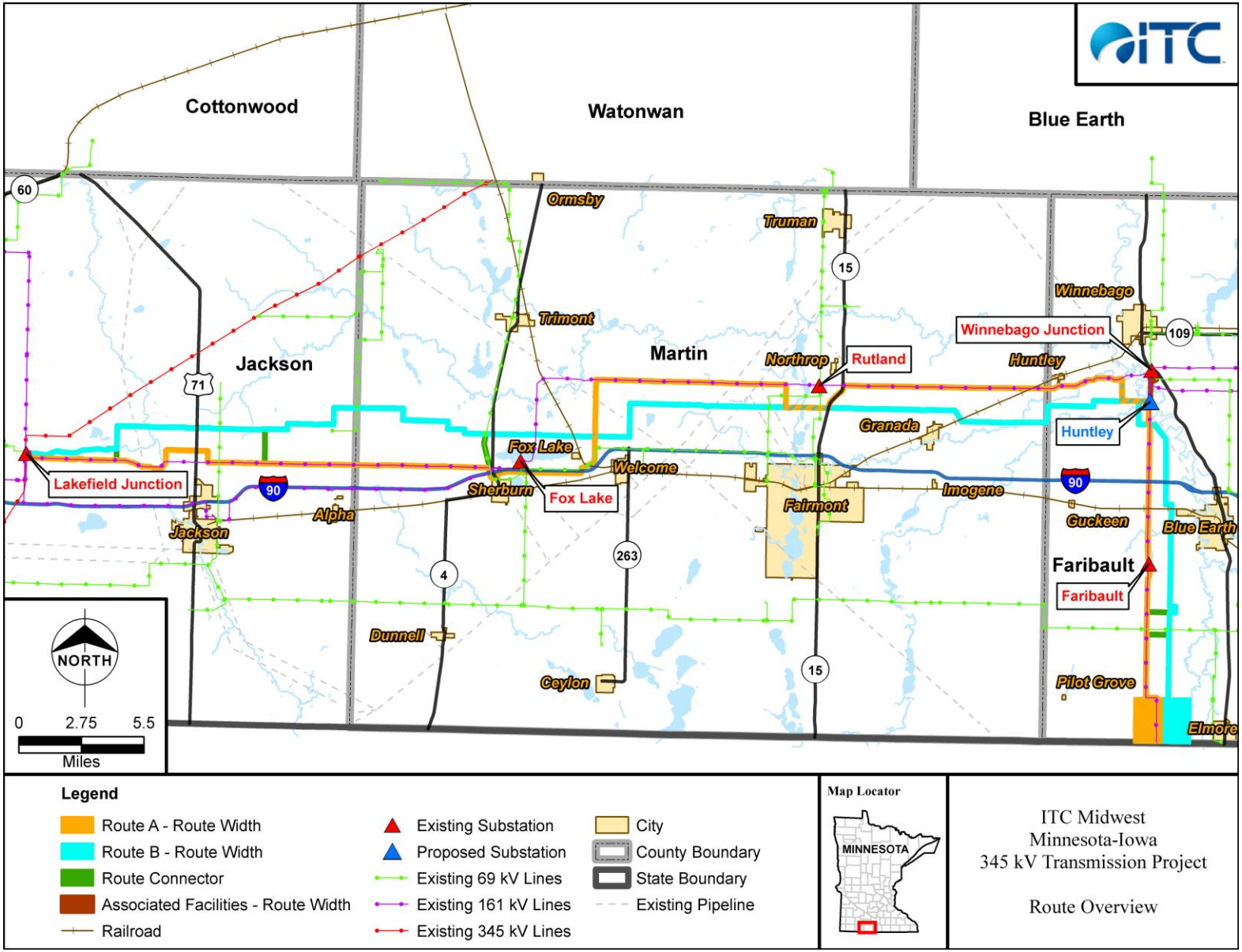
MidAmerican will construct and own all other facilities in Iowa. All Iowa facilities must be approved by the Iowa Utilities Board.

ITC Midwest will also construct and own all 161 kV facilities that will be relocated to connect at the Huntley Substation, with the exception of the N.B.E.I. – Winnebago Junction 161 kV transmission line. That line is owned by Northern States Power Company, doing business as Xcel Energy. ITC Midwest will construct the N.B.E.I. line on common structures and Xcel Energy will own the conductor and insulators between Winnebago Junction and Huntley. None of the Project's 161 kV associated facilities requires a Certificate of Need because no new 161 kV segment is longer than 10 miles or crosses a state border.[2]

An overview map of the two routes ITC Midwest is proposing is shown in **Figure 2**. More detailed maps of the routes can be found in ITC Midwest's Route Permit Application for the Project at Appendix D (Route A and Route B) and Appendix F (associated facilities).

[2] See Minn. Stat. § 216B.243, subd. 2 (requiring a certificate of need for a large energy facility) and Minn. Stat. § 216B.2421, subd. 2(1) (defining a "large energy facility" as, among other things, a transmission line with a capacity of 100 kV that (i) has more than ten miles of its length in Minnesota; or (ii) crosses a state line).

Figure 2. Proposed Routes for the Minnesota Portion of the MN-IA Project



Route A primarily follows the right-of-way of an existing ITC Midwest 161 kV transmission line. The existing 161 kV transmission line currently has terminations in Minnesota as follows: Lakefield Junction Substation – Fox Lake Substation – Rutland Substation – Winnebago Junction Substation – Faribault Substation. From the Faribault Substation, the 161 kV line continues to the Iowa border and terminates at the Winnco Substation in Kossuth County, Iowa. This ITC Midwest 161 kV transmission line will be referred to in this Application as the "Lakefield to Border 161 kV line". Route B primarily runs on new transmission right-of-way along existing road rights-of-way and agricultural field lines from the Lakefield Junction Substation to the Huntley Substation and then down to the Iowa border, a route which is separated from Route A by approximately two miles.

As required by the routing rules, ITC Midwest has stated a preference in its Route Permit Application for Route A. This is because Route A makes the greatest use of existing transmission right-of-way, has fewer new impacts to agricultural production lands, and minimizes impacts to the natural and cultural environment.

The proposed configuration along Route A is a 345 kV/161 kV line design, with the new 345 kV line largely co-located with the existing Lakefield Junction to Border 161 kV line, with the exception of a few locations where co-location is not feasible. ITC Midwest proposes to construct the entire length of Route A to 345 kV/161 kV standards, even where Route A is proposed to be co-located with a 69 kV transmission line or where no co-location is proposed.

If Route B were selected, the Project would not be co-located with the Lakefield Junction to Border 161 kV line except for a short portion of the 161 kV line that must be relocated from the Winnebago Junction Substation to the Huntley Substation. For Route B, ITC Midwest proposes a double circuit capable 345 kV/161 kV line configuration to accommodate future expansion. The 345 kV side of the structures would be used for the Project, while the 161 kV side would be available for a new 161 kV line in the area when conditions warrant. Only the 345 kV arms would be installed initially. The 161 kV arms would not be added until such time as a 161 kV line was proposed to be located on the structures and had received all required regulatory approvals. The Lakefield to Border 161 kV line would remain in its current location except for a short portion that must be relocated to the Huntley Substation.

1.3 PROJECT LENGTH, TIMING, AND COST

The Minnesota portion of the Project - from the Lakefield Junction Substation to the Iowa border - is estimated to be approximately 75 miles long. The right-of-way for the 345 kV line would be 200 feet wide, with spans between structures of approximately 600 to 1,000 feet, and an average span of approximately 900 feet. The new right-of-way needed for the 161 kV transmission lines relocated from the Winnebago Junction Substation to the Huntley Substation, other than the area where the Rutland – Winnebago Junction line will be co-located with the 345 kV Project, will be 150 feet. Where ITC Midwest proposes to locate multiple 161 kV rights-of-way in parallel between the Winnebago Junction and Huntley substation sites, a right-of-way up to 250 feet will be required. The 161 kV transmission lines will be constructed with spans between structures of approximately 400 to 700 feet. The Iowa portion of the Project, from the Iowa border to the Kossuth County Substation, is estimated to be approximately 25 miles long, and is also proposed to be constructed using 345 kV/161 kV design. The MidAmerican portions of MVP Project 3 are approximately 120 miles long.

ITC Midwest has estimated costs for the MN-IA Project. The estimates, which are subject to revision based on the final route and design of the line, include (i) expansion of the Lakefield Junction Substation and construction of the new Huntley Substation; (ii) reconfiguration of four existing 161 kV lines and three 69 kV lines to terminate at the Huntley Substation; and (iii) decommissioning/removal of the Winnebago Junction Substation.

The estimated cost for the Minnesota portion of the MN-IA Project using Route A is approximately $206 million, plus/minus 30 percent. The estimated cost for the Project using Route B is $194 million plus/minus 30 percent. The cost for Route B does not include the cost to install the 161 kV arms and conductor at some time in the future if Route B were selected for the Minnesota portion of the Project.

The projected in-service date for the Project is mid-year 2017. The first segment of the Minnesota portion of the Project, connecting the Lakefield Junction and Huntley substations, is expected to be completed by early 2017. The second segment of the Project, from the Huntley Substation to the Iowa border, is expected to be completed by mid-year 2017. The Iowa Border to Kossuth County Segment is estimated to cost $77 million, plus/minus 30 percent. The total estimated cost for ITC Midwest's MN-IA Project, based on the two routes proposed in the Route Permit application ranges from $271 to $283 million, plus/minus 30 percent.

The final length, cost, and in-service date for the Project are dependent on various factors. These include: the final route selected; the amount of double-circuiting required; permitting delays; changes in component costs, including steel pricing; and various other contingencies inherent in estimating costs for a major infrastructure project several years in advance of construction.

Based on an estimated MN-IA Project cost of $283 million and the MISO cost allocation methodologies, the estimated first year Project revenue requirement to be collected from Minnesota energy customers would be approximately $7 million for the ITC Midwest portion of MVP Project 3. **Appendix E.**

1.4 NEED FOR THE PROJECT

MVP Project 3 is needed to remove Minnesota and regional transmission system constraints which currently limit the ability to reliably deliver generation throughout the MISO footprint. In Minnesota, MVP Project 3 will alleviate constraints on the transmission system in southern Minnesota, including the Fox Lake – Rutland -- Winnebago 161 kV constraint, and result in three benefits. First, MVP Project 3 will significantly increase the transmission system's ability to reliably transfer generation, specifically including wind generation, throughout the MISO footprint, including Minnesota. Right now, available wind energy from existing wind generators in southwest Minnesota cannot always be delivered to load due to the existing system's constrained capacity. MVP Project 3 will enable this existing generation to be delivered while also adding an additional 1,000 megawatts ("MW") of capacity in off-peak times and 2,500 MW of capacity in peak times.

Second, MVP Project 3 will improve system reliability by relieving heavy loading on the existing 161 kV system in southern Minnesota. In southern Minnesota, MVP Project 3 will eliminate reliance on complicated system operating procedures, called Special Protection Systems ("SPSs"). These operational procedures have been necessary to enable new generators, including gas and wind generators to interconnect to the grid in the absence of needed transmission upgrades. The SPSs prevent line overloading in the case of critical contingencies.

Third, MVP Project 3 and MVP Project 4 will result in lower cost energy for Minnesota consumers. To calculate economic benefits to Minnesota, ITC Midwest had a PROMOD analysis conducted of the impact of MVP Projects 3 and 4 on the locational marginal prices ("LMP") for energy in the state. Using inputs from MISO's MVP Portfolio analysis, the PROMOD model calculated that construction of these two MVP projects will cause the average Minnesota LMP to

drop by $0.61 and $0.70 per megawatt hour ("MWh") in 2021, depending on studied market conditions. In 2026, the reductions are $0.71 and $0.090 per MWh depending on market conditions. For Minnesota, these LMP reductions result in a reduction in annual LMP payments of between $48.3 million to $76.6 million across the cases evaluated. The details of this analysis are included in **Appendix M**. ITC Midwest is continuing to evaluate the economic benefits of these MVP projects.

1.5 ALTERNATIVES TO THE PROJECT

ITC Midwest evaluated several alternatives to confirm that MVP Project 3 is the best solution to meet the identified needs in Minnesota and within the MISO footprint. These alternatives included generation, a higher voltage line, and a new 345 kV line at the Lakefield Junction Substation that terminated at three different eastern end-points: 1) the Rutland Substation immediately north of Fairmont, Minnesota; 2) the Adams Substation, southeast of Austin, Minnesota; and 3) Mitchell County Substation northeast of Osage, Iowa. ITC Midwest also analyzed whether re-conductoring the existing 161 kV line between the Lakefield Junction and Winnebago Junction substations with higher capacity 161 kV conductor could address the needs. ITC Midwest determined that none of the alternatives performs as well as the proposed Project for Minnesota.

ITC Midwest and MISO also evaluated alternatives to address the identified regional needs and determined that MVP Project 3 is the best performing alternative to provide the transmission capacity necessary for the region.

1.6 POTENTIAL ENVIRONMENTAL EFFECTS

Chapter 9 of this Application is an inventory of the natural environment and land use features in the Project Study Area, which is shown in **Figure 24** in that chapter. The Study Area consists primarily of agricultural land. It is not anticipated that any homes or businesses would be displaced by the Project.

The right-of-way for the Project totals approximately 1,770 acres of land in Minnesota whether Route A or Route B is selected (200 feet wide for the 345 kV line, and 150 feet wide for each 161 kV line to be relocated from the Winnebago Junction Substation to the Huntley Substation—although where 161 kV lines are constructed in parallel, a total right-of-way up to 250 feet will be required). Route A's right-of-way includes at 540 acres of existing right-of-way. Another 2.2 acres of land will be added to the fenced area of the expanded Lakefield Junction Substation. The fenced area for the new Huntley Substation will be

approximately nine acres. At the proposed Huntley Substation site, ITC Midwest owns 40 acres. At the Lakefield Junction Substation site, a minimum of approximately three acres of additional land will be needed for a buffer and for transmission line connections.

The major lakes and rivers in the Project Study Area include Fox Lake, the Chain of Lakes (*i.e.*, a series of lakes located in a north-south line in Martin County, including Lake Charlotte), the Des Moines River, and the Blue Earth River. ITC Midwest's proposed routes do not cross Fox Lake or Lake Charlotte. Where crossing of the Des Moines River and the Blue Earth River is required, appropriate mitigation measures will be determined in consultation with state and federal agencies to minimize the Project's impacts.

No other significant environmental conditions or land use issues have been identified that would prevent construction of the Project. With appropriate construction practices, all environmental impacts can be properly mitigated.

1.7 PUBLIC INVOLVEMENT

The public can review this Application and submit comments on the Project to the Commission. A copy of the Application is available at the Commission's website:

http://www.puc.state.mn.us/PUC/index.html

On the Commission's homepage, click on the "Search e-Dockets" link, and then enter the docket number "12-1053" in the docket look up box. A copy of this Application is also available on ITC Midwest's website:

www.itctransco.com/minnesota-iowa-project

In addition to determining whether the Project should be granted a Certificate of Need, the Commission must also issue a Route Permit to the Project before it can be constructed. Once filed with the Commission, the Project's Route Permit Application will also be available on the Commission website by searching docket number "12-1337" and on the ITC Midwest website.

ITC Midwest held open houses in September 2012 to provide information to members of the public who live and work in the Project area. As part of the Certificate of Need proceedings, the Commission will also hold one or more public hearings in the Project area to answer questions about the Project.

Comments from all interested persons, both oral and written, will be solicited on the Project's necessity, route, and the environmental impact.

The Minnesota Department of Commerce Energy Facility Permitting ("EFP") is responsible for conducting environmental review of the Project. The Certificate of Need rules require EFP to prepare an Environmental Report for the Certificate of Need proceeding. EFP will also prepare an Environmental Impact Statement ("EIS") for the Route Permit proceeding. EFP may elect to combine these two documents and issue one document, an EIS, which satisfies the environmental review requirements of both the Certificate of Need and Route Permit proceedings. In the course of its environmental review, EFP will conduct one or more public meetings in the Project area where interested persons may ask questions, present comments, and suggest alternatives and possible impacts to be evaluated in the EFP's environmental review. Interested persons will also be able to submit written comments to the EFP regarding the Project.

Persons interested in receiving notices and other announcements about these meetings and hearings can register their names and addresses with the Commission. Persons can register electronically at:

http://energyfacilities.puc.state.mn.us/mailinglist.html.

The Minnesota regulatory staff members listed below can also address questions about the regulatory review process for the Project:

Minnesota Public Utilities Commission
Scott Ek
121 7th Place East, Suite 350
St. Paul, Minnesota 55101
651.201.2255
800.657.3782
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1.8 PROJECT MEETS CERTIFICATE OF NEED CRITERIA

The Commission must apply specific criteria to determine whether a proposed high voltage transmission line is needed. Those criteria are found in Section

216B.243 and the rules promulgated by the Commission.[3] Section 216B.243 requires the Commission to consider conservation, state energy needs, benefits of the project, alternatives, and compliance with policies of state, federal and local governmental entities. For a high voltage transmission line, the Commission must also consider "the benefits of enhanced regional reliability, access, or deliverability to the extent these factors improve the robustness of the transmission system in Minnesota or lowers the cost of electricity for Minnesotans." Minn. Stat. § 216B.243, subd. 3(9).

Pursuant to Minnesota Rule 7849.0120, an applicant for a Certificate of Need must show that: (i) the probable result of denying the request would have an adverse effect on the future adequacy and reliability of the system or efficiency of energy supply to the people of Minnesota and neighboring states; (ii) a more reasonable and prudent alternative has not been demonstrated; (iii) the proposed facility will provide benefits to society compatible with protecting the environment; and (iv) the Project will comply with all applicable standards and regulations.

This Application demonstrates that the Project satisfies these four criteria:

A. Probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states:

- MVP Project 3 will increase the transfer capacity of the transmission system in southern Minnesota, enabling transfer of existing wind generation that is currently being curtailed, and supporting development of new wind generation to serve Minnesotans and the region. It will also facilitate compliance with State Renewable Portfolio Standards or State Renewable Energy Standards ("RPS") throughout the MISO footprint.

- MVP Project 3 will remove the Fox Lake – Rutland – Winnebago 161 kV constraint on the 161 kV transmission system serving southwest Minnesota.

[3] There are additional statutory requirements that also must be met relating to renewable energy, distributed generation, and community-based energy projects. A table identifying these statutory requirements and where they are addressed in this Application is included in **Appendix A.**

- MVP Project 3 will create a more robust 345 kV system connecting Minnesota and Iowa.
- MVP Project 3 will enhance the operational flexibility and reliability of the electrical system in the region, including southwest Minnesota where it will eliminate the need for two SPSs.
- In Minnesota, the construction of MVP Project 3 and MVP Project 4 will lower the cost of electricity for Minnesotans by reducing wholesale energy prices.
- If MVP Project 3 is not built, the generation outlet capacity of the transmission system in southern Minnesota will continue to be inadequate to handle existing renewable generation, and new generation needed to meet regional RPS standards will be hampered. SPSs will also have to remain in place, and energy prices will not be reduced.

B. A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.

- ITC Midwest has evaluated generation and transmission alternatives and the analysis shows that MVP Project 3 is the best performing alternative.

C. A preponderance of record evidence shows the proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.

- No land use or environmental factor would prevent the proposed facilities from being constructed and operated in a manner consistent with Minnesota's strong environmental and natural resource laws.
- MVP Project 3 will facilitate economic development in southwest Minnesota by supporting new generation.

D. The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

- All rules and regulation applicable to the construction and operation of the Project have been identified by ITC Midwest, and ITC Midwest can comply with all of them.

1.9 APPLICATION ORGANIZATION

The remaining eight chapters of the Application are organized as follows:

Chapter 2 – Project Description and Regulatory Review

Chapter 3 – Transmission Planning

Chapter 4 – Description of Need

Chapter 5 – Need Analysis

Chapter 6 – Alternatives Analysis

Chapter 7 – Construction, Restoration, and Maintenance

Chapter 8 – Operating Characteristics of Transmission Lines

Chapter 9 – Environmental Information

1.10 APPLICANT'S REQUEST AND CONTACT INFORMATION

ITC Midwest requests that the Commission find this Application complete and, upon concluding its review of the proposal, grant a Certificate of Need for the MN-IA Project. All correspondence relating to this Application should be directed to:

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2.0 PROJECT DESCRIPTION AND REGULATORY REVIEW

2.1 INTRODUCTION

ITC Midwest is applying for a Certificate of Need to construct the MN-IA Project. In Minnesota, ITC Midwest proposes to construct approximately 75 miles of new 345 kV facilities from the Lakefield Junction Substation to a new Huntley Substation, south of its existing Winnebago Junction Substation, to the Iowa border near Elmore, Minnesota. The Project also includes connecting the four existing 161 kV lines that presently terminate at the Winnebago Junction Substation to the new Huntley Substation, along with three existing 69 kV lines that will be constructed to 161 kV standards. All of the 161 kV and 69 kV equipment at the Winnebago Junction Substation will also be moved to the Huntley Substation. At the Iowa border, the 345 kV line will continue south to connect to a new ITC Midwest Ledyard Substation located near Ledyard, Iowa, and then to a new Kossuth County Substation to be constructed and owned by MidAmerican near Burt, Iowa.

In Iowa, MidAmerican will build a 345 kV line south from the Kossuth County Substation to the existing Webster Substation, near Fort Dodge, Iowa. MidAmerican will also construct a 345 kV line that runs west from the Kossuth County Substation to a new O'Brien Substation, near Sanborn, Iowa.

The Minnesota portion of the Project requires ITC Midwest to obtain a Certificate of Need and Route Permit from the Commission. The Iowa portion of the Project requires ITC Midwest and MidAmerican to obtain Electric Transmission Franchises from the Iowa Utilities Board.

2.2 PROJECT OWNERSHIP

ITC Midwest is a transmission-only utility that owns approximately 6,600 circuit miles of transmission lines and more than 200 transmission substations in Iowa, Minnesota, Illinois, and Missouri. ITC Midwest is a "transmission company" pursuant to Minnesota Statutes Section 216B.02, subd. 10. ITC Midwest is a public utility under Section 203 of the Federal Power Act ("FPA"). As such, ITC Midwest is subject to rate and other regulatory oversight by the Federal Energy Regulatory Commission ("FERC"). ITC Midwest is a transmission-owning member of MISO, with headquarters in Cedar Rapids, Iowa, and operating locations in Dubuque, Iowa City, and Perry, Iowa; and Albert Lea and Lakefield, Minnesota. In December 2007, ITC Midwest acquired the electric transmission assets previously owned by Alliant Energy's subsidiary, Interstate Power &

Light Company ("IPL") (MPUC Docket No. E001/PA-07-540). ITC Midwest connects more than 700 communities over almost 54,000 square miles in Iowa, southern Minnesota, and northwestern Illinois. **Figure 8** in **Section 4.1** of this application is a map of ITC Midwest's transmission system in Minnesota and Iowa.

ITC Midwest is not a retail load serving entity, however, and does not have retail rate tariffs on file with the Commission. It neither owns generation nor buys capacity and energy to serve electric service end-users. Because of this, ITC Midwest does not engage in the energy power planning that retail load serving utilities engage in to ensure they have the right resources available at the right times to serve the power needs of their customers.[4]

ITC Midwest will construct and own the Minnesota portion of the Project requiring a Certificate of Need. ITC Midwest will also be relocating certain 161 kV lines from the Winnebago Junction Substation to interconnect with the new Huntley Substation. ITC Midwest will construct all these facilities. ITC Midwest will own all the facilities that are part of the Minnesota Portion of the Project, with the exception of the circuit of the Xcel Energy N.B.E.I.-Winnebago Junction 161 kV transmission line, which will be re-routed to terminate at the Huntley Substation on structures to be owned by ITC Midwest.

ITC Midwest will also construct and own the Project facilities from the Iowa border to the Kossuth County Substation. MidAmerican will construct and own the Kossuth County Substation and all other MVP Project 3 facilities in Iowa.

2.3 PROJECT COMPONENTS

2.3.1 345 kV Transmission Line

A high voltage transmission line consists of three electrical paths known as phases. Each phase (conductor) is installed at the end of an insulator. Insulators are attached to support structures that are available in different configurations. Design constraints, voltage of the transmission line, and other considerations determine what structure configuration is used for the construction of any portion of a high voltage transmission line.

[4] For this reason, ITC Midwest does not maintain the information sought in Minnesota Rule 7849.0280 A (power planning programs) and H (monthly adjusted net demand/capability data, and the correlation of that data with planned maintenance outages).

Each phase of a high voltage transmission line consists of one or more conductors. When more than one conductor is used to make up a phase, it is referred to as a "bundled" conductor. Conductors are metal cables with an inner core usually consisting of multiple steel strands with multiple aluminum strands wound around the steel strands. Shield wires are typically less than one inch in diameter and are strung above the electrical phases to prevent damage from lightning strikes. The shield wire may also include fiber optic cable to provide a communication path between substations.

A single circuit transmission line carries three phases (conductors) and shield wire(s). A double circuit transmission line carries six phases (conductors) and two shield wires. Structure variations can include single pole structures, H-Frame structures, and other multiple pole structures. Transmission lines are constructed within a right-of-way, the width of which is dependent on the voltage of the high voltage transmission line, the structure type selected for its construction, and vegetation management requirements.

ITC Midwest proposes to primarily use single pole, weathering or galvanized steel double-circuit 345 kV/161 kV structures for the Project on a 200-foot right-of-way. The single pole structures would be placed using spans that range between approximately 600 to 1,000 feet, with an average span of approximately 900 feet. Single pole structures are typically installed on a concrete foundation. Where the 345 kV line is double-circuited with the Lakefield to Border 161 kV line or other transmission facilities, ITC Midwest proposes to use double-circuit structures with six conductors installed. Specialty structures may also be used in areas of environmental sensitivity or where construction conditions require their use. If a route not primarily following the existing Lakefield to Border 161 kV line is not selected by the Commission for the Minnesota Portion of the Project, ITC Midwest proposes to construct double-circuit 345 kV/161 kV capable facilities, but with only the 345 kV arms and conductors installed. The other side would be fitted with 161 kV arms, insulators, and conductor when future conditions warrant addition of a 161 kV line.

Each phase will consist of two twisted pair Drake (2-795) Aluminum Conductor Steel Reinforced ("ACSR") cables, or cables of comparable capacity in a bundled configuration. Each conductor is approximately 1.8 inches in diameter (795 kcmil). Each ACSR cable consists of a core of seven steel conductors surrounded by 26 aluminum strands. ITC Midwest proposes to use the same conductor and bundled configuration for all the 345 kV sections of the transmission line in

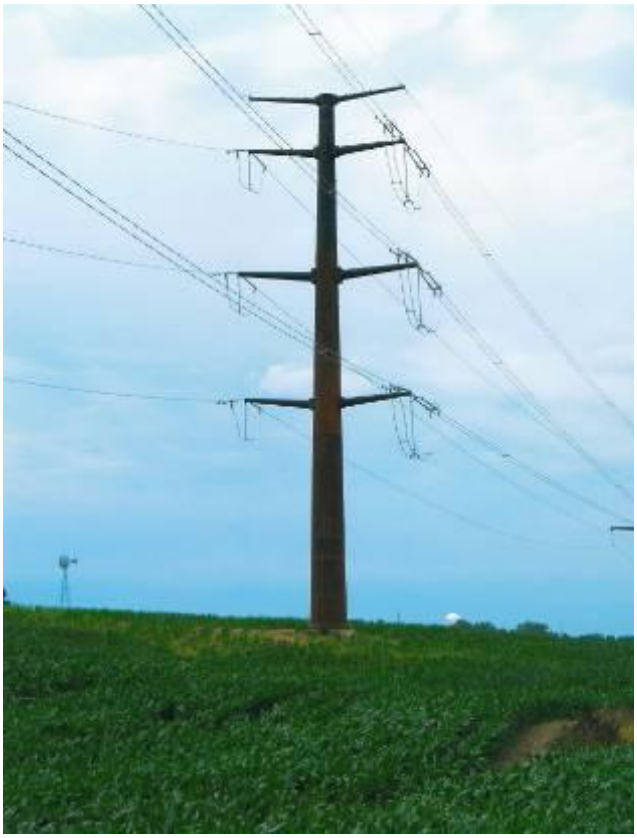
Minnesota and in Iowa. The 345 kV twisted pair conductors (two sets of three conductors) will have a capacity equivalent to 3,000 amps.

This conductor is ITC Midwest's standard conductor in areas where there is wind generation, and is preferred for the following reasons:

- Anti-galloping characteristics - The design of two twisted pair conductors in a bundled configuration reduces ice buildup on the conductor, therefore reducing galloping during windy and icy conditions.
- Higher ampacity ratings - bundled conductors. increase the ampacity capability by increasing the surface area of the conductor which provides greater dissipation of heat.
- Vibration Resistance – twisted pair conductors reduce low frequency vibration (Aeolian vibration) produced at relatively low wind conditions, thereby increasing service life of the conductor.

Figure 3 provides sample photos of the double-circuit 345 kV/161 kV structures that ITC Midwest will primarily use for the Project.

Figure 3. 345 kV/161 kV Double-Circuit Sample Photos



345 kV/161 kV Double-Circuit

345 kV/161 kV Low Profile Double-Circuit

Technical drawings of all the 345 kV/161 kV structure types that are proposed to be used for the Project are included in **Appendix D-1**.

ITC Midwest will design the Project to meet or surpass all applicable local and State building codes and the National Electric Safety Code ("NESC") requirements, and additional standards developed by ITC Midwest. Appropriate safety protocols, procedures, and standards will be followed during design and construction, and after installation.

2.3.2 Associated Facilities

<u>The 161 kV Transmission Lines</u>

The Rutland – Winnebago Junction portion of the existing Lakefield Junction to Border 161 kV line, three other 161 kV lines that currently terminate at the Winnebago Junction Substation (two of which are owned by ITC Midwest and the other by Xcel Energy), and three 69 kV transmission lines (proposed to be

constructed to 161 kV standards) will need to be reconfigured to terminate at the new Huntley Substation as part of the Project. **Figure 4** shows the current locations of the existing 161 kV and 69 kV lines connecting at the Winnebago Junction Substation. The four 161 kV transmission lines that would be reconfigured are:

a. Rutland – Winnebago Junction;

b. N.B.E.I. – Winnebago Junction (owned by Xcel Energy);

c. Faribault – Winnebago Junction; and

d. Freeborn – Winnebago Junction.

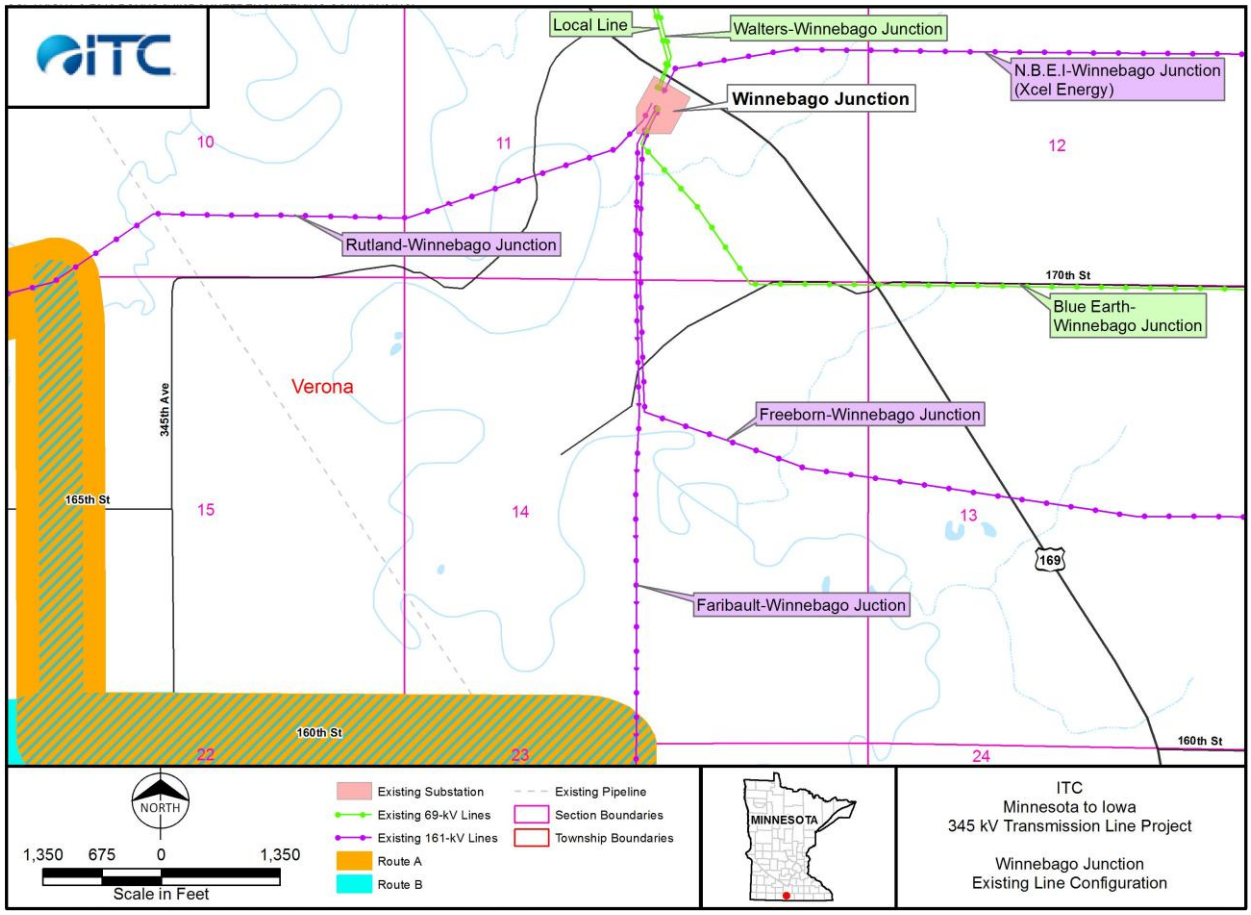
The three 69 kV transmission lines that would be reconfigured and constructed to 161 kV standards as part of the Project are:

a. Winnebago Junction – Winnebago Local;

b. Blue Earth – Winnebago Junction; and

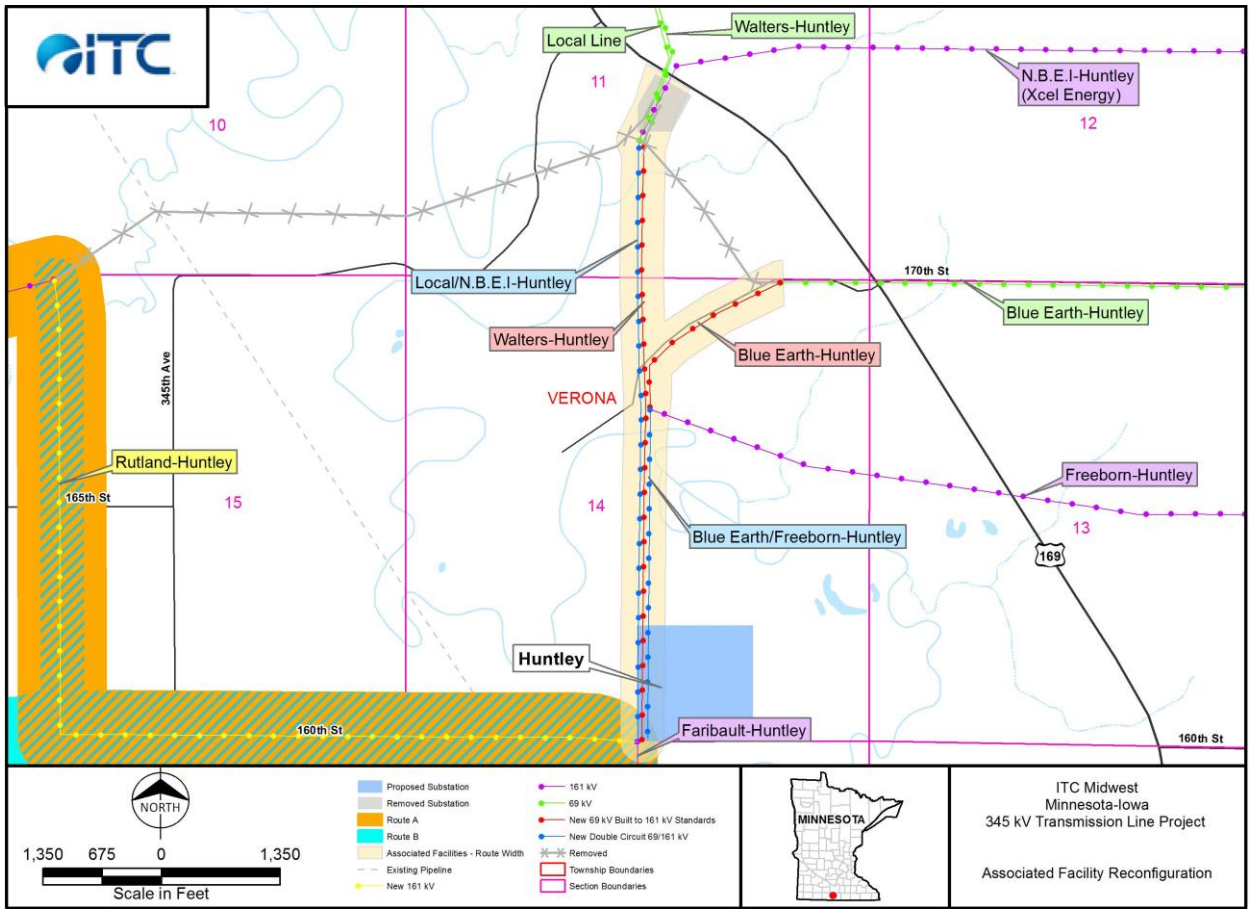
c. Walters – Winnebago Junction.

Figure 4. Current Configuration of 161 kV Associated Facilities Terminating at the Winnebago Junction Substation



The proposed routes and configurations to relocate the 161 kV associated facilities to connect at the new Huntley Substation are shown in **Figure 5**. The three 69 kV transmission lines that are proposed to be constructed to 161 kV standards will continue to be operated at 69 kV until conditions warrant an increase in operational voltage. These lines are proposed to be constructed to 161 kV standards to minimize future ground disturbance along the right-of-way and to minimize the need for future outages should the need to increase the operating voltage arises.

Figure 5. Proposed 161 kV Associated Facility Relocations



More detailed information on the proposed relocation and construction of the transmission lines currently terminating at the Winnebago Junction Substation can be found in the Project's Route Permit Application (Docket No. ET6675/TL-12-1337).

Where the Lakefield Junction to Border 161 kV line is co-located with the 345 kV line, ITC Midwest proposes to primarily use single pole, double-circuit capable weathering or galvanized steel structures. Single pole, single- and double-circuit structures will primarily be used for the four relocated 161 kV line and three 69 kV lines, subject to a determination in final design. ITC Midwest proposes to co-locate these associated facilities to the greatest extent feasible to minimize the right-of-way needed for their construction. For the associated transmission facilities, ITC Midwest will acquire and maintain a 150-foot right-of-way, except where multiple trans mission lines are proposed to be located in parallel between the Winnebago Junction and Huntley substations, where a right-of-way up to 250 feet may be acquired. **Figure 6** provides photograph examples of similar 161 kV facilities.

Figure 6. 161 kV Associated Facilities Sample Photographs

161/161 kV Double Circuit

161 kV Single Circuit

Technical drawings of all the 161 kV structures types that are being considered for the Project are included in **Appendix D-2**.

ITC Midwest proposes to use twisted pair Drake (2-795) ACSR, or equivalent 1600 amp, cable. The N.B.E.I.—Huntley 161 kV transmission line will be constructed using Aluminum Conductor Steel Supported ("ACSS") 565 kcmil Calumet, or equivalent 1400 amp, cable per Xcel Energy's specifications.

Other specialty structures may be necessary due to environmental conditions developed in cooperation with other State or federal agencies or to accommodate particular design considerations that cannot be identified until detailed survey

work and soil sampling has been performed for the Project. Such detailed work will not likely be performed until after the Commission has issued a Route Permit for the Project to ensure that the areas where these activities are undertaken are those covered by the final route selected by the Commission.

ITC Midwest will design the 161 kV associated facilities to meet or surpass all applicable local and State building codes and NESC requirements, and additional standards developed by ITC Midwest. Appropriate safety protocols, procedures, and standards will be followed during design and construction, and after installation.

Substations

The Project includes expanding the existing Lakefield Junction Substation, removing the existing Winnebago Junction Substation, and constructing the new Huntley Substation.

(a) Lakefield Junction Substation (existing)

ITC Midwest owns the Lakefield Junction Substation. A location plan for the expansion of the Lakefield Junction Substation is available in the Route Permit Application at Appendix E.

(i) Current Equipment and Operation

Currently, four 345 kV transmission lines terminate at the Lakefield Junction Substation: one 345 kV transmission line owned by ITC Midwest (Lakefield Junction—Raun), two 345 kV transmission lines owned by Xcel Energy (Lakefield Junction—Nobles and Lakefield Junction—Lakefield Generation), and one 345 kV transmission line that connects the collector substation for the Lakefield Wind Project to the Lakefield Junction Substation (Hunter—Lakefield Junction). Additionally, there are four 161 kV transmission lines owned by ITC Midwest that currently terminate at the Lakefield Junction Substation. In 2011, ITC Midwest rebuilt the 345 kV portion of the substation, including a three-bay breaker-and-a-half configuration, providing six breaker positions. The 161 kV equipment is positioned on the west side of the substation with the 345 kV equipment on the east side and the 345 kV/161 kV transformers located between the two voltage bays.

(ii) Substation Expansion Requirements

ITC Midwest is proposing to expand the Lakefield Junction Substation to the east as part of the Project. In-depth investigations into the site and existing transmission line infrastructure determined that expansion in any other direction at the site is not a reasonable alternative. The new 345 kV transmission equipment necessary for the Project is anticipated to include one additional 345 kV bay using one position, and a future bay position to allow for three future connections. This equipment must be located on the east side of the substation to avoid a costly reconfiguration of the entire substation. If the new 345 kV equipment is not located on the east side, the two 345 kV/161 kV transformers and the entire existing 161 kV bay, along with two control buildings, would need to be reconfigured and relocated within the substation. This substantial work would require many extended transmission system outages, and coordinating those outages with the overall system would be challenging and costly.

The proposed expansion east of the Lakefield Junction Substation would require ITC Midwest to acquire an additional 160 feet of property for the length of the eastern side of the existing substation. In total, ITC Midwest proposes to acquire approximately three acres of property east of the current substation to accommodate the Project. ITC Midwest anticipates that grading will be necessary over the full area acquired, but that the fenced area will be expanded by approximately 2.2 acres to accommodate the new 345 kV equipment.

(b) Huntley Substation (new)

As part of the Project, ITC Midwest proposes to construct a new substation approximately 1.2 miles south of the current location of the Winnebago Junction Substation. ITC Midwest owns the property where it proposes to construct the new Huntley Substation. A detailed location plan for the Huntley Substation has not yet been prepared.

(i) New Substation Equipment and Operation

ITC Midwest will install two 345 kV breaker-and-a-half bays with three 345 kV breakers, associated switches, steel, foundations, and dead end structures. A 345 kV/161 kV transformer will also be installed at the Huntley Substation, along with four 161 kV breaker-and-a-half bays with eleven 161 kV breakers, associated switches, steel, foundations, and dead end structures. Certain 69 kV equipment will also be installed, including two 161 kV/69 kV transformers, three 69 kV

breakers, and associated switches, steel, foundations, and dead end structures. A control building and road access will also be constructed at the site.

(ii) New Substation Land Requirements

ITC Midwest purchased 40 acres of land for the Huntley Substation in December 2012. Within this area, ITC Midwest proposes to construct an approximately nine-acre fenced area for the Huntley Substation. ITC Midwest intends to design and grade the Huntley Substation to provide sufficient space for two additional 345 kV breaker-and-a-half bays and one additional 161 kV breaker-and-a-half bay. Additionally, this site will allow ITC Midwest to maintain a substantial buffer between the boundaries of the substation and adjacent landowners.

(c) Winnebago Junction Substation (existing)

ITC Midwest proposes to remove all existing equipment from the Winnebago Junction Substation and remove all foundations and fenced area as part of the Project. The substation is currently covered by an easement between ITC Midwest and IPL. ITC Midwest and IPL are in the process of transferring ownership of the Winnebago Junction Substation site to ITC Midwest. At the time of this Application, ITC Midwest intends to retain ownership of the Winnebago Junction Substation site, but after the existing substation equipment is removed will allow the site to return to a natural state in areas not crossed by transmission line rights-of-way. One 161 kV transmission line (N.B.E.I.—Winnebago Junction) and two 69 kV transmission lines will remain on the property after the Winnebago Junction Substation is removed.

(i) Current Equipment and Operation

ITC Midwest initially investigated the possibility of expanding the Winnebago Junction Substation site as part of the Project. ITC Midwest determined that the property it owns at this location is not sufficient in size to allow for the expansions necessary for the Project. Additionally, because of the site's proximity to the Blue Earth River, a heavily treed area, US Highway 169, and a perpetual conservation easement, the ability to acquire additional land rights was limited. Therefore, ITC Midwest determined it was appropriate to investigate a new location for the 345 kV substation and removal of the Winnebago Junction Substation.

The age of the equipment at the Winnebago Junction Substation was also of concern. The Winnebago Junction Substation was constructed in the 1950s and

contains equipment, including 69 kV breakers and 161 kV breakers, of 1950s vintage. Before MVP Project 3 was approved by MISO, ITC Midwest planned to replace this equipment as it was approaching the end of its operational life. ITC Midwest has now put these replacement projects on hold in light of this Project. Additionally, the control building on site is over 60 years old and would need to be updated if the Winnebago Junction Substation were to continue operation. ITC Midwest determined that the cost to construct a new substation with equipment to support the existing transmission infrastructure and the proposed Project was less expensive than the cost to upgrade the aged equipment at the Winnebago Junction Substation to meet the Project needs.

Based on these land and equipment replacement issues, ITC Midwest concluded that construction of a new substation south of the Winnebago Junction Substation and removal of the existing substation was the best option for the Project.

(ii) Substation Decommissioning

Although ITC Midwest will continue to own and operate transmission lines across this parcel, ITC Midwest proposes to remove all substation infrastructure at the Winnebago Junction Substation site. This includes the electrical equipment at the substation, foundations, gravel, fencing, and other materials that would no longer be necessary after the substation is removed from operation. At this time, ITC Midwest intends to own the Winnebago Junction Substation property and allow it to return to a more natural state by reestablishing vegetation on the site after removing all current substation infrastructure.

2.4 PROJECT SCHEDULE

Table 1 provides the permitting and construction schedule currently anticipated for the Minnesota portion of the Project and for the facilities between the Iowa border and the Ledyard Substation.

Table 1. Estimated Schedule for MN-IA Project

Activity	Estimated Activity Dates
Minnesota Certificate of Need Issued	Spring 2014
Minnesota Route Permit Issued	Spring 2014
Franchise from Iowa Utilities Board Issued	Third Quarter 2015
State/Federal Environmental Permits Issued for MN portion of MN-IA Project	Third Quarter 2015
Other State/Local Permits Issued for MN portion of MN-IA Project	Third Quarter 2015
Land Acquisition for MN portion of MN-IA Project	Third Quarter 2014 to Second Quarter 2015
Survey and Transmission Line Design for MN portion of MN-IA Project	Fourth Quarter 2014 to Fourth Quarter 2015
Right-of-Way Clearing for MN portion of MN-IA Project	Fourth Quarter 2015
Construction for MN portion of MN-IA Project	First Quarter 2016 to Second Quarter 2017
Construction for IA portion of MN-IA Project	First Quarter 2016 to Second Quarter 2017
In-Service (Lakefield – Huntley)	First quarter 2017
In-Service (Huntley – Ledyard)	Second quarter 2017
In-Service (Ledyard-Kossuth)	Second quarter 2017

2.5 PROJECT COST ANALYSIS

The estimated costs for the Project include costs to obtain additional environmental permits, obtain road sharing and crossing permits and licenses, complete survey work, complete line and substation design work, obtain materials, acquire property for substations and transmission line rights-of-way, complete construction of the Project, complete restoration of the Study Area, and obtain a Certificate of Need and Route Permit from the Commission.

Project costs are considered to have a +/- 30 percent accuracy because the cost of a project of the size proposed in this Application can be affected considerably by timing of construction, availability of construction crews and components, and the final design that can only be determined once a route is selected by the Commission in the Route Permit proceedings. Based on the information gathered to date, and assumptions about likely structure types and line lengths, the total cost of the Project from Lakefield Substation to the Iowa border is estimated to

range from $194 million to $206 million. **Table 2** below provides the estimated costs for the Minnesota portion of the Project.

Table 2. ITC Midwest Estimated Costs for the Minnesota Portion of the MN-IA Project

Project Facility	Estimated Cost ($ millions)
Lakefield Junction – Iowa Border 345 kV Transmission Line	$152-164[5]
161 kV Line Relocations	$3
Lakefield Junction Substation	$6
Huntley Substation[b]	$33
Total	$194-206

[a] The estimated cost for the Lakefield – Iowa Transmission line includes the estimated cost to remove the existing Lakefield to Border 161 kV line, where necessary.

[b] The estimated cost for the Huntley Substation includes the cost to remove the Winnebago Junction Substation infrastructure and the cost of construction of equipment to support the 345 kV, 161 kV, and 69 kV systems at the Huntley Substation.

The IA Border to Kossuth County Segment is estimated to cost an additional $77 million, plus/minus 30 percent. Adding this amount to the totals above yields a total cost in both states for the MN-IA Project ranging from $271 million to $283 million (based on the two routes identified), plus/minus 30 percent to account for other uncertainties.

2.6 ALLOCATION OF COST UNDER MISO

The recovery of all but approximately $7.4 million of the Project's costs from Minnesota ratepayers will be governed by Schedule 26-A, Multi-Value Project Usage Rate, in MISO's Tariff. The annual revenue requirement is determined pursuant to the formula rate in Attachment MM-MVP Charge in the MISO Tariff. This annual revenue requirement collected under Schedule 26-A is then paid by all MISO network and point-to-point transmission customers based on their annual energy consumption. Minnesota ratepayers share of the annual revenue requirement is determined by the percent of total MISO energy used in

[5] The $152 million estimate is for Route B, where 345 kV/161 kV double-circuit capable structures would be used but only the 345 kV arms, insulators, and conductors would be installed. The $164 million estimate is for Route A, which includes 345 kV/161 kV double-circuit capable structures with the arms, insulators, and conductors installed for both circuits.

Minnesota, which has been estimated at approximately 13.3 percent based on MISO's posted 2010 Energy withdrawal data. Based on the high end of the cost range for the Project of $283 million, less the cost of 69 kV work not included in MVP Project 3 of $7.4 million, the estimated annual first year revenue requirement for the Project would be approximately $51 million. Of this total, $6.8 million would be collected from Minnesota transmission customers annually. The estimated first year revenue requirement for the 69 kV facilities, recovered through the ITC Midwest zonal rate is about $200,000, making the total cost of the Project recovered from Minnesota customers approximately $7 million. The calculation of the annual revenue requirement and the amounts to be recovered from Minnesota utilities can be found in **Appendix E**.

2.7 MIDAMERICAN'S CONNECTING 345 KV FACILITIES IN IOWA

MidAmerican's 345 kV facilities in Iowa will interconnect with ITC Midwest's Project at the new Kossuth County Substation that will be constructed and owned by MidAmerican. MidAmerican will build a new 120-mile 345 kV line from its new O'Brien County Substation near Sanborn, in west central Iowa, east to the Kossuth County Substation, and additional 345 kV transmission south to MidAmerican's existing Webster Substation outside Fort Dodge, Iowa. **Figure 1** in **Section 1.2** of this Application shows MidAmerican's proposed 345 kV facilities in relation to the facilities of the MN-IA Project. It is anticipated that the MidAmerican facilities will be in service by fourth quarter 2016.

2.8 CERTIFICATE OF NEED REQUIREMENT AND CRITERIA

Minnesota Statutes Section 216B.243, Subdivision 2 provides that "[n]o large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the commission pursuant to Minnesota Statutes Sections 216C.05 to 216C.30 and this section and consistent with the criteria for assessment of need." A large energy facility is defined to include "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length."[6]

The Minnesota portion of the Project includes a 345 kV transmission line approximately 75 miles long. A Certificate of Need to construct the Project is, therefore, required.

[6] Minn. Stat. § 216B.2421, subd. 2(2).

Minnesota Rule 7849.0120 sets forth four criteria that must be met for the Commission to grant a Certificate of Need:

- denial would likely have an adverse effect on the future adequacy, reliability, or efficiency of the supply of energy for the applicant, the applicant's customers, or the people of Minnesota and neighboring states;
- a more reasonable and prudent alternative to the proposed facility has not been demonstrated;
- the proposed facility will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health; and
- the design, construction, operation of the proposed facility will comply with relevant polices, rules, and regulations of other state and federal agencies and local governments.

Pursuant to Minnesota Statutes Section 216B.243, subdivision 3(9), the Commission must also consider whether the proposed project enhances regional reliability, access, or deliverability to the extent these factors improve the robustness of the transmission system in Minnesota or lowers the cost of electricity for Minnesotans. And there are other statutory criteria relating to Renewable Energy Portfolio standards and certain generation alternatives that must be considered. A completeness checklist of the informational requirements set out in Minnesota Rules for Certificate of Need applications is available in **Appendix A-1** and a table of the additional informational requirements set out in Minnesota Statutes is included in **Appendix A-2**. The checklist and table identify where the various informational requirements are addressed in this Application.

2.9 CERTIFICATE OF NEED DATA EXEMPTIONS

On December 4, 2012, ITC Midwest filed a request for an exemption from certain of the data requirements in Minnesota Rules, Chapter 7849 because the data would not assist the Commission in making its determination of whether the Project is needed. For some of the data requirements, ITC Midwest proposed submitting substitute information that would be helpful to the Commission in making its Certificate of Need determination.

The Commission issued its order on ITC Midwest's request on February 8, 2013. It its order, the Commission granted all the requested exemptions from data requirements with the exception of one, relating to environmental data. A copy of ITC Midwest's Request for Exemption from Certain Certificate of Need

Application Content Requirements and the Commission's order on ITC Midwest's request are included in **Appendix C**. The completeness checklist in **Appendix A-1** identifies all the data requirements from which ITC Midwest is exempted, and all the substitute information that it is providing instead of the exempted data.

2.10 ROUTE PERMIT REQUIREMENT

Minnesota Statutes Section 216E.03, Subdivision 3 provides that "any person seeking to construct a . . . high voltage transmission line must apply to the commission for a . . . route permit." For the purposes of this statutory requirement, a high voltage transmission line is defined as one "designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length."[7]

The Minnesota portion of the Project includes a 345 kV transmission line that is approximately 75 miles long. A Route Permit to construct the Minnesota portion of the Project is, therefore, required.

A Route Permit application is being filed with the Commission concurrently with this Certificate of Need Application (Docket No. ET6675/TL-12-1337). The Commission may consider the Certificate of Need and Route Permit applications together. A description of how the Commission could consider the two applications together is provided in **Section 2.11** of this Application.

2.11 POTENTIAL COMBINED CERTIFICATE OF NEED AND ROUTE PERMIT PROCEEDINGS

While the Certificate of Need proceedings for a proposed facility may be handled separately from the facility's Route Permit proceedings, the Legislature has directed that they be handled together where appropriate. Minnesota Statutes Section 216B.243, Subdivision 4 provides that "[u]nless the commission determines that a joint hearing on [routing] and need under [the Certificate of Need statute] and the [Route Permit statute] is not feasible or more efficient, or otherwise not in the public interest, a joint hearing under those [statutes] shall be held." ITC Midwest has requested that the Certificate of Need and Route Permit proceedings for the Project be combined because it is feasible, more efficient, and in the public interest.

[7] Minn. Stat. § 216E.01, subd. 4.

As required under Minnesota Rule 7829.2550, ITC Midwest filed a proposed plan for providing notice to local government officials, and landowners and residents reasonably likely to be affected by the Proposed Project of ITC Midwest's intention to file an application for a Certificate of Need for the Project. The Commission issued an order on December 31, 2012 approving the plan as modified by ITC Midwest and Commission staff based on comments from EFP.[8] A copy of the Commission's Order Approving Notice Plan and Granting Variances is included in **Appendix B-1** of this Application. **Appendix B-2** also contains a copy of ITC Midwest's Notice Plan compliance filing, including affidavits of mailing and publication.

An electronic version of this Application and the Project's Route Permit Application are available on the Commission's website:

http://www.puc.state.mn.us/PUC/index.html.

At the Commission's homepage, click the "Search e-Dockets" link and enter the docket number "12-1053" in the docket look up box to access the Certificate of Need docket. Searching for "12-1337" will retrieve the Route Permit docket. Electronic versions of the applications are also available on ITC Midwest's website:

www.itctransco.com/minnesota-iowa-project

Upon filing, the Applications will be reviewed by the Commission for completeness.[9] At the time it determines the applications are complete, the Commission will determine whether the Certificate of Need and Route Permit proceedings should be handled separately or together. Within 60 days of finding the applications complete, the Commission must hold one or more public meetings on each proceeding. If the Commission chooses to combine the Certificate of Need and Route Permit proceedings, these meetings will be held together. The purpose of the meeting(s) for the Certificate of Need proceeding is to obtain public opinion on the necessity of granting a certificate for the Project.[10] The purpose of the meeting(s) for the Route Permit proceeding is to provide information to the public about the Project, answer questions, and obtain information regarding the appropriate scope of the EIS required for the Project.[11]

[8] The Commission determined, in its order, that no notification to tribal officials was necessary.
[9] Minn. R. 7849.0200, subp. 5 and 7850.2000, subp. 1.
[10] Minn. Stat. § 216B.243, subd. 4.
[11] Minn. Stat. § 216E.03, subd. 6 and Minn. R. 7850.2300, subp. 1.

EFP is responsible for conducting environmental review of the Project. This involves preparing an Environmental Report for the Commission for the Certificate of Need proceeding, and an EIS for the Route Permit proceeding.[12] EFP may elect to combine these two documents and issue one document, an EIS, which satisfies the environmental review requirements of both the Certificate of Need and Route Permit proceedings.

In the course of its environmental review of the Project, EFP will conduct one or more public meetings to develop the scope of that review, during which interested persons may ask questions and provide comments on the scope of the environmental review, and suggest that alternative routes and possible impacts be evaluated in the review. Interested persons will also be able to submit written comments to the Department regarding the Project. These scoping meeting(s) may be combined with the Commission's public meeting(s) on the scope of the EIS.[13]

Based on the Applications and public input, EFP will determine the scope of the environmental review and complete a Draft EIS for public review. This review includes public informational meetings on the Draft EIS where the public has the opportunity to provide oral and written comments. The Final EIS must include the EFP's response to all substantive comments received on the Draft EIS.[14]

The Certificate of Need and Route Permit applications will be the subject of either separate or combined contested case hearing(s), during which interested persons can submit evidence supporting or challenging the Project as proposed. Upon closing the record for the contested case(s), the administrative law judge will submit a report and recommendation to the Commission on the applications.[15] The Commission will consider the administrative law judge's report and recommendation in reaching its determination whether to grant the Applications with or without modifications, or deny them.[16]

The Legislature has directed that a final decision on a Certificate of Need or Route Permit Application must be made within one year of the Commission's

[12] Minn. R. 7849.1200; Minn. Stat. § 216E.03, subd. 5.
[13] Minn. R. 7849.1400, subps. 3-6; Minn. R. 7850.2500, subps. 2-3.
[14] Minn. R. 7850.2500, subps. 6-9.
[15] Minn. Stat. §§ 216B.243, subd. 4 and 216E.03, subd. 6; Minn. R. 7849.0230, subp. 2 and 7850.2600.
[16] Minn. R. 7850.2700.

determination that the application is complete, unless the applicant agrees more time may be taken or the Commission finds that there is good cause to do so..[17]

The regulatory proceedings outlined above satisfy all the requirements of Minnesota Statutes Sections 216B.243 and 216E.03, and the Commission's rules for Certificate of Need and Route Permit proceedings, Minnesota Rule Chapters 7849 and 7850.

[17] Minn. Stat. §§ 216B.243, subd. 5 and 216E.03, subd. 9.

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3.0 TRANSMISSION PLANNING

3.1 TRANSMISSION SYSTEM OVERVIEW

The electric transmission system in the United States is comprised of a highly decentralized interconnected network of generating plants, high voltage transmission lines and distribution facilities. Electricity uses all available paths as it flows from generation to consumers. Since the electricity from all sources is commingled in the transmission system, it is impossible to know exactly where the electric power came from that lights the room of a home. Designing the transmission network and the proper implementation of new transmission facilities requires complex analysis, including modeling of power system steady-state and dynamic performance.

Today, there are 211,000 miles of extra high voltage transmission lines (230 kV and greater) in the North American bulk power system (United States and Canada).[18] There are also many hundreds of thousands of miles of additional transmission lines between 100 and 200 kV. Transmission facilities also include both alternating current lines ("AC") and direct current lines ("DC").

The United States (excluding Alaska and Hawaii) electric transmission grid is divided into three major subsystems, called interconnections: The Eastern Interconnection, the Western Interconnection, and the Electric Reliability Council of Texas Interconnection. While very little power is exchanged across the interconnections, power is readily transferred within an interconnection.

Minnesota is a part of the largest subsystem – the Eastern Interconnection. This means that Minnesota's electric system is not only interconnected with neighboring states of North Dakota, South Dakota, Iowa and Wisconsin, but also indirectly with virtually all of the other states and Canadian provinces in the eastern two-thirds of North America. The entire electric system in the Eastern Interconnection operates as a single integrated electrical machine. The dynamics of the electrical system are also extremely complicated, and require moment-by-moment matching of generation resources and load requirements at the proper voltage across the interconnection. If the load balance or voltage is disturbed by a sudden change in generation output, transmission line availability, or customer usage, the bulk transmission system provides capacity for other generation to adjust and keep the system in balance. As a result, the operation of electrical

[18] *See* NERC Company Overview, *Fast Facts*, at: http://www.nerc.com/page.php?cid=1/7/10.

generators and transmission facilities in Ohio or Nebraska can potentially impact the reliability of electric service to customers in Minnesota, or vice versa.

3.2 EXISTING UPPER MIDWEST 345 KV TRANSMISSION SYSTEM

The bulk transmission system in Minnesota and surrounding states consists predominantly of 230 kV and 345 kV AC voltage facilities, with some 500 kV and DC facilities. In Minnesota, the foundation for the bulk network is a 345 kV ring around the Twin Cities developed in the 1960s along with three lines that connect the Twin Cities to adjacent regions. With the advent of larger generation plants in excess of 500 MW , transmission planners selected the 345 kV voltage class to reliably provide service in place of an overtaxed 115 kV system. In the 1960s, 345 kV transmission ties were built to connect the Twin Cities to major load centers in other states, including St. Louis, Missouri, Chicago, Illinois and Omaha, Nebraska. In the late 1970s, a 345 kV and 500 kV tie to Manitoba, Canada was constructed. These regional connections created a more robust electrical system that could better withstand outages of transmission lines and large-scale generators. In 2011, there were more than 3,000 miles of 200 kV and above transmission in the state.[19]

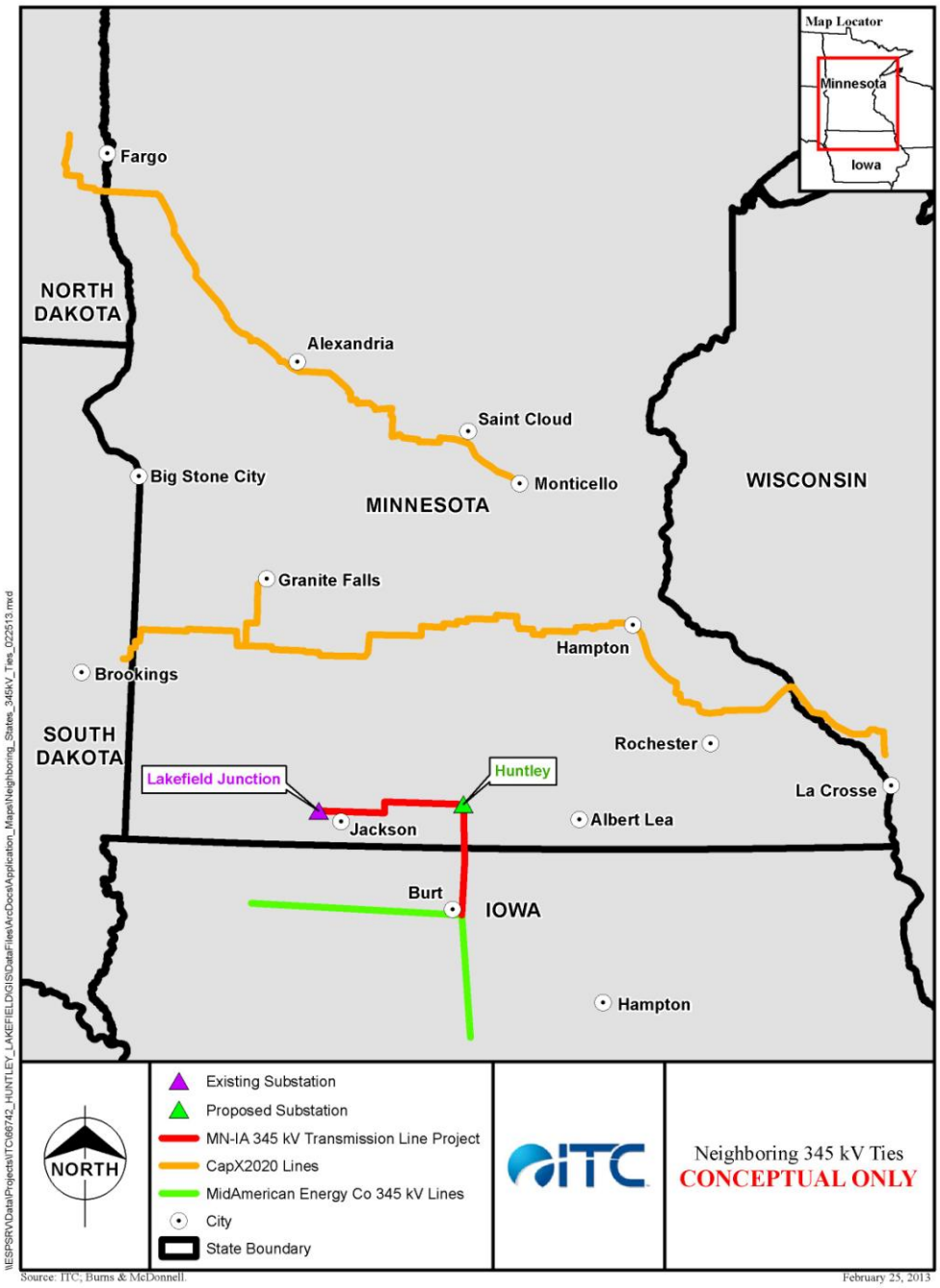
The next significant addition of 345 kV bulk transmission facilities in Minnesota is now underway. This phase of 345 kV development began in 2004 and 2005 with study work undertaken by the CapX2020 group of utilities. In 2007, the CapX2020 utilities proposed three 345 kV line projects: (i) Brookings County – Hampton 345 kV Project; (ii) Fargo – Monticello 345 kV Project; and (iii) the Hampton – La Crosse 345 kV Project. The CapX2020 utilities also proposed a 230 kV transmission line between Bemidji and Grand Rapids, Minnesota. These projects were designed to enhance regional reliability, meet local load serving needs, and increase generation outlet. In 2009, the Commission granted Certificates of Need for the projects, and Route Permits were issued in subsequent proceedings. The Monticello – St. Cloud 345 kV line segment (Docket No. ET2, E002/TL-09-246) of the Fargo – Monticello 345 kV Project and the Bemidji – Grand Rapids 230 kV line have been completed and are in service. The remaining facilities (Docket Nos. ET2/TL-08-1474; ET2, E002/TL-09-1056; E002/TL-09-1448) are all under construction and expected to be in-service by 2015.

One of the substantial benefits of the CapX2020 345 kV projects is that they create additional 345 kV ties between Minnesota and North Dakota, South Dakota, and

[19] 2011 Biennial Transmission Report, at 79.

Wisconsin. A new 345 kV tie between Minnesota and Iowa is also necessary to address the transmission system congestion in southern Minnesota and northern Iowa. **Figure 7** illustrates the Project's proposed expansion of the 345 kV connections with Minnesota's neighboring states.

Figure 7. MN-IA Project's Expansion of Upper Midwest 345 kV Transmission System



3.3 REGULATORY SYSTEM OVERVIEW

Because of the importance of providing safe, adequate and reliable service to customers and the important role electric transmission plays in that service, matters pertaining to electric transmission are highly regulated. Regulatory oversight of transmission in Minnesota occurs at several levels and by several different regulatory bodies:

The Commission has authority over Certificates of Need, which must be obtained to build high voltage transmission facilities in Minnesota. If the Commission determines a transmission facility is needed, it must also determine the route for the line by issuing a Route Permit before construction can begin.

The FERC has authority over the transmission of electric energy in interstate commerce and wholesale sales of electricity, including regulating transmission rates and practices and authorizing and overseeing the operation of regional transmission organizations. Under the Energy Policy Act of 2005 ("EPAct 2005"), FERC is also responsible for oversight of mandatory electric reliability standards and for designating the Electric Reliability Organization ("ERO") for the United States.

Regional transmission organizations ("RTOs"), including MISO, oversee and coordinate regional transmission planning and regional transmission services and manage access to the transmission grid to facilitate fair and competitive wholesale electric markets.

The North American Electric Reliability Corporation ("NERC") has been designated as the ERO by FERC, aided by Regional Entities ("REs") that set standards for grid planning and operations, and monitor compliance with reliability standards. Recently the NERC reliability standards, which previously were merely voluntary, became mandatory pursuant to EPAct 2005 and FERC Order No. 693.[20] Electric utilities in Minnesota must now plan, construct, operate and maintain their electric systems (both transmission and generation) in compliance with the mandatory reliability standards.

The Midwest Reliability Organization ("MRO") is the RE that implements the NERC standards for Minnesota and surrounding states. The MRO develops standards, monitors compliance, enforces standards, and assesses the reliability

[20] *Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, 72 Fed. Reg. 16,416 (Apr. 4, 2007), FERC Stats. & Regs. ¶ 31,242 (2007); *order on reh'g,* 120 FERC ¶ 61,053 (July 19, 2007).

of the bulk power system. The MRO operates independently of the entities subject to its jurisdiction, thus ensuring that the reliability standards developed and enforced by the MRO are fair.

3.4 FERC TRANSMISSION ORDERS

FERC has issued a number of orders over the last 15 years that affect planning for the transmission system in Minnesota. An important change has been the functional separation of transmission from generation to ensure equal access to the grid, which FERC mandated in 1996 when it issued its Order No. 888 (as recently updated by FERC Order No. 890).[21] Transmission planning must now be performed separate from other utility functions in a non-discriminatory manner and transmission planning and development must be prepared to meet the needs of all regional market participants rather than just those of the individual utility's customers or a specific generation resource type.

As part of its open access policy, FERC in Order No. 888 encouraged utilities to join regional independent transmission system operators, or Independent Transmission System Operators. To that end, MISO was founded in 1998 as a voluntary association of electric transmission owners in the Midwest.

In 1999, FERC issued a second order – Order No. 2000 – further encouraging competition in the wholesale power supply market by encouraging transmission-owning utilities to voluntarily join large regional transmission organizations, or RTOs. On December 20, 2001, MISO became the first RTO in the nation to be approved by FERC. On February 1, 2002, MISO began providing "Day 1" regional transmission services under the MISO Open Access Transmission Tariff ("OATT"). On April 1, 2005, MISO implemented its Day Ahead, Real Time and Financial Transmission Rights Markets pursuant to its Open Access Transmission and Energy Markets Tariff ("TEMT"). ITC Midwest is a transmission-owning member of MISO, and is subject to the terms and conditions of MISO's tariffs.

During this same time frame, there were also new FERC policy initiatives relating to transmission planning. In 2007, FERC issued Order 890, clarifying and expanding the obligations of transmission providers to provide transmission service on a non-discriminatory basis. To remedy the potential for undue discrimination in transmission planning activities, FERC directed all

[21] *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 72 Fed. Reg. 12,266 (March 15, 2007), FERC Stats. & Regs. ¶ 31,241 (2007).

transmission providers to develop a transmission planning process that satisfies nine principles: (1) coordination; (2) openness; (3) transparency; (4) information exchange; (5) comparability; (6) dispute resolution; (7) regional participation; (8) economic planning studies; and (9) cost allocation for new projects.[22]

The eighth principle - economic planning studies - requires transmission providers to account for economic considerations in the transmission planning process.[23] FERC determined that good utility practice requires transmission providers to focus on system upgrades that can reduce the overall costs of serving load, as well as those required to maintain the reliability of the transmission network.[24]

In Order No. 1000, issued in 2011, FERC expanded these planning principles to require transmission providers to (i) participate in a regional transmission planning process that produces a regional transmission plan, and (ii) include in their local and regional transmission planning processes provisions to identify and evaluate transmission needs driven by public policy requirements established by state or federal laws or regulations.[25]

3.5 OVERVIEW OF MISO FUNCTIONS

MISO is a non-profit RTO responsible for the independent planning and operation of the transmission grid and wholesale energy market across 11 states and the province of Manitoba. MISO administers and manages the transmission of electricity within its footprint – approximately 53,200 miles of transmission lines.[26]

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[22] *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 118 FERC ¶ 61,119 (2007), *order on reh'g*, Order No. 890-A, 121 FERC ¶ 61,297 (2007), *order on reh'g*, Order No. 890-B, 123 FERC ¶ 61,299 (2008), *order on reh'g*, Order No. 890-C, 126 FERC ¶ 61,228 (2009), *order on clarification*, Order No. 890-D, 129 FERC ¶ 61,126 (2009).

[23] MTEP 2009 ("MTEP09") at 52.

[24] *Id*.

[25] *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, 136 FERC ¶ 66,051 (2011), *order on reh'g*, Order No. 1000-A, 139 FERC ¶ 61,132 (2012), *order on reh'g and clarification*, Order No. 1000-B, 141 FERC 61,044 (2012).

[26] MISO Transmission Expansion Plan 2012 at page 17, which can be found at: https://www.midwestiso.org/Library/Pages/Results.aspx?q=MISOTransmissionExpansionPlan2012.

ITC Midwest is one of 35 transmission owning members of MISO.[27] There are also 98 members of MISO in other sectors, including independent power producers, transmission dependent utilities, power marketers, and state regulatory authorities.[28]

As noted, the dynamics of the electrical system are extremely complicated, requiring moment-by-moment matching of generation resources and load requirements at the proper voltage. If the load balance or voltage is disturbed by a sudden change in generation output, transmission line availability, or customer usage, the bulk transmission system provides capacity for other generation to adjust and keep the system in balance. Projecting the movement of power in real-time, MISO's control room staff of Reliability Coordinators and Reliability Analysts monitor and manage activity on the electric transmission system 24/7.

MISO also oversees both generation interconnection requests and transmission service requests. It is obligated to provide generators and transmission customers non-discriminatory access to the grid in accordance with its Open Access Transmission Energy and Operating Reserve Markets Tariff, on file with FERC.

3.5.1 MISO Wholesale Energy Market

For Summer 2012, MISO projected that it had 127,493 MW of nameplate electric generating capacity within its footprint.[29] This generation is used primarily by load-serving entities that either own and operate the generators or have long-term bilateral supply arrangements with generators or other utilities, to serve their native load customer requirements.

In April 2005, MISO began operations of a centralized regional wholesale energy market, known as the "Day 2" market, where short-term and spot market transactions are available to utilities to acquire energy supply to meet load demands at lower cost than operating their own longer-term resources. Under

[27] ITC Midwest is a transmission-only utility. As such, ITC Midwest does not own generation, and it does not have a "service area" in which it provides retail electric service to end-users. Rather, ITC Midwest provides transmission service across a multi-state area to investor owned public utilities, electric cooperatives, and municipal utilities, who in turn provide retail electric service in their respective service areas.

[28] A list of current MISO members can be found at: http://www.midwestiso.org/StakeholderCenter/Members/Pages/MembershipList.aspx.

[29] MISO 2012 Summer Resource Assessment at pages 15-17, which can be found at: https://www.midwestiso.org/Library/Pages/Results.aspx?q=2012%20Summer%20resource%20assessment.

the MISO TEMT, participating utilities are required to purchase and sell energy within the MISO Day-Ahead and Real Time markets. MISO uses a security constraint economic dispatch that employs LMP to take into account the costs of the resources and the capacity limitations (referred to as "congestion") on the transmission system so that the least cost available generation is used to serve loads on a regional basis within MISO.

Congestion in areas of the existing transmission system in the MISO region not only decreases the operational flexibility of the system, which impacts reliability, but also results in the dispatch of higher priced generation due to the constraint. FERC approved the establishment of the Southeast Minnesota, Northern Iowa, and Southwest Wisconsin Narrowly Constrained Area ("Minnesota NCA") in 2007 because of concerns identified by MISO's independent market monitor that generators within the constrained area could exercise local market power by offering constraint-easing generation into the MISO Day 2 market at higher prices. The net result is that market energy prices in a constrained area can be higher than in neighboring areas that are not subject to such transmission constraints.

An NCA designation alters the operation of the Day Ahead and Real Time energy market in that area. Generators in an NCA face restrictions on their offer price into the MISO energy markets because they can impact the affected transmission constraints in the NCA.

NCA designation indicates the need for additional transmission to alleviate congestion and allow lower cost energy supplies to be delivered.

3.5.2 MISO Transmission Planning

Since its inception, MISO has conducted transmission studies of the transmission system within the MISO footprint to identify and recommend construction of projects required to address network reliability issues. Pursuant to the directives in FERC Order Nos. 890 MISO's transmission planning process has broadened to identify and recommend those projects that increase system efficiency and reduce costs, as well as those projects that meet specific state and federal public policy objectives. MISO reports on its recommended transmission projects in its annual MISO Transmission Expansion Plan ("MTEP").

MISO uses a "bottom up, top down" approach in its transmission expansion planning process. It relies on individual transmission owners to identify and report the projects they have determined are needed for their systems. MISO

then reviews all the various projects in relation to one another and the MISO system as a whole to prioritize projects based on their ability to effectively address system reliability, market efficiency, and evolving federal and state energy policy issues.

MISO's process for identifying and recommending Multi Value Projects in its annual MTEP was specifically reviewed and approved by FERC.[30] In finding that the MVP process is the best way to overcome the challenges inherent in maintaining and expanding the region's grid, FERC analyzed the proposal using three interrelated factors required by its previous Order No. 890: (1) whether the proposal fairly assigns costs equitably; (2) whether the proposal presents incentives (and removes disincentives) to construct new transmission; and (3) the level of support from state regulators.[31] Based on their regional nature, MISO proposed that MVP costs be allocated on a regional basis to all customers taking energy off the grid.[32] FERC agreed, recognizing that broad support from state regulatory authorities was important because states may be reluctant to site regional transmission projects if they believe that costs are not being fairly allocated.[33]

The MVP proposal garnered broad support from state authorities, including the Organization of MISO States ("OMS"), and other stakeholders.[34] The state authorities' effort was led by the OMS's Cost Allocation and Regional Planning Group ("CARP"), which worked closely with the MISO RECB Task Force.[35] The result was that nine of the then-13 OMS states, including Minnesota, supported MISO's MVP proposal before FERC.[36]

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[30] *Midwest Indep. Transmission Sys. Operator, Inc.*, 137 FERC ¶ 61,074 (2011) ("Rehearing Order") and *Midwest Indep. Transmission Sys. Operator, Inc.*, 133 FERC ¶ 61,221 (2010) ("MVP Order").
[31] Rehearing Order at ¶ 116.
[32] MVP Order at ¶ 28.
[33] Rehearing Order at ¶ 173.
[34] Rehearing Order at ¶ 174.
[35] Rehearing Order at ¶ 175.
[36] Rehearing Order at n. 369; "Therefore, Minnesota recommends that [FERC] approve MISO's proposal of charging 100 percent of the cost of MVP projects to the load across MISO's system . . . ." Joint Comments of the Commission and Minnesota Department of Commerce, Sept. 10, 2010.

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4.0 DESCRIPTION OF NEED

4.1 INTRODUCTION

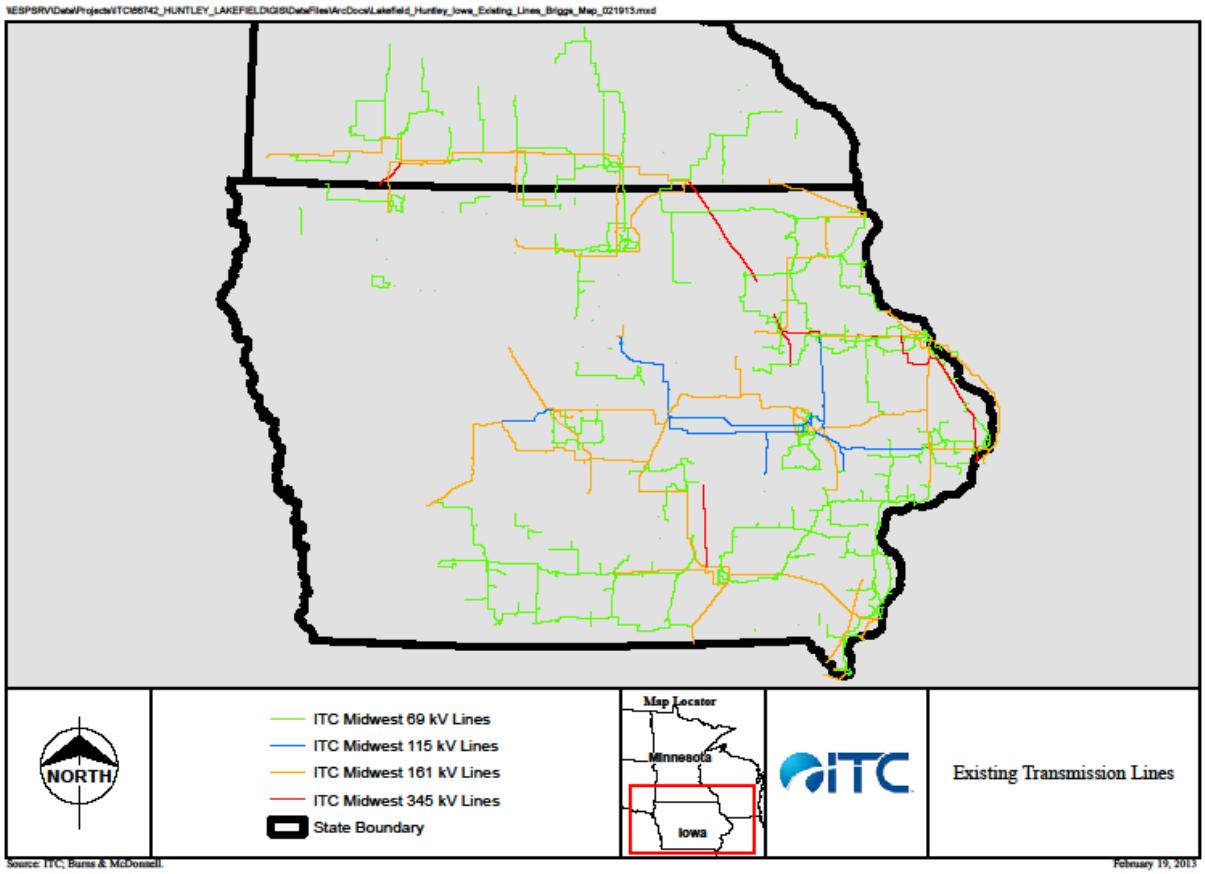
Constraints on the bulk transmission system affect the transmission system's reliability. Because a contingency or combination of contingencies can lead to dramatic power swings on the system, the adequacy of the system can be measured at any given time by the unused transmission line capacity remaining. Thus, if there is a large amount of available capacity on the system – i.e., the system is not constrained – an outage of certain element(s) can be handled due to the available capacity on the remaining elements. But if there is a low amount of available capacity due to constraints, the loss of certain element(s) could result in the remaining elements, which are already nearly fully utilized, to become more heavily loaded.

The system's ability to provide adequate and reliable service is at risk when equipment is heavily loaded, equipment is at risk of failing, which in turn can cause brownouts or even blackouts. In addition, the repetition of the heavy loading over time reduces its service life.

Constraints also lead to congestion which impacts the economic efficiency of the bulk electric system. When the system is sufficiently congested, the congestion will cause the re-dispatch of generation in the area to relieve the loading on the line(s) within the congested area. Re-dispatching generation – which can involve hundreds or thousands of MW depending on the situation – can result in less efficient, more costly generation being dispatched to relieve the stress on the loaded line(s).

The need for the MVP Project 3 arises from constraints on the transmission system in southern Minnesota and northern Iowa leading to congestion on the 161 kV transmission system in the area. See **Figure 8**.

Figure 8. Southern Minnesota/Iowa 161 kV Transmission System



There are three distinct aspects of the need arising from the current constraints and congestion of the transmission system in southern Minnesota and northern Iowa:

- Insufficient generation outlet capacity, specifically including outlet capacity for existing and planned wind generation, all of which cannot currently be reliably delivered and thus impacts the ability of Minnesota and the other states within the MISO footprint to achieve their renewable energy mandates and goals;

- Reduced operational flexibility and reliability of the transmission system due to reliance on SPSs currently in place to prevent overloading of ITC

Midwest's Fox Lake-Rutland-Winnebago 161 kV line in the event of critical contingencies; and

- Inefficient and less cost effective delivery of energy.

Each of these aspects of the need for the Project is discussed below.

4.2 INSUFFICIENT GENERATION OUTLET CAPACITY

4.2.1 Renewable Generation Needed to Meet Minnesota RPS

Minnesota is a national leader in wind energy production. It currently ranks seventh for the most installed wind capacity in the nation (2,986 MW). In 2011, approximately 12 percent of Minnesota's electric energy came from wind, ranking it fourth in the nation for the percentage of electricity consumption from wind.

Minnesota utilities also lead the nation in wind energy purchases. For investor-owned utilities, Xcel Energy currently has more wind energy purchases than any other utility (4,047 MW), while Great River Energy (465 MW) and Minnkota Power Cooperative (359 MW) rank second and third, respectively, for cooperatives.

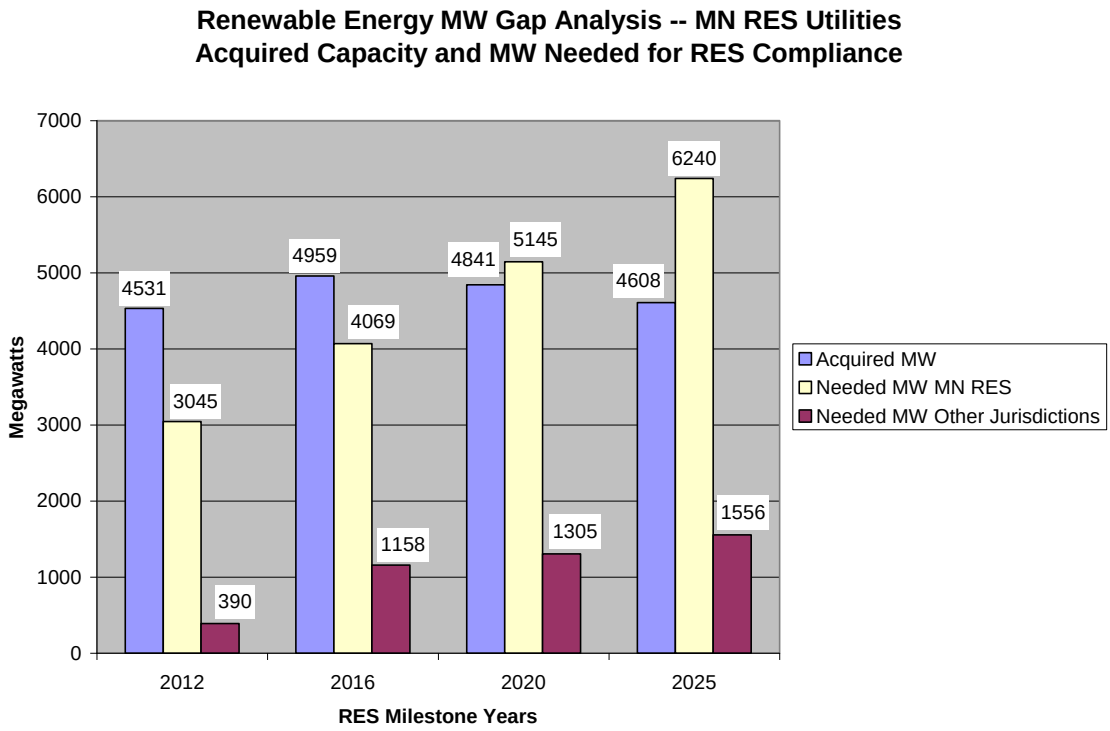
Minnesota's success in this area has been heavily driven by the availability of abundant wind resources and strong policies to boost renewable energy use over the next 15 – 20 years. Minnesota Statutes Section 216B.1691, Subdivision 2a requires that utilities serving retail load in the state must provide 25 percent of their total retail electric sales from eligible renewable resources by 2025, and Xcel Energy, the state's largest utility, must provide 30 percent of its load from renewable resources by 2020, with 25 percent coming specifically from wind generation, as shown in **Table 3**.

Table 3. Renewable Energy Standard Milestones

Year	Non-Nuclear Utility Requirement	Xcel Energy Requirement
2012	12%	18%
2016	17%	25%
2020	20%	30% (25% from wind)
2025	25%	30% (25% from wind)

Minnesota's 2011 Biennial Transmission Projects Report includes an update on the status of Minnesota utilities' efforts to meet their short- and long-term renewable energy requirements. As shown in **Figure 9** below, Minnesota utilities project that they have procured adequate renewable capacity to meet Minnesota RPS needs through the 2016 statutory milestone. In 2020, however, Minnesota utilities estimate they will need to acquire approximately 1,600 MW to meet their Minnesota RPS and other states' RPS requirements. By 2025, the estimated gap increases to approximately 3,200 MW.

Figure 9. Renewable Energy MW Gap Analysis



According to recent utility reports, a number of Minnesota utilities have added renewable resources in 2012. Most Minnesota utilities continue to report having adequate renewable resources to meet the 2016, and in some cases, 2020 milestones. Significant additional renewable resources will still be required to meet the 2020 and 2025 RPS milestones.

Utilities are unlikely to procure all of the additional capacity in even increments, and there may be cost benefits for some utilities to acquire additional renewable resources ahead of the milestone dates. Thus, while significant additional wind resources need to be constructed to meet Minnesota utilities' RPS requirements for 2020 and 2025, utilities may choose to bring additional renewables online ahead of these milestone dates to take advantage of tax incentives, favorable pricing, or other advantages.

4.2.2 Southern Minnesota/Northern Iowa Premier Wind Resource

The MN–IA Project is strategically located in and adjacent to some of the region's strongest wind resources. **Figure 10** and **Figure 11** are 80-meter (m) height wind resource maps for Minnesota and Iowa published by the U.S. Department of Energy's Wind Program and the National Renewable Energy Laboratory ("NREL").

Figure 10. Minnesota Average Wind Speed

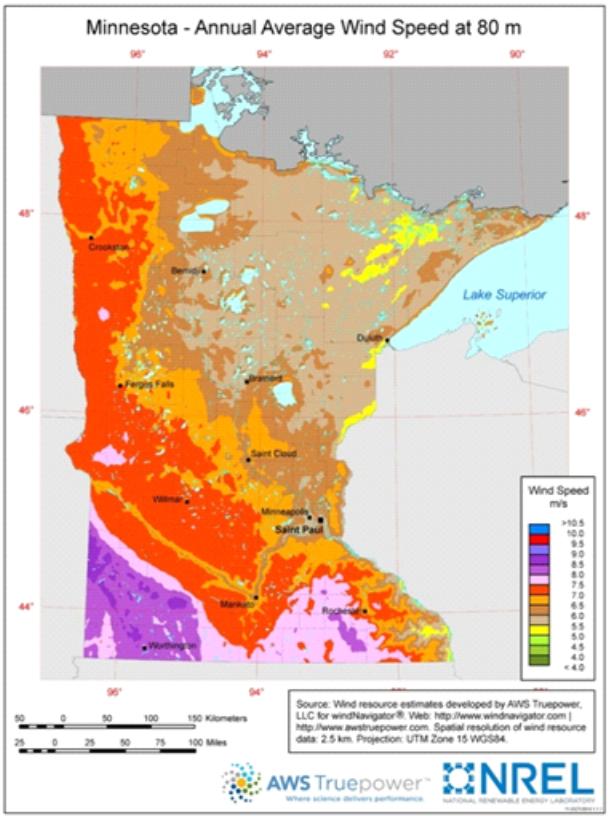
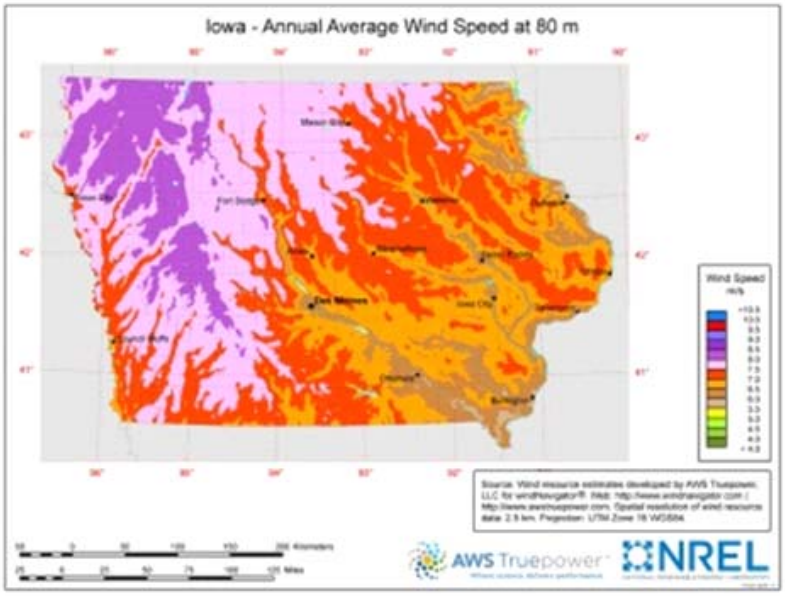


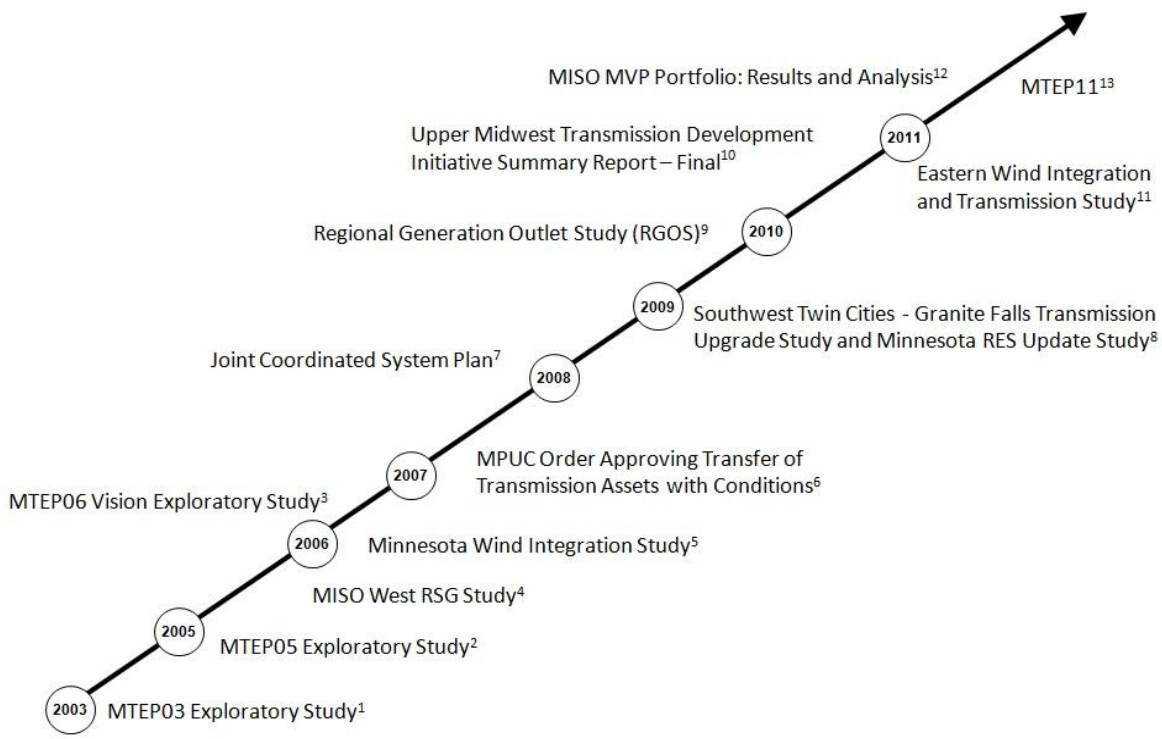
Figure 11. Iowa Average Wind Speed



As a result of the strong wind resources, southern Minnesota and northern Iowa have been consistently identified as a key region for the development of additional renewable generation.

To take advantage of this resource, stakeholders in the regional transmission system have been looking at transmission expansion scenarios for more than 10 years. **Figure 12** below summarizes the various transmission planning efforts that have identified the need to build an additional 345 kV or larger bulk transmission line through this region to enable the interconnection of additional wind resources.

Figure 12. Studies Identifying Need for 345 kV+ Bulk Transmission Lines in Southern Minnesota and Northern Iowa

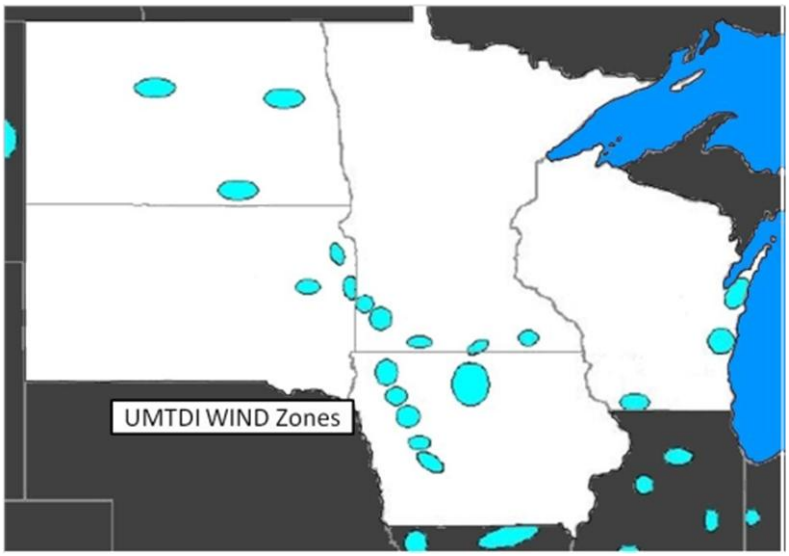


Many of the studies identified in **Figure 12** were conducted as long-range planning exercises to determine the most cost effective solutions for moving high volumes of wind from Midwest states with strong wind resources to larger load centers to the east. A bulk transmission line in southern Minnesota or northern Iowa, such as the MN–IA Project, has consistently been identified among the projects critical for facilitating the transportation of wind from the Buffalo Ridge area. **Appendix F** contains the citations to all studies listed in **Figure 12**.

UMTDI Final Report

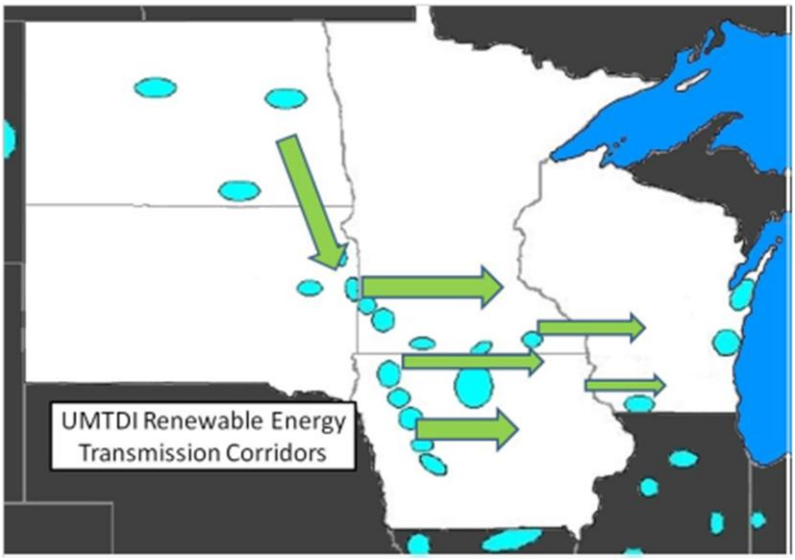
The Upper Midwest Transmission Development Initiative ("UMTDI") was formed in 2008 by the governors of Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin to identify regional transmission planning and cost allocation issues associated with the delivery of renewable energy from wind rich areas within its five-state footprint. UMTDI published its Executive Committee Final Report ("UMTDI's Final Report") on these issues on September 29, 2010, a copy of which is included as **Appendix G** to this Application. UMTDI's Final Report identified those areas where it was likely that wind generation would be developed, as well as the likely paths for the Extra High Voltage ("EHV") transmission lines (345 kV and above) that would be needed to deliver that generation to load. It identified likely wind development across southern Minnesota from the Buffalo Ridge in the southwest corner of the State along the I-90 corridor to the southeast corner of the State. UMTDI's wind zones are illustrated in **Figure 13**.

Figure 13. UMTDI Wind Zones



UMTDI also identified, among others, a likely west to east EHV transmission path along the border between Minnesota and Iowa to deliver the generation from the UMTDI wind zones to load. UMTDI's EHV transmission paths are shown in **Figure 14**.

Figure 14. UMTDI EHV Transmission Paths

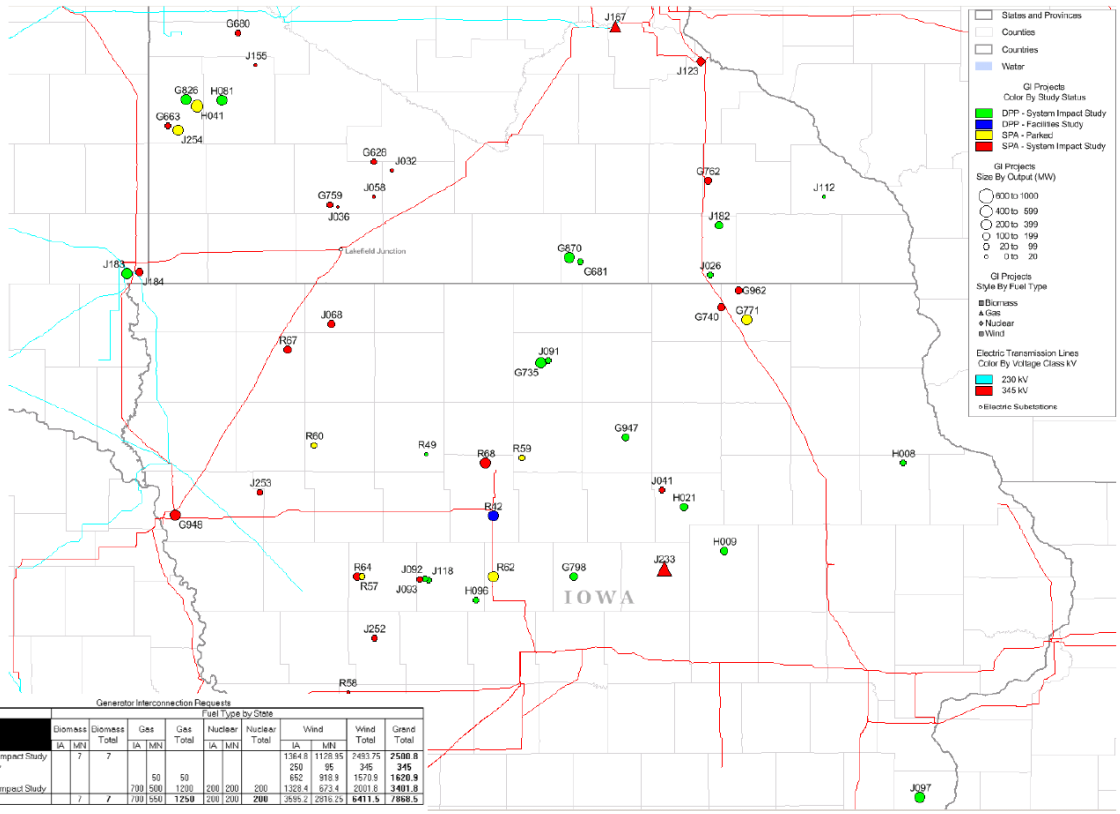


UMTDI noted that this transmission corridor generally coincided with a Lakefield Junction, MN to Mitchell County, IA 345 kV transmission line that MISO had identified as a potential project in its contemporaneous regional generation outlet capacity study discussed in Section 4.2.6 below. While UMTDI cautioned that it was not endorsing any particular project or corridor arising out of its or MISO's generation outlet studies, it affirmed its general support of the identified transmission projects and corridors because they "appear to have value in all identified reasonable futures."

MISO Generator Interconnection Request Queue

Analysis of the current MISO generator interconnection queue requests also supports the assertion that more wind energy will be developed in southern Minnesota and northern Iowa if adequate transmission is available to deliver this power to load. **Figure 15** presents the geographic dispersion of the approximately 2,500 MW of current wind interconnection requests in Minnesota and Iowa that are in MISO's Definitive Planning Phase ("DPP"). Projects within the DPP are considered "late stage" projects likely to be built, as interconnection customers have made significant, largely nonrefundable, deposits to complete final interconnection studies.

Figure 15. MISO Interconnection Request Queue



Generator Interconnection Requests

Study Status	Fuel Type by State													
	Biomass		Biomass Total	Gas		Gas Total	Nuclear		Nuclear Total	Wind		Wind Total	Grand Total
	IA	MN		IA	MN		IA	MN		IA	MN		
DPP - System Impact Study		7	7							1364.8	1128.95	2493.75	**2500.8**
Facilities Study										250	95	345	**345**
SPA - Parked					50	50				652	918.9	1570.9	**1620.9**
SPA - System Impact Study				700	500	1200	200	200	200	1328.4	673.4	2001.8	**3401.8**
Grand Total		7	**7**	700	550	**1250**	200	200	**200**	3595.2	2816.25	**6411.5**	**7868.5**

As shown on **Figure 15**, a significant number of generator interconnection queue requests are located in southern Minnesota and northern Iowa. In addition, approximately 3,400 MW of wind remain in MISO's intermediary System Planning and Analysis Phase ("SPA"), waiting until adequate transmission is available to efficiently and economically connect to the grid before they move forward. The MVP Project 3 will enable some of these additional wind power projects in wind-rich Minnesota and Iowa to be developed.

4.2.3 Transmission Needed to Integrate Wind into Grid

Integration of large amounts of intermittent renewables requires a robust and flexible regional transmission system. While variability and uncertainty are common characteristics of all power systems (e.g., due to continually changing loads, imports and exports, etc.), wind generation adds to the variability and uncertainty of the power system. Numerous peer-reviewed studies have shown that power systems have much greater ability to handle variable renewable energy than commonly understood. Importantly, wind integration impacts are significantly reduced with:

- Large, liquid, and fast markets (e.g., sub-hourly, co-optimized energy and ancillary service markets);
- Large balancing areas with a strong grid that captures significant benefits from diversity (geographic, resource, load) and enables access to the physical flexibility that exists in the regional power system; and
- Forecasting wind generation to reduce uncertainty and costs.

Minnesota regulators have long-recognized that building sufficient transmission is an essential component to reliably integrate the wind generation needed to meet Minnesota's RPS. For example, the 2006 Wind Integration Study focused on the operational impacts of the variability of wind generation. The study found that the addition of wind generation to supply 20 percent of Minnesota retail electric energy sales can be reliably accommodated by the electric power system, but only if sufficient transmission investments are made to support it.

In support of this finding, the Wind Integration Study incorporated the MISO West Regional Study Group Study, which specifically assumed that additional 345 kV transmission lines would be built in southern Minnesota and northern Iowa. In particular, a 345 kV upgrade between the Lakefield and Winnebago substations was listed among the assumed transmission facilities supporting integration of a 20 percent wind scenario.

The 2008 and 2009 Minnesota Dispersed Renewable Generation ("DRG") studies focused on power flow for dispersed renewable generation (wind plants of 10 to 40 MW). The DRG studies found that the Minnesota transmission system is at its design capacity and that there are limited opportunities to interconnect new wind generation, even if it is dispersed around the state in smaller projects, without significant additional transmission investments.

In combination, these and other studies have shown that interconnection and integration of large amounts of wind generation for Minnesota and regional customers requires the addition of new high voltage transmission lines.[37]

[37] *See, e.g.,* "Joint Coordinated System Plan (JCSP),"Volume 1: Economic Assessment at 8-9 (2008) and EnerNex Corporation (for National Renewable Energy Laboratory), "Eastern Wind Integration and Transmission Study" at 38 (rev. Feb. 2011), available at: http://www.nrel.gov/docs/fy11osti/47078.pdf (accessed Mar. 4, 2013).

Within MISO, there are a number of efforts underway to make sure wind is appropriately integrated into the market. For example, MISO market rules for wind generation are evolving to reflect the significant role that wind generation now has in the Midwest. An example of a new rule that more fully integrates wind generation into the MISO market is the Dispatchable Intermittent Resources designation ("DIR"), implemented in June 2011. DIR is designed to provide many system benefits, including improved market efficiency through economic dispatch and better market signals, improved system reliability through better congestion management, by enabling wind generation to more fully participate in the real time market. What DIR does not do, however, is solve the fundamental problem of congestion-driven wind curtailments. Solving this problem requires new and expanded regional transmission.

4.2.4 Transmission Needed to Reduce Curtailment of Existing Wind Generation

In addition to helping to reliably interconnect new wind generation to the grid, high voltage transmission is also needed to relieve constraints that prevent existing generators from fully delivering wind energy to the market. The Fox Lake – Rutland 161 kV line has historically been one of the most frequent sources of manual curtailment for wind facilities. While the implementation of DIR has made it more difficult to pinpoint problem constraints, existing wind generators continue to report significant curtailment in the area of southern Minnesota and northern Iowa.

MISO has analyzed the ability of the existing transmission system to support the generation needed for utilities to comply with states' respective RPS mandates and goals. The analysis showed that without the 17 projects in MISO's MVP Portfolio, 34,711,578 MWh of wind energy would need to be curtailed. This sum is equivalent to 63 percent of the 55,010,629 MWh of renewable energy needed to cover the RPS mandates and goals that have been established by states within MISO's footprint.[38]

When existing wind generation is curtailed, ratepayers lose the benefit of cost-effective renewable energy. In addition, Minnesota landowners and local governments receive less revenue in the form of wind lease and easement payments and wind energy production taxes. Another consequence of congestion in areas of high wind energy production is that offsetting generation

[38] MISO Candidate MVP Reliability Analysis Wind Curtailment at 7. This curtailment analysis can be found in **Appendix L** to this Application.

must be run, typically fossil fuel generation, thereby reducing the potential environmental benefits associated with wind generation.

The existing system limitations have a negative effect on the local economies in the wind-rich areas of southwestern Minnesota; in 2012, the constraint resulted in nearly $500,000 of additional generation costs that ratepayers paid as a result of the constraint.[39]

4.2.5 Socioeconomic Benefits of Enhancing Outlet Capacity for Wind Generation

States have recognized that investment in wind energy is an investment in jobs and increases family incomes, particularly in rural areas. In Minnesota alone, the wind industry supports, directly or indirectly, approximately 3,000 jobs, more than $7.5 million in annual wind energy production tax payments to local governments, and more than $8 million in annual lease payments to Minnesota landowners. In Jackson County, for example, wind production taxes enabled a property tax cut for the 2012 budget. According to Jackson County Coordinator Jan Fransen, Jackson County is currently planning to issue bonds for construction of a new highway department facility based on the expected revenue the county will receive from wind energy production taxes.[40] In Iowa, the statistics are even more impressive: approximately 7,000 jobs, annual property tax payments of $19.5 million, and annual lease payments approaching $13 million. Other MISO states share similar success stories.

4.2.6 Insufficient Transmission Support for State RPS Mandates and Goals Within MISO Footprint

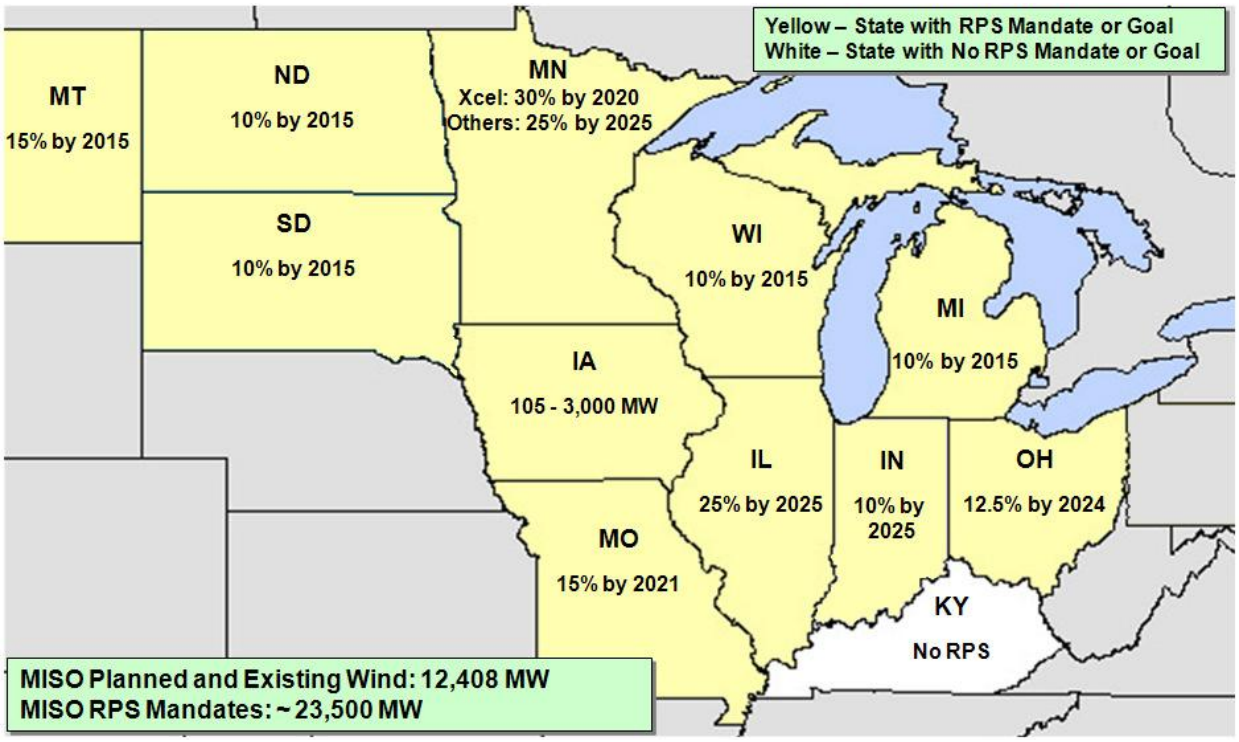
Looking beyond Minnesota, ten of the eleven MISO states have established policies supporting renewable or other forms of clean generation. For instance North Dakota, South Dakota, and Wisconsin each have 10 percent renewable portfolio goals. Ohio has a 12.5 percent requirement by 2024, and Illinois has a 25

[39] For a twelve-month time period in 2011-2012, MISO reported $469,130 in market uplift costs associated with infeasible Long Term Transmission Rights relating to the Fox Lake-Rutland-Winnebago 161 kV constraint. See **Appendix I** of this Application, MTEP 2011 ("MTEP11") at 117. This was the third highest uplift cost in MISO's footprint for the 2011-2012 period reviewed.

[40] Julie Buntjer, "Wind Turbines Create Windfall for Counties, Townships," Worthington Globe (April 1, 2012), available at: http://www.dglobe.com/event/article/id/56283/ (accessed March 1, 2013).

percent requirement by the year 2025. **Figure 16**[41] below provides a summary of the MISO states' renewable portfolio requirements analyzed in MTEP11.[42]

Figure 16. MISO State Renewable Portfolio Requirements.



To meet the collective renewable portfolio standards within the MISO states, MISO estimates that an additional nearly 48 million MWh of renewables will need to be added by 2021, and approximately 55 million MWh will be needed by 2026.[43] The MISO states continue to add new renewable generation to meet this demand. On November 23, 2012, MISO reported that it reached a new wind peak, with a peak output of 10,012 megawatts.[44] This peak represented more than 25 percent of the generation output being used at that time.[45]

[41] MISO MVP Portfolio Results and Analyses (January 10, 2012) at 3.
[42] At the time MTEP11 was completed, Ohio utilities First Energy and Duke were members of MISO. Duke Energy and FirstEnergy have since left MISO and joined PJM Interconnection LLC.
[43] MISO MVP Portfolio Results and Analysis at 19.
[44] MISO. "Wind Output in MISO Surpasses 10GW; Nov. 23 peak represented 25 percent of total output" Press Release, (November 27, 2012), available at:

Regional Generation Outlet Study

Beginning in 2008, MISO, in conjunction with state utility regulators and industry stakeholders, initiated a collaborative effort to determine how to build the transmission facilities that would meet the significant renewable energy requirements within MISO at the lowest delivered cost per megawatt hour. This study, the Regional Generator Outlet Study ("RGOS"), laid the primary foundation for the portfolio of MVP projects approved by the MISO Board of Directors in December 2011, including MVP Project 3.

A key early task of the RGOS process was the identification of areas where wind generation would likely be sited, in turn pointing to where development of additional high voltage transmission lines should be focused. In addition to looking at areas with the highest wind speeds, other factors were considered, such as the existing available transmission capacity, types of turbines likely to be used, transportation considerations, and individual states' desires to ensure that at least some (and in some cases all) wind development occur within its borders.[46]

RGOS identified "wind zones" in each state utilizing a ranking system consisting of weighted capacity factors, the distance of the zone to a significant load center, wind variability, and the distance of the zone to existing infrastructure (e.g., existing transmission railroads, major highways, etc.). With input from UMTDI and other stakeholders, MISO then evaluated how the MISO states' RPS could be met effectively and cost-efficiently from generation development within (i) "local" wind zones where the wind would serve in-state or localized load; (ii) "remote" or "regional" zones that would utilize higher capacity factor areas along longer transmission corridors to serve larger, more distant load; and (iii) a combination of wind zones that would serve both local and more remote load.[47] **Figure 17** shows the regional wind zones that MISO identified.[48]

https://www.midwestiso.org/AboutUs/MediaCenter/PressReleases/Pages/WindOutputSurpasses10GW.aspx (accessed February 21, 2013).

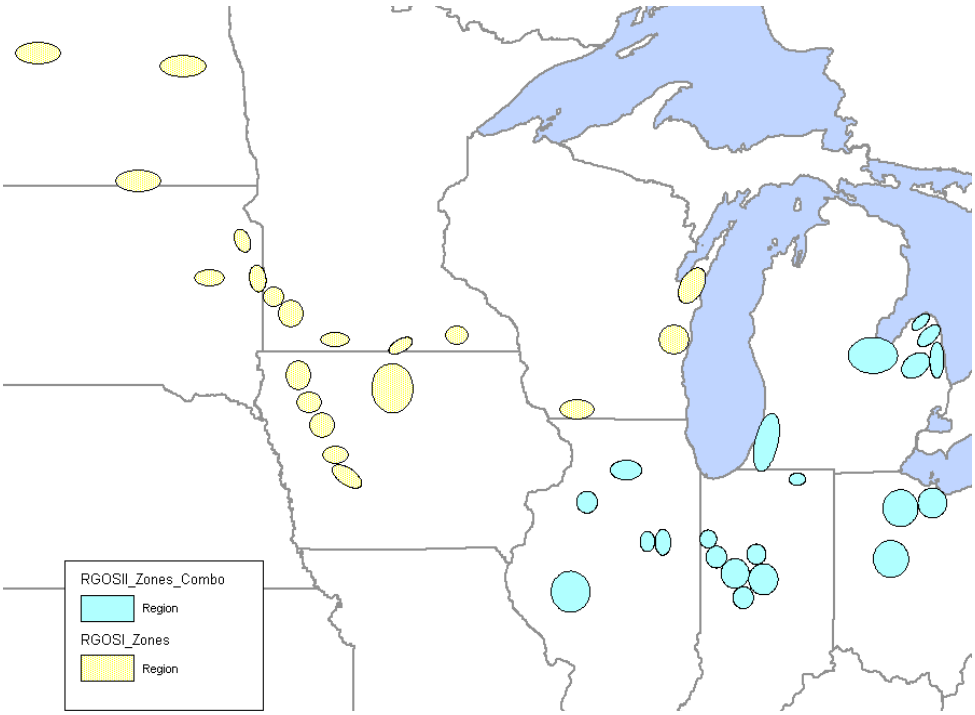
[45] *Id.*

[46] RGOS at 25.

[47] RGOS at 27.

[48] RGOS at 27.

Figure 17. Regional Wind Zone Identification[49]



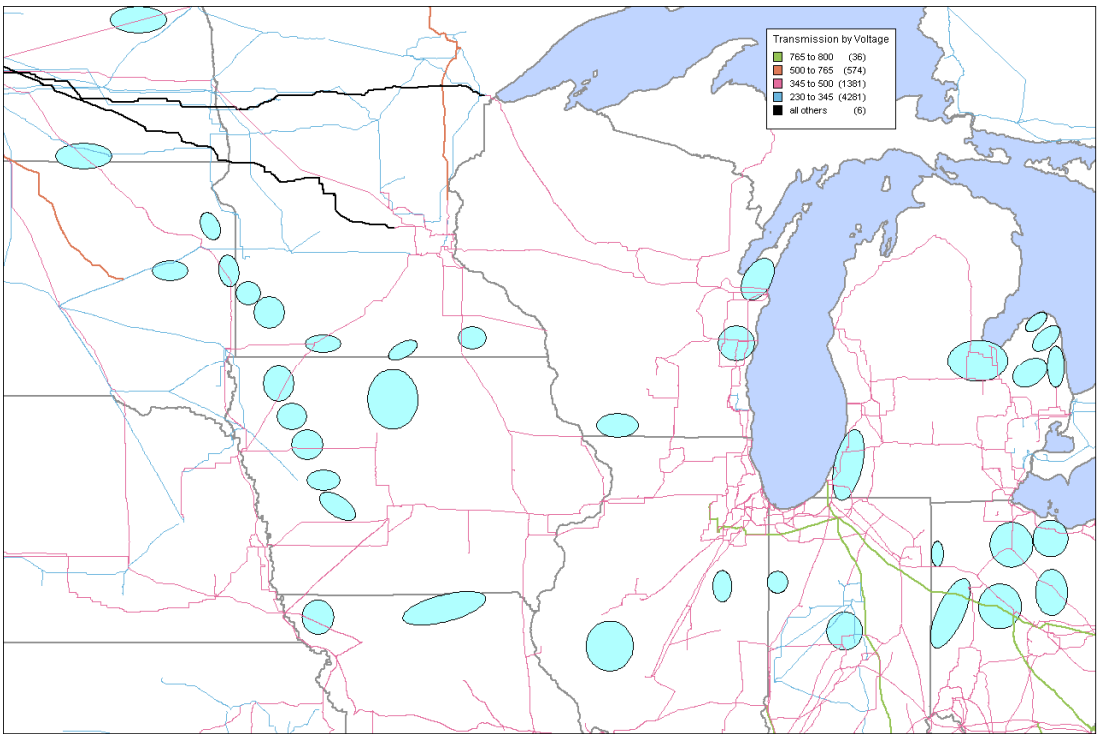
The RGOS identified a 345 kV line running from Lakefield Junction Substation in Minnesota to Mitchell County Substation in Iowa, and another 345 kV line running from the Sheldon to the Hazleton Substations in Iowa as two of five transmission lines in the Upper Midwest which were considered "no regrets" projects because they would meet identified needs and provide ancillary benefits in a variety of likely future generation scenarios.[50]

MISO's MTEP11

The wind zones MISO identified in RGOS were then subjected to further analysis in MISO's 2011 transmission planning process. That analysis concluded that the distribution of wind zones (re-labeled "energy zones") across the region provided the best method of meeting the RPS requirements at the least overall cost to the system.[51] MISO's MVP energy zones are depicted in **Figure 18** below.

[49] RGOS at 28.
[50] **Appendix G**, UMTDI at 9. The other four projects are (i) Big Stone – Brookings 345 kV line; (ii) Brookings – Twin Cities [Hampton] 345 kV line; and (iii) La Crosse – Madison – Dubuque – Spring Green – Cardinal 345 kV line.
[51] MISO MVP Portfolio Results and Analysis at 18.

Figure 18. MISO MVP Energy Zones



MISO also analyzed the project recommendations that came out of the RGOS process to ensure they met the criteria to be included in MISO's MVP Portfolio.[52] MISO's analysis determined that the Lakefield Junction – Mitchell County 345 kV line in combination with the Sheldon – Webster – Hazleton 345 kV line could be modified to more effectively enable the states to meet the state RPSs as set forth below:

- a 345 kV line running east from Lakefield Junction to Winnebago Junction in Minnesota, which then turns south to run through Winnco, Iowa to Burt, Iowa, where it interconnects with a new 345 kV line that runs east from Sheldon, Iowa to Burt, and then turns south and runs to Webster, Iowa;[53] and

[52] **Appendix I,** MTEP11 at 46. Candidate MVPs from RGOS were evaluated to determine whether they could reliably enable MISO states to meet their renewable energy mandates. *Id*. at 49.

[53] ITC Midwest has conferred with MISO regarding the move to Huntley Substation and understand that MISO agrees that running the 345 kV line from Lakefield Junction to the new Huntley Substation is not electrically different than running it from Lakefield Junction to the existing Winnebago Substation.

- a 345 kV line that runs east from Winnco to Lime Creek, Iowa, and then turns south to run through Emery to Franklin, Iowa, where it turns east again to run through Blackhawk to Hazleton, Iowa.

As a result, MISO recommended - and its Board of Directors approved – the above combination of 345 kV lines for construction as MVP Projects 3 and 4, respectively.[54]

4.3 CONGESTION ON FOX LAKE-RUTLAND-WINNEBAGO 161 KV LINE

The Fox Lake – Rutland – Winnebago 161 kV line constraint results from the line being heavily loaded with power generated by area power plants, including wind farms. When this line is constrained, the ability of wind generated in southwest Minnesota to reach market is limited. The loading of the Fox Lake – Rutland – Winnebago line has increased over time as new wind farms have come into service. At times, the loading is so high that some wind generated power needs to be curtailed to maintain the safe operation of the electrical system. This means that not all power that is produced is able to reach the market. For example, prior to the implementation of DIR, there were 8,005 curtailment hours in 2009, and 20,365 hours in 2011. In 2012, with DIR, there were 10,430 curtailment hours.[55]

The limited capacity of the transmission system has a negative effect on the local economies in the wind-rich areas of southwestern Minnesota; more wind generation could be interconnected to the grid if the transmission infrastructure necessary to handle it was in place.

The Fox Lake – Rutland – Winnebago 161 kV constraint also contributes to increased system operational costs. In 2012, the constraint resulted in nearly $500,000 in market uplift costs for infeasible Long Term Transmission Rights relating to the Fox Lake-Rutland-Winnebago constraint. This was the third highest uplift cost in MISO's footprint for the time period of summer 2011 through winter 2012.[56] In 2011, this constraint also resulted in 1,981 binding hours which impacted MISO's Day-Ahead Energy Market.[57] The problem did not

[54] **Appendix I**, MTEP11 at 43.
[55] https://www.midwestiso.org/Library/Repository/Meeting%20Material/Stakeholder/RSC/2013/20130129/20130129%20RSC%20Item%2014%20Wind%20Curtailment%20Data.pdf.
[56] **Appendix I**, MTEP11 at 117.
[57] See **Appendix H** of this Application, MISO Response to ITC Midwest LLC Regarding Commission Order Requesting Data Dated May 15, 2012 ("MISO Response to May 2012 MPUC

diminish in 2012; binding hours for the Fox Lake – Rutland constraint totaled 1,222 through July 2012.[58]

The Commission has recognized the need for additional transmission facilities to relieve the constraints on ITC Midwest's system in Minnesota. In its order approving the transfer of IPL's transmission facilities to ITC Midwest, the Commission ordered that ITC Midwest "shall abide" by the commitments, terms, and conditions set forth in its December 12, 2007 Settlement Agreement with the Department, which included condition 13.d: "That ITC Midwest will resolve the system constraints in the IPL service territory as reported by MISO."[59] And in May 2012, the Commission identified the specific need to address the constraint associated with the Fox Lake – Rutland – Winnebago 161 kV line:

> ITC shall file the following . . . :
>
> * * *
>
> b. A report on MISO projects that address constraints in the MN NCA and ITC's plans to implement such projects, including its plans for the Lakefield-Fox Lake-Rutland-Winnebago-Hayward-Adams 161 kV line.[60]

In its compliance filing, ITC Midwest reported that MISO is recommending construction of the MN-IA Project, among others, to address constraints in the Minnesota NCA.[61]

4.4 REDUCED SYSTEM RELIABILITY DUE TO SPSS FOR CONGESTED FOX LAKE-RUTLAND-WINNEBAGO 161 KV LINE

ITC Midwest's 161 kV system in southwest Minnesota is highly congested, particularly the Fox Lake – Rutland – Winnebago 161 kV line, which MISO has

Order"), Table of ITC Midwest Binding Constraints Impacting Minnesota Nodes ("Constraint Table") at 1-5.

[58] **Appendix H**, MISO Response to May 2012 MPUC Order, Constraint Table at 6-7.

[59] *In the Matter of the Joint Petition for Approval of Transfer of Transmission Assets of Interstate Power and Light Company to ITC Midwest LLC*, Docket No. E001/P A-07-540, ORDER APPROVING TRANSFER OF TRANSMISSION ASSETS, WITH CONDITIONS at 7 (Feb. 7, 2008).

[60] *Id.*, ORDER REQUIRING FILINGS at ordering point 1.b (May 15, 2012).

[61] *Id.*, ITC Midwest's Compliance Filing at 2 (June 28, 2012).

identified as one of the most constrained lines on ITC Midwest's system.[62] There is no 345 kV path to handle the flow of west-to-east energy from Jackson County to Mower County in southern Minnesota, causing heavy loading on the 161 kV line. And because the Fox Lake-Rutland-Winnebago line is so heavily loaded, a series of SPSs have had to be put in place to prevent overloading the line in the event of certain contingencies.

4.4.1 Special Protection System

Generally, a SPS is a remedial solution to a transmission reliability violation, often resulting from the installation of new facilities which either aggravate or initiate the violation. NERC defines a SPS as:

> An automatic protection system designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. Such action may include changes in demand, generation (MW and MVAr), or system configuration to maintain system stability, acceptable voltage, or power flows. An SPS does not include (a) underfrequency or undervoltage load shedding or (b) fault conditions that must be isolated or (c) out-of-step relaying (not designed as an integral part of an SPS). Also called a "Remedial Action Scheme".

SPSs can function well as operational solutions to address certain transmission deficiencies, but do not obviate the underlying need for new transmission facilities. Historically, ITC Midwest viewed SPSs as appropriate temporary solutions to a reliability problem until such time as infrastructure improvements could be built. As discussed below, ITC Midwest no longer views SPSs as appropriate solutions to reliability problems.

4.4.2 Limitations of SPSs

ITC Midwest's experience is that SPSs are generally undesirable for two reasons. First, their design and implementation places significant demands on a utility's

[62] An extensive analysis completed by MISO in 2010 confirmed that the Lakefield-Fox Lake-Rutland 161 kV line constitutes a highly congested flowgate that requires mitigation. MTEP 2010 ("MTEP10") at 198-99.

transmission staff. Second, SPSs can greatly expand the complexity of operating the transmission system.

The strain on resources associated with developing and managing SPSs has been significant for ITC Midwest. As more wind farms began to connect to the transmission grid in northwest Iowa and southwest Minnesota, ITC Midwest began receiving additional requests from wind farm developers to add SPSs to the system to disconnect their wind farm from the grid in the event of various transmission line contingencies. Many of the SPSs were driven by timing concerns as wind farm projects, even those as large as 100-300 MW, can be constructed within a year of signing a Generation Interconnection Agreement, while upgrading or constructing the transmission lines necessary to accommodate the increased MW loaded onto the system can take several years.

Significant engineering resources are required to establish the SPSs. First, ITC Midwest must design an SPS that addresses the reliability issue that has been identified without creating new reliability issues. Second, there are NERC standards that directly relate to SPSs. These require the MRO, as the regional reliability authority, to review and approve the SPS.[63] There are also NERC standards that require ITC Midwest to demonstrate the functionality of the SPS and how its implementation would be coordinated with other existing SPSs. SPS's design must be fully redundant such that the loss of any one SPS component, including the communications scheme, will not prevent the transmission system from meeting reliability criteria. ITC Midwest is required to provide block diagrams, modeling assumptions, and performance analysis to the MRO for review and approval before an SPS can be implemented. Third, there are also various reporting requirements and yearly compliance activities that have to be recorded for each SPS.[64] These procedures have been determined to be essential since SPSs must operate as intended when called upon since their purpose generally is to mitigate reliability violations observed in the study horizon.

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[63] The relevant NERC standards for the MRO are Standard PRC-012-1 (requiring review procedures for planning and using an SPS); Standard PRC-013-0 (requiring records of each SPS's objective, operation and modeling); and Standard PRC-014-0 (requiring assessment of the operation, coordination, and effectiveness of all installed SPSs).

[64] The relevant NERC standards for the transmission owner are Standard PRC-015-0 (requiring SPS data and documentation); Standard PRC-016-0.1 (requiring analyses and records of all SPS operations and misoperations); and Standard PRC-017-0 (requiring SPS maintenance and testing).

4.4.3 Complexity of Existing SPSs for Fox Lake-Rutland-Winnebago 161 kV Line

There are currently two SPSs that have been implemented to prevent overloading of the Fox Lake-Rutland-Winnebago Junction 161 kV line: the Fieldon Capacitor Bypass SPS, and the Nobles County – Wilmarth SPS. The history of these SPSs began in 2001. At that time, Great River Energy's Lakefield Generating Station ("LGS") power plant connected to the grid on Xcel Energy's Lakefield-Wilmarth 345 kV line. A loss of the 345 kV line from LGS to Wilmarth would result in all of the output power being directed to ITC Midwest's Lakefield Junction Substation, which overloads ITC Midwest's Lakefield-Fox Lake-Rutland-Winnebago 161 kV line sections. To alleviate this concern, GRE initially configured the LGS substation to be connected to the system via an unprotected tap off the 345 kV line so that a line fault on either the Lakefield – LGS 345 kV line or LGS – Wilmarth 345 kV line would trip both line sections and effectively isolate the LGS from the grid. But this configuration had the undesirable effect of causing the plant to lose station power during a contingency. To correct this, an SPS was then installed to trip the LGS generators if there was a fault on the LGS – Wilmarth.

After this, a series capacitor was installed on LGS – Wilmarth 345 kV line section to increase flows on the line which, by reducing flows to the south, mitigated power flows on transmission lines in Nebraska resulting from the generation additions at Buffalo Ridge**.** But the series capacitor could produce sub-synchronous resonance oscillations due to the interaction of the series capacitor with the generation at LGS if LGS were radially fed from the LGS – Wilmarth 345 kV line. This led to the Fieldon SPS being installed to bypass the series capacitor if the Lakefield – LGS 345 kV line were lost.

When Xcel Energy installed the Split Rock – Lakefield 345 kV line in 2007 to transfer more wind generation from southwest Minnesota and eastern South Dakota to the Twin Cities metropolitan area, the new line further aggravated the loading on ITC Midwest's 161 kV facilities. To address this, Xcel Energy implemented the Wilmarth/Nobles SPS to open the Split Rock – Lakefield 345 kV line if any line section is open between Lakefield and Wilmarth. When the Elm Creek and Elm Creek II wind farms were then constructed in 2009 and 2011, respectively, they were added to Wilmarth/Nobles SPS, as was the existing Trimont wind farm. Now there is a condition that if the LGS – Wilmarth 345 kV line trips, the SPS will trip any units at the LGS, as well as the Trimont and Elm Creek Wind Farms, as well as the Split Rock – Lakefield 345 kV line.

4.4.4 ITC Midwest's New SPS Policy

ITC Midwest has experienced increasing SPS requests in recent years and concluded that implementing additional SPS would lead to exponential growth in the demands placed on its engineering resources. Not only is upfront engineering and maintenance work required for the establishment of the SPS, but transmission operations staff needs to make sure the SPS is incorporated into their real-time security operations. Because of this, and the inherent risks associated with operating its transmission system with many SPSs, ITC Midwest has revised its policy on SPSs and will no longer support the addition of new SPSs on its system or on adjacent systems to address ITC Midwest loading issues:

> It is ITC Midwest policy that new Special Protection Schemes ("SPS") not be installed on the ITC Midwest system. ITC Midwest will not support the installation of an SPS on a neighboring system whose purpose is to mitigate potential issues on the ITC Midwest system. For those SPS's that have already been placed in service, periodic reviews should be performed to ensure that the scheme is deactivated when the conditions requiring its use no longer exist or system improvements to remove the SPS are warranted.[65]

[65] ITC Midwest Transmission Planning Criteria- 100 kV and Above at page 16. A copy of ITC Midwest's Transmission Planning Criteria is included as Appendix 54 of ITC Midwest's MN-IA Project Planning Study, located in **Appendix J** of this Application.

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5.0 NEED ANALYSIS

The need for MVP Project 3 has been evaluated on a regional and local level by both MISO and ITC Midwest. This chapter summarizes those study efforts, starting first with the engineering and economic analysis undertaken by MISO, then turning to ITC Midwest's evaluation confirming that MVP Project 3 as the best alternative to address persistent transmission deficiencies in south central and southwest Minnesota caused by the increasing demands for generation outlet capability. The last part of this chapter describes a separate economic analysis ITC Midwest undertook in support of this application.

5.1 MISO's Analysis of MVP Projects 3 and 4

As noted in **Section 5.0**, MISO analyzed the project recommendations that came out of the RGOS process to ensure they met the criteria to be included in its 2011 MVP Portfolio. The candidate MVPs from RGOS were premised on the MVP criteria contained in Attachment FF of MISO's OATT:[66]

- Criterion 1 - the MVP must enable the transmission system to deliver energy reliably and economically in support of documented federal or state energy policy mandates or laws.

- Criterion 2 - the MVP must provide multiple types of economic value across multiple pricing zones with a total cost/benefit ratio prescribed in Attachment FF of the MISO Tariff; and

- Criterion 3 - the MVP must address at least one transmission issue associated with a projected violation of a NERC or Regional Entity standard and at least one economic based transmission issue that provides economic value across multiple pricing zones.

With respect to Criterion 1 - public policy needs - RGOS analyzed whether candidate MVPs could reliably enable MISO member states meet their respective RPSs.[67] But the ultimate goal of the MISO planning process is to reliably deliver energy to load at the lowest possible cost.[68] RGOS therefore sought to identify

[66] **Appendix I**, MTEP11 at 49.
[67] **Appendix I**, MTEP11 at 49.
[68] **Appendix I**, MTEP11 at 50.

transmission options that met RPS mandates at the lowest delivered wholesale cost:

> The cost calculation combined the expenses of the new transmission portfolios with the capital costs of the new renewable generation, balancing the trade offs of a lower transmission investment to deliver wind from low wind availability areas, typically closer to large load centers; against a larger transmission investment to deliver wind from higher wind availability areas, typically located further from load centers.[69]

Through this process RGOS identified three potential transmission portfolios.

MISO then selected projects for further evaluation in its 2011 Candidate MVP Portfolio Analysis that were common to all three RGOS portfolios and where previous reliability, economic, and generation interconnection analyses had been performed. This analysis evaluated the candidate projects against MISO's MVP cost evaluation criteria to determine whether they were indeed high value transmission projects with benefits that were widely distributed across MISO's footprint.[70]

Approximately 11 months of intensive studies were performed on the candidate portfolio, with heavy review and involvement by stakeholders, including the MISO states. The resulting 17-project MVP Portfolio:

> combines reliability, economic and public policy drivers to provide a transmission solution that provides benefits in excess of its costs throughout the MISO footprint. This portfolio, when integrated into the existing and planned transmission network, resolves about 650 reliability violations for more than 6,700 system conditions, enabling the delivery of 41 million MWh of renewable energy annually to load. The portfolio also provides strong economic benefits; all zones within the MISO footprint see benefits of at least 1.6 to 2.8 times their cost.[71]

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[69] **Appendix I**, MTEP11 at 44-45.
[70] **Appendix I**, MTEP11 at 46.
[71] **Appendix I**, MTEP11 at 7.

Importantly, the MVP Portfolio also results in a transmission network that is able to respond to evolving reliability, generation, and policy needs within its footprint.

> [A]lthough the study was premised on a set of energy zones created to distribute wind capacity throughout the footprint in a least-cost pattern, these energy zones were also located with respect to existing infrastructure, such as transmission lines and natural gas pipelines. As a result the transmission will support a variety of different generation fuel sources, and with the fuel sources, a variety of generation policies.[72]

As noted above, RGOS identified the Spencer – Hazelton 345 kV line and Lakefield Junction – Mitchell County 345 kV line as candidate MVPs to mitigate the constraints on the transmission system in southern Minnesota/northern Iowa. MISO's analysis of these candidate MVPs showed, however, that they did not perform as well as the alternative MVPs that became MVP Project 3 and Project 4.[73]

MISO's analysis showed that the combination of the Spencer – Hazelton and Lakefield Junction – Mitchell County 345 kV lines relieved the majority of congestion on the 161 kV system in southern Minnesota. But it did not fully mitigate a critical constraint on the Iowa 161 kV system that prevents the flow of energy south from Minnesota into Iowa. Specifically, the Lime Creek – Emery portion of the Lime Creek – Emery – Floyd – Blackhawk constraint in northern Iowa was not mitigated, and the mitigation of the Emery – Floyd – Blackhawk portion of the constraint was only a 20 percent loading reduction.[74]

In addition, the Lakefield Junction – Mitchell County 345 kV line actually reduced the transfer capability of the existing Mitchell County – Hazelton 345 kV line, from 4,200 MW to 4,000 MW.[75] Thus the Lakefield Junction – Mitchell County 345 kV line would require the Mitchell County – Hazelton 345 kV line to be rebuilt, increasing the overall cost to relieve the congestion.

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[72] **Appendix I**, MTEP11 at 8.

[73] **Appendix K** of this Application contains an excerpt of MISO's September 16, 2011 PowerPoint summarizing its analysis of the RGOS candidate MVPs for Iowa and MVP Projects 3 and 4 ("MISO Iowa MVP Analysis").

[74] **Appendix K**, MISO Iowa MVP Analysis at 16, 18, and 19.

[75] **Appendix K**, *Id*.

The combination of MVP Project 3 and Project 4 resolved these problems. The entire Lime Creek – Emery – Floyd – Blackhawk 161 kV line constraint was mitigated, with the reduction in loading along the line within a range of 45-60 percent.[76] And the transfer capability of the Mitchell County – Hazelton 345 kV line increased from 4,200 MW to 8,500 MW.[77]

5.2 ITC Midwest's Analysis of MVP Project 3

While MISO's analysis focused on the need for MVP Project 3 and Project 4 to reliably and cost effectively serve the entire MISO footprint to meet RPS requirements, ITC Midwest conducted its own transmission planning study focused on the local transmission system in southern Minnesota and northern Iowa to complement MISO's analysis, which confirmed the benefits of MVP Project 3 on a stand-alone basis. ITC Midwest's MVP Project 3 Planning Study ("ITC Midwest Project Planning Study") is in **Appendix J** of this Application.

The ITC Midwest Project Planning Study focuses on how MVP Projects 3 and 4, and a 161 kV transmission alternative, impact ITC Midwest's system in Minnesota under a range of wind generation scenarios. These scenarios identified the existing "base case" summer peak outlet capacity to be approximately 425 MW–445 MW , and summer shoulder (70 percent of peak) transfer capacity to be approximately 2,040–2,700 MW , depending on three different generation development scenarios.

The study's transfer capability and contingency analyses show that MVP Project 3 is the best alternative, alone and in combination with MVP Project 4, to (i) relieve constraints on the existing 161 kV system (including the Fox Lake-Rutland-Winnebago Junction 161 kV constraint); (ii) increase the incremental generation transfer capability of the transmission system in southern Minnesota and northern Iowa to support wind and other generation resources; (iii) increase the reliable operation of the transmission system in southern Minnesota by eliminating the need for two SPSs on the existing system; and (iv) reduce the level of energy losses on the bulk transmission system.

5.2.1 Background

ITC Midwest's transmission system in southwest Minnesota and northwest Iowa is comprised primarily of 161 kV and 69 kV facilities. This system was initially

[76] **Appendix K**, MISO Iowa MVP Analysis at 23-25.
[77] **Appendix K**, *id*.

designed to serve load but has increasingly been called upon to support generation outlet. The primary generation source is wind, with developers seeking out the high wind speeds available in the Buffalo Ridge region. As detailed in **Chapter 4**, constraints on the system, including the Fox Lake – Rutland – Winnebago 161 kV line constraint, have limited the delivery of wind energy output from generation currently installed in the Buffalo Ridge region and prevented additional generation from being developed in this wind rich area. Because of the quality of the wind resource in southwest Minnesota and the renewable portfolio requirements of Minnesota and states throughout the MISO footprint detailed above, the demand for additional capacity to deliver wind energy is expected to continue to grow, further straining the existing 161 kV system absent additional improvements. Currently, there are approximately 7,868 MW of planned wind generation in the study area, as evidenced by projects participating in MISO's SPA and DPP studies in Minnesota and Iowa.

5.2.2 Geographic Scope

ITC Midwest analyzed alternatives based on their performance in southern Minnesota and northern Iowa. Alternatives were also analyzed with respect to how they resolved and/or created constraints on the existing transmission system. The general transmission study area is shown in **Figure 19** below. Elements within this study area and on neighboring systems were monitored.

Figure 19. Transmission Study Area

5.2.3 Alternatives

Planning engineers evaluated MVP Project 3 alone and in conjunction with MVP Project 4 as well as a 161 kV rebuild alternative. This alternative was considered because 161 kV is the primary transmission voltage in the study area, and an upgraded 161 kV transmission line would have some potential to address the need for greater generation outlet capacity, as well as reduction of existing system constraints in the study area. Further, the main constraint on the electrical system has historically been the Fox Lake – Rutland – Winnebago Junction 161 kV line. As noted in Minnesota's biennial transmission report for 2009, replacing just the conductor of the line is impractical because of the age of the line's structures. The existing structures cannot support heavier conductors. Accordingly, a 161 kV rebuild alternative that upgraded the Fox Lake – Rutland – Winnebago Junction 161 kV ("161 kV Rebuild Alternative") was studied. The current rating on this line is 168 MVA. In this study, the line was upgraded to

795 ACSR conductor with a rating 446 MVA, which is ITC Midwest's standard 161 kV conductor used in wind generation areas.

5.2.4 Generation Development Scenarios

Due to the uncertainty of predicting the location of actual generating facility locations, several different scenarios where analyzed to determine the effects of the MVPs on the transmission system. The wind zones where divided into two different groups, a Buffalo Ridge North group (the Lakefield, Split Rock, White, and Brookings areas), and a Buffalo Ridge South group (Sheldon, Sioux City, Raun, and Webster areas). Modeling scenarios were then developed to reflect different levels of generation from the North and South zones being delivered to two different sinks to provide alternative scenarios where wind generated energy is consumed in Minnesota and another where it is primarily exported. One sink consisted of the Minnesota utility areas and the other consisted of the utility areas located farther south and east in the MISO footprint, including Illinois, Missouri, Michigan, and Indiana. The resulting generation scenarios that were analyzed in the study are set out below:

- Base Case
  The Base Case represents the anticipated transmission system and generation that will exist in 2017 with no wind zone generation.

- Buffalo Ridge 25%N / 75%S Wind Zones – Minnesota Transfer
  simulates a 5,000 MW transfer from Buffalo Ridge generation to the Minnesota areas with the generation in the Buffalo Ridge north zone increased by 25 percent of the total transfer while generation in the south zone is increased by 75 percent of the total transfer.

- Buffalo Ridge 50%N / 50%S Wind Zones – Minnesota Transfer
  simulates a 5,000 MW transfer from Buffalo Ridge to the Minnesota areas with generation in the Buffalo Ridge north and south zones each increased by 50 percent of the total transfer.

- Buffalo Ridge 75%N / 25%S Wind Zones – Minnesota Transfer
  simulates a 5,000 MW transfer from the Buffalo Ridge generation to the Minnesota areas with the generation in the Buffalo Ridge north zone increased by 75 percent of the total transfer while generation in the south zone is increased by 25 percent of the total transfer.

- Buffalo Ridge 25%N / 75%S Wind Zones – MISO East Transfer
  simulates a 5,000 MW transfer from Buffalo Ridge generation to the areas located south and east in the MISO footprint with the generation in the Buffalo Ridge north zone increased by 25 percent of the total transfer while generation in the south zone is increased by 75 percent of the total transfer.

- Buffalo Ridge 50%N / 50%S Wind Zones – MISO East Transfer
  simulates a 5,000 MW transfer from Buffalo Ridge generation to the areas located south and east in the MISO footprint with generation in the Buffalo Ridge north and south zones each increased by 50 percent of the total transfer.

- Buffalo Ridge 75%N / 25%S Wind Zones – MISO East Transfer
  simulates a 5,000 MW transfer from Buffalo Ridge generation to the areas located south and east in the MISO footprint with generation in the Buffalo Ridge north zone increased by 75 percent of the total transfer while generation in the south zone is increased by 25 percent of the total transfer.

5.2.5 AC Contingency Analysis

ITC Midwest undertook an AC contingency analysis to determine whether the addition of any of the alternatives would resolve existing thermal violations on the transmission system without creating an unacceptable level of new violations. NERC Category C contingencies, which include common tower outages, were included in the analysis. While all three alternatives provided acceptable performance, the 161 kV Rebuild Alternative did the poorest job of alleviating or eliminating violations.[78]

5.2.6 Incremental Transfer Capability Analysis

ITC Midwest also performed an analysis of the increase in the incremental transfer capability of the transmission system for MVP Project 3, MVP Projects 3 and 4 together, and an upgraded Fox Lake – Rutland – Winnebago Junction 161 kV line. This involved establishing what the anticipated transfer capability of the system would be under the various generation scenarios discussed above, given the expected 2017 load demands and anticipated system upgrades discussed in **Section 2.1** above, without MVP Projects 3 or 4, or the upgraded 161 kV line in service. The first step was to establish the base case for system transfer capability for each of the six generation scenarios during peak and shoulder conditions without any of the studied transmission options.. Then modeling was done to determine the level of incremental gain or loss in system transfer capability for the scenarios when: (i) MVP Project 3 alone was added to the system; (ii) MVP Projects 3 and 4 were both added to the system; and (iii) the upgraded 161 kV line alone was added to the system.[79]

This analysis showed that MVP Project 3 was superior to an upgraded Fox Lake-Rutland-Winnebago Junction 161 kV line in increasing outlet capacity within Minnesota and the region, and that the combination of MVP Projects 3 and 4 was the best at doing so.

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[78] **Appendix J**, ITC Midwest Project Planning Study at 10-11.

[79] **Appendix J**, ITC Midwest Project Planning Study, Appendices 3-50 contain the complete FCITC results for each case under each generation scenario. Appendices 3-10 contain the results for the Buffalo Ridge 25%N / 75%S Gen – Minnesota scenario; Appendices 11-18 contain the results for the Buffalo Ridge 50%N / 50%S Gen – Minnesota scenario; Appendices 19-26 contain the results for the Buffalo Ridge 75%N / 25%S Gen – Minnesota scenario; Appendices 27-34 contain the results for the Buffalo Ridge 25%N / 75%S Gen – MISO East scenario; Appendices 35- 42 contain the results for the Buffalo Ridge 50%N / 50%S Gen – MISO East scenario; and Appendices 43-50 contain the results for the Buffalo Ridge 75%N / 25%S Gen – MISO East scenario.

Figures showing the performance of each of the alternatives in the summer peak and shoulder seasons are provided below. **Figure 20** and **Figure 21** show that both MVP Project 3 alone and MVP Project 3 and Project 4 together outperform the upgraded 161 kV alternative in improving generation outlet capacity in Minnesota.

Figure 20. Incremental Transfer Capability of Transmission Options Minnesota Summer Shoulder

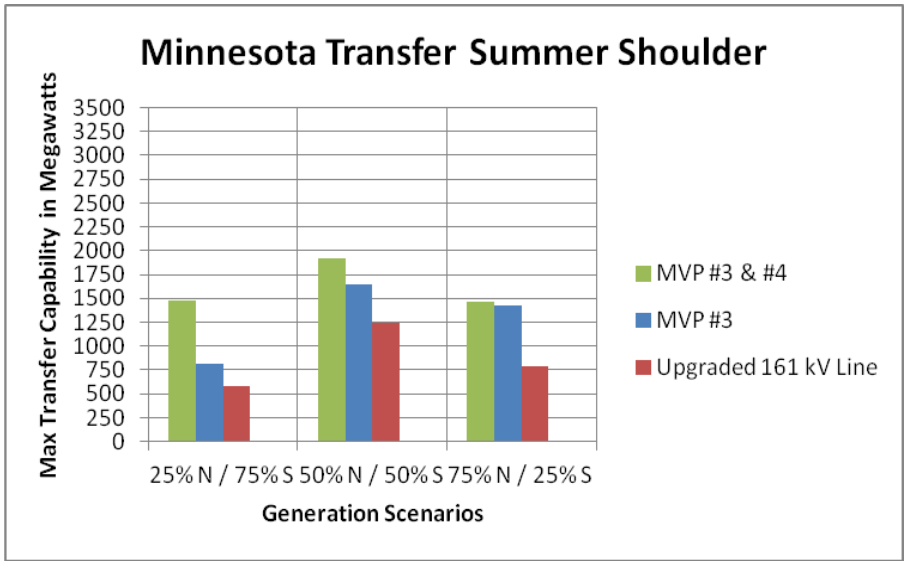


Figure 21. Incremental Transfer Capability of Transmission Options Minnesota Summer Peak

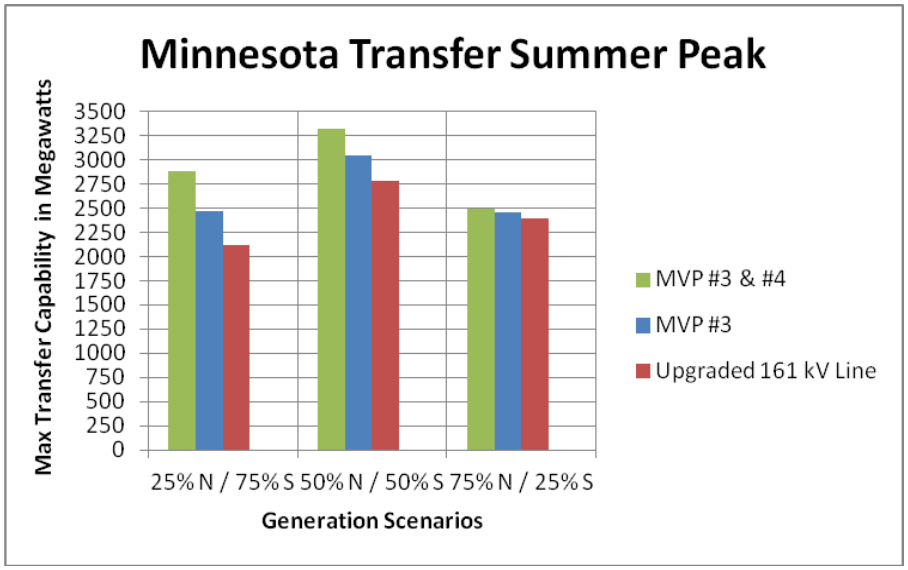


Figure 22 shows that neither MVP Project 3 nor an upgraded 161 kV line between Fox Lake – Rutland – Winnebago Junction significantly increase

generation outlet capacity to the eastern portion of the MISO footprint under two of the three generation scenarios during the high wind season. However, a significant increase in generation outlet capacity is achieved under all generation scenarios by a combination of MVP Projects 3 and 4.

Figure 22. Incremental Transfer Capability of Transmission Options MISO East Summer Shoulder

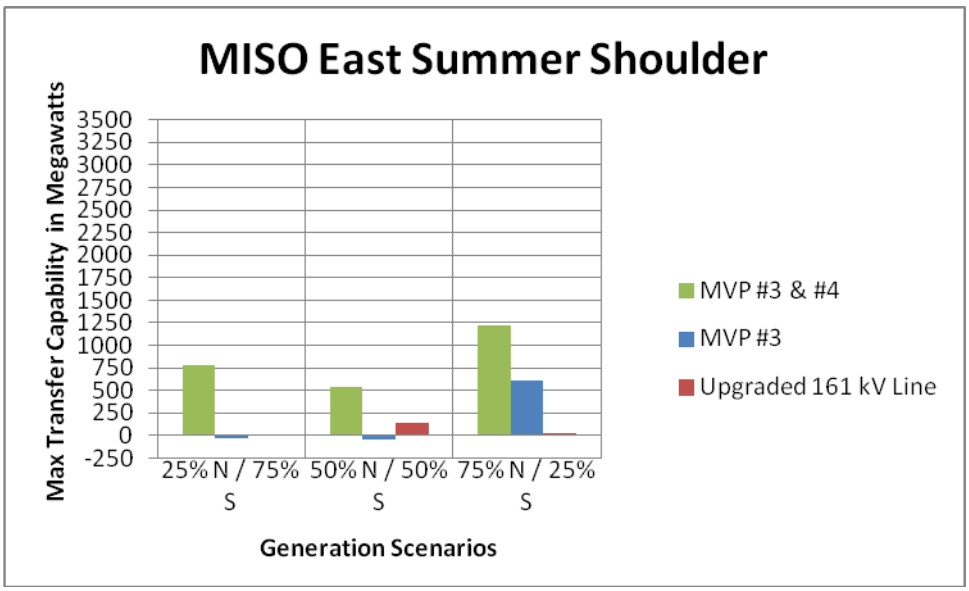
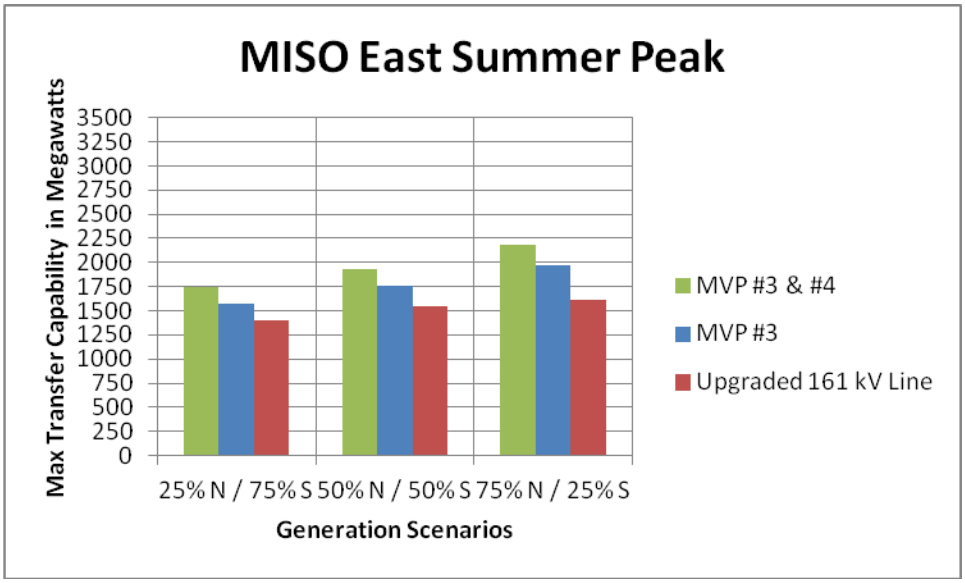


Figure 23 shows that while all three options significantly increase transfer capacity during summer peak, MVP Project 3 alone and in combination with MVP Project 4 again outperform an upgraded Fox Lake – Rutland – Winnebago Junction 161 kV line.

Figure 23. Incremental Transfer Capability of Transmission Options MISO East Summer Peak



5.2.7 Fox Lake-Rutland-Winnebago Junction 161 kV Constraint

All three alternatives relieved the Fox Lake – Rutland – Winnebago Junction 161 kV line constraint.[80]

5.2.8 Special Protection Schemes

ITC Midwest performed an analysis to determine whether the addition of MVP Project 3 would allow for the Fieldon Capacitor Bypass and Nobles County – Wilmarth SPSs to be retired. ITC Midwest developed a model that recreated the scenario, described above, for both the Fieldon Capacity Bypass and the Nobles County – Wilmarth SPSs that drove the need for the installation of the SPSs. MVP Project 3 was then added to the model and the scenario was again recreated. The results of the analysis indicate that the impact of MVP Project 3 on the transmission system would allow for the retirement of both SPSs.[81] In the end it will be MISO, however, that makes the final determination whether the SPSs can be retired once MVP Project 3 is in service.

5.2.9 Special Considerations

One important factor in wind generation development is the ultimate location of the generators. The wind zones and scenarios analyzed above capture, at a

[80] **Appendix J**, ITC Midwest Project Planning Study at Section 4.3.
[81] **Appendix J**, ITC Midwest Project Planning Study at Section 5.

system level, the different transfer capabilities that would be present under those scenarios. Further sensitivity analyses were undertaken to evaluate how the 161 kV Rebuild Alternative and MVP Project 3 alternatives would perform on a more micro level. Specifically, how would each alternative perform if generation were geographically concentrated near the existing 161 kV system. This scenario is particularly realistic in evaluating wind generation areas because existing wind generators seek to take advantage of the best wind resources which can be geographically limited. Existing wind generators also seek to take advantage of existing interconnection points by expanding their wind farms, creating additional demands on the interconnection facilities.

An analysis was performed to determine how much generation could be connected to the area transmission system before the capacity provided by the 161 kV Rebuild Alternative would be depleted. Using the Summer Peak base for the Fox Lake – Rutland – Winnebago Junction line,[82] the 161 kV Rebuild Alternative was monitored under contingency conditions while generation was increased in the surrounding area. The results showed that directly connecting 500 MW to the rebuilt line would consume all the capacity provided by the line's upgrade. The MVP Project 3 alone and in combination with MVP Project 4 is more efficient at supporting generation development in southwest Minnesota.

Another important consideration when evaluating the 161 kV Rebuild Alternative is its effect on overall regional reliability. MVP Project 3 establishes a new 345 kV connection between the Minnesota and Iowa 345 kV systems. The 345 kV voltage is the most efficient voltage in the region for moving large amount of energy long distances to load centers in the Twin Cities, Iowa metropolitan areas, and points east. This connection also provides system operators with flexibility in reliably operating the electrical grid by enabling more transfers between states when conditions warrant. While the 161 kV Rebuild Alternative could potentially resolve local overloading problems on the 161 kV system in southwest Minnesota, it provides little in the way of regional reliability benefits.

5.2.10 Energy Loss and Emissions Reduction

New transmission lines added to the electric system affect the resistive losses of the system. In turn, the costs for capacity and energy for the system are affected. If adding a new transmission line reduces losses, then the amount of energy generated to serve load is reduced. This not only reduces the costs ratepayers

[82] **Appendix J**, ITC Midwest Project Planning Study at Section 2.2.

incur for energy generation, but also reduces the emissions associated with the reduced generation.

The loss effects of MVP Project 3, MVP Project 3 and MVP Project 4, and the 161 kV Rebuild Alternative were analyzed.[83] The analysis showed that the loss reduction MVP Project 3 alone provides is more than double what the 161 kV Rebuild Alternative provides. The combination of MVPs Project 3 and Project 4 provides more than double the loss reduction of MVP Project 3 alone, and more than six times that of the 161 kV Rebuild Alternative. Based on this, MVP Project 3 and Project 4, together, would reduce emissions the most, followed by MVP Project 3. The 161 kV Rebuild Alternative would reduce emissions the least.

5.2.11 ITC Midwest Planning Study Conclusion

While MTEP11's analysis focused on MVP Projects 3 and 4 together, ITC Midwest's MVP Project 3 Planning Study confirms that construction of MVP Project 3 alone would address long-standing transmission needs in Minnesota. Specifically, MVP Project 3 would effectively relieve constraints on the existing 161 kV system. MVP Project 3 would also provide a critical addition to the 345 kV bulk transmission system serving Minnesota, Iowa and the region. ITC Midwest's planning study also confirms the conclusion in MTEP11 that the combination of MVP Project 3 and Project 4 as additions to the 345 kV bulk transmission system provides the most robust and efficient means of delivery for thousands of megawatts of new generation from the Buffalo Ridge to points in Minnesota and further south and east.

5.3 ECONOMIC ANALYSIS

To evaluate the economic impact of MVP Project 3, ITC Midwest engaged a consultant, the Analysis Group, to conduct a PROMOD analysis to estimate the impact of MVP Projects 3 and 4 on Minnesota LMPs.[84] The PROMOD model simulates the operation of the regional generation and transmission system, capturing the effect of transmission constraints on the ability to flow power from generator to load, and calculating the resulting LMPs at individual nodes within the system. The PROMOD market simulation model and data set employed in

[83] **Appendix J**, ITC Midwest Project Planning Study at Section 7.

[84] A copy of the Analysis Group's report, LMP Impacts of Proposed Minnesota-Iowa 345 kV Transmission Project ("LMP Analysis"), can be found in **Appendix M**.

the analysis were identical to those used by MISO in the MISO MVP Report assessing the 17 projects in the MVP Portfolio package.[85]

The PROMOD analysis used a "base case" in which all projects in the MVP Portfolio except MVP Projects 3 and 4 are in service, and computed the difference in LMPs between the base case and the "study case," in which all 17 MVP projects including Projects 3 and 4 are in service. The analysis was run for two future years, 2021 and 2026, using two scenarios: (i) Business As Usual-Low Demand, which assumes continuing "recession level" demand and energy growth; and (ii) Business As Usual-High Demand, assuming a return to pre-recession demand and energy growth levels.[86]

The study results show that when MVP Projects 3 and 4 are added to the transmission system, the average LMPs for Minnesota fall by $0.70 per MWh (2.4 percent) in 2021 and $0.71 per MWh (2.2 percent) in 2026 under the Business As Usual-Low Demand scenario. Under the Business As Usual-High Demand scenario, the LMP price reductions are similar: $0.61 per MWh (1.7 percent) in 2021, and $0.90 per MWh (2.0 percent) in 2026. These LMP changes result in annual reductions in wholesale energy payments for Minnesota load ranging from $48.3 million (2021 Business As Usual—High Demand) to $76.6 million (2026 Business As Usual-High Demand).[87]

LMP reductions from the implementation of MVP Projects 3 and 4 are also estimated to be widespread across the eight individual load-serving entities ("LSEs") in Minnesota included in the PROMOD analysis. Average LMPs decline for all eight LSEs in 2021, and for seven of the eight LSEs in 2026.[88]

ITC Midwest's economic evaluation based on wind curtailment estimates is on-going.

[85] **Appendix M**, LMP Analysis at 3.
[86] **Appendix M**, LMP Analysis at 3-4.
[87] **Appendix M**, LMP Analysis, Executive Summary.
[88] **Appendix M**, LMP Analysis, Executive Summary.

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6.0 ALTERNATIVES ANALYSIS

ITC Midwest evaluated multiple alternatives in determining that the Project is the best solution to meet the identified needs, including generation, a higher voltage line; a lower voltage 161 kV alternative; and three different eastern terminations for a Lakefield Junction 345 kV line: at Rutland Substation near Fairmont, Minnesota; at the Adams Substation, southeast of Austin, Minnesota; and at Mitchell County Substation northeast of Osage, Iowa. ITC Midwest also analyzed whether re-conductoring the existing 161 kV line between the Lakefield Junction and Winnebago Junction substations could address the needs in its engineering analysis detailed in **Chapter 5**. MISO also evaluated alternatives, specifically different 345 kV configurations, before selecting MVP Project 3 as the best alternative. As discussed below, none of the alternatives performed as well as the proposed Project.

6.1 GENERATION ALTERNATIVE

During the evaluation of alternatives to MVP Project 3, ITC Midwest considered the addition of generation resources instead of transmission facilities and concluded generation was not a reasonable alternative. Generation cannot eliminate a deficit of generation outlet capacity on a transmission system, which is the problem in southern Minnesota/northern Iowa. Any generation additions would require further transmission system build out. As a result, neither fossil fueled nor renewable generation would meet the identified need, regardless of whether it was distributed generation or C-BED.

6.2 SYSTEM CONFIGURATION ALTERNATIVES

6.2.1 Upgrading Existing Transmission Lines

The 161 kV Rebuild Alternative was evaluated in the ITC Midwest study and determined not to be a reasonable alternative, as detailed in **Chapter 5**. While it provided acceptable performance in alleviating or eliminating contingency violations, the 161 kV Rebuild Alternative was nevertheless less effective than MVP Project 3, or MVP Projects 3 and 4 combined. The MVP Project alternatives also outperformed the 161 kV Rebuild Alternative with respect to increasing the outlet capacity of the local transmission system. Finally, the 161 kV Rebuild Alternative is less robust than the other alternatives. It will reach its capacity limits sooner in the face of growing generation than will the 345 kV alternatives, and it cannot maximize the performance of already existing 345 kV transmission in the area as the 345 kV alternatives do.

6.2.2 Transmission With Different Voltages/Conductor Arrays

Transmission lines in this region are operated at 69 kV and above. The standard transmission voltages in this area under the Project's 345 kV voltage are 69 kV, 115 kV, 161 kV, and 230 kV. The standard transmission voltages over 345 kV are 500 kV and 765 kV. Both higher and lower voltage transmission lines were considered as alternatives to the Project.

For higher voltage lines, ITC Midwest considered 765 kV and 500 kV. Since there are no existing transmission lines operated at those voltages in southwest Minnesota or northern Iowa, any additions at either of these voltages would require significant substation upgrades and costs for interconnection. In addition, no conditions have been identified that warrant a higher voltage in the study area. Therefore voltages above 345 kV were eliminated from further analysis.

Lower voltage transmission lines (230 kV, 161 kV, 138 kV, 115 kV, or 69 kV) were also considered. The 230 kV and 138 kV voltages were eliminated because there are no existing transmission lines operated at 230 kV or 138 kV in the immediate area. As a result, use of these voltage would be non-standard and require significant substation upgrades and costs for interconnection. The lower voltages of 115 kV and 69 kV would not provide enough capacity to address the identified outlet and delivery needs for existing and future generation in Minnesota and the region. As noted in **Section 6.2.1** above, an upgraded Fox Lake — Rutland — Winnebago Junction 161 kV transmission line did not meet the identified needs as well as MVP Project 3 alone or MVP Projects 3 and 4 in combination.

6.2.3 Transmission With Different Terminals/Substations

Since the early 2000s, transmission owners, MISO, and other stakeholders have engaged in study efforts to determine how best to build out the transmission system to support RPS obligations. These studies include the MTEP03 Exploratory Studies, Minnesota's Wind Integration Study, UMTDI's Executive Committee Final Report, and MISO's RGOS, undertaken by MISO, the UMTDI, and OMS. *See* **Figure 9**. Alternative transmission projects have been identified in these and other studies to meet the transmission constraint and generation outlet needs that the Project will meet. These alternatives are discussed below.

Spencer - Hazelton and Lakefield Junction - Mitchell County 345 kV Lines

These lines were candidate MVPs coming out of MISO's RGOS process. They did not do as good a job as MVP Projects 3 and 4 in alleviating existing constraints on the Iowa 161 kV system, and increasing the transfer capability of the Iowa 345 kV system, as discussed in detail in **Section 5.1**. They were therefore dropped by MISO in favor of MVP Projects 3 and 4.

Lakefield Junction – Rutland 345 kV Line

This line was identified in MTEP09 as a transmission option that would mitigate the constraints on the Fox Lake – Rutland – Winnebago Junction 161 kV line.[89] While it is true that a Lakefield Junction – Rutland 345 kV line would help relieve constraints on the Fox Lake to Rutland section of the 161 kV line, it resulted in constraints elsewhere. Specifically, the termination of the 345 kV line at Rutland resulted in constraints farther east on the 161 kV system, increasing loading on the 161 kV line between Rutland and Winnebago Junction.

Lakefield Junction – Adams 345 kV Line

In the 2009, Minnesota transmission owners identified the Lakefield Junction — Adams 345 kV line as a project that would alleviate the transmission constraint on the 161 kV system in southern Minnesota.[90] This line would run along a path north of and parallel to the path of the Lakefield Junction – Mitchell County 345 kV line that was a candidate MVP coming out of the RGOS process. And the line's termination at Adams would interconnect it with the north-to-south Adams – Mitchell County -- Hazelton 345 kV line with which the Lakefield Junction – Mitchell County also connected. Thus, the Lakefield Junction – Adams 345 kV line has the same problems as the Mitchell County – Hazelton 345 kV line, namely, it will not mitigate the Lime Creek – Emery 161 kV line constraint, and will reduce the transfer capability of the Adams – Mitchell County – Hazelton 345 kV line.[91]

6.2.4 Double-Circuiting Existing Transmission/Upsizing

ITC Midwest analyzed the potential to co-locate portions of the Project on the same structures as existing electric facilities.

[89] MTEP09 at 182.
[90] 2009 Minnesota Biennial Transmission Report at 246
[91] See Section 5.1 of this Application, and **Appendix K** at 16, 18, 19.

With respect to double circuiting with existing lines, the Company evaluated the electrical system performance if the Project were constructed using common towers. Specifically, ITC Midwest evaluated performance under a common tower outage (NERC category C contingency). The analysis showed that the system could withstand the outage of both the 345 kV line and the 161 kV line. As a result, the Company proposed Route A, co-locating the Project with the Lakefield Junction to Border 161 kV line in its existing right-of-way and alignment for the majority of the route.

ITC Midwest also considered whether the Project should be designed to be capable of operation at a higher voltage, *i.e.*, 345 kV/345 kV or capable of carrying a second circuit if a greenfield route were selected, i.e. 345 kV/161 kV. ITC Midwest concluded that the characteristics of the existing system and costs favor a 345 kV/161 kV configuration over a 345 kV/345 kV configuration. The existing 161 kV facilities form the backbone of the transmission system in the study area, and provide the principal source for the underlying load serving 69 kV system across southern Minnesota and northern Iowa. Removing these 161 kV sources from the underlying 69 kV system would cause reliability and voltage issues affecting the majority of the load on the system. Further, to uprate the existing 161 kV system to 345 kV would require costly upgrades to many of the existing 161 kV facilities. As a result, it appears there will be a need for the existing 161 kV system for the foreseeable planning horizon. Future generation and transmission needs may also call for future expansion of the 161 kV system.

Moreover, while MVP #3 provides significant outlet capability for generation in the study area, future generation may develop beyond the capacity provided for by the Project. In that event, and even if a new 345 kV line were to be determined to be the best alternative to meet the increased outlet need, it would not be prudent to double-circuit the new 345 kV line with the Project because that would create a NERC Category C contingency (common tower 345 kV/345 kV). Because two 345 kV lines on a common tower poses the risk that a single incident results in the outage of both circuits, the system must be able to reliably withstand the outage of both circuits under contingency. Therefore the capacity of the system would be limited to the amount of capacity available in the event both circuits were out of service and would not create significant additional capacity.

As a result of this analysis, ITC Midwest has proposed as an alternative that the Project could be built double-circuit-capable if located in new right-of-way. *See* Route B in **Figure 2** (**Section 1.2**). If Route B were selected, the Project would be

placed on double-circuit 345/161 kV structures. The 345 kV side of the structures would be used for the Project, while the 161 kV side of the poles would be available for a new 161 kV line in the area when conditions warrant.

6.2.5 DC Lines

ITC Midwest does not have any DC lines in its system. An AC transmission system provides a high voltage backbone that is capable of gathering energy resources (including abundant renewable energy sources in the Buffalo Ridge area) from disparate and rural areas and transporting those resources to multiple load centers throughout the transmission system. In contrast, a DC transmission line's primary purpose is to deliver energy from a distant generation location (typically located several hundred miles away) to a load center without intermediate substation connections along its path. Without intermediate substations, DC lines cannot provide service reliability support to the many and various communities on a typical AC system. Nor can they facilitate the integration of renewable generation resources, which are developed in multiple locations and would interconnect at multiple points along the line.

A DC transmission line is also not an economically viable alternative here. Industry experience indicates that the total cost of a DC system becomes equal to an AC system at about 300 miles of untapped line length. This is primarily due to reduced energy losses on DC transmission. Depending on design constraints, there may also be a slight cost savings resulting from the need for only two conductors and the corresponding simplification of supporting structures. The advantages of long distance transmission capability and slightly lower line costs are countered by the increased expense of converting AC to DC or DC to AC at each end of the line as well as any intermediate substation. These conversion stations are costly, and historically the expense of conversion stations is only justifiable when power is transmitted over long, uninterrupted distances.

6.2.6 Underground Construction

The alternative of placing the proposed 345 kV transmission line underground was also considered, but ultimately rejected because of cost, construction, and maintenance considerations. Generally, overhead construction is the preferred configuration for transmission voltages of 115 kV or greater due to cost. Underground transmission lines also take longer to construct and more time to repair than equivalent overhead lines. In ITC Midwest's experience, underground transmission lines can cost anywhere from five to 10 times the cost of overhead lines of the same voltage.

This cost differential is based on the different design requirements for overhead and underground installations. Overhead transmission lines rely on the dielectric properties of air to provide insulation, thereby preventing the occurrence of short circuits. The properties of the air also efficiently dissipate heat away from the conductor surface.

When a transmission line is placed underground, the conductors must be adequately insulated from the ground and each other, and adequately cooled to prevent equipment failure. Thus, the conductors are wrapped with insulating materials and often placed inside oil filled pipes. The oil is circulated through cooling stations every few thousand feet along the line. Some electric cables have been designed with a specially-formulated plastic covering that does not require circulating oil to dissipate heat. However, the amount of current that can be applied to such conductors is limited.

Technologies for construction of underground lines include surface-cut open trenching, horizontal boring, and horizontal directional drilling. Trenching is usually the preferred method of underground construction because it is easily controlled and the most cost effective method for construction. Construction of a trench for the underground transmission line would result in greater temporary construction impacts than the proposed overhead line. Underground transmission construction as compared to overhead line construction increases noise, dust, traffic disruption, and requires more clearing and grading, and increases construction time.

Underground transmission lines present challenging service issues. They are subject to fewer outages because underground cables do not have temporary faults such as branches falling or ice breakage. When outages do occur, they are typically longer in duration because they are more difficult to isolate and require special expertise and equipment. As a result, the downtime associated with an underground transmission line fault will be longer in duration than the equivalent overhead line failure.

Because of the significantly greater expense associated with underground transmission, the use of underground technology is limited to locations where the impacts of overhead construction are unacceptable or where physical circumstances allow for no other option. Typical examples include congested downtown centers where there is no space available between city streets and adjacent buildings for adequate clearance, or airport approaches where an overhead transmission line cannot be constructed for safety reasons. No circumstance warrants underground construction based on ITC Midwest's

examination of the environmental and land use setting associated with the proposed Project.

6.3 NO-FACILITY ALTERNATIVE

In accordance with its data exemption request, ITC Midwest has provided a discussion of the congestion on its 161 kV system in southern Minnesota which affects the area's transmission system reliability, economic efficiency, and ability to provide needed outlet capacity for renewable generation. None of the problems associated with this congestion will be addressed if the Project is not built.

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7.0 CONSTRUCTION, RESTORATION, AND MAINTENANCE

SEQUENCE OF CONSTRUCTION OF NEW TRANSMISSION FACILITIES

Construction, after acquisition of property or rights-of-way, is anticipated to progress generally as follows: survey marking of the right-of-way, right-of-way clearing and preparation, grading or filling where necessary, installation of concrete foundations, installation of poles with insulators and hardware attached, conductor stringing, and installation of any markers required by state or federal permits on conductors. Right-of-way restoration will follow the completion of construction activities.

ENGINEERING DESIGN AND REGULATORY APPROVALS

Detailed transmission line and substation engineering design work generally begins after a route permit is obtained. The design of a transmission line is refined as more site-specific information is gathered for properties along the approved route. Throughout the design process, utilities work with landowners to design facilities to minimize impacts and ensure that all permit conditions are satisfied.

Plan and profile documents are prepared for each new high voltage transmission line and associated substation work. These plans provide a detailed descriptions of the facilities, including pole placement, and are submitted to the Commission and reviewed by the Department of Commerce staff before construction begins.

7.1 RIGHT-OF-WAY EVALUATION AND ACQUISITION

The right-of-way acquisition process for the transmission lines, associated facilities, and substations is discussed below.

7.1.1 Transmission Line

ITC Midwest plans to begin the transmission line right-of-way acquisition process early in the detailed design phase of the Project, which primarily occurs after a Route Permit has been issued by the Commission, although some right-of-way acquisition may begin earlier if circumstances allow. ITC Midwest typically acquires easements for transmission line right-of-way. The right-of-way evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and easement negotiation and purchase. Each of these activities is described in more detail below. Generally,

the existing right-of-way for the Lakefield to Border 161 kV line that would be followed by Route A measures 100 feet to 150 feet in width, with some variations. In the areas where the existing right-of-way can be used for the Project, ITC Midwest will seek permission to increase the width of the right-of-way through an easement.

Prior to contacting landowners, ITC Midwest will conduct a title search to identify all persons and entities that have a recorded interest in the affected real estate. A title company will be engaged to complete the public records search. A title report for each parcel will be prepared to document the legal description and the owners of record, and to report information regarding easements, liens, restrictions, encumbrances and other conditions of record.

After owners are identified, a right-of-way agent will contact each landowner or the landowner's representative. The right-of-way agent will describe how the Project may affect the landowner's property. At this time, the right-of-way agent will ask the landowner for information about any specific concerns related to construction of the Project on the landowner's property.

The right-of-way agent will also request the landowner's permission for survey crews to enter the property to conduct any necessary preliminary surveys and examinations. Surveys are conducted to establish right-of-way corridors, natural and manmade features, and associated elevations, which are used during detailed engineering of the transmission line. Soil borings may be taken by an independent geotechnical testing company to assess soil conditions and determine appropriate foundation design. During or before initial contact with a landowner after a Route Permit has been issued by the Commission, ITC Midwest will provide landowners with a copy of the Route Permit and any other materials the Commission determines are necessary.

The right-of-way agent will discuss with the landowner where the structure(s) will be located on the property, as well as the boundaries of the easement area. If requested by the landowner, ITC Midwest will stake the proposed transmission line's location (i.e., the survey crew will identify the proposed boundary of the easement and the approximate location of the structure or pole on the ground with a surveyor's stake).

The right-of-way agent will collect area land value data to determine the amount of just compensation to be paid for the rights to build, operate, and maintain the transmission facilities within the easement area and reasonable access to the

easement area. The agent will provide the landowner with a map of the transmission line route across the landowner's parcel and will negotiate with the landowner regarding compensation for the transmission line easement. An appraisal may be obtained to resolve any complicated valuation issues. The landowner will be allowed a reasonable amount of time to consider the offer and to present any information that the owner believes is relevant to determining the property's value.

ITC Midwest is committed to working with the landowners to address their concerns. In most cases, an agreement can be reached to purchase the land rights. The right-of-way agent will prepare the documents required to complete each transaction, which may include an easement, a purchase agreement, and subordination agreements.

If a negotiated settlement cannot be reached, ITC Midwest will acquire real property rights through exercise of the power of eminent domain pursuant to Minnesota Statutes Chapter 117, including the "quick-take" process set forth in Minnesota Statutes, Section 117.042. The process of exercising the power of eminent domain is called condemnation.

In the event of condemnation, ITC Midwest will provide the landowner with a copy of each appraisal it has obtained for the property interests to be acquired. To initiate the condemnation process, ITC Midwest files a petition in the district court in the county where the property is located. If the court approves the petition, the court appoints a three-person condemnation "commission." The three people appointed must be knowledgeable of applicable real estate values. Once appointed, the commissioners schedule a viewing of each parcel identified in the petition. Next, the commissioners schedule a valuation hearing, where the utility and landowners present testimony and evidence regarding the just compensation for acquisition of the easement. The commission then makes an award of just compensation and files it with the court. Each party has 40 days from the filing of the award to appeal to district court for a de novo jury trial. In the event of an appeal, the jury would hear land value evidence and render a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

Once right-of-way is acquired and prior to construction, the right-of-way agent will contact each owner to discuss the construction schedule and requirements. To ensure safe construction, special consideration may be needed for fences, crops, or livestock. For instance, fences or livestock may need to be moved, or

temporary or permanent gates may need to be installed. In each case, the right-of-way agent would coordinate with the landowner, who would be compensated for Project-related construction damages, including crop losses.

7.1.2 Substations

When acquiring property for new substations or substation expansions, ITC Midwest typically follows the same general steps outlined above. The exception is that ITC Midwest acquires a fee interest, rather than an easement, in the land required for substations. ITC Midwest will generally seek to acquire a parcel of sufficient size to construct the fenced area of the substation and to provide a buffer between the substation and neighboring properties.

As the regulatory review process proceeds, ITC Midwest's representatives will consult with the owners of each proposed substation site to discuss the Project in detail and to obtain permission to access the site to conduct any surveys and soil borings required to finalize the substation's design. During the acquisition phase, landowners will be advised of construction schedules, needed access to the site, and required vegetation clearing. Where possible, ITC Midwest will negotiate and obtain necessary property rights through voluntary sale. If a voluntary sale agreement cannot be reached, ITC Midwest would acquire the substation parcel through condemnation.

ITC Midwest purchased 40 acres of property at the site proposed for its Huntley Substation in December 2012. At the time of the purchase, the selling landowner was aware of ITC Midwest's plans to use the site for the Huntley Substation if the Commission approves its proposal. Although ITC Midwest has purchased this site and believes that it is the most reasonable site for the Project to address all system needs, ITC Midwest understands that the Commission may identify a different site that it believes is more appropriate for the Huntley Substation. If the Commission grants a Route Permit that approves the 40-acre parcel owned by ITC Midwest for the Huntley Substation, the only additional fee interest ITC Midwest will need to obtain for the Project for a substation site in Minnesota will be for the expansion of the Lakefield Junction Substation. At this location, ITC Midwest will need to acquire at least three acres for the proposed expansion.

7.2 TRANSMISSION LINE CONSTRUCTION

Project construction will not begin until all necessary federal, State, and local approvals are obtained, property and rights-of-way are acquired, soil conditions

are established, and final design is completed. Construction in areas where State, federal, or local approvals are not needed or have already been obtained may proceed while approvals for other areas of the Project, right-of-way acquisition, surveys, or design are still pending or in process. Precise timing and phasing of right-of-way clearing and construction will be dependent on permit conditions, system loading issues, when existing transmission lines can be taken out of service for construction to proceed, and workforce availability.

Construction, after acquisition of property or rights-of-way, is anticipated to progress generally as follows: survey marking of the right-of-way, right-of-way clearing and preparation, grading or filling where necessary, installation of concrete foundations, installation of poles with insulators and hardware attached, conductor stringing, and installation of any markers required by state or federal permits on conductors. Construction will follow ITC Midwest's standard construction and mitigation best practices developed from past project construction experience. ITC Midwest has developed best practices to address right-of-way clearing, staging, erecting transmission line structures, and stringing transmission lines. Construction and mitigation practices will also be developed specific to the Project based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain, and other practices. For construction across agricultural lands, ITC Midwest is also in the process of developing an Agriculture Impact Mitigation Plan ("AIMP") that will be reviewed with the Minnesota Department of Agriculture to minimize impacts to these lands. ITC Midwest will also take advantage of weather conditions (e.g. frozen ground in wet areas for construction, etc.) when feasible to minimize impacts to lands.

ITC Midwest intends to design the transmission line structures for installations at the existing grades. As a standard design parameter, ITC Midwest will not generally grade or level structure sites with a slope of 10 percent or less. Where a site slope exceeds 10 percent, working areas will be graded or leveled with fill. If acceptable to the landowner, ITC Midwest proposes to leave the graded/leveled areas after construction for future maintenance activities. If not acceptable to the landowner, ITC Midwest will, to the best of its ability, return the grade of the site back to its original condition. Based on initial review, grades exceeding 10 percent are not anticipated as part of the Project.

ITC Midwest anticipates that construction of the Project will require the use of many different types of construction equipment including, tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted

drill rigs, dump trucks, front-end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, and various trailers or other hauling equipment. Excavation equipment is often set on wheel or track-driven vehicles. Construction crews will attempt to use equipment, when opportunities are available, that minimizes impacts to lands. Poles will be transported on tractor-trailers to staging areas or construction sites.

Staging areas will be required for the Project. Staging areas will be identified after a route is selected and are typically set up at intervals of approximately 25 miles along the route. These staging areas will be used as receiving locations for the delivery and storage of construction materials and equipment for the Project. For staging areas outside the transmission line right-of-way or not located on property owned by ITC Midwest, rights to use these areas will be obtained from affected landowners through individual agreements.

After a Route Permit is granted by the Commission, ITC Midwest will evaluate construction access opportunities by identifying existing transmission line rights-of-way, roads, or trails that run parallel or perpendicular to the transmission line. Where feasible, ITC Midwest intends to traverse the right-of-way acquired for the Project to access construction areas. This method of access will minimize impacts to landowners and adjacent properties. In some situations, private field roads, trails, or fields must be used to gain access to areas for construction. Additionally, where no current access is available or existing access is inadequate to cross roadway ditches or other features, new access roads may be constructed. Permission from landowners will be obtained prior to using any of these areas to access the right-of-way for construction. Where necessary to accommodate heavy construction equipment, including cranes, cement trucks, and hole-drilling equipment, existing roads may be upgraded or new roads may be constructed. If new roads must be constructed, in addition to permission from landowners, ITC Midwest will also obtain permissions necessary from the local road authority. During construction activities, ITC Midwest will work with appropriate road authorities to ensure proper maintenance of roadways traversed by construction equipment.

After right-of-way clearing and grading or filling, where necessary, has been completed, pole installation will begin. Most structures for the Project will have concrete foundations. To install a foundation, a hole is drilled that measures approximately eight feet in diameter for a 345 kV transmission structure and 25 or more feet deep. An angle or deadend structure may require a foundation up to 12 feet in diameter. A foundation for a 161 kV transmission structure typically

measures eight to ten feet in diameter. The diameter and depth of the hole (and foundation) depend on soil conditions that are established during the initial survey and soil testing phases. Concrete is brought to the site by concrete trucks from a local concrete batch plant and filled around a steel rebar support cage. Once the foundation is set, installation of the actual pole can begin.

Poles will be moved from staging areas and delivered to the foundation. Insulators and other hardware are attached while the pole is still on the ground at the installation location. Using a crane, the pole is lifted, placed, and secured to the set concrete foundation. Some 161 kV poles may be directly embedded into the ground instead of set on concrete foundations for the Project. Direct embedding requires drilling a hole that measures approximately six to eight feet in diameter and 15 to 20 feet in depth, with some soil conditions requiring a deeper drilled hole.

Some soil conditions will require that construction mats be placed along the right-of-way or at a pole location to minimize soil disturbances. These mats can also be used to provide access across sensitive areas to minimize impacts including soil compaction, rutting, or damage to plant species.

Once the pole has been set, any remaining holes are back-filled with the excavated material or crushed rock. ITC Midwest prefers to spread any remaining excavated material in the area from which it was removed if landowner permission is obtained. If spreading of the excavated material is not permitted by the landowner, the material will be offered to the landowner for other use or completely removed from the site.

Conductor stringing is the last major component of transmission line construction. Stringing setup areas within the right-of-way or on temporary construction easements outside the right-of-way are established. Conductor stringing setup areas are typically located at two-mile intervals along a route. These operations require brief access to each structure to secure the conductor wire to the insulator hardware and the shield wire to clamps once final conductor sag, compliant with ITC Midwest procedures and NESC minimum clearances, is established. Where the transmission line crosses streets, roads, highways, or other energized conductors or obstructions, temporary guard or clearance poles may be installed during conductor stringing. These guard or clearance poles would not be installed in road rights-of-way without road authority approval. The temporary guard or clearance poles ensure that conductors will not obstruct traffic or contact existing energized conductors or

other cables during stringing operations and also protect the conductors from damage. ITC Midwest intends to use compression splices for the conductor installation.

Special construction techniques may be necessary in environmentally sensitive and wetland areas. The most effective way to minimize impacts to these areas during construction is to span them where feasible. ITC Midwest will restrict construction traffic from waterways except under special circumstances and only after discussion with, and approval from, the appropriate resource agency. Where waterways must be crossed during conductor stringing, workers may walk across, use boats, or drive equipment across ice in the winter or use helicopters to facilitate installation of stringing equipment. ITC Midwest will attempt to complete construction and conductor stringing operations in these areas when the ground is frozen. When completing these activities under frozen conditions is not feasible, the methods discussed above and use of construction matting, where practicable, will be implemented.

Equipment fueling and other maintenance will occur away from environmentally sensitive and wet areas. These construction practices help prevent soil erosion and ensure that fuel and lubricants do not enter waterways or impact environmentally sensitive areas.

7.3 SUBSTATION CONSTRUCTION

The Project will require construction of the new Huntley Substation and expansion of the Lakefield Junction Substation. Construction of a substation facility begins with site preparation work, which involves grading and leveling the site to support electrical equipment and the control house. Site soils may or may not need to be replaced, depending largely on the existing soil conditions. As with transmission line construction, a construction plan will be developed and followed for substation projects. The construction plan would address the site preparation work that precedes substation construction. Much of what is referenced in the plan is a result of requirements for stormwater pollution prevention plans by the state in which the facility is being constructed.

Once substation grading has been completed, concrete foundations are then placed throughout the substation for pad-mounted substation equipment. Substation perimeter fencing (*i.e.*, chain link fence) will then be installed, likely after initial installation of concrete foundations. All substation equipment will be contained within the fenced area. Construction of the substation control house

also takes place during this time. The control house encloses protective relaying and control equipment. Erection of steel structures follows the installation of foundations. These steel structures consist of rolled or tubular steel columns. Beams are used for mounting the electrical conductors and disconnect switches. Large high voltage equipment such as circuit breakers and transformers are installed following completion of the steel structures.

7.4 RESTORATION PROCEDURES

Crews will attempt to minimize ground disturbance whenever feasible during right-of-way clearing for, and construction of, the Project. Although these attempts will be made, areas will be disturbed during the normal course of work. Once construction is completed in an area, disturbed areas will be restored to their original condition to the maximum extent feasible. Temporary restoration in some areas may be required per National Pollution Discharge Elimination System ("NPDES") and Minnesota Pollution Control Agency ("MPCA") construction permit requirements.

After construction activities have been completed, a representative of ITC Midwest will contact a property owner to discuss any damage that has occurred as a result of the Project. This contact may not occur until after ITC Midwest has started restoration activities. If, during the course of construction of the Project, crops, fences, or drain tile have been damaged, ITC Midwest will repair damages or reimburse the landowner to repair the damages.

Ground-level vegetation disturbed or removed during construction of the Project will naturally reestablish to pre-construction conditions. Areas where significant soil compaction or other disturbance from construction activities occur will require additional assistance to reestablish the vegetation stratum and control soil erosion. Various best management practices to be used during the construction of the Project will be identified in the Stormwater Pollution Prevention Plan ("SWPPP") that will be prepared when ITC Midwest applies for an NPDES permit from the Minnesota Pollution Control Agency, but some commonly-used methods to control soil erosion are:

- Erosion control blankets with embedded seeds;
- Silt fences; and
- Straw bales.

Another aspect of restoration after completion of construction relates to the roads used to access staging areas or construction sites. After construction activities have been completed, ITC Midwest will ensure that township, city, and county roads used for purposes of access during construction will be returned to either the condition they were in, or to better condition than they were in before right-of-way clearing began. ITC Midwest will meet with township road supervisors, city road personnel, or county highway departments to address any issues that arise during construction with roadways to ensure the roads are adequately restored, if necessary, after construction is complete.

7.5 SOCIO-ECONOMIC IMPACTS OF CONSTRUCTION

The primary purpose of the Project is to maintain the reliability of electric service throughout the State and region, which will have overall positive impacts on the economy. Increasing transmission capacity in southwestern Minnesota and the rest of the State will provide long-term economic opportunities for further renewable energy development.

There also will be short-term impacts to community services as a result of construction activity and an influx of contractor employees during construction of the various projects. Utility personnel or contractors will be used for all construction activities. The communities near the various projects should experience short-term positive economic impacts through the use of area hotels, restaurants and other services by the various workers.

ITC Midwest employees, consultants and contractors will design, construct and maintain the proposed facilities. All workers will either be employees of the ITC Midwest or contract employees. Contractors may hire local workers on a temporary basis. It is estimated that 100 to 125 workers will be employed to construct the Project in Minnesota. These workers would be spread across the various worksites for the Project.

It is not expected that additional permanent jobs will be created. The construction activities will provide a seasonal influx of additional dollars into the communities during the construction phase, and materials such as concrete may be purchased from local vendors where feasible.

Long-term beneficial impacts from the proposed Project include increased local tax base resulting from the incremental increase in revenues from utility

property taxes. Additional wind generation, enabled by the Project, will pay production taxes.

7.6 MAINTENANCE PROCEDURES

ITC Midwest and other utilities design transmission lines and substations to operate for decades while requiring minimal maintenance, particularly in the first few years of operation. Substantial work on an existing transmission line is typically only required after it has been exposed to the elements for a long period of time (55-plus years) or after a storm event has caused damage to the transmission line.

ITC Midwest estimates the service life of its transmission lines at approximately 55-60 years. Practically speaking, however, high voltage transmission lines are seldom retired. This infrastructure has very few mechanical elements and is designed and constructed to withstand weather extremes typical for the region. With the exception of severe weather, transmission lines rarely fail. Protective relaying equipment will automatically take these facilities out of service when a fault is sensed on the system, and these interruptions are usually only momentary. Outages necessary for scheduled maintenance are also infrequent. Because of these general operational characteristics, the average annual availability of transmission infrastructure is in excess of 99 percent.

Costs associated with the operation and maintenance of transmission facilities include the cost of inspections, usually done semi-annually by helicopter with a forester, vegetation planner, and line inspector; annually by ground with a forester; and once every four years by ground with a line inspector. Recent experience has shown that annual operation and maintenance costs for 345 kV transmission lines in the ITC Midwest system are approximately $2,000 per mile, including vegetation removal and maintenance, the previously-mentioned helicopter and ground patrols, and line and tower maintenance activities. The actual cost of transmission line maintenance depends on the setting, the amount of vegetation management necessary to ensure and maintain required safety clearances, the frequency of storm damage, structure types and materials, and the overall age of the transmission infrastructure.

Certain maintenance is required at substations to ensure proper operation within NESC and NERC requirements. Various equipment, including transformers, circuit breakers, batteries, and protective relays, must be periodically serviced according to the manufacturers' guidelines. Circuit breakers proposed to be

installed as part of the Project will contain sulfur hexafluoride ("SF_6"), a greenhouse gas, as an insulator. Newer circuit breakers contain less SF_6 at lower pressures than older designs and do not sustain the releases associated with older circuit breakers. ITC Midwest intends to install dead-tank Mitsubishi Electric Power Products circuit breakers at the Lakefield Junction and Huntley substations.

8.0 OPERATING CHARACTERISTICS OF ELECTRIC TRANSMISSION LINES

8.1 OPERATING CHARACTERISTICS OVERVIEW

Overhead transmission line components typically include: (1) an above ground structure, often referred to as a pole or tower; (2) the wires carrying the electricity, called conductors; (3) insulators that connect the conductors to the structures and provide structural support and electrical insulation; (4) ground rods located below ground and connected to each structure; and (5) grounded shield wires to protect the line from direct lightening strikes. Transmission poles are generally made of either steel or wood. Overhead conductors are typically comprised of aluminum and steel strands.

During operation, transmission lines are for the most part passive elements of the environment. Their primary impact is aesthetic, i.e., a man made structure in the landscape. Because of the line's electrical characteristics, some chemical reactions occur around conductors in the air; noise can occur in some circumstances; interference with electromagnetic signals can occur; and electrical and magnetic fields are created around the conductors. All of these operating characteristics are considered as part of the design of a transmission line to prevent any significant impacts to its operation and, generally, to the overall environment.

8.2 OZONE AND NITROGEN OXIDE EMISSIONS

Corona consists of the breakdown or ionization of air within a few centimeters of conductors. Usually some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone also forms in the lower atmosphere from lightning discharges, and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight, and inversely proportional to humidity. Thus humidity or moisture, the same factor that increases corona discharges from transmission lines, inhibit the production of ozone. Ozone is a very reactive form of oxygen molecules and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived.

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen ("NOx"). The

national ambient air quality standards for ozone are 0.075 parts per million "ppm" on an eight hour averaging period. The state standard is 0.08 ppm based upon the fourth highest eight hour daily maximum average in one year. A small amount of ozone, however, is created due to corona from the operation of transmission lines (EPRI Transmission Line Reference Book 1982). The production rate of ozone depends on a number of operational parameters. The production rate of ozone due to corona discharges decreases with humidity and less significantly with temperature. The production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. The production rate of ozone increases with applied voltage. Rain causes an increase in ozone production, but rain also accelerates the decay of ozone. Ozone production by high voltage transmission lines is not detectable during fair weather conditions. Ozone production under wet-weather conditions is detectable with special efforts, but is still considered insignificant. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility. The emission of ozone from the operation of transmission lines of the voltages proposed for the Project is not anticipated to have a significant impact on the environment.

There is not a state or national standard for general NOx. The national standard for nitrogen dioxide ("NO_2"), one of several oxides of nitrogen, is 0.053 ppm on an annual basis and the Minnesota State Air Quality Standard for NO_2 is 0.08 ppm. The operation of the proposed transmission lines would not create any potential for the concentration of these pollutants to exceed the nearby (ambient) air standards.

8.3 NOISE

Transmission Line Noise

Transmission conductors produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. Generally, activity-related noise levels during the operation and maintenance of substations and transmission lines is minimal.

Noise emission from a transmission line occurs during certain weather conditions. In foggy, damp, or rainy weather, power lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain, the background noise level of the rain is usually greater than

the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, transmission lines will produce audible noise equal to approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible. At substations, noise is created primarily by transformers.

Since human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more "weight" in most measurement schemes. The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in "dBA," which is the A-weighted sound level recorded in units of decibels. A noise level change of 3 dBA is barely perceptible to human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise level is perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. **Table 4** below shows noise levels associated with common, everyday sources.

Table 4. Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Outdoor Environment	Indoor Environment
140	Deafening	Jet aircraft at 75 feet	
130	Threshold of pain	Jet aircraft during takeoff at 300 feet	
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet	
90		Noisy urban street	Full symphony or band, food blender
80	Moderately loud	Diesel truck (40 mph) at 50 feet	Garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 feet	General office
50	Quiet		Private office
40		Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20		Rustling leaves	Whisper
10	Just audible		Human breathing

Source: Adapted from Egan 1988 and Ramsey and Sleeper 1994

In Minnesota, statistical sound levels ("L Level Descriptors") are used to evaluate noise levels and identify noise impacts. The standards are expressed as a range of permissible dBA within a one hour period; L_{50} is the dBA that may be exceeded 50 percent of the time within an hour (i.e., 30 minutes), while L_{10} is the dBA that may be exceeded 10 percent of the time within the hour (i.e., 6 minutes).

Land areas, such as picnic areas, churches, or commercial spaces, are assigned to an activity category based on the type of activities or use occurring in the area. Activity categories are then categorized based on their sensitivity to traffic noise. The Noise Area Classification ("NAC") is listed in the MPCA noise regulations to distinguish the categories. **Table 5** identifies the MPCA established daytime and nighttime noise standards by NAC

Table 5. Noise Standards by Noise Area Classification (dBA)

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

Source: Minn. R. 7830.0050

The proposed Project is anticipated to have maximum calculated noise levels during rainy conditions. It is likely however, the sound of falling rain would result in inaudible noise from the Project. Noise during fair conditions is anticipated to be inaudible. Calculated noise levels are summarized in **Table 6**.

Table 6. Calculated Audible Noise for Proposed Transmission Line Designs

Operating Voltage	L_{50} Rain (dBA)		L_{50} Fair (dBA)	
	0′	100′	0′	100′
345 kV/161 kV	41	38	16	13
345 kV/161 kV Low Profile	43	39	18	14
345 kV/69 kV	41	38	16	12
345 kV	40	37	16	12
161 kV/161 kV	30	23	5	0
161 kV/69 kV	33	27	8	2
161 kV	24	17	1	0

Transformer Substation Noise

Transformer "hum" is the dominant noise source at substations. All of the substation modifications required for the Project will comply with the MPCA NAC noise standards.

8.4 RADIO, TELEVISION, CELLULAR PHONE, AND GPS

Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. Minor interference with AM radio may occur immediately under or adjacent to a transmission line. Any interference would be expected to cease outside the 200-foot right-of-way. Care was taken during the routing process to ensure that transmission lines would be placed an adequate distance away from any towers associated with these facilities to avoid any safety or quality problems that could be a concern.

ITC Midwest does not anticipate that the Project will impact radio, television, cellular phones, or GPS units.

8.5 SAFETY

The Project will be designed in compliance with local, state, and NESC standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

The proposed transmission lines will be equipped with protective devices to safeguard the public from the transmission lines if an accident occurs, such as a structure or conductor falling to the ground. The protective devices include breakers and relays located where the line connects to the substation(s). The protective equipment will de-energize the line should such an event occur. Proper signage will be posted on substations warning the public of the risk of coming into contact with the energized equipment.

8.6 ELECTRIC AND MAGNETIC FIELDS

The term electromagnetic fields ("EMF") refer to electric and magnetic fields that are coupled together, such as in high frequency radiating fields. For lower frequencies associated with power lines (referred to as "extremely low frequencies" or "ELF"), EMF should be separated into electric fields ("EFs"), measured in kilovolts per meter ("kV/m"), and magnetic fields ("MFs"), measured in milliGauss ("mG"). EFs are dependent on the voltage of a transmission line and MFs are dependent on the current carried by a transmission line. The intensity of an EF is proportional to the voltage of the line, and the intensity of an MF is proportional to the current flow through the

conductors. Transmission lines in the United States operate at a power frequency of 60 hertz (cycles per second).

8.6.1 Electric Fields

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, ORDER GRANTING ROUTE PERMIT (*adopting* ALJ Findings Of Fact, Conclusions and Recommendation at Finding 194 (Apr. 22, 2010 and as amended Apr. 30, 2010)) (Sept. 14, 2010). The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kilovolt or greater. The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater. The maximum electric field, measured at one meter above ground, associated with the Project is calculated to be 4.71 kV/m. Calculated EFs for the various structure types proposed for the Project are provided in **Table 7**.

Table 7. Calculated Electric Fields (kV/m) (3.28 feet above ground)

Structure Type	Maximum Conductor Voltage	Distance to Proposed Centerline												
		-300′	-200′	-100′	-75′	-50′	-25′	0′	25′	50′	75′	100′	200′	300′
Single Pole Davit Arm 345 kV/ 161 kV	362.25 kV/ 169.05 kV	0.05	0.10	0.30	0.57	1.67	4.45	3.33	0.74	0.37	0.21	0.12	0.03	0.02
Single Pole Davit Arm 345 kV/ 161 kV at Initial 345 kV/69 kV Operation	362.25 kV/ 72.45 kV	0.05	0.11	0.31	0.57	1.72	4.64	3.86	1.00	0.14	0.09	0.09	0.06	0.03
Single Pole Davit Arm 345 kV/161 kV with only one 345 kV circuit in service	362.25 kV	0.08	0.15	0.31	0.53	1.70	4.71	4.12	1.28	0.25	0.21	0.24	0.13	0.07
Single Pole Davit Arm Low Profile 345 kV/161 kV	362.25 kV/ 169.05 kV	0.03	0.09	0.83	2.00	4.36	3.55	2.46	0.27	0.92	0.51	0.21	0.03	0.02
Single Pole Davit Arm Low Profile 345 kV/161 kV with only 345 kV circuit	362.25 kV	0.05	0.11	0.82	1.97	4.34	3.66	3.32	1.68	0.89	0.57	0.39	0.13	0.06
Single Pole Braced Post 161 kV/ 161 kV	169.05 kV/ 169.05 kV	0.00	0.01	0.03	0.02	0.12	0.96	1.38	0.96	0.12	0.02	0.03	0.01	0.00
Single Pole Braced Post 161 kV/161 kV with 161 kV/69k V Initial Operation	169.05 kV 72.45 kV	0.01	0.02	0.06	0.05	0.12	1.14	1.61	0.20	0.05	0.03	0.02	0.01	0.01
Single Pole Braced Post 161 kV	169.05 kV	0.01	0.03	0.12	0.22	0.45	0.92	1.96	1.35	0.37	0.19	0.12	0.03	0.01

8.6.2 Magnetic Fields

There are presently no Minnesota regulations pertaining to MF exposure. ITC Midwest provides information to the public and employees so they can make informed decisions about MFs.

The maximum MF profiles around the transmission lines for each structure and initial operation being considered for the Project is shown in **Table 8**. MFs were calculated under normal system conditions (system intact) for the expected peak and average current flows. The peak MF values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the MF at the edge of the right-of-way. The MF profile data show that MF levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source).

Table 8. Estimated 2017 Magnetic Fields (mG)

Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline (feet)												
			-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Davit Arm 345 kV/161 kV	Peak	215/29	0.8	1.7	5.9	9.2	15.3	23.3	21.3	12.5	7.1	4.4	3.0	1.1	0.6
	Average	144/19	0.5	1.1	4.0	6.2	10.2	15.6	14.3	8.4	4.7	3.0	2.0	0.7	0.4
Single Pole Davit Arm 345 kV/161 kV at Initial 345 kV/69 kV Operation	Peak	215/75	0.6	1.4	5.2	8.3	14.0	22.0	20.6	11.9	6.1	3.4	2.2	0.7	0.4
	Average	144/50	0.4	0.9	3.5	5.6	9.4	14.7	13.8	8.0	4.1	2.3	1.5	0.5	0.3
Single Pole Davit Arm 345 kV/161 kV with only one 345 kV circuit	Peak	215	0.8	1.8	6.3	9.8	16.1	24.2	22.0	13.6	8.3	5.4	3.7	1.3	0.6
	Average	144	0.6	1.2	4.2	6.6	10.8	16.2	14.7	9.1	5.6	3.6	2.5	0.9	0.4
Single Pole Davit Arm Low Profile 345 kV/161 kV	Peak	215/29	0.9	1.8	7.0	12.0	21.8	28.6	21.2	10.6	5.0	3.2	2.3	0.7	0.4
	Average	144/19	0.6	1.2	4.7	8.1	14.6	19.2	14.2	7.1	3.4	2.2	1.5	0.5	0.2
Single Pole Davit Arm Low Profile 345 kV/161 kV with only 345 kV circuit	Peak	215	0.9	1.9	7.3	12.5	22.6	29.8	22.3	12.5	7.1	4.3	2.8	0.9	0.4
	Average	144	0.6	1.3	4.9	8.4	15.1	19.9	14.9	8.4	4.7	2.9	1.9	0.6	0.3
Single Pole Braced Post 161 kV/161 kV	Peak	55/68	0.0	0.1	0.2	0.4	0.9	3.3	8.2	4.9	1.9	0.9	0.5	0.1	0.1
	Average	37/46	0.0	0.0	0.1	0.2	0.6	2.2	5.5	3.3	1.3	0.6	0.3	0.1	0.0
Single Pole Braced Post 161 kV/161 kV with 161 kV/69 kV Initial Operation	Peak	55/191	0.3	0.5	1.6	2.4	4.1	9.3	24.2	18.3	8.2	4.2	2.5	0.6	0.3
	Average	37/128	0.2	0.3	1.0	1.6	2.8	6.2	16.2	12.3	5.5	2.8	1.6	0.4	0.2
Single Pole Braced Post 161 kV	Peak	94	0.2	0.4	1.2	2.0	3.7	7.9	14.6	9.6	4.2	2.2	1.3	0.3	0.1
	Average	63	0.1	0.2	0.8	1.3	2.5	5.3	9.8	6.4	2.8	1.4	0.9	0.2	0.1

The actual MF when the Project is placed in service will likely typically less than that illustrated in the table provided herein, and for certain segments of the Project, the calculated values are less than what is shown in the table. This is because the charts represent the MF with current flow at expected normal peak based on projected regional load growth through 2017, when the last segment of the Project is anticipated to be placed in service. Actual current flow on the line will vary, so magnetic fields will be less than peak levels during most hours of the year.

Extensive research has been conducted over the past three decades to evaluate whether exposure to ELF-MFs causes biological responses and health effects. Epidemiological and toxicological studies have not shown statistically significant associations or have shown only weak associations between ELF-MF exposure and health risks. Public health professionals have also investigated the possible impact of exposure to EFs and MFs upon human health for the past several decades. While the general consensus is that EFs pose no risk to humans, the question of whether exposure to MFs can cause biological responses or health effects continues to be debated.

In 2007, the World Health Organization ("WHO") concluded a review of the health implications of electromagnetic fields. In this report, WHO stated:

> Uncertainties in the hazard assessment [of epidemiological studies] include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level [extremely low frequency] magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern. (Environmental Health Criteria Volume N°238 on Extremely Low Frequency Fields at p. 12, WHO (2007)).

WHO did not recommend these levels as an exposure limit but instead provided: "The best source of guidance for both exposure levels and the principles of scientific review are international guidelines." *Id*. at pp. 12-13. The international

guidelines referred to by WHO are the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") and the Institute of Electrical and Electronic Engineers ("IEEE") exposure limit guidelines to protect against acute effects. *Id*. at p. 12. The ICNIRP-1998 continuous general public exposure guideline is 833 mG and the IEEE continuous general public exposure guideline in 9,040 mG.

In 2010, ICNIRP revised its continuous general public exposure guideline increasing it from 833 mG to 2,000 mG. The WHO has not provided any analysis of the ICNIRP-2010 continuous general public exposure guideline to date.

The Commission, based on a Minnesota Interagency Working Group ("Working Group") report and the WHO findings, has found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects." *In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County*, Docket No. E-002/TL-07-1407, FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDER ISSUING A ROUTE PERMIT TO XCEL ENERGY FOR THE LAKE YANKTON TO MARSHALL TRANSMISSION PROJECT at p. 7-8 (Aug. 29, 2008); *See also In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project*, Docket No. ET-2, E015/TL-06-1624, FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDER ISSUING A ROUTE PERMIT TO MINNESOTA POWER AND GREAT RIVER ENERGY FOR THE TOWER TRANSMISSION LINE PROJECT AND ASSOCIATED FACILITIES at p. 23 (Aug. 1, 2007).

This finding was recently confirmed in the Brookings County – Hampton 345 kV Route Permit proceeding ("Brookings Project"). In the Brookings Project Route Permit proceeding, applicants and one of the intervening parties provided expert evidence and testimony on the potential impacts of EFs and MFs on human health. The administrative law judge in that proceeding evaluated written submissions and a day-and-half of testimony from these two expert witnesses. The administrative law judge concluded:

> there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for [EF or MF] exposure.

In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota, Docket No. ET-2/TL-08-1474, ALJ FINDINGS OF FACT, CONCLUSIONS

AND RECOMMENDATION at Finding 216 (Apr. 22, 2010 and as amended Apr. 30, 2010). The Commission adopted this finding on July 15, 2010. Id., ORDER GRANTING ROUTE PERMIT at 12 (Sept. 14, 2010); *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET2/TL-08-1474, FINDINGS OF FACT, CONCLUSIONS OF LAW, AND ORDER ISSUING AN HVTL ROUTE PERMIT TO GREAT RIVER ENERGY AND XCEL ENERGY FOR A 345 KV TRANSMISSION LINE FROM BROOKINGS COUNTY, SOUTH DAKOTA TO HAMPTON, MINNESOTA at 1 and 8 (Sept. 14, 2010).

8.7 STRAY VOLTAGE

"Stray voltage" is a condition that can occur on the electric service entrances to structures from distribution lines—not transmission lines. The term generally describes a voltage between two objects where no voltage difference should exist. More precisely, stray voltage exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors. Typically, high voltage transmission lines do not create stray voltage issues. Stray voltage is not a feature generally attributed to the operation of a transmission line and is, therefore, not expected from the proposed transmission line.

Appropriate measures, however, will be taken to prevent stray voltage problems when the transmission lines proposed for the Project parallel or cross distribution lines. ITC Midwest does not anticipate that the Project will be responsible for any stray voltage problems.

To design a project to avoid stray voltage, certain measures can be taken in the engineering phase. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet. ITC Midwest's minimum clearance design is greater than the NESC recommended clearances. The portions of the Project where either a single-circuit 345 kV line is constructed or a 345 kV line is double-circuited with another line, the facility will be designed to maintain a clearance of 35 feet and the 161 kV associated facilities will be designed to maintain a clearance of 25 feet.

Another question that arises when operating vehicles near power lines is whether vehicles can be safely refueled. The possibility of fuel ignition near a high voltage transmission line of the voltage and design proposed for the Project

is extremely unlikely and ITC Midwest is unaware of any safety issues related to vehicle refueling near its existing power lines.

Buildings are permitted near transmission lines, but are generally prohibited within the Easement Area because a structure under a transmission line may interfere with safe operation. For example, a fire in a building located within the right-of-way could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. For example, metal buildings near transmission lines of 200 kV or greater must be properly grounded. People who have questions about a new or existing metal structure can contact ITC Midwest for further information about proper grounding requirements. ITC Midwest may allow certain structures to be constructed within the Ancillary Easement Area, but any such construction in this area is subject to ITC Midwest review and approval.

9.0 ENVIRONMENTAL INFORMATION

The Certificate of Need rules require ITC Midwest to provide environmental information relating to the major features of the region likely encompassed by the routes between the proposed facilities' endpoints. Specifically, ITC Midwest must present information regarding hydrologic features, natural vegetation and wildlife, topography and land use types (including human settlement, recreation, agricultural production, forestry production and mineral extraction). Minn. R. 7849.0330. Additional environmental information is compiled by the Department of Commerce, which is responsible for preparing an Environmental Report on these projects as part of the Certificate of Need process. Minn. R. 7849.1400. The content of the Environmental Report is dictated by Minn. R. 7849.1500.

The primary way to address the potential impacts of transmission line and substation projects is during the routing and siting process. Through these processes, a variety of forums with the public, local government units, and state and federal agencies are created to gather information regarding the potential impacts on environmentally sensitive areas and to develop strategies to address those issues. Such strategies could include selecting a route that avoids these areas or sharing rights-of-way with an existing transmission line. Where sensitive areas cannot be avoided, impacts can be mitigated by design and construction methods. These methods could include using special structures that span longer distances where necessary, scheduling construction in wetlands areas when the ground is frozen or using shorter structures where required to avoid interference with aviation.

Based on the current level of review, the Project's anticipated design and approximate routing do not present any environmental issues that would preclude construction of the facilities. While there may be environmental factors that will influence the ultimate location of the Project, these impacts can be mitigated through the routing and siting processes and construction techniques.

In this section, ITC Midwest provides a general overview of the environmental concerns common to all projects and general mitigation measures to address those concerns, discusses the more significant environmental issues for the Project, and lists the potential additional approvals needed for construction. A thorough compilation of this information as mandated by Minnesota Rule 7849.0330, is contained in this chapter.

Overall environmental information on the region between the endpoints of the Minnesota portion of the Project is provided. Specific information related to the

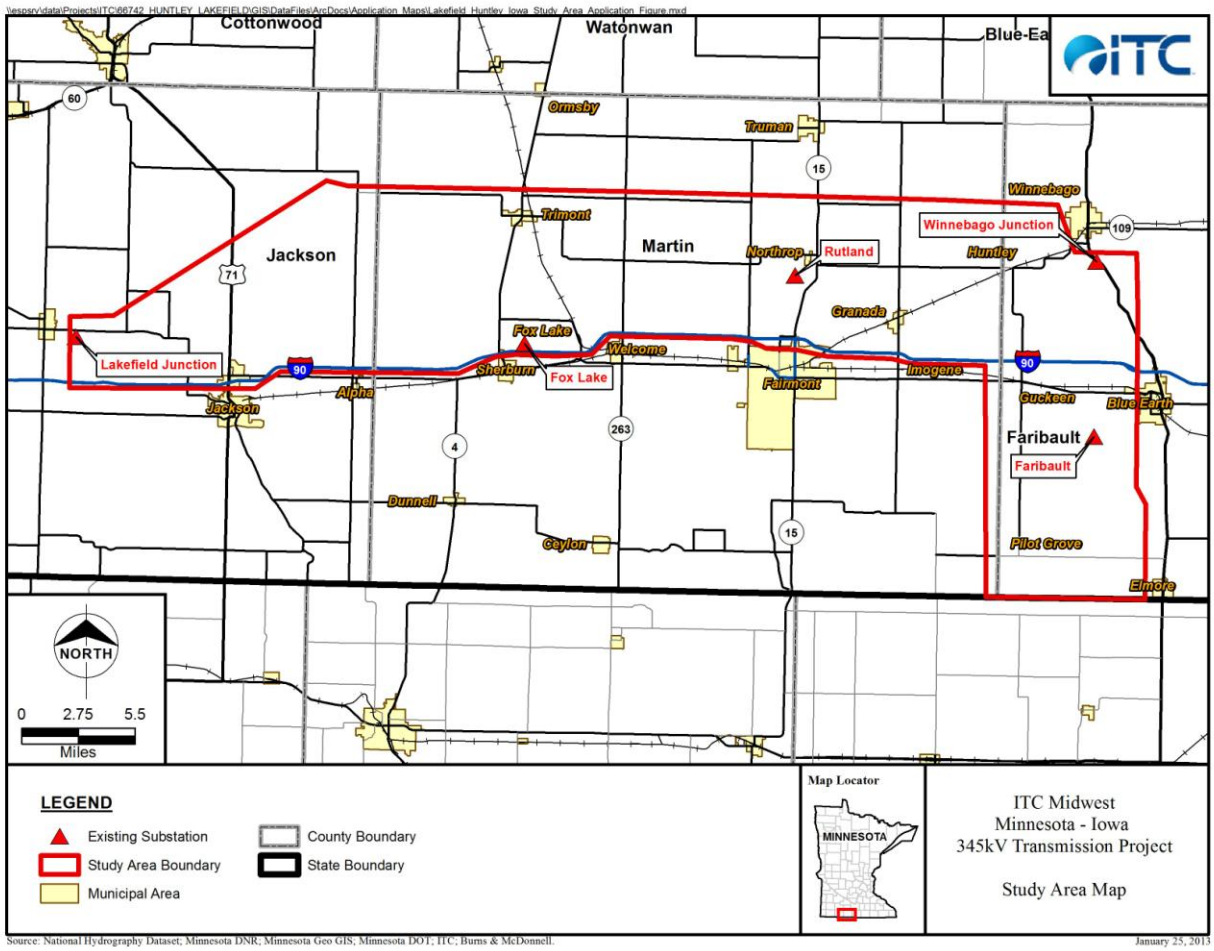
three proposed endpoints of the Project, the Lakefield Junction Substation, the new Huntley Substation, and the point at which the Project crosses the Iowa border, follows the general study area information.

9.1 MINNESOTA PROJECT STUDY AREA

9.1.1 Description of Environmental Setting

The Project Study Area, shown in **Figure 24**, encompasses portions of Jackson, Martin, and Faribault counties. Portions of the cities of Blue Earth, Jackson, Sherburne, and Fairmont, and the cities of Huntley, Granada, Northrop, and Trimont, are within the Project Study Area. Additionally, ITC Midwest investigated environmental features within three miles of each substation and the Minnesota side of the Iowa border.

Figure 24. Project Study Area – Environmental



9.1.2 Geomorphology and Physiography

Geologic and topographic information from the Minnesota Department of Natural Resources ("MnDNR") and the United States Geological Survey ("USGS") was analyzed to determine the existing conditions within the Project Study Area. Jackson, Martin, and Faribault counties are within the Prairie Parklands ecological province in Minnesota. This province traverses western Minnesota, Manitoba, North Dakota, South Dakota, Iowa, Nebraska, Kansas, Oklahoma, Missouri, Illinois, and Indiana. The Prairie Parkland Province in southern Minnesota receives approximately 33 inches of precipitation each year, but is prone to spring fire seasons due to its low levels of winter precipitation, short snow cover season, and western winds. The land in this region was shaped by the Wisconsin glaciations, during which ice sheets crossed the area several times and deposited a mantle of drift hundreds of feet thick in places.

The Project Study Area is located within two subsections of the North Central Glaciated Plains Section of the Prairie Parklands Province: the Minnesota River Prairie Subsection and the Coteau Moraines Subsection. The Project Study Area is located primarily in the Minnesota River Prairie Subsection, where loamy ground moraine is the dominant landform and the topography is level to gently rolling. The western portion of the Project Study Area is located in the Coteau Moraines Subsection, which ranges from gently undulating to steeply rolling and hilly terrain. This subsection is made up of rolling moraine ridges, terminal and end moraines, and ground moraines with glacial till covering bedrock from 600 to 800 feet in depth.

The Project Study Area is primarily made up of agricultural, rural, lands. Primary water features in the Project Study Area include the Des Moines River in Jackson County, Fox Lake and the Chain of Lakes (*i.e.*, an assemblage of lakes) in Martin County, and the Blue Earth River in Faribault County.

9.1.3 Land Use and Human Settlement

(a) Commercial, Industrial, Residential Land Use

Land use within the Project Study Area is primarily agricultural and undeveloped open space. Typical crops in the Project Study Area include corn, soybeans, wheat, and alfalfa. Grassland, burr and white oak forests, and lowland deciduous forests also make up a portion of the Project Study Area. Typical prairie vegetation in the Project Study Area include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum*

nutans), sideoads grama (*Bouteloua curtipendula*), prairie june-grass (*Koeleria macrantha*), and sun sedge (*Carex heliphila*). Less prevalent in the Project Study Area are low and high density urban areas, sedge meadows, maple and basswood forests, upland shrub land, broadleaf sedge and cattail areas, and cottonwood forests.

(b) Displacement

No displacement of residential homes or businesses will occur as a result of the Project. NESC and ITC Midwest standards require certain minimum clearances between transmission line facilities and buildings to ensure the safe operation of transmission line facilities. ITC Midwest will acquire a 200-foot right-of-way for 345 kV transmission line facilities and 150-foot right-of-way for 161 kV transmission line facilities as part of the Project to maintain these clearances. In the area between the Winnebago Junction Substation and Huntley Substation sites, where 161 kV and 69 kV transmission lines need to be reconfigured to allow removal of the Winnebago Junction Substation, a right-of-way up to 250 feet in width may be acquired. A wider right-of-way in this area will allow for the construction of several 161 kV circuits in one right-of-way while maintaining necessary clearances and separation between the facilities.

The Project will be designed in compliance with State, NESC, and ITC Midwest standards for clearance to ground, clearance to crossing other utilities, clearance to buildings, strength of materials, and clearance to vegetation and other obstructions. ITC Midwest, NESC, and Occupational Safety and Health Administration standards for construction practices will also be complied with for construction of the Project.

(c) Aesthetics

Overhead transmission lines and multiple wind turbine installations occur throughout the Project Study Area. The route for the Project preferred by ITC Midwest primarily follows the existing Lakefield to Border 161 kV line. In these areas, the existing H-frame structures will be removed and replaced by, primarily, single pole structures. There are areas along the route ITC Midwest prefers for the Project and elsewhere throughout the Project Study Area where an existing transmission line is not present. The 345 kV structures for the Project will range in height from 160 feet to 190 feet where low profile structures are not proposed with an average span length of 900 feet. Where low profile 345 kV structures would be necessary, structure heights would range from 130 to 160 feet, but could be as short as 100 feet. The 161 kV structures for the Project will

range in height from 70 to 120 feet with an average span length of 700 feet. Poles will be galvanized or self-weathering steel.

The structures proposed for the Project will be greater in height than current overhead transmission structures in the Project Study Area. These structures, however, would be considerably shorter in height than the wind turbines throughout the area and would not create a new type of feature to the landscape and transmission and distribution lines are prevalent within the visual landscape of the Project Study Area.

(d) Socioeconomics

The Project Study Area encompasses portions of Jackson, Martin, and Faribault counties. The median household income for the counties within the Project Study Area are lower than the State of Minnesota median household income (**Table 9**).

Table 9. Economic Characteristics for the Project Study Area

Location	Median Household Income	Unemployment Rate	Percent of Population Below Poverty
Faribault County	$41,631	4.8%	10.9%
Martin County	$43,960	3.4%	9.0%
Jackson County	$46,869	3.3%	9.1%
Minnesota	**$57,243**	**6.4%**	**10.6%**

Source: U.S. Census Bureau, 2006-2010 American Community Survey 5-Year Estimates.

The three counties in the Project Study Area have small populations compared to the State of Minnesota as a whole, combined comprising less than one percent of the State's total population. A large majority of the population in the Project Study Area is Caucasian (**Table 10**). The percentage of total minority[92] residents is lower in the Project Study Area counties as compared to the State of Minnesota as a whole, although Faribault County has a slightly higher percentage of Hispanic residents when compared to the State as a whole.

[92] Total minority is calculated by adding the populations for all non-white races and the population for white-Hispanics.

Table 10. Population Characteristics for the Project Study Area

Location	Total Population	Caucasian	Black or African American	Asian	Other	Hispanic	Total Minority
Faribault County	14,553	96.5%	0.3%	0.3%	2.9%	5.6%	7.1%
Jackson County	10,266	95.8%	0.5%	1.4%	2.4%	2.7%	5.5%
Martin County	20,840	96.7%	0.3%	0.5%	2.5%	3.6%	5.2%
Minnesota	**5,303,925**	**85.3%**	**5.2%**	**4.0%**	**5.5%**	**4.7%**	**16.9%**

Source: U.S. Census Bureau, 2010 Census

Short-term impacts to community services as a result of Project construction activities and an influx of contractor employees during construction are anticipated. ITC Midwest anticipates using both utility personnel and contractors for construction activities. Socioeconomic impacts resulting from the Project are anticipated to be short-term but positive with increased expenditures at local businesses during construction of the Project. No additional permanent staff are expected for line operations and maintenance. Therefore, the transmission line is not expected to change population trends, economic indicators, or employment.

(e) Cultural Values

Cultural values include those perceived community beliefs or attitudes in a particular area, which provide a framework for community unity. The Project Study Area is rural in nature with an agriculture-based economy. Farming and protection of agriculture, the land, and the ability to continue to farm and support livelihoods through agriculture are strong values within the Study Area. Examples of regional cultural events in the Project Study Area include the Martin County Fair, referred to as Minnesota's "Other Big Fair", Annual Sprint Car Jackson Nationals at the Jackson Speedway, and the Annual Upper Midwest Woodcarvers and Quilt Expo held in Blue Earth.

Construction of the Project is not expected to conflict with cultural values of the Project Study Area.

(f) Recreation

Recreational opportunities within the Project Study Area include hunting and trapping, wildlife viewing, fishing, canoeing and kayaking, and snowmobiling. There are several State Wildlife Management Areas ("WMAs") in the Project

Study Area that provide outdoor recreational opportunities and wildlife protection. In Martin County, there is also a large game refuge managed by the MnDNR for the protection of waterfowl. Hunting by firearms and archery, and trapping, for deer and bear is allowed in the refuge, although waterfowl hunting and trapping is prohibited. Waterfowl Production Areas ("WPAs"), public lands managed by the United States Fish and Wildlife Service ("USFWS") for the purpose of waterfowl habitat protection, are also found in the Project Study Area. Snowmobile trails groomed and maintained by local snowmobile club volunteers are also located in the Project Study Area. Watercraft recreational opportunities are also available on rivers and lakes in the Project Study Area, including the Des Moines River, the Blue Earth River, Fox Lake, and the Chain of Lakes.

Construction of the Project is not anticipated to change available recreational opportunities in the Project Study Area, although vegetation removal will be required in some recreational areas and use of certain recreational areas may be restricted or limited during construction activities. The Project is anticipated to reduce the number of crossings of the Blue Earth River because of the reconfiguration of facilities to terminate at the proposed Huntley Substation.

(g) Public Services and Transportation

In rural areas found in the Project Study Area residences often utilize privately-owned septic systems and wells, although some residence may have access to rural water distribution facilities. More urbanized areas, like the cities of Blue Earth, Jackson, Fairmont, and Trimont, are serviced by municipal public works for water, sewer, and electrical services. Outside these more urbanized areas, many residents receive their electric services from various electric cooperatives.

Many State and County highways are within the Project Study Area, including State Highway 4 and State Highway 15. US Highway 169, US Highway 71, and Interstate 90 are also located within the Project Study Area, although US Highway 169 is located further east than the easternmost proposed endpoint for the Project. A rail line owned by Union Pacific and one owned by Canadian Pacific are located in the Project Study Area and will each likely be crossed at least once by the Project.

There are three airports within or near the Project Study Area: the Jackson Municipal Airport, the Fairmont Municipal Airport, and the Blue Earth Municipal Airport. Only the Jackson Municipal Airport is within the Project Study Area. On December 4, 2012, the Federal Aviation Administration ("FAA")

approved the most current Airport Layout Plan ("ALP") for the Jackson Municipal Airport expansion, including a new and longer runway and upgraded instrumentation to accommodate additional aircraft types, including small jets. The FAA is initiating an EIS process for the Jackson Municipal Airport ALP. The FAA estimates the process to complete the EIS and construct the new facilities at the Jackson Municipal Airport to be a ten-year process.

Construction of the Project is not anticipated to impact public services or transportation, other than temporary impacts to roadways if closures or diversions are necessary to accommodate construction equipment. The Project will be designed so that structures and overhead conductors will not interfere with public service and transportation activities.

9.1.4 Land-Based Economies

(a) Agriculture

Almost all of the land area in Faribault and Martin counties, and a large majority of the land in Jackson County, is agricultural. By comparison, only about half of the land in Minnesota is agricultural. Average farm size in the three counties is very similar, and the farms are generally larger, than the average size of farms in Minnesota. Crop sales account for a larger percentage of total market value of agricultural products compared to livestock sales in Faribault ($197 million/$93 million, annually) and Jackson ($153 million/$114 million, annually) counties. In Martin County, however, livestock sales ($218 million, annually) account for a slightly larger percentage of total market value of agricultural products compared to crop sales ($185 million, annually). Agriculture statistics for the three counties within the Project Study Area are summarized in **Table 11**.

Table 11. Agriculture Statistics

Location	Number of Farms	Average Farm Size	Land in Farms	Crop Sales	Livestock Sales
Faribault County	952	477 acres	453,761 acres (99.5 percent of county)	$197 million (68 percent)	$93 million (32 percent)
Jackson County	969	413 acres	400,531 acres (89.3 percent of county)	$153 million (57 percent)	$114 million (43 percent)
Martin County	960	468 acres	449,655 acres (99.1 percent of county)	$185 million (46 percent)	$218 million (54 percent)
Minnesota	**80,992**	**332 acres**	**27 million acres (52.9 percent of State)**	**$7 billion (53 percent)**	**$6 billion (47 percent)**

Source: USDA 2007 Census of Agriculture

Permanent impacts to agriculture activities in the Project Study Area are anticipated to be minimal and concentrated at pole and substation locations. Both crop and livestock activities will be able to continue around Project facilities after construction.

(b) Forestry

The Project Study Area is dominated by agricultural lands and minimal forestland. No commercial forestry operations have been identified in the Project Study Area and no impacts to commercial forestry operations are anticipated for the Project.

(c) Tourism

Tourism in the Project Study Area centers around outdoor recreational opportunities, such as fishing, hunting, and water sports. Many out-of-State hunters and fishermen visit Minnesota every year to take advantage of these tourism activities. Impacts to tourism in the Project Study Area are not anticipated during construction or operation of the Project.

(d) Mining

Mining does not comprise a major industry in the Project Study Area. Sand and gravel operations are found throughout Jackson, Martin, and Faribault counties. Sand and gravel are primarily mined for local use such as making concrete for highways, roads, bridges, and buildings. Gravel pits (active, depleted, or unexcavated deposits) leased or owned by the Minnesota Department of Transportation ("MnDOT") are scattered throughout the Project Study Area. Transmission lines are anticipated to be routed around these mining resources and no impacts to mining are anticipated.

9.1.5 Archaeological and Historical Resources

Background research on known cultural resources was conducted in July 2012, in the Minnesota State Historic Preservation Office ("SHPO") Archaeology Inventory and in the Standing Structures Inventory in St. Paul. This initial investigation was based on the Project Study Area. In November 2012 and January 2013, the data were further analyzed based on specific routes retained for the analysis and additional research was conducted in public online records. Archaeological sites and historic structures or properties, and resources were included in the analysis.

There are 43 National Register of Historic Places ("NRHP")-listed sites, structures, properties, or districts in Jackson County. There are 23 NRHP-listed sites, structures, or properties, or districts in Martin County. There are 13 NRHP-listed sites, structures, properties, or districts in Faribault County. Historic properties, such as archaeological sites, are designated as location restricted, for reasons of preservation, protection, or privacy.

Minnesota laws protect resources in conjunction with federal laws. The Minnesota Field Archaeology Act (Minn. Stat. §§ 138.31-138.42) requires State agencies to submit development plans to the State Archaeologist, the Minnesota Historical Society, and the Minnesota Indian Affairs Council for review when there are known or suspected archaeological sites in the area. The Minnesota Historic Sites Act (Minn. Stat. §§ 138.661-138.669) established the State Historic Sites Network and the State Register of Historic Places. As necessary, ITC Midwest will contact the Historical Society before undertaking activities that may affect properties on the network or on the State or National Registers of Historic Places.

The Minnesota Historic District Acts (Minn. Stat. §§ 138.71-138.75) designates certain historic districts and enables local governing bodies to create commissions to provide architectural controls in these areas. No communities within the three counties in the Project Study Area have achieved the status of Certified Local Government or have Heritage Preservation Commissions.

ITC Midwest does not anticipate any material impacts to any archaeological or historic resources as part of the Project. If high potential areas are identified along a selected route, ITC Midwest will work with the State Archaeologist to develop survey protocol to ensure no material impacts result from construction of the Project. If, during construction, crews discover cultural resources, further survey work will be completed in cooperation with the Minnesota SHPO. Additionally, if any unmarked burials, human remains, or grave goods are discovered during construction, they will be reported to the State Archaeologist per Minnesota Statutes Section 307.08 and construction will be suspended in that area until adequate mitigation measures have been developed between ITC Midwest and the State Archaeologist.

9.1.6 Hydrologic Features

The Project Study Area is part of the Minnesota River Watershed. The Minnesota, Des Moines, and Blue Earth sub-watersheds are all within the Project Study Area. Wetlands, lakes, and streams intersect the Project Study Area at several locations, including the Des Moines River, Fox Lake, the Chain of Lakes, and the Blue Earth River, from west to east.

(a) Water Quality

Groundwater

In Jackson, Martin, and Faribault counties, within the Project Study Area, groundwater exists in unconsolidated glacial deposits and in the underlying bedrock. This water is held in bedrock aquifers in hydraulically isolated layers under high pressure.

Karst topography developed from mildly acidic groundwater slowly dissolving carbonate bedrock, which formed areas of “karst”. Karst aquifers are susceptible to groundwater contamination as sinkholes in these areas form passageways that funnel water from the surface into the groundwater system. Portions of Faribault County determined to be either Covered Karst or Transition Karst lands are within the Project Study Area. Covered Karst lands are areas underlain by

carbonate bedrock with more than 100 feet of sediment cover. Transition Karst lands are those underlain by carbonate bedrock with 50 to 100 feet of sediment cover.

Floodplains

The Project Study Area crosses 100-year floodplains associated with the Blue Earth River and Center Creek. Floodplain crossings of these waters and tributaries occur primarily in agricultural land.

Wetlands, Waters, and Watercourses

GIS data from the USFWS National Wetlands Inventory ("NWI") was reviewed to assess wetlands present with the Project Study Area. Wetland complexes and small isolated wetlands are scattered throughout the Project Study Area. Many of these wetlands are associated with the Blue Earth River, the Chain of Lakes, Elm Creek, and Center Creek.

Of the NWI wetlands present in the Project Study Area, most are palustrine type wetlands. Riverine type wetlands, associated with rivers, are also found in the Project Study Area. Palustrine type wetlands in the Project Study Area include emergent, forested, unconsolidated bottom, and scrub-shrub.

The MnDNR Public Waters Inventory ("PWI") was also reviewed to identify Public Wetlands, Waters, and Watercourses. Notable watercourses in the Project Study Area include the Des Moines River, Elm Creek, Center Creek, and the Blue Earth River. Notable Public Waters include the Chain of Lakes, Cedar Lake, Big Twin Lake, and Fox Lake.

ITC Midwest will design the Project to minimize or avoid impacts to surface water resources to the extent feasible. The Project will also be designed to span surface water resources where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned.

The Project will have minor, mostly short-term, effects on surface water resources. Waters and wetlands permits and licenses, letters of no jurisdiction, or exemptions may be required from the United States Army Corps of Engineers ("USACE"), MnDNR Division of Waters, and local units of government that administer the Wetland Conservation Act. No alteration in the course, current, or cross-section below the ordinary high water level of a Public Water or Watercourse, which would require a Public Waters Work Permit from the

MnDNR Division of Waters, is anticipated. It is likely that the work proposed for the Project would fall under a Letter of Permission (LOP-05-MN) or the Regional General Permit (RGP-3-MN) utility line discharge provision under the USACE.

The MPCA, through the NPDES under the Clean Water Act, regulates construction activities that may impact stormwater runoff. An NPDES permit is required for construction activity disturbing: 1) one acre or more of soil; 2) less than one acre of soil, but part of a "larger common plan of development or sale" that is greater than one acre; or 3) less than one acre of soil, but that the MPCA determines poses a risk to water resources. As part of the NPDES requirements, a SWPPP must be prepared to identify best management practices (which may include biodegradable erosion matting), inspection protocol in compliance with MPCA requirements, and stabilization measures to minimize impacts of stormwater runoff.

9.1.7 Vegetation and Wildlife

(a) Vegetation

The Project Study Area was historically dominated by tallgrass prairie. The area is now, primarily, agricultural land with few remnants of presettlement vegetation remaining. Common crops in the Project Study Area include corn, soybean, alfalfa, and winter wheat. Prairie vegetation in this area includes big bluestem, little bluestem, indiangrass, sideoats grama, prairie june-grass, and sun sedge.

Impacts to trees and woodlands in the Project Study Area will occur only where clearing is necessary for construction and maintenance of the Project, including substations and transmission lines. Minimal tree removal is anticipated because of the primarily agricultural and open nature of the Project Study Area.

(b) Wildlife

Resident and migratory wildlife species found in agricultural landscapes, prairie remnants, wetlands, and riverine habitats are commonly found in the Project Study Area. These species include large and small mammals, songbirds, waterfowl, raptors, fish, reptiles, mussels, and insects. These species us the Project Study Area for forage, shelter, breeding, or as stopover during migration.

The Project Study Area also includes eight Grassland Bird Conservation Areas ("GBCA"). All GBCA within the Project Study Area are of the most narrow

types, (at least 44 acres of grassland, at least 0.25 mile wide). There are no Important Bird Use Areas in the Project Study Area.

Avian interactions with transmission lines can occur in proximity to agricultural fields that serve as feeding areas, wetlands and water features, and along riparian corridors used during migration. Electrocution of avian species is most often associated with distribution lines and not with transmission lines, which achieve much larger spacing between the conductors (phases). ITC Midwest will work with MnDNR and USFWS to identify areas where marking transmission shield wires with bird flight diverters, which minimize avian collisions, may be appropriate once a route for the Project has been selected by the Commission.

9.1.8 Rare and Unique Natural Resources

The MnDNR Natural Heritage Information System ("NHIS") was reviewed to identify known occurrences of rare and unique natural resources. Multiple rare species, including endangered species ("END"), threatened species ("THR"), and species of special concern ("SPC") occur in Jackson (**Table 12**), Martin (**Table 13**), and Faribault (**Table 14**) counties.[93] Multiple ecological and animal assemblages are also located in these counties and in the Project Study Area (**Table 15**). The assemblages are grouped into two categories: zoological assemblages and ecological assemblages. Zoological assemblages are communities made up of animal species. Ecological assemblages are communities that are comprised of plant species. There are numerous Minnesota County Biological Survey sites in the Project Study Area. There are also several WMAs and WPAs in the Project Study Area.

[93] On December 10, 2012, the MnDNR proposed amendments to Minnesota Rules Chapter 6134 to alter the designation of certain species in Minnesota. The lists and discussions contained herein refer only to the designations identified in the adopted rules and not those proposed by the MnDNR.

Table 12. State- and Federally-Listed Species: Jackson County

Common Name	Scientific Name	Occurs in Study Area?	Status	
			State	Federal
A Jumping Spider	*Marpissa grata*	–	SPC	–
American Ginseng	*Panax quinquefolius*	–	SPC	–
Bald Eagle	*Haliaeetus leucocephalus*	–	SPC	–
Black Sandshell	*Ligumia recta*	Yes	SPC	–
Common Gallinule	*Gallinula galeata*	–	SPC	–
Fescue Sedge	*Carex festucacea*	–	THR	–
Forster's Tern	*Sterna forsteri*	–	SPC	–
Franklin's Gull	*Leucophaeus pipixcan*	–	SPC	–
Hair-like Beak-rush	*Rhynchospora capillacea*	–	THR	–
Henslow's Sparrow	*Ammodramus henslowii*	Yes	END	–
Iowa Skipper	*Atrytone arogos iowa*	Yes	SPC	–
King Rail	*Rallus elegans*	–	END	–
Loggerhead Shrike	*Lanius ludovicianus*	Yes	THR	–
Monkeyface	*Quadrula metanevra*	–	THR	–
Mucket	*Actinonaias ligamentina*	Yes	THR	–
Ottoe Skipper	*Hesperia ottoe*	–	THR	–
Powesheik Skipper	*Oarisma Poweshiek*	–	SPC	–
Prairie Bush Clover	*Lespedeza leptostachya*	Yes	THR	THR
Rattlesnake-master	*Eryngium yuccifolium*	–	SPC	–
Regal Fritillary	*Speyeria idalia*	Yes	SPC	–
Round Pigtoe	*Pleurobema sintoxia*	Yes	THR	–
Small White Lady's-slipper	*Cypripedium candidum*	–	SPC	–
Snow Trillium	*Trillium nivale*	–	SPC	–
Spike	*Elliptio dilatata*	Yes	SPC	–
Sullivant's Milkweed	*Asclepias sullivantii*	–	THR	–
Trumpeter Swan	*Cygnus buccinators*	–	THR	–
Whorled Nut-rush	*Scleria verticillata*	–	THR	–
Wilson's Phalarope	*Phalaropus tricolor*	–	THR	–

Source: MnDNR

Table 13. State- and Federally-Listed Species: Martin County

Common Name	Scientific Name	Occurs in Study Area?	Status	
			State	Federal
American White Pelican	*Pelecanus erythrorhynchos*	Yes	SPC	–
Blanding's Turtle	*Emydoidea blandingii*	–	THR	–
Burrowing Owl	*Athene cunicularia*	Yes	END	–
Eared False Foxglove	*Agalinis auriculata*	Yes	END	–
King Rail	*Rallus elegans*	Yes	END	–
Prairie Bush Clover	*Lespedeza leptostachya*	Yes	THR	THR
Rattlesnake-master	*Eryngium yuccifolium*	Yes	SPC	–
Regal Fritillary	*Speyeria idalia*	–	SPC	–
Round Pigtoe	*Pleurobema sintoxia*	Yes	THR	–
Small White Lady's-slipper	*Cypripedium candidum*	Yes	SPC	–
Sullivant's Milkweed	*Asclepias sullivantii*	Yes	THR	–
Tuberous Indian-plantain	*Arnoglossum plantagineum*	Yes	THR	–

Source: MnDNR

Table 14. State- and Federally-Listed Species: Faribault County

Common Name	Scientific Name	Occurs in Study Area?	Status	
			State	Federal
Bald Eagle	*Haliaeetus leucocephalus*	Yes	SPC	–
Black Sandshell	*Ligumia recta*	Yes	SPC	–
Creek Heelsplitter	*Lasmigona compressa*	Yes	SPC	–
Fluted-shell	*Lasmigona costata*	Yes	SPC	–
Iowa Skipper	*Atrytone arogos iowa*	–	SPC	–
Mucket	*Actinonaias ligamentina*	Yes	THR	–
Rattlesnake-master	*Eryngium yuccifolium*	–	SPC	–
Regal Fritillary	*Speyeria idalia*	–	SPC	–
Round Pigtoe	*Pleurobema sintoxia*	Yes	THR	–
Small White Lady's-slipper	*Cypripedium candidum*	Yes	SPC	–
Sullivant's Milkweed	*Asclepias sullivantii*	–	THR	–
Trumpeter Swan	*Cygnus buccinators*	–	THR	–
Tuberous Indian-plantain	*Arnoglossum plantagineum*	–	THR	–
White Wild Indigo	*Baptisia lactea var. lactea*	–	SPC	–

Source: MnDNR

Table 15. Ecological and Animal Assemblages in Jackson, Martin, and Faribault Counties

Name	Type of Assemblage	County of Occurrence	Found in Study Area?
Colonial Waterbird Nesting Site	Zoological	Faribault	Yes
Dry Sand - Gravel Prairie (Southern)	Ecological	Faribault	–
Mesic Prairie (Southern)	Ecological	Faribault	–
Native Plant Community, Undetermined Class	Ecological	Faribault	Yes
Wet Prairie (Southern)	Ecological	Faribault	–
Calcareous Fen (Southwestern)	Ecological	Jackson	–
Colonial Waterbird Nesting Site	Zoological	Jackson	–
Dry Hill Prairie (Southern)	Ecological	Jackson	Yes
Mesic Prairie (Southern)	Ecological	Jackson	Yes
Native Plant Community, Undetermined Class	Ecological	Jackson	Yes
Southern Seepage Meadow/Carr	Ecological	Jackson	–
Wet Prairie (Southern)	Ecological	Jackson	–
Wet Seepage Prairie (Southern)	Ecological	Jackson	Yes
Calcareous Fen (Southeastern)	Ecological	Martin	–
Colonial Waterbird Nesting Site	Zoological	Martin	Yes
Dry Hill Prairie (Southern)	Ecological	Martin	Yes
Mesic Prairie (Southern)	Ecological	Jackson, Martin	Yes
Wet Prairie (Southern)	Ecological	Martin	Yes

Source: MnDNR

The Project will be designed to avoid impacts to known occurrences of rare and unique natural resources to the extent practicable. ITC Midwest will coordinate with the appropriate natural resource agency if rare species or unique natural resources will be affected to modify the Project or implement construction practices to minimize impacts. In the event MCBS sites are crossed by the Project, attempts will be made to design the Project to span these natural resource sites, where feasible. There are no Scientific and Natural Areas ("SNAs") within the Project Study Area. If WMAs or WPAs are crossed by the Project, attempts will be made to design the Project to be located along site boundaries or parallel to existing infrastructure. Additionally, if work is to be performed in the Pilot Grove Lake WPA as part of the Project, it would be limited to the existing right-of-way and ITC Midwest will work with USFWS to address any agency-specific concerns.

9.2 LAKEFIELD JUNCTION SUBSTATION

The Lakefield Junction Substation is located in Jackson County, Section 3 of Hunter Township. It is within the Western Corn Belt Plains ecoregion of Minnesota as defined by the USGS. This ecoregion is typically flat with gently rolling topography, with an average elevation of 1,500 feet above sea level, and averages 24 to 36 inches of precipitation annually. Agricultural land accounts for the vast majority of this ecoregion, with typical crops including corn, soybeans, wheat, and alfalfa. The USGS National Land Cover Database ("NLCD") lists two land cover types (Developed, Medium Intensity and Cultivated Crops) for the Lakefield Junction Substation vicinity. The substation is surrounded by cropland on all sides, with the exception of the access driveway.

Specific soil classifications are called soil map units. Soil map units describe the soil characteristics in a specific geographic area. The Lakefield Junction Substation area is dominated by Canisteo, Clarion, Crippin and Nicollet soil units. These soil units are typically considered to be loamy or a clay loam, are typically used for agricultural purposes, are moderately well drained to poorly drained, and are considered prime farmland according to the Natural Resources Conservation Service ("NRCS").

The Lakefield Junction Substation area lies within the Lower Mississippi River Basin watershed. The nearest perennial waterway is the Des Moines River, approximately five miles east of the Lakefield Junction Substation. There are various unnamed tributaries/drainages in addition to three nearby lakes (Boot, Heron, and Clear). The Des Moines River and all three lakes are listed under the Public Waters Inventory Program, which protects specific waters in Minnesota under the jurisdiction of the MnDNR.

Commonly associated agricultural vegetation of Southern Minnesota includes corn, soybean, alfalfa, and winter wheat. Typical prairie vegetation of Southern Minnesota includes big bluestem, little bluestem, indiangrass, sideoats grama, june-grass, and sun sedge.

According to the MnDNR's NHIS, no federal- or State-listed threatened or endangered species are known to occur within the Lakefield Junction Substation area. In addition, no State-listed species of concern are known to occur within the Lakefield Junction Substation study area. Within three miles of the Lakefield Junction Substation, NHIS data include sightings of one State-listed endangered species- Henslow's sparrow (*Ammodramus henslowii*), one State-listed threatened species, trumpeter swan (*Cygnus buccinator*), and two State-listed species of

concern, common gallinule (*Gallinula galeata*) and upland sandpiper (*Bartramia longicauda*). According to USFWS, one federally listed threatened species, prairie bush-clover (*Lespedeza leptostachya*), may potentially occur within Jackson County, however, it has not been noted in the area of the Lakefield Junction Substation.

The Lakefield Junction Substation is approximately 1.5 miles west of the Toe WMA, an area containing a complex of wetlands and upland areas where upland sandpiper have been recorded. Boot Lake WPA) and the Windom Wetland Management District are located approximately 2.5 miles east of the substation. Both are federal, protected land set aside as part of a migration corridor for waterfowl. The Boot Lake Archaeological site is located at the northeast corner of the WPA, approximately 2.9 miles from the Lakefield Junction Substation.

Based on USFWS NWI maps, no wetlands occur in the Lakefield Substation area. Within three miles of the Lakefield Junction Substation, there are two types of wetlands; palustrine emergent ("PEM") and palustrine unconsolidated bottom ("PUB" or "pond"). The "Palustrine System" includes all nontidal wetlands dominated by trees, shrubs, and emergents (herbaceous plants). The "Riverine System" includes all wetlands and deepwater habitats contained within a channel, except for wetlands dominated by trees, shrubs, persistent emergents, emergent moss, or lichens, and habitat with water containing ocean-derived salts in excess of 0.5 percent (Cowardin et al, 1979).

Although generally a rural agricultural area, the Lakefield Junction Substation lies on the western edge of a commercial wind farm. It is bounded by 820th Street to the north, 460th Avenue to the east, 810th Street to the south, and 480th Street to the east. All of these county roads, primarily gravel surface around the substation, contain numerous rural residences, farmsteads, and agriculture-related facilities such as barns, shops, and grain bins. Interstate 90 runs from east to west approximately 2 miles south of the Lakefield Junction Substation, and the municipality of Lakefield, Minnesota (population 1,700) is located about 1 mile northwest of the substation (US Census Bureau 2010). Numerous existing transmission lines connect with the Lakefield Substation, including 345 kV, 161 kV and 69 kV lines. These include the existing 161 kV Fox Lake to Lakefield Junction line under consideration for double circuiting with the proposed new 345 kV line.

9.3 HUNTLEY SUBSTATION

The proposed Huntley Substation is located in Faribault County, Section 14 of Verona Township. This area is situated within the Western Corn Belt Plains ecoregion of Minnesota as defined by the USGS. This ecoregion is typically flat with gently rolling topography, with an average elevation of 1,500 feet above sea level, and averages 24 to 36 inches of precipitation annually. Agricultural land accounts for the vast majority of this ecoregion, with typical crops including corn, soybeans, wheat, and alfalfa. The USGS NLCD lists two land cover types (Developed, Medium Intensity and Cultivated Crops) for the proposed Huntley Substation area. The site of the proposed Huntley Substation is currently a cropfield. An existing 161 kV transmission line extends along the east side of the substation site, un-maintained portions of 160th Street bound the south side of the substation and a dirt and sand operation is located to the east which would be unaffected by the Project. The terrain slopes away from the site to the west and north, with riparian woodland and the Blue Earth River located to the west, crop land and Blue Earth River floodplain occur to the north.

The proposed Huntley Substation study area is dominated by Shorewood and Minnetonka soil units. These soils units are typically considered to be a silty clay loam, are typically used for agricultural purposes, are moderately well drained to poorly drained, and are considered prime farmland according to the NRCS.

The proposed Huntley Substation study area lies within the Minnesota River Basin watershed. The nearest perennial waterways are the Blue Earth River and South Creek, approximately 0.2 mile southeast and 0.5 mile south respectively, of the proposed Huntley Substation study area. Both the Blue Earth River and South Creek are listed under the Public Waters Inventory Program.

Commonly associated agricultural vegetation of Southern Minnesota includes corn, soybean, alfalfa, and winter wheat. Typical prairie vegetation of Southern Minnesota includes big bluestem, little bluestem, indiangrass, sideoats grama, prairie june-grass, and sun sedge.

According to the MnDNR's NHIS, no federal- or State-listed threatened or endangered species are known to occur within the proposed Huntley Substation study area. In addition, no State-listed species of concern are known to occur within the proposed Huntley Substation study area. Within three miles of the proposed Huntley Substation, NHIS lists two State- listed threatened species are known to occur- round pigtoe (*Pleurobema sintoxia*) and mucket (*Actinonaias ligamentina*) mussels; and three State- listed mussel species of concern- fluted-

shell (*Lasmigona costata*), creek heelsplitter (*Lasmigona compressa*), and black sandshell (*Ligumia recta*). Two other State- listed species of special concern found within three miles of the proposed substation are the bald eagle (*Haliaeetus leucocephalus*), and the small white lady's slipper (*Cypripedium candidum*). No federally protected species are noted as potentially occurring in Faribault County according to USFWS.

Based on USFWS NWI maps, no wetlands occur in the proposed Huntley Substation study area. Within two miles of the proposed Huntley Substation there are five types of wetlands- PEM, PUB, PFO, palustrine shrub/scrub ("PSS"), and riverine. Most of these wetlands are associated with the streams and rivers in the adjacent areas. The Prescott WPA is located approximately 2.5 miles east of the proposed Huntley Substation. This WPA is a federally owned area of diverse wetland habitat associated with the Blue Earth River.

Center Creek Archaeological District is located approximately one mile northwest of the proposed Huntley Substation. Forty one archaeological sites occur within three miles of the proposed substation. These sites are associated with the archaeological district, as well as the Blue Earth River floodplain. The closest of these sites is approximately 500 feet away from the proposed substation boundaries, and it is the only cultural site within 1,000 feet of the proposed Huntley Substation site.

The location of the proposed Huntley Substation is near the meandering Blue Earth River and associated floodplain, an area more inaccessible than others in the region due to few roads and limited bridges over the river. U.S. Highway 169 is the closest large transportation corridor to the proposed Huntley Substation. It runs north to south approximately one mile east of the proposed substation, on the eastern side of the Blue Earth River. Most of the lands in the vicinity of the substation are farmed with wooded riparian areas adjacent to the river and creek. Only three residences and a hunting cabin occur within 0.5 mile of the substation location, with two of the residences located on the opposite side of the Blue Earth River. The municipality of Winnebago is located approximately three miles north of the proposed Huntley Substation, and has a population of around 1,500 people (US Census Bureau 2010).

9.4 IOWA BORDER CROSSING

The proposed 345 kV transmission line crossing at the Minnesota border is located in Faribault County, Section 36 of Pilot Grove Township, approximately three miles west of Elmore. This area is situated within the Western Corn Belt

Plains ecoregion of Minnesota as defined by the USGS. This ecoregion is typically flat with gently rolling topography, with an average elevation of 1,500 feet above sea level, and averages 24 to 36 inches of precipitation annually. Agricultural land accounts for the vast majority of this ecoregion, with typical crops including corn, soybeans, wheat, and alfalfa. The USGS NLCD lists 11 land cover types (Open Water, Developed Open Space, Developed Low Intensity, Developed Medium Intensity, Developed High Intensity, Deciduous Forest, Grassland/Herbaceous, Pasture/Hay, Cultivated Crops, Woody Wetlands, and Emergent Herbaceous Wetlands) in Minnesota within three miles of the proposed 345/161 kV transmission line three mile study area at the Minnesota border. Cultivated Crops comprise the majority of the study area, approximately 86 percent.

The three-mile Minnesota study area for the Minnesota border crossing of the proposed 345 kV transmission line is dominated by Caniesteo-Glencoe and Clarion-Swanlake soil units. These soils units are typically considered to be loams, are typically used for agricultural purposes, are well drained to poorly drained, and are considered prime farmland according to the NRCS.

The Minnesota crossing area lies within the Minnesota River Basin watershed. The nearest perennial waterway is the West Branch of the Blue Earth River, which is approximately 0.2 mile north of where the proposed line crosses the Minnesota border. In addition, the Middle Branch of the Blue Earth River and an unnamed perennial drainage ditch occur approximately two miles east and west, respectively, of where the proposed line crosses the Minnesota border. All three of these perennial waterways are listed under the Public Waters Inventory Program.

Commonly associated agricultural vegetation of Southern Minnesota includes corn, soybean, alfalfa, and winter wheat. Typical prairie vegetation of Southern Minnesota includes big bluestem, little bluestem, indiangrass, sideoats grama, prairie june-grass, and sun sedge.

According to the MnDNR's NHIS, no federal- or State-listed threatened or endangered species are known to occur within three miles of the proposed 345 kV transmission line at the Minnesota border. No federally protected species are noted as potentially occurring in Faribault County according to USFWS. Based on USFWS NWI maps, there are five types of wetlands- PEM, PUB, PFO, PSS, and lake within three miles of the proposed 345 kV transmission line at the Minnesota border. Most of these wetlands are associated with the streams and

rivers in the adjacent areas. Aside from the three listed perennial waterways, no other waterways or wetlands are listed under the Public Waters Inventory Program.

One Minnesota County Biological Survey ("MCBS") site of moderate biodiversity significance and two Reinvest in Minnesota ("RIM") conservation easement areas occur within three miles of the proposed 345 kV transmission line at the Minnesota border.

9.5 MITIGATION MEASURES

The Project must mitigate the environmental impacts it may have on several types of formally managed and regulated lands, including municipal and county parks and trails, trust lands, State trails, trout streams and other public waters, federal easement lands, forest lands, WMAs, WPAs, state parks, National Wildlife Refuges ("NWRs") and SNAs. These lands are typically used for recreational purposes, habitat management and conservation. To mitigate impacts, these areas will be avoided where practicable. No SNAs or NWRs have been identified in the Project Study Area.

The Project would affect agricultural lands, which is the dominant land use in the majority of the Project Study Area shown in **Figure 24**. Much of the agricultural land is designated as "prime farmland," which is an indicator of land that is most desirable for agricultural production. Federal regulations define prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is available for these uses." 7 C.F.R. § 657.5(a)(1). Prime farmland is important because the land itself contains the necessary features for successful agriculture production.

The primary method used to minimize impacts to agricultural land is to locate transmission lines along road rights-of-way, section lines or fence lines. In addition, impacts can be minimized by using the single pole structure, proposed by ITC Midwest, as opposed to the H-frame, two pole structure.

New transmission facilities would also have aesthetic impacts. The visual character and setting of the majority of the affected areas are largely level agricultural fields broken up by field tree lines, roads and large water features (i.e., wetlands, lakes and rivers). There are also large blocks of forested areas and river valleys interspersed throughout the areas. Transmission lines will be seen from a variety of potential viewpoints within the proposed areas, including

private residences, highways, county and township roads and recreation areas. Structures, conductors, insulators, aeronautical safety markings, avian diverters, vegetation clearing and access roads may create visual effects. Potential mitigation measures include:

- Locating facilities in relationship to landforms so they will screen transmission line features;
- Locating rights-of-way and structures with input from landowners or land management agencies;
- Using care in routing, structure design and pole placement to preserve the natural landscape;
- Implementing restoration measures that reflect the existing vegetation as much as possible without impacting the safe and reliable operation of the lines; and
- Where possible, proposing river crossings near existing transmission lines, highways or other infrastructure.

The Project may potentially impact state threatened, endangered, or of concern flora or fauna species and cultural resources. ITC Midwest anticipates that impacts to these resources can generally be avoided through the routing process. In limited instances, where impacts cannot be avoided, impacts can be mitigated by pole placement and special construction measures. ITC Midwest will also comply with the various state and federal endangered species laws where necessary.

Human settlement, such as homesteads, wind farms, highway expansions and new subdivisions also need to be considered. Minimizing impacts to homes is an important factor in determining routes. During the routing process, coordination with multiple state agencies, municipalities and counties will identify potential changes in human settlement. Mitigation methods include routing lines such that planned road expansions can be accommodated and locating substations away from known future subdivision sites. ITC Midwest does not anticipate that any homes or businesses will be displaced by the Project.

Archeological site (e.g., artifact scatters and earthworks) are located in the Project Area. In some cases, surveys of potential sites will be conducted during the permitting process. These surveys will focus on areas of high potential for archeological sites or where required by the permitting process underway at the time. Normally, archeological sites are only evaluated for significance if there is

potential for direct physical effects and impacts are generally addressed through avoidance.

The Project Area also contains historic architectural resources. Some of the sites are listed or considered eligible for listing in the NRHP, while other sites have yet to be evaluated. Indirect effects (e.g., visual, noise) to the properties can be avoided by proper routing of the transmission lines. If impacts to any recorded site within the Project Area cannot be avoided, that recorded site will require formal significance evaluation to determine if it meets the eligibility requirements of the NRHP. If found significant, mitigation strategies will be undertaken to reduce impacts. This could include identifying the site in detail prior to construction, limiting construction access and activities as much as possible and having an archeologist present during construction to monitor work and to gather any artifacts found. If properties are listed on the NRHP, or if they are considered eligible for listing, they may be afforded protection under federal and state regulations. ITC Midwest will work with the appropriate state, federal and tribal agencies during the routing process to avoid known areas as much as possible.

No active aggregate mining operations have been identified along the two routes proposed in the Route Permit Application. No impacts are expected and therefore no mitigation measures have been described.

9.6 OTHER PERMITS AND APPROVALS

In addition to a Minnesota Certificate of Need and Route Permit, ITC Midwest will be required to obtain a number of other permits or approvals from local, State and federal agencies prior to constructing the facilities in Minnesota and Iowa. A list of permits and other approvals that may be required for the Project is presented in **Table 16**. All required permits will be obtained prior to construction.

Table 16. List of Potential Permits and Approvals

Permit	Jurisdiction
Federal Requirements	
Clean Water Act Section 404 Permit (Local/State/Federal Application for Water/Wetland Projects)	USACE
Rivers and Harbors Act Section 10 Permit	USACE

Permit	Jurisdiction
Part 7460 review	FAA
Special Use Permit	USFWS
Incidental Take Permit	USFWS
Eagle Non-Purposeful Take Permit	USFWS
Spill Prevention, Control and Countermeasure ("SPCC") Plan	MPCA/EPA
Minnesota State Approvals	
License to Cross Public Waters or State Lands Public Water Works Permit	MnDNR
General Permit No. 1997-0005; Temporary Water Appropriations	MnDNR
Endangered Species Statutes – Permits and Coordination	MnDNR
Utility Permit on Trunk Highway Right-of-Way (Long Form No. 2525)	MnDOT
Driveway Access	MnDOT
Oversize/overweight permits	MnDOT
NPDES Permit	MPCA
Clean Water Act, Section 401 Permit	MPCA
Agriculture Mitigation Plan	MDA
Minnesota Local Approvals	
Local/State/Federal Application for Water/Wetland Projects (under WCA)	County, Township, City, BWSR
Work within the Right-of-Way permits	County, Township, City
Lands Permits	County, Township, City
Overwidth/Overweight Loads Permits	County, Township, City
Road Crossing Permits	County, Township, City
Driveway/Access Permits	County, Township, City
Coordination meetings	Soil and Water Conversation Districts
Iowa State Approvals	
Electric Transmission Franchise	Iowa Utilities Board
NPDES Permit	Iowa DNR
Clean Water Act, Section 401 Permit	Iowa DNR
Flood Plain Development Permit	Iowa DNR
Joint 404 Application Form – Wetlands	Iowa DNR
Work within the Right-of-Way Permit	Iowa DOT
Utility Accommodation Permit	Iowa DOT
Railroad Permit	Iowa Utilities Board

Permit	Jurisdiction
Iowa Local Approvals	
Building Permits/Zoning Compliance Permits	County, City
Overwidth/Overweight Loads Permits	County, City
Utility Accommodation Permits	County, City
Entrance Permits	County, City
Local Floodplain Requirements	County, City
Other Approvals	
Approval to cross lands with conservation easements	Various, depending on program, including USDA, NRCS, and local implementing governmental entities

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