

# **ENVIRONMENTAL ASSESSMENT**

In the Matter of the Xcel Energy Route Permit  
Application for the Yankee Substation to  
Brookings County Substation 115 kilovolt  
Transmission Line Project

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**RESPONSIBLE GOVERNMENT UNIT**

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**ABSTRACT**

Pursuant to the provisions of Minnesota Statutes, chapter 216B.243 and chapter 216E, Xcel Energy (Xcel) filed a certificate of need application (December 4, 2006) and route permit application (January 18, 2008) with the Minnesota Public Utilities Commission (PUC or the Commission) for the Yankee Substation, Lincoln County, Minnesota to Brookings Substation, Brookings County, South Dakota #2 115 kilovolt (kV) high voltage transmission line project (the project).

Xcel proposes to construct an approximate 13-mile single-circuit 115 kV high voltage transmission line between Lincoln County, Minnesota and Brookings County, South Dakota, to provide a second 115 kV connection between the Yankee Substation and the Brookings County Substation. Approximately 6.5 miles of the line will be located in Minnesota. The proposed project also includes necessary modifications to both substations.

The project is being evaluated in conformance with the alternative review process (Minnesota Rules 7849.5500). The Office of Energy Security, Energy Facilities Permitting is the responsible government unit for preparing the environmental assessment required for a route permit under this process. An applicant is not required to propose any alternative routes or sites to the preferred, under the alternative review process. The Commission has six months to reach a final decision on the route permit starting the date the Commission determined the route permit application complete.

Persons interested in these matters can register their names on the project docket webpage at <http://energyfacilities.puc.state.mn.us/Docket.html?Id=19453> or by contacting:

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Documents of interest can be found at the above website or also by going to the following: <https://www.edockets.state.mn.us/EFiling/search.jsp> and entering docket number "07-1626" under search criteria.

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## 1.0 INTRODUCTION

The Yankee Substation (Lincoln County, Minnesota) to Brookings Substation (Brookings County, South Dakota) #2 115 kilovolt (kV) high voltage transmission line project (Yankee to Brookings #2 or the project) is an approximate 13-mile single-circuit 115 kV high voltage transmission line (HVTL) that will provide a second 115 kV connection between the two substations. Approximately six and one-half miles of the line will be located in Minnesota and the remainder in South Dakota (Figure 1). The project also includes necessary modifications to both substations.

The project is part of the Xcel Energy (Xcel), Buffalo Ridge Incremental Generation Outlet Transmission Project (BRIGO). The purpose of the BRIGO project is to increase existing transmission outlet capacity for wind energy generated by projects located on the Buffalo Ridge, thereby allowing for greater exportation of wind energy to Xcel customers. Xcel indicates that the three proposed BRIGO transmission lines would increase the transmission outlet capacity on the Buffalo Ridge from 825 megawatts (MW) to 1,175 MW and resolve electric reliability issues.

In addition to increased generation capacity, the project would also provide a redundant transmission pathway that will remove the reliability-based limit on transmission capacity in the area. Specifically, the Yankee to Brookings #2 will support the electrical system in the event the existing Yankee to Brookings #1 115 kV HVTL suffers an outage. The Yankee to Brookings #2 project will be constructed on separate rights-of-way to provide this necessary redundancy (Figure 1).

Minnesota Office of Energy Security (OES), Energy Facility Permitting (EFP) is required to perform environmental review on applications for HVTL route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers concerning potential impacts and possible mitigations for the proposed project. This environmental assessment (EA) covers the environmental review requirements for the proposed project and route permit application as follows:

- Section 2.0 – Describes the regulatory framework associated with the project which includes certificate of need criteria, route permit requirements, and the alternative permitting processes.
- Section 3.0 – Provides a detailed description of the project as proposed by the applicant.
- Section 4.0 – Details the potential impacts of the proposed project to human and natural environments and recommends mitigative measures that could be implemented to eliminate or minimize the adverse impacts.
- Section 5.0 – Identifies a site or design specific alternative suggested in a comment letter received during the comment period for the scope of this EA.
- Section 6.0 – Lists additional permits that may be required for the proposed project.

## 2.0 REGULATORY FRAMEWORK

The project requires two separate approvals from the Minnesota Public Utilities Commission (PUC or the Commission) prior to being constructed: one determining the need for the transmission line, and one determining the route of the transmission line.

## 2.1 Certificate of Need

Pursuant to Minnesota Statute 216B.243, subdivision 2, “No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the commission pursuant to sections 216C.05 to 216C.30 and this section and consistent with the criteria for assessment of need.” In this case a large energy facility is defined in Minnesota Statute 216B.2421, subdivision 2(3) as, “any high-voltage transmission line with a capacity of 100 kilovolts or more with more than ten miles of its length in Minnesota or that crosses a state line.”

The project consists of a high voltage transmission line with a capacity in excess of 100 kV and crosses the state line, therefore a certificate of need is required.

Xcel filed a certificate of need application for the BRIGO project with the PUC on December 4, 2006. Pursuant to the criteria set forth in Minnesota Rules, chapter 7849, on September 14, 2007, the Commission issued a certificate of need for the BRIGO projects, which included the proposed Yankee to Brookings #2 project. In its Order, the Commission required that Xcel file route permit applications for all three BRIGO transmission lines by January 2008 and take the necessary steps to have the lines constructed and in-service no later than spring 2009.

## 2.2 Route Permit

In accordance with Minnesota Rule 7849.5040, subpart 2, “No person may construct a high voltage transmission line without a route permit from the commission. A high voltage transmission line may be constructed only within a route approved by the commission.” In this case Minnesota Rule 7849.5010, subpart 9, define a high voltage transmission line as, “...a conductor of electric energy and associated facilities designed for and capable of operating at a nominal voltage of 100 kilovolts or more either immediately or without significant modification. Associated facilities shall include, but not be limited to, insulators, towers, substations, and terminals.”

Xcel filed a route permit application with the Commission for the proposed project on January 18, 2008. The Commission accepted the route permit application as complete on February 8, 2008.

The route permit application for the project is eligible for consideration under the alternative permitting process (Minnesota Rule 7849.5500). The alternative permitting process is shorter than the full permitting procedures and does not require the applicant to propose any alternative routes to the preferred route, but does require the applicant to disclose rejected route alternatives and an explanation of why they were rejected.

## 2.3 Scoping & Environmental Assessment Process

The process OES must follow in preparing the environmental assessment is set forth in Minnesota Rule 7849.5700. This process requires the at least one public meeting in the area of the proposed project. The purpose of the meeting is to advise the public of the project and to solicit public input into the scope of the EA.

A public information meeting was conducted by EFP staff on March 3, 2008, at the Midwest Center for Wind Energy in Hendricks, Minnesota. Representatives from EFP and Xcel were available at the meeting and provided the public an opportunity to learn about the proposed project and the PUC’s route permitting process, review the route permit application, ask questions and submit comments. A public comment period beginning the day of the public information meeting and ending on March 14, 2008, provided the public an additional opportunity to provide comments and suggest alternative routes to be considered for the scope of the EA.

Based on review of public comments on the scope of the environmental review, the EA scoping decision document was issued by the Director of OES on March 27, 2008, as required by rule. The EA scoping decision document is included in Appendix A.

Upon completion of this EA, continuing procedural steps include: providing notice on the availability of the EA, scheduling and providing notice of a public hearing in the area where the project is located, and bringing the matter or final record to the Commission for a final decision. The Commission has six months from the time the application is accepted to reach a final decision under the alternative permitting process.

Copies of the route permit application and other documents relevant to the process are available for viewing and download on the PUC website (<http://energyfacilities.puc.state.mn.us>) or can be obtained by contacting the EFP project manager.

### 3.0 PROPOSED PROJECT

Xcel proposes to construct an approximate 13-mile single-circuit 115 kV high voltage transmission line between Lincoln County, Minnesota, and Brookings County, South Dakota, to provide a second 115 kV connection between the Yankee Substation and the Brookings County Substation. Approximately six and one-half miles of the line would be located in Minnesota. The proposed project also includes necessary modifications to both substations.

The proposed transmission line will be designed to meet or surpass all relevant local and state codes, North American Electric Reliability Corporation standards, the National Electric Safety Code (NESC), and Xcel standards. Appropriate standards will be met for construction and installation and all applicable safety procedures will be followed during and after installation.

#### 3.1 Project Location

The proposed project would be located in Lincoln County, Minnesota, and Brookings County, South Dakota. Townships, ranges, and sections for the Minnesota portion of the project are shown below in Table 1. A detailed depiction of the proposed project is presented on Figure 1.

**Table 1.  
Project Location in Minnesota**

County	Township	Range	Section
Lincoln	109N	46W	6
	110N	46W	7, 18, 19, 30, 31, 32
	110N	47W	12, 13, 24, 25, 36

**NOTE:** Information obtained from *Northern States Power Company Application to The Public Utilities Commission for a Route Permit – Yankee Substation to Brookings County Substation 115 kV Transmission Line Project*. Page 17. January 18, 2008.

#### 3.2 Route Description

Xcel is requesting that the Commission grant a route permit for the six and one-half miles of the project that would be located in Minnesota. A detailed description of the route is described below and is shown on Figure 1.

The route that Xcel is proposing begins at the Yankee Substation located at the southeast corner of 120<sup>th</sup> Avenue and 160<sup>th</sup> Street in Lincoln County. The line would exit the substation from the west and extend approximately 600 feet to County Road 1. The line would continue north approximately 1,300 feet along County Road 1 until it reached 160<sup>th</sup> Street. The line would then proceed west, following 160<sup>th</sup> Street for approximately one mile to 110<sup>th</sup> Avenue where it would turn north along 110<sup>th</sup> Avenue for an estimated 1.7 miles. An approximate 500 foot segment along 110<sup>th</sup> Avenue just south of 170<sup>th</sup> Street would be located 35 to 40 feet west of an existing north/south positioned 34.5 kV PPM Energy, Inc. owned feeder line to minimize impacts to a shelterbelt for a residence located on the east side of 110<sup>th</sup> Avenue.

A large wetland located to the south of the 110<sup>th</sup> Avenue and 180<sup>th</sup> Street intersection will require that the route be detoured to the west and around the wetland, thereby avoiding construction within the wetland. Following the detour around the wetland the proposed route would continue north along 110<sup>th</sup> Avenue for approximately 2.2 miles to a half-section line about one-half mile north of 200<sup>th</sup> Street. The route would then be directed northwest and then west along the half-section line towards the Minnesota/South Dakota border. The route would then proceed north along the state line for one-third mile turning west at 209<sup>th</sup> Street where it would enter South Dakota.

### **3.3 Route Width**

Xcel is requesting a 400 foot wide route; 200 feet each side of the road centerline for the six and one-half mile route proposed in Minnesota with the exception of one segment. A wider route width (1,200 foot total) is being requested near the intersection of 180<sup>th</sup> Street and 110<sup>th</sup> Avenue. The wider route width is needed to provide greater flexibility during detailed design to develop the best method for avoiding a large wetland and the existing Yankee to Brookings #1 HVTL.

### **3.4 Yankee Substation Modification**

Xcel is also proposing modifications to the existing Yankee Substation. The substation would be modified to accommodate the switching gear, bus work and new transformers necessary to integrate the proposed 115 kV transmission line into the transmission network. The construction and new equipment would be located within the substation's existing fenced area. The new equipment includes

- a 115 kV dead end structure with a 115 kV, 2000A motor-operated disconnect;
- two empty circuit breaker bays;
- a 115 kV, 3000A breaker between the Main Bus #1 and the second transformer;
- a single-phase coupling capacitor voltage transformer on the second transformer position;
- and
- four 115 kV, 3000A group-operated disconnects.

All controls and protection for the new breaker need to be installed, in addition to all foundations, steel, conductor, trenching, and grounding for the equipment installations. No additional grading will be required.

### **3.5 Transmission Line & Structures**

High voltage transmission line circuits generally consist of three phases, each at the end of a separate insulator string, and physically supported by structures. A phase consists of one or more conductors. A conductor is a cable typically less than one inch in diameter consisting of multiple strands of steel and aluminum wire wound together. When more than one conductor is used to make a phase, the term "bundled conductor" is used.

There are also shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire may also include a fiber optic cable that allows for substation protection equipment to communicate with other terminals on the line.

### Conductors

The phases for this project would consist of bundled conductors comprised of two aluminum conductor steel supported cables or similar, made of seven steel wires in the center, surrounded by 26 aluminum strands. The separate conductors are 795,000 circular mils or approximately 1.1 inches in diameter. The application indicates that 115 kV bundled conductor, single circuit configurations will be used for the entirety of the proposed project within Minnesota (Table 2). Ultimately, the transmission lines would be three-phase, 60 Hz (hertz), alternating current lines.

### Structures

Xcel proposes to use the same structures for the entire transmission line route in Minnesota (Table 2). The structures would be steel, single circuit poles with three davit arms (Figure 2). The steel poles are to have a galvanized or weathering steel finish and will be anchored with concrete pier foundations that may vary from 6.5 to 9 feet in diameter and 12 or more feet in depth from ground surface. The poles will average 90 feet in height and approximately 42 inches in diameter for tangent poles and 65 inches in diameter for dead-end poles, with an average span of 500 feet between the structures.

**Table 2.**  
**Transmission Line Structure Design (Minnesota segment)**

Line Voltage	Structure Type	Pole Type	Pole Diameter	Conductor	Foundation	Double-Circuit or Single-Circuit	Average Height
115 kV	Davit Arm	Steel (galvanized or weathered finish)	42 inches & 65 inches	Bundled 795 kcmil 26/7	Concrete	Single	90

**NOTE:** Information obtained from *Northern States Power Company Application to The Public Utilities Commission for a Route Permit – Yankee Substation to Brookings County Substation 115 kV Transmission Line Project*. Page 36. January 18, 2008.  
Kcmil = Thousand circular mil

### Right-of-Way

There is approximately 6.5 miles of proposed transmission line located in Minnesota. The route as proposed will parallel existing road right-of-way for 95 percent of the route. In areas where it is not possible to follow a road right-of-way Xcel will make an effort to follow section and half-section lines. Xcel proposes a 75-foot right-of-way for the transmission line.

### 3.6 Construction Procedures

Project construction will begin after the appropriate federal, state, and local permits and approvals are issued. Xcel will also need to acquire property rights of way, complete soil investigations, and develop the final detailed design. The construction schedule must take into account the various permit requirements/conditions, availability of materials and labor, and overall system loading issues.

Construction and mitigation best practices have been developed by Xcel from experience with past projects, consultation with respective federal, state, and local agencies, and affected property owners. The best practices include, but are not limited to, right-of-way clearance, staging locations, installing structures, and stringing transmission line. Practices to mitigate potential construction impacts will be established based on permit requirements, construction schedules, geology and topography, maintenance guidelines, inspection procedures, and encountering of sensitive environments or species. Modifications are made throughout the construction process to ensure that potential impacts are minimized to the greatest extent.

The transmission line structures are typically designed for the specific site location at which they are to be constructed. Generally, sites with a 10 percent slope or greater are graded and filled to create working pads, whereas sites with less than 10 percent slope will not be graded.

If the landowner permits, Xcel prefers to leave the leveled working pads for future maintenance activities. Should the landowner decide against leaving the graded working area, Xcel will return the site to its original pre-construction condition to the maximum extent possible. Upon completion of construction and restoration, Xcel contacts the property owner to determine if any damage has occurred as a result of the project. If damage has occurred, Xcel will arrange with the property owner, a fair compensation for the damages sustained. An outside contractor may be used to restore the damaged property to its original condition to the greatest extent possible.

The project would likely include one or two staging areas. Transmission line, associated structures, and other related construction materials are delivered, sorted, and stored at the staging locations throughout the duration of the project. Typical construction equipment consists of cranes, backhoes, digger-derrick line trucks, concrete trucks, bulldozers, front end loaders, dump trucks, and flatbed tractor-trailers to name a few.

Structures are loaded from the staging area and delivered to the determined field location for installation. The structures are assembled on the ground within the right-of-way at the respective location. The pole structure including insulators and other hardware are then lifted by crane and secured to the pre-constructed foundation. In some cases, temporary lay down areas may be required due to problematic structure location. Should the temporary lay down areas fall outside the right-of-way, rental agreements would likely be arranged with the affected landowner.

Once structures have been erected, conductors are installed by establishing stringing setup areas within the rights-of-way. Conductor stringing operations require brief access to each structure to secure the conductor wire to the insulators or to shield wire clamps once final sag is established.

### **3.7 Maintenance Procedures**

Transmission lines and substations typically require only moderate maintenance, and are designed to operate as such for decades. However, regular maintenance and inspections are performed during the life of the facility to ensure its continued integrity. Monthly inspections of the transmission facilities are usually done by air. Periodic access to the transmission line rights-of-way and substation will be required to perform on-ground inspections and conduct routine maintenance or repair.

In addition, the transmission line rights-of-way are managed to remove vegetation that have the potential to interfere with the operation and maintenance of the line. Vegetation management typically includes a combination of mechanical and hand clearing, along with herbicide application to remove or control the growth of vegetation in some areas.

## **4.0 POTENTIAL IMPACTS & MITIGATION MEASURES**

The construction of a transmission facility involves both short- and long-term impacts. An impact is a change to the pre-construction environment as a direct or indirect result of the proposed action and may be positive or negative. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable.

This section describes the potential impacts on resources and the possible mitigation measures intended to minimize impacts caused by the construction and future operation and maintenance of the proposed transmission facility.

#### **4.1 Environmental Setting**

The general location of the proposed transmission line project lies within Coteau Moraines subsection of the North Central Glaciated Plains. This subsection rises abruptly east to west from the Minnesota River Prairie subsection to a Minnesota landform commonly known as Buffalo Ridge. Windy conditions are common to this area. Shallow lakes and prairie wetlands are numerous throughout the subsection, making it important waterfowl habitat. Agriculture (row crop and pasture) is the predominant land use. Gravel mining is common to this area along with the dramatic expansion of large-scale wind power facilities. A number of the original prairie-grasslands are privately owned and are used for grazing. Wetland protection and restoration are important conservation issues in this area of Minnesota.

#### **4.2 Human Settlement**

The main thoroughfares in the area of the project are U.S. Highway 14 and County Roads 1, 15 (207<sup>th</sup> Street), 13 (180<sup>th</sup> Street), and 12 (170<sup>th</sup> Street). The most populated city near the project is Hendricks which is approximately 7 to 8 miles north on County Road 1.

Overall, the population density is very low across the county. The total land area of Lincoln County is 537 acres in size and has a population of 5,963 or approximately 12 persons per square mile. The percentage of people living at or below poverty is similar to other county and statewide levels.

#### **Potential Impacts**

The proposed route passes within 300 feet of three residences, 1,500 feet of three residences, and near one abandoned residence. This proposed route was selected, as it passed by a fewer number of homes when compared with alternate routes that were ultimately rejected. The approximate total permanent impact to the existing land use/environment due to the project is well below one acre.

#### **Mitigation**

No mitigation measures are necessary since the proposed route was chosen among a number of alternative routes because it passed by the least number of homes when compared with other suggested routes.

#### **4.3 Public Health and Safety**

Proper safeguards will be required during construction and operation of the proposed transmission facility. The proposed project will be designed to comply with local, state, NESC and Xcel standards concerning clearance to ground, clearance to other crossing utilities, clearance to buildings/structures, strength of materials and right-of-way widths.

During installation and construction of the transmission line facilities, Xcel construction crews and/or contract crews will comply with all pertinent local, state, NESC and Xcel standard construction practices. The established industry and Xcel safety procedures will be followed both during and after construction and during future operation and maintenance. This includes the use of clear signage during all construction and maintenance activities.

Protective devices in the form of breakers and relays located at the substation connections would be installed to safeguard the public should an accident occur and a structure or conductor falls to the ground. The protective equipment is designed to de-energize the transmission line, should such an event occur. In addition, the substation facilities would be fenced and access limited to authorized personnel only.

### 4.3.1 Electric and Magnetic Fields

Electric and magnetic fields arise from the voltage and the flow of electricity (current) through a conductor (wire or transmission line). The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the electric current. Together, these fields are generally referred to electric and magnetic fields or EMF.

The electric field associated with HVTLs “extend” from the energized conductors to other nearby objects, whereas the magnetic field “surrounds” the conductor. This section of the EA specifically addresses electric and magnetic fields produced through transmission of electric power at 60 Hz (cycles per second), also referred to as power frequency EMF. Transmission lines, household appliances and electric equipment, lighting and wiring all create electric and magnetic fields.

#### Electric Fields

Electrical fields are created by voltage. Voltage can be described as the potential difference between two points and will always try to drive an electric current. The voltage on any conductor produces an electric field that extends from the wire in all directions. The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/m).

Transmission line electric field levels are typically greatest near the center of the line right-of-way with levels decreasing as one moves away from the central transmission corridor. The electric field associated with a high voltage transmission line may extend from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings, and vehicles. These objects are commonly referred to as “screeners”. The screening effect associated with these and other objects reduce the strength of transmission line electric fields.

Electrical fields at maximum conductor voltage for the proposed project are presented in Table 3. Maximum conductor voltage is defined as the nominal voltage plus 5 percent, or 121 kV.

**Table 3.**  
**Calculated Electric Fields (kV/m) for Proposed 115 kV Transmission Line (3.28 feet above ground)**

Structure Type	Nominal Voltage	Distance to Proposed Centerline (feet)											
		-300	-200	-100	-50	-37.5	0	12.5	37.5	50	100	200	300
Single Circuit 115 kV Steel Pole Davit Arm	121 kV	0.005	0.012	0.057	0.253	0.408	0.862	1.114	0.413	0.248	0.062	0.014	0.006

**NOTE:** Information obtained from *Northern States Power Company Application to The Public Utilities Commission for a Route Permit – Yankee Substation to Brookings County Substation 115 kV Transmission Line Project*. Page 47. January 18, 2008.

The proposed 115 kV transmission line would have an electric field density of approximately 0.862 kV/m at centerline, one meter above the ground and a maximum electric field of 1.114 kV/m approximately 12.5 feet from center, one meter above the ground. The maximum electric field of 1.114 kV/m is approximately 86 percent less than the 8 kV/m limit imposed by the Minnesota Environmental Quality Board and PUC in other route permit proceedings. The restriction was designed to prevent serious hazard from shocks when touching large objects like a bus or combine parked under high voltage transmission lines, usually of 345 kV or greater.

### Magnetic Fields

Electric current passing through a conductor produces a magnetic field in the area surrounding the wire. Similar to electric fields, magnetic fields are strongest close to the conductor and diminish with distance. Magnetic fields however, are not shielded by most common materials and easily pass through them. The magnetic field may also be called magnetic flux density (or magnetic induction) and is measured in units of gauss (G) or milligauss (mG).

The estimated magnetic fields based on the proposed line and structure designs are presented in Table 4. The expected magnetic fields for the structure type and voltage have been calculated at various distances from the centerline.

**Table 4.**  
**Calculated Magnetic Flux Density in Milligauss (mG)**  
**for Proposed 115 kV Transmission Line (3.28 feet above ground)**

100-foot Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline (feet)										
			-300	-200	-100	-50	-37.5	0	37.5	50	100	200	300
Single Circuit 115 kV Steel Pole Davit Arm	Peak	1080	1.25	2.67	12.13	30.31	45.18	144.06	56.40	36.35	10.18	2.50	1.07
	Average	648	0.75	1.60	5.75	18.19	27.11	86.43	33.84	21.81	6.11	1.50	0.64

**NOTE:** Information obtained from *Northern States Power Company Application to The Public Utilities Commission for a Route Permit – Yankee Substation to Brookings County Substation 115 kV Transmission Line Project*. Page 50. January 18, 2008.

A U.S. government study conducted by EMF Research and Public Information Dissemination Program determined that most people in the United States on average are exposed to magnetic fields of 2 mG or less daily, and varies by individual.

It can be noted that magnetic fields are not singularly associated with transmission lines. People are exposed to these varying magnetic fields to a greater or lesser extent throughout each day, whether at home or in schools and offices. Table 5 (below) presents magnetic field readings for a select number of common home and business appliances. These reading represent median readings, meaning one might expect to find an equal number of readings above and below these levels.

**Table 5.**  
**Average Magnetic Fields (milligauss) from Common Home and Business Appliances**

Source	Distance from Source			
	0.5-foot	1-foot	2-feet	4-feet
Baby Monitor	6	1	-	-
Computer Displays	14	5	2	-
Fluorescent Lights	40	6	2	-
Copy Machines	90	20	7	1
Microwave Ovens	200	4	10	2
Electric Pencil Sharpeners	200	70	20	2
Vacuum Cleaner	300	60	10	1
Can Opener	600	150	20	2
Color Televisions	NA	7	2	-

**Note:** Referenced from *The National Institute of Environmental Health Sciences, Electric and Magnetic Fields Associated with the Use of Electric Power*, pages 34 to 36, June 2002.

### Pacemakers

Research has established that EMF can potentially interfere with cardiac pacemakers and implantable cardioverter defibrillators under certain circumstances. Electromagnetic fields may interfere with an implanted cardiac device's ability to sense normal electrical activity in the heart if the electric field intensity is high enough to induce body currents strong enough to cause interaction. Modern bipolar devices are much less susceptible to interactions with electric fields. Medtronic and Guidant, manufacturers of pacemakers and implantable cardioverter defibrillators, have indicated that electric fields below 6 kV/meter are unlikely to cause interactions affecting operation of most of their devices. Older unipolar designs are more susceptible to interference from electric fields. Research suggests that the earliest evidence of interference occurred in electric fields ranging from 1.2 to 1.7 kV/meter. The estimated electric fields for this project (Table 3) are below levels at which modern bipolar and older unipolar devices are susceptible to interaction.

In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker would return to its normal operation when the person moves away from the source of the interference. Individuals using such devices should consult with their doctor regarding recommended precautions or avoidance. The interference of a cardiac pacemaker implant by high voltage transmission line electric and magnetic fields cannot be excluded, but the risk of the interference inhibition in everyday life is small.

### Potential Impacts

Research on the effects of electric and magnetic fields to human health have been studied and debated since the 1970's. Conclusions have ranged from no significant association between exposure to EMF and health effects to a weak association between the two. A number of national and international health agencies (The Minnesota Department of Health, The World Health Organization, The National Institute of Environmental Health Sciences) have generally concluded in their research that there is insufficient evidence to prove a connection between EMF exposure and health effects. Research has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease.

There are currently no federal or Minnesota exposure standards for magnetic fields. Florida and New York are the only two states in the country that have set standards for magnetic field exposure (150 mG limit in Florida and 200 mG limit in New York). These exposure limits were not based on scientific analysis, but in response to maintaining transmission systems within historic levels.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has developed occupational and residential guidelines for EMF exposure (see Table 6 below). They have also concluded that available data regarding potential long-term effects, such as increased risk of cancer are insufficient to provide a basis for setting exposure restrictions.

**Table 6.**  
**Voluntary Exposure Guidelines for EMF**

International Commission on Non-Ionizing Radiation Protection Guidelines for 60 Hz EMF Exposure		
Exposure	Electric Field (kV/m)	Magnetic Field (mG)
Occupational	8.3	4,200
General Public	4.2	833

**Note:** Referenced from *The National Institute of Environmental Health Sciences, Electric and Magnetic Fields Associated with the Use of Electric Power*, page 47, June 2002.

The maximum estimated electric field generated by the project is 1.114 kV/m. This level is 73 percent less than the 4.2 kV/m ICNIRP developed guidelines for the general public. The maximum peak estimated magnetic field generated by this project is 144.06 mG which is 83 percent less than the 833 mG ICNIRP developed guidelines for the general public.

In Fact Sheet, WHO/322, *Electromagnetic Fields and Public Health: Exposure to Extremely Low Frequency Fields*, June 2007, The World Health Organization provided an update. In many studies, a weak, statistical link between exposure to EMF and incidence of childhood leukemia has been noted. Additionally, some epidemiologic studies making a regression analysis of leukemia cases have found a statistical association. A similar link has not been noted with other types of cancer. In its report, after reviewing recent studies, The World Health Organization concludes that laboratory evidence does not support these findings:

*... epidemiological evidence is weakened by methodological problems, such as potential selection bias. In addition, there are no accepted biophysical mechanisms that would suggest that low-level exposures are involved in cancer development. ... Additionally, animal studies have been largely negative. Thus, on balance, the evidence related to childhood leukaemia is not strong enough to be considered causal. ... Regarding long-term effects, given the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia, the benefits of exposure reduction on health are unclear.*

Although scientists are still debating whether EMF is a hazard to health, at the current time in the United States, there are no federal standards for occupational or residential exposure to 60-Hz EMF.

The following resource provides additional information regarding electric and magnetic fields: *Electric and Magnetic Fields Associated with the Use of Electric Power*, The National Institute of Environmental Health Sciences, June 2002, and can be found on the internet at: <http://www.niehs.nih.gov/health/topics/agents/emf/docs/emf2002.pdf>.

### Mitigation

To assist the public in understanding this issue, Xcel routinely provides information to the public, interested customers and employees. The information contains references to studies and provides data to help explain the relative impact of transmission line exposure to other common EMF exposures, and allows individuals to make informed decisions regarding EMF.

Xcel will provide measurements (i.e. distances from transmission lines, substations, and associated equipment) for landowners, customers and employees who request them. In addition, Xcel will use structure designs that minimize magnetic field levels and where practicable, locate facilities in areas affecting the fewest number of people.

Where there are sources of extreme electric and magnetic field exposure, access by the public will likely be restricted by fences or barriers.

#### **4.3.2 Stray Voltage**

Electrical supply systems delivering power to farms, homes, and businesses are grounded to the earth to make them safe and to ensure their reliability. Grounding of these electrical supply systems results in a small amount of current moving through the earth. A small voltage called neutral-to-earth voltage may develop at each point where the electrical system is grounded. When neutral-to-earth voltage is found near animal contact points at levels considered to have potential impact on animals, it is often called stray voltage. Stray voltage is the difference in voltage measured between two points contacted simultaneously by a person or animal (typically less than 10 volts).

Stray voltage arises from poor electrical connections, deteriorated insulation, or faulty equipment. Some sources of stray voltage are cathodic protection systems, telephone systems, and direct current power lines. Instances where HVTLs have been shown to contribute to stray voltage occurred when the electrical distribution system serving the farm was located directly under or parallel to HVTLs.

#### **Potential Impacts**

Stray voltage has been raised as a concern on some dairy farms because of the potential for dairy cows to come into contact with two points and provide a conducting path for current to flow, thereby impacting operations and milk production.

#### **Mitigation**

In instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm/structure was directly under and/or parallel to the transmission line. These circumstances are considered when installing transmission lines and can be readily mitigated. Appropriate measures will be taken during transmission line detailed design and construction to prevent the potential for any stray voltage problems for this project.

#### **4.4 Noise**

Noise is measured in units of decibels (dB), or sound pressure level. The sound pressure level for purposes of human hearing is measured with the A-weighted decibel scale or dB(A). Noise sources associated with the proposed project will include initial construction and long-term operation.

The Minnesota Pollution Control Agency (MPCA) is charged with enforcing Minnesota's noise level standards (Minnesota Rules, chapter 7030) with regards to protecting the health and welfare of the general public.

Noise area classifications (NACs) based on the land use activity at a certain receptor have been developed to determine the noise standard applicable to that land use. There are four NACs that have been developed in Minnesota; NAC 1 – residential, NAC 2 – commercial, NAC 3 – industrial, and NAC 4 – undeveloped. The NACs are assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) noise level standards. Minnesota pertinent NAC daytime and nighttime noise level standards are present in Table 7.

**Table 7.  
Minnesota Daytime and Nighttime Noise Level Standards**

Noise Area Classification	Daytime dB(A)		Nighttime dB(A)	
	L10	L50	L10	L50
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

**Note:** The limits are expressed as a range of permissible dB(A) within a 1-hour period; L50 is the dB(A) that may be exceeded 50 percent of the time within an hour, while L10 is the dB(A) that may be exceeded 10 percent of the time within 1 hour.

### Potential Impacts

Short-term impacts from general construction noise is expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel to and from the work area.

Long-term operational noise would be associated with the insulators, transmission conductor hardware and transformers at the substations. The level of noise is dependant upon the conductor conditions, voltage levels and weather conditions. Conductors and transformers may create subtle crackling noise due to the electric ionization of moist air near the wires when it is rainy, damp, or foggy (i.e. corona effect, see Sections 4.11 and 4.16).

### Mitigation

Short-term exceedance of daytime noise standards would be intermittent and temporary in nature. Potential noise impacts will be mitigated by using standard sound reduction equipment and by implementing responsible construction procedures. Construction activities will be limited to daytime working hours, therefore the nighttime noise level standards will not be exceeded.

In general, the noise produced by a 115 kV HVTL is less than normal outdoor background levels (~30 dB(A) or less) and is therefore not usually audible. Long-term noise impacts from the project are not anticipated.

## 4.5 Aesthetics

The area in which the project is proposed is mainly agricultural land. In recent years the proliferation of wind energy generation projects has contributed to a changing view of the area landscape. The proposed transmission line and structures will add to the changing landscape.

### Potential Impacts

The proposed transmission line structures will be visible to residents living near the route and to drivers using public roads adjacent to the route.

### Mitigation

The proposed route will utilize existing corridors and will avoid homes to the greatest extent practicable. Input pertaining to visual impacts from landowners or land management agencies will be considered prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance. Care will be used to preserve the natural landscape and prevent any unnecessary destruction of the natural surroundings in the vicinity of the project.

To the extent practicable, wetlands, lakes, and surface flows will be crossed in the same location as existing transmission lines; new transmission lines will parallel existing transmission lines and other rights-of-way, to the extent that such actions do not violate sound engineering principles or system reliability criteria.

#### **4.6 Recreation**

The closest recreation areas are at least five miles from the proposed transmission line route (Lake Shaokatan, Shaokatan Waterfowl Production Area, Weeks and Schindel Wildlife Management Areas). The proposed transmission line will not impact any public recreational area and it is not anticipated that the transmission line will be visible from recreational resources greater than five miles from the proposed route.

#### **Mitigation**

No impacts are anticipated therefore no mitigation is necessary.

#### **4.7 Transportation**

Throughout the construction phase of the project local motorists may be temporarily inconvenienced by the increase in construction vehicles on the roadways and minimal delays in traffic. Construction will not impact the community's emergency public infrastructure that is provided by Lincoln County.

Lincoln County has requested that structures not be placed on the north and west sides of the roads to minimize potential problems with snow drifts. Xcel may accommodate this request where the pole placement does not conflict with other land use constraints such as residences and wetlands.

#### **Mitigation**

No impacts are anticipated therefore no mitigation is necessary.

#### **4.8 Soils and Geology**

The general surface geology in this area of Minnesota is comprised of unconsolidated glacial till. Well-drained, silty clay loam over clay loam is the typical soil profile in the project area. The typical topography in the project area is gently sloping with approximate zero to six percent slopes. The groundwater table averages approximately 80-inches below ground surface.

#### **Potential Impacts**

Disturbance and/or compaction of soils will likely result in the areas where transmission line structures would be placed. In addition, soils exposed during construction may be vulnerable to erosion until stabilized. It is not anticipated that bedrock will be encountered during the construction of the project.

#### **Mitigation**

Soil erosion control measures will be followed to minimize loss of topsoil. Areas disturbed will be returned to their pre-construction condition. Transmission line route permits generally require that soil erosion control and soils compacted by construction activities are restored to pre-construction condition upon project completion.

Xcel will implement best management practices during construction in an effort to reduce dust, erosion, and minimize compaction. Methods commonly used to control soil erosion and assist re-establishing vegetation may include prompt seeding, silt fences, and erosion control blankets. No permanent impacts to the soil or geology within the proposed corridors are anticipated.

#### **4.9 Land Use**

The project lies within Drammen Township in Lincoln County, Minnesota. The project area is zoned primarily for agriculture and is mapped as transitional agriculture and grassland by the Minnesota Land Management Information Center.

The proposed 115 kV transmission line will require a 75-foot right-of-way. The transmission line would share the road rights-of-way when located adjacent to an existing road and would therefore require a smaller easement from a potential landowner. However, where the transmission line does not follow a road, Xcel would require a 75-foot easement from the landowner. The amount of new easement along roads will depend upon structure type and road configuration. The proposed route parallels existing road rights-of-way for approximately 95 percent of the route.

#### **Potential Impacts**

Temporary impacts caused by the proposed project during construction include soil rutting, compaction and potential crop damages from construction equipment accessing and operating on agricultural lands and rights-of-way. The only foreseeable permanent impacts will occur due to the placement of the transmission line structures; however, these impacts would be minimal.

The proposed route passes by six occupied residential structures and one abandoned structure, all of which are located along 110<sup>th</sup> Avenue. This proposed route was selected, as it passed near the least number of homes as compared to alternate routes that were ultimately rejected. It may be necessary to remove trees and/or windbreaks near three of the residential structures along the route, depending on the final design of the transmission line and structures. The approximate total permanent impacts to the existing land use/environment due to the project is well below one acre.

#### **Mitigation**

Impacts to agricultural land attributed to the proposed project would be temporary in nature. In an effort to minimize agricultural land loss, Xcel intends to place transmission structures 5-feet outside the public road rights-of-way. Attempts will be made to schedule the proposed project construction after spring, before crop planting, or after harvest. Temporary driveways may be constructed between the roadway and the structures to minimize impact by using the shortest route possible. Construction mats may also be used to minimize impacts on access paths and construction areas. Transmission line route permits generally require that the project related land impacts are to be restored to pre-construction condition upon project completion.

The Commission could require, as a permit condition, that Xcel work with landowners to identify issues related to the transmission line, distance from structures, tree clearing, and other aesthetic concerns, should a route permit be issued for the proposed project. The final alignment of the transmission line could cross the public roads along the route several times in order to avoid homes and windbreaks. An example of a route permit is presented in Appendix B.

#### **4.10 Archaeological and Historic Features**

Previous cultural resources investigations conducted by others in the late 1990's identified several Native American sites in Drammen Township, two of them (Site numbers 21 LN 0030 and 0033) are less than one mile east of rejected route option one.

In addition, four Native American archaeological sites (Site numbers 21 LN 0037, 0038, 0039, and 0040) located in Shaokatan Township are all less than one mile to the north/northeast of rejected route option one.

A historical literature search indicated five known archaeological resources (Site numbers 21 LN 0052, 0053, 0064, 0065, and 0069) within one mile of the proposed project. The research conducted for this project indicates there is potential for encountering archaeological and cultural resources in the proposed project area, specifically near streams and rolling topography. The proposed project crosses the Medary Creek or its tributaries three times and will also be located near a large wetland.

### **Potential Impacts**

Based on past surveys, literature research, and project location there is a reasonable possibility of encountering unidentified archaeological and cultural resources within the proposed project boundaries.

### **Mitigation**

In the event that a resource is encountered, the State Historical Preservation Office should be contacted and consulted; the nature of the resource should be identified; and a determination should be made on the eligibility for listing in the National Registry of Historic Places.

It is anticipated that a historic or cultural resource, if encountered, could more than likely be avoided by design modification (movement of planned structures) or data recovery by selective excavation, depending on the extend of the resource.

## **4.11 Air Quality Resources**

There are minimal air quality impacts associated with transmission line construction and operation. The only potentially direct air quality issue associated with transmission lines is the production of ozone and nitrogen oxides resulting from the corona effect. The corona effect is the ionization of air in the electric field at the surface of a transmission line and may be a contributing source of audible noise, electromagnetic radiation, and chemical reactions. In this case, the chemical reactions that take place when corona is present result in minute amounts of ozone and nitrogen oxides being produced. Ozone comprises approximately 90 percent of the oxidants produced, with the remaining 10 percent composed principally of nitrogen oxides.

Corona is an undesirable occurrence for electric transmission line facilities, as it is oftentimes caused by imperfect conductor support hardware and/or faulty insulators or cracks and separations in the line. The corona effect is cumulative, in that its presence contributes to increased deterioration of the transmission facility components and could reduce electric transmission reliability if left unchecked.

The Clean Air Act, National Ambient Air Quality Primary Standard (2008) for ozone in an area is 0.075 parts per million (ppm). Studies designed to monitor the production of ozone under transmission lines have essentially been unable to detect a significant increase in ozone from a 115 kV transmission line. Calculations referenced from the Bonneville Power Administration (BPA), *Corona and Field Effects Program Ver. 3* (U.S. Department of Energy, BPA, Undated) for a standard single circuit 115 kV transmission line project predicted the maximum ozone concentration of 0.008 ppm near the conductor and 0.003 ppm at one meter above ground during foul weather or worst case conditions (rain at 4 inches per hour).

During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0003 ppm near the conductor and 0.0001 ppm at one meter above ground level. In both instances the detectable ozone levels were well below Environmental Protection Agency standards. Given this, there are no anticipated impacts relating to ozone for the proposed project.

## Potential Impacts

During project construction there will be emissions and fugitive dust from vehicles and other construction related equipment. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Adverse impacts to the surrounding environment would be minimal due to the short and intermittent nature of project construction.

## Mitigation

There will be no significant impacts to air quality; therefore, no mitigation is necessary. Temporary impacts due to construction would be minimized by using best management practices to reduce dust emissions (see also Section 4.8.1).

### 4.12 Surface Water & Wetland Resources

The proposed project area is situated within the Minnesota River – Granite Falls and the Redwood River surface watersheds of the Minnesota Watershed Basin; and the Big Sioux – Medary Creek watershed of the Missouri River Basin. This area of southwest Minnesota has a well developed drainage system with numerous lakes and wetlands scattered throughout. The combined expansion and intensification of agriculture is a major contributor to water quality and quantity concerns in this area.

Surface waters in the proposed project area that could potentially be impacted by the construction of the project include approximately ten small wetlands located within or directly adjacent to the proposed route. There are also a number of small intermittent and perennial surface flows in-line with the proposed route. These unnamed tributaries drain the southeastern portion of the project area to the Missouri River and the northeastern portion to Norwegian Creek and southeast into Lake Benton.

The tributaries to be crossed are small and will readily be spanned by the transmission structures with the exception of one area. The area is located south of the 180<sup>th</sup> Street and 110<sup>th</sup> Avenue intersection (Figure 1). At this point the proposed route would be designed to avoid a large wetland and unnamed tributary to Medary Creek which is listed on the Minnesota Department of Natural Resources (DNR), Public Water Inventory. A Minnesota public water is a lake, wetland, or watercourse defined by Minnesota Statute 103G.005, subdivision 15 and 15a, and regulated by the DNR. The DNR requires a permit for a utility that crosses over or under a designated public water per Minnesota Statute 84.415.

There are no wetlands identified in the Nation Wetlands Inventory located in-line with or near the proposed route. The project will be designed to span or avoid all wetlands with no structures located in a designated wetland; therefore, a federal section 404 permit will not be required. In addition, the project footprint is not located within a designated 100 year floodplain.

## Mitigation

Although not anticipated, ground disturbance (excavation, grading, fugitive dust) during the construction phase of the project has the potential to cause increased sedimentation to existing surface waters. A National Pollution Discharge Elimination construction stormwater permit is not required; however, Xcel will follow standard erosion control measures outlined in MPCA guidance and best management practices regarding sediment control practice during construction. These practices include, but are not limited to, protecting storm drain inlets, use of silt fences, protecting exposed soil, immediately stabilizing restored soil, controlling temporary soil stockpiles, and controlling vehicle tracking. By maintaining sound water and soil conservation practices and implementation of best management practices, the construction and long-term operation of the proposed project is not expected to impact surface water quality.

#### 4.13 Flora

The project area is zoned primarily for agriculture and is mapped as transitional agriculture (row crops) and grassland (pasture and hayland) by the Minnesota Land Management Information Center. Land use and potential impacts are described in Section 4.9.

This area of Minnesota is generally described as upland prairie and is divided into a number of subsections. Historically this area of Minnesota is known for its mostly grass-dominated herbaceous communities. Moisture deficits in the area occur often and severe periodic droughts can be frequent.

The plant species in this area are dominated by tall grass blue stem (*Andropogon gerardii*), prairie drop seed (*Sporobolus heterolepis*), little blue stem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*). Woody species include leadplant (*Amorpha canescense*), prairie rose (*Rosa akansana*), American hazelnut (*Corylus Americana*), and smooth sumac (*Rhus glabra*). The main vegetation layers in this community are 40 inches in height with savannas exhibiting patchy shrub layers and tree canopies of approximately 6 feet and 33 feet in height, respectively.

Higher quality tracts of prairie exist throughout the area. The closest of these is located approximately one-half mile northwest of the project footprint along County Road 15, approximately one-half mile east of the Minnesota/South Dakota border.

#### Potential Impacts

There may be impacts to trees/windbreaks along the proposed route should they be located in the proposed right-of-way. The trees/windbreaks would be removed due to the potential for collapsing and contact impacts they could have on the safe and reliable operation of the transmission line facility. In addition, there may be a limited number of aged or unstable trees located outside the right-of-way that may need to be removed due to the potential for falling into the transmission line.

#### Mitigation

There are no listed native plant communities or areas of high biodiversity located within or near the project area; therefore, no impacts are anticipated. See Section 4.5.1 of this document for mitigation measures that are applicable to tree removal and rights-of-way clearing.

#### 4.14 Fauna

A number of prairie wetlands, grasslands, and shallow lakes in the area provide important habitat for numerous species of waterfowl, American bitterns, short-eared owls, northern harriers, and associated waterbirds, shorebirds, and grasslandbirds, including various raptors, prairie chickens and sharp-tailed grouse. Mammals include white-tailed deer, badgers, coyote, raccoon, various species of ground squirrels and other small rodents.

#### Potential Impacts

There is a potential for temporary displacement of wildlife during construction of the proposed project. The habitat that would be affected is limited to trees that require removal and fringe areas of agriculture plots. Displaced wildlife would likely re-establish itself in closely located and comparable habitats within the project area. Displacement of fauna will be minor and temporary in nature. No long-term effects related to displacement are anticipated; therefore, no mitigation measures are necessary.

The principal impact posed by the transmission line project to wildlife is avian collision once the transmission lines have been constructed and are operational. Although the potential for avian mortality is low, the applicant will evaluate mitigative measures in areas of the project where the chance of avian collision or electrocution is higher (i.e. wetlands).

### **Mitigation**

Xcel's standard transmission design incorporates adequate spacing of conductor(s) and grounding devices. This is intended to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices.

In April 2002, Xcel and the U.S. Fish and Wildlife Service (USFWS) entered into a memorandum of understanding (MOU) to take a comprehensive look at all of the power equipment, poles/structures, transmission lines that may potentially contribute to avian collision and mortality. The MOU provides for the development of an avian protection plan for all of Xcel's service territories and is currently in development. In addition, areas will be identified by Xcel in cooperation with the DNR and USFWS, where swan flight diverters could be incorporated into the transmission line design to prevent swan and other large avian collisions attributed to visibility issues.

### **4.15 Rare and Unique Natural Resources**

The DNR's, Natural Heritage and Nongame Research Program was consulted for listed endangered, threatened, and special concern species in addition to any unique native plant communities within or near the proposed project area.

The immediate project area was found to include habitat of one federally endangered and state special concern specie, the Topeka shiner (*Notropis topeka*). The Topeka shiner is rare throughout its Midwestern habitat range and limitedly distributed in a few pockets of streams in southwest Minnesota.

### **Potential Impact**

The unnamed wetland tributary to Medary Creek, located south of 180<sup>th</sup> Street and 110<sup>th</sup> Avenue and directly in-line with the proposed project route is designated as critical habitat for the Topeka shiner.

### **Mitigation**

Mitigation measures for potential impacts to the Topeka shiner and its habitat will include construction techniques and sediment control measures such as:

- Following recommendations outlined in the USFWS, *Recommendations for Projects Affecting Waters Inhabited by Topeka Shiners (Notropis topeka) in Minnesota*; May 11, 2007;
- Utilizing silt fences, practicing prompt re-seeding, and using erosion control blankets; and
- Placing structures to either span critical watercourses or avoidance by routing around the area, as in the case of the large wetland tributary to Medary Creek.

### **4.16 Radio, Television, and Cellular Phone Interference**

The corona effect on transmission line conductors in rare circumstances can produce electromagnetic interference or high frequency (~120 Hz) electric noise that can potentially cause radio, television, and communication system interference.

Radio interference is limited to amplitude modulation broadcast bandwidths and typically does not impact frequency modulation broadcasts. Television interference caused by corona usually occurs during foul weather when the conditions for corona are ideal. Corona-related television interference is rare and generally only a concern for conventional receivers within approximately 600 feet from the transmission line. Satellite and cable receivers are not affected by corona-generated electromagnetic interference.

### **Mitigation**

This phenomena is generally associated with transmission lines that are operating at 345 kV or greater. No impacts are anticipated therefore no mitigation is necessary.

## **5.0 ALTERNATIVES**

A site specific alternative was suggested in a comment letter received during the comment period for the scope of this EA and was included as part of the scoping decision. The alternative does not deviate from the route corridor proposed in the route application permit. The alternative specifically suggests the transmission line be routed along the east side of 110<sup>th</sup> Avenue through Section 19 to approximately the three quarter point (residential structure) of Section 18, the line would then cross to the west side of 100<sup>th</sup> Avenue at this point and continue north as proposed. This would avoid the residence located on the east side of 110<sup>th</sup> Avenue in the northwest quadrant of Section 18. This alternative only considers the line route and not the other items suggested in the comment letter (i.e. buried PPM lines, geodetic cement marker, etc.). The additional suggestions are items that would be discussed in separate agreements between Xcel and the particular landowners.

This alternative is very specific in nature and because it does not deviate from the initially proposed route corridor; the environmental impacts/mitigation outlined above are relevant to this alternative. In keeping with the effort to avoid occupied residences and trees/windbreaks to the greatest extent possible, the Commission could require, as a permit condition, that Xcel work with the landowners suggesting this alternative to identify issues related to the transmission line, distance from structures, tree clearing, and other aesthetic concerns, should a route permit be issued for the proposed project. The suggested alternative may be feasible, as the final alignment of the transmission line can cross public roads along the route several times in order to avoid homes and windbreaks. The feasibility of this alternative would likely be determined during final detailed route design.

## 6.0 ADDITIONAL PERMITS & APPROVALS REQUIRED

There are no federal permits or approvals required for the proposed project. State and local permits for the proposed project in addition to the certificate of need and route permit are listed below in Table 8.

**Table 8.  
Potentially Required Permits**

Permit	Authority
Utility Crossing Permit	State, County, Township, City
Lands Permit	State, County, Township, City
Over-Width Load Permit	State, County, Township, City
Driveway/Access Permit	County, Township, City
License to Cross Public Waters	Minnesota Department of Natural Resources
Certificate of Need	Minnesota Public Utilities Commission
Route Permit	Minnesota Public Utilities Commission

## 7.0 REFERENCES

Much of the information contained within this document was provided by the applicant or the applicant's representatives in the *Northern States Power Company Application to the Public Utilities Commission for a Route Permit*, January 18, 2008 (available for viewing at: <http://energyfacilities.puc.state.mn.us/Docket.html?Id=19453>).

Additional information sources include:

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# FIGURES







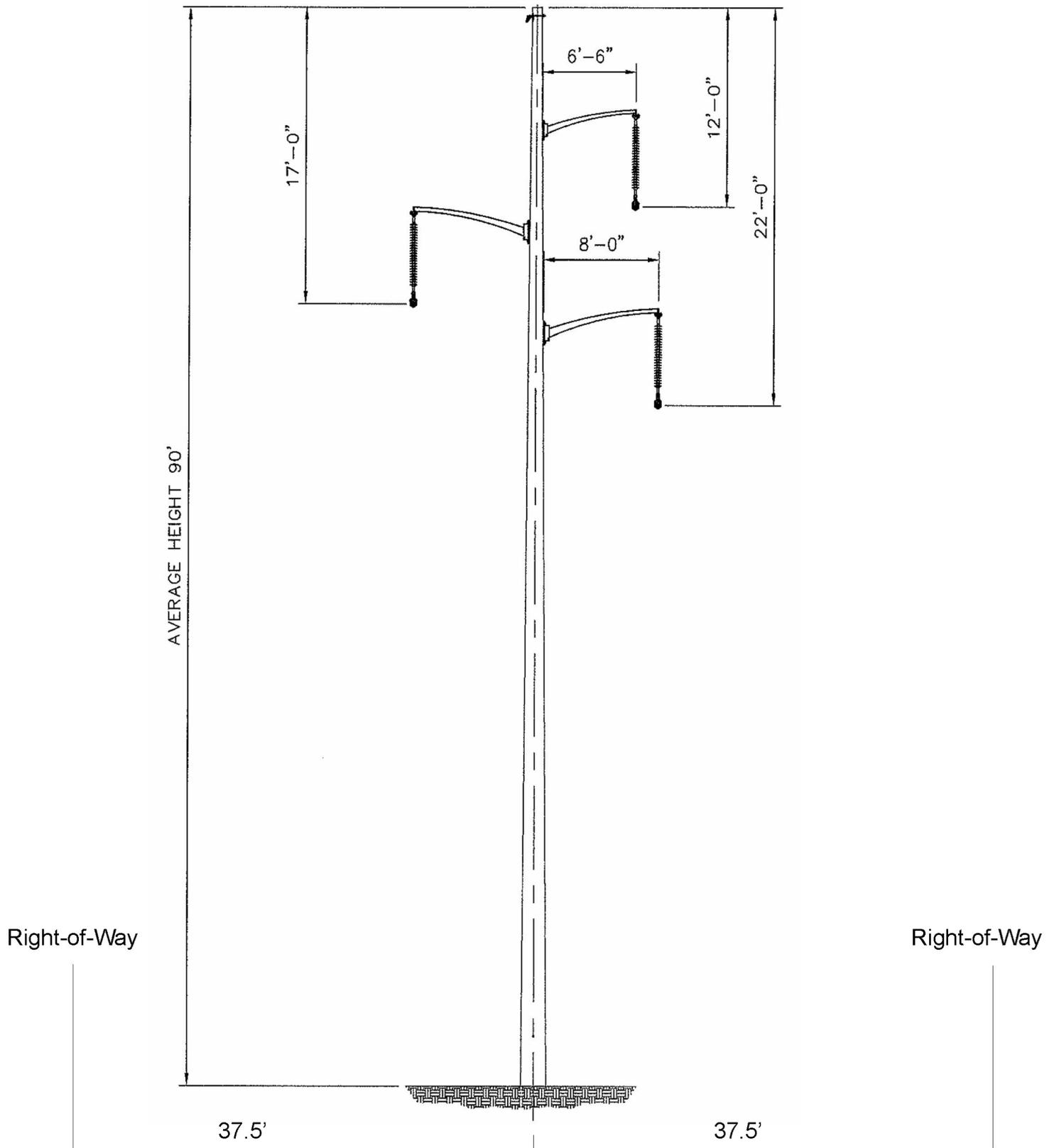


Figure 2  
 115 kV Line Typical Structure  
 75' Typical Right-of-Way Width



**APPENDIX A**  
**Environmental Assessment Scoping**  
**Decision**





**In the Matter of the Application for a Route  
Permit for the Yankee Substation to Brookings  
County Substation #2 115 kV High Voltage  
Transmission Line**

**ENVIRONMENTAL ASSESSMENT  
SCOPING DECISION  
PUC Docket No. E002/TL-07-1626**

The above matter has come before the Director of the Office of Energy Security for a decision on the scope of the Environmental Assessment to be prepared on the proposed Xcel Energy, Yankee Substation to Brookings County Substation #2 115 kV High Voltage Transmission Line Project.

Xcel Energy proposes to construct an approximate 13-mile 115 kV transmission line in Lincoln County, Minnesota, and Brookings County, South Dakota, to provide a second 115 kV connection between the Yankee Substation and the Brookings County Substation. Approximately 6.5 miles of the line will be located in Minnesota. The project also includes necessary modifications to both substations. The line is one of three 115 kV transmission line projects in the area that together will improve the overall system's general reliability and capability to support future wind generation development in southwestern Minnesota and eastern South Dakota.

Xcel filed an Application for a Route Permit with the Public Utilities Commission for the proposed High Voltage Transmission Line Project on January 18, 2008. The Public Utilities Commission accepted the application.

The Office of Energy Security, Energy Facility Permitting staff held a public information and Environmental Assessment scoping meeting on March 3, 2008, at the Midwest Center for Wind Energy in Hendricks, Minnesota, to discuss the project with the public and gather public input into the scope of the Environmental Assessment to be prepared. Approximately 16 people attended the meeting. The public was given until March 14, 2008, to submit written and/or email comments. The Office of Energy Security received a total of two comment letters that were reviewed and considered during preparation of the scoping decision.

Having reviewed the matter, consulted with the Energy Facility Permitting staff, and in accordance with Minnesota Rule 7849.5700, I hereby make the following Scoping Decision:

**MATTERS TO BE ADDRESSED**

The Environmental Assessment on the Yankee Substation to Brookings County Substation #2 115 kV High Voltage Transmission Line Project will address and provide information on the following matters:

**A. GENERAL DESCRIPTION OF THE PROPOSAL**

1. Purpose of the Transmission Line
2. Project Location and Environmental Setting

3. Engineering and Operation Design
  - a. Transmission Line and Structures
  - b. Transmission Capacity
  - c. Construction Procedures
  - d. Right of Way Maintenance

## **B. IMPACTS AND MITIGATIVE MEASURES**

1. Human Settlement
2. Public Health and Safety (including electromagnetic fields [EMF], and safety codes)
3. Noise
4. Aesthetics
5. Recreation
6. Transportation
7. Soils and Geology
8. Land Use
9. Archaeological and Historic Features
10. Air Quality Resources
11. Surface Water Resources
12. Wetlands
13. Flora
14. Fauna
15. Rare and Unique Natural Resources
16. Radio, Television, and Cellular Phone Interference

## **C. ALTERNATIVES TO BE ADDRESSED IN THE EA**

The Environmental Assessment will address impacts and mitigation of Xcel Energy's proposed route, including both the east and west sides of 110<sup>th</sup> Avenue which are within the proposed route, as recommended in a comment letter submitted by Mr. Theodore Schwing (a landowner along the proposed route).

## **D. IDENTIFICATION OF PERMITS**

The Environmental Assessment will include a list of permits that will be required for construction of this project.

### ISSUES OUTSIDE THE SCOPE OF THE EA

The Environmental Assessment will not consider the following:

1. The manner in which land owners are paid for transmission rights of way easements, as that is outside the jurisdiction of Public Utilities Commission.
2. Alternatives not described specifically in this Scoping Decision.
3. Whether a different size or different type of transmission line should be built.
4. The no-build option regarding the High Voltage Transmission Line or routes other than those noted herein.
5. The impacts of specific energy sources, such as carbon outputs from coal-generated facilities or environmental impacts from a wind generation installation.

### SCHEDULE

The Environmental Assessment shall be completed and available in May 2008. A public hearing will be held in the city of Hendicks area after the Environmental Assessment has been issued and notice served.

Signed this 27 day of March, 2008

STATE OF MINNESOTA  
DEPARTMENT OF COMMERCE  
OFFICE OF ENERGY SECURITY



Edward A. Garvey, Deputy Commissioner and Director



**APPENDIX B**  
**Sample Route Permit**





**BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION**

**COMMENTS AND RECOMMENDATIONS OF THE  
MINNESOTA OFFICE OF ENERGY SECURITY  
ENERGY FACILITY PERMITTING STAFF**

DOCKET NO. E002/TL-07-1233

Meeting Date: May 8, 2008

Agenda Item # \_\_\_\_\_

Company: Xcel Energy

Docket No. E002/TL-07-1233

**In the Matter of the Application for a Route Permit for the Fenton – Nobles #2  
115kV High Voltage Transmission Line**

Issue(s): Should the Commission find that the Environmental Assessment and the record adequately address the issues identified in the Scoping Decision? Should the Commission issue a route permit identifying a specific route and permit conditions for the proposed Fenton to Nobles #2 HVTL project?

OES Staff: Adam M. Sokolski .....651-296-2096

**Relevant Documents (in Commission Packet)**

- Initial Filing - Route Permit Application – Xcel Energy .....October 18, 2007
- Xcel Energy Letter Proposing Design Modification ..... February 26, 2008
- Environmental Assessment ..... March 5, 2008
- ALJ’s Summary of Testimony at Public Hearings ..... April 15, 2008

The enclosed materials are work papers of the Office of Energy Security Energy Facility Permitting Staff. They are intended for use by the Public Utilities Commission and are based on information already in the record unless otherwise noted.

This document can be made available in alternative formats, i.e., large print or audio tape, by calling (651) 201-2202 (Voice) or 1-800-627-3529 (TTY relay service).

## **Statement of the Issues**

Should the Commission find that the Environmental Assessment and the record adequately address the issues identified in the Scoping Decision? Should the Commission issue a route permit identifying a specific route and permit conditions for the proposed Fenton to Nobles #2 transmission project?

## **Introduction and Background**

Xcel Energy proposes to build a second 115 kilovolt (kV) high voltage transmission line (HVTL) from its existing Fenton Substation to its existing Nobles County Substation. On October 18, 2007, Xcel Energy filed a route permit application for the Fenton to Nobles #2 115kV Project (the "Project").

The proposed Project is the first of three transmission line route permits anticipated to be considered by the PUC for Xcel Energy's (Xcel) "Buffalo Ridge Incremental Generation Outlet" (BRIGO) transmission project.

The BRIGO transmission project is part of a series of measures intended to increase transmission capacity to export wind energy generated on the Buffalo Ridge to Xcel Energy's customers. Xcel indicates that the three proposed BRIGO transmission lines will increase the transmission outlet capacity on the Buffalo Ridge from approximately 825 megawatts (MW) to approximately 1,175 MW and resolve electric reliability issues in the city of Marshall.

The Minnesota Public Utilities Commission (PUC or Commission) issued a Certificate of Need (CON) to Xcel for the BRIGO transmission project on September 14, 2007. In its Order, the PUC required that Xcel file route permit applications for all the three BRIGO transmission lines no later than January 2008 and take necessary steps to have the lines constructed and in-service no later than spring 2009.

### ***Project Area***

The Xcel Energy Fenton – Nobles #2 Project is proposed in Murray and Nobles counties, Minnesota. The proposed route begins south of Chandler at the existing Fenton Substation and terminates at the Nobles County Substation immediately north of Reading. Nearly the entire proposed route runs parallel to state, county and township road rights-of-way (ROW).

The area along the proposed route is rural and dominated by agricultural land uses. The area contains some rural homes and farmsteads. Several transmission and distribution lines are present in the area.

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<sup>1</sup> PUC Docket E002/CN-06-154, <https://www.edockets.state.mn.us/Efiling/ShowFile.do?DocNumber=4772937>

### ***Project Description***

The length of the proposed transmission line route is approximately 23 miles. Xcel also proposes to install associated facilities including improvements to both substations to accommodate the new transmission line.

The Environmental Assessment (EA) conducted by the Office of Energy Security (OES) Energy Facilities Permitting (EFP) staff provides a detailed description and analysis of Xcel's proposed route, as well as, a short alternative route segment (Kluis Alternative). Nearly the entire 23 mile long route runs parallel and immediately adjacent to existing ROW.

Xcel is requesting a 400 foot wide route (200 feet each side of the centerline) and proposes to construct the transmission line primarily on private lands within 10 feet outside of the road ROW it parallels where possible.

Xcel Energy proposes to utilize two different transmission line structures (poles) for the proposed line. Most of the line will be constructed on steel single circuit transmission line structures with davit arms designed to carry 115 kV conductors throughout the approved route. These structures are 90 feet tall and will have an average span of 500 feet between structures. Figure 2 in the Application shows a cross section drawing of a typical 115 kV single pole structures being considered for this Project.

Xcel Energy has also requested permission to install galvanized steel, single circuit, davit arm transmission line structures designed to carry 345 kV conductor on a limited basis primarily between the Fenton Substation and Minnesota Truck Highway 91, and at locations where taller poles are necessary to cross other existing transmission lines and where the line is required to achieve longer spans to cross wetlands and bodies of water. These structures are 135 – 145 feet tall and will have an average span of approximately 950 feet. Xcel's February 25, 2008, letter proposing to use larger transmission structures shows a cross section drawing and photo of the 345 kV structure.

The transmission right of way (easement area) width requirement for the 115 kV transmission project would be 75 feet where the 115 kV structures will be used and 150 feet where the taller 345 kV structures will be used.<sup>2</sup>

### **Regulatory Process and Procedures**

A route permit from the Commission is required to construct an HVTL, which is a transmission line and associated facilities capable of operation at 100 kilovolts or more. The Power Plant Siting Act requirement became law in 1973 in Minnesota Statutes, 216E.001 through 216E.18. The rules to implement the permitting requirement for an HVTL are in Minnesota Rules Chapter 7849.

The Application was reviewed under the Alternative Review Process (Minnesota Rules 7849.5510) of the Power Plant Siting Act (Minnesota Statutes Chapter 216E). Under the

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<sup>2</sup> Exhibit 2, Chapters 4 -5

Alternative Review Process, an applicant is not required to propose any alternative sites or routes. The OES EFP staff holds initial public information/scoping meeting, develops a scoping decision recommendation, prepares a document called an EA, and holds public hearing is held. The Commission has six months to reach a decision under the Alternative Process from the time an application is accepted

### ***Application & Acceptance***

On September 20, 2007, a letter was filed with the Commission by Xcel noticing their intent to submit a Route Permit Application under the Alternative Permitting Process. On October 18, 2007, Xcel filed a Route Permit Application for a second 115 kV HVTL to be constructed between the Fenton Substation and the Nobles County Substation (Exhibit 1). The Commission accepted the Application as complete on November 2, 2007.

### ***Public Information and EA Scoping Meeting***

On November 15, 2007, EFP staff held the initial public information/scoping meeting in Wilmont. Approximately 25 persons, excluding OES staff and the Applicant's representatives, attended the meeting. The purpose of the public meeting was to provide the public with information about the Project, afford the public an opportunity to ask questions and present comments, and to solicit input on the content of the EA.

During the initial public information/scoping meeting concern was raised about the portion of Xcel's proposed route (approximately 1 mile) that follows along 70<sup>th</sup> Avenue between 11<sup>th</sup> Street and 1<sup>st</sup> Street in Murray County. Building the transmission line along this segment would require the removal of mature wind break protecting several west facing farmsteads in the segment. Potentially impact landowners Jim and Joan Kluis, provided verbal and written comments proposing an alternative segment which was included in the scope and evaluated in the EA. The proposed alternative segment would move the transmission line approximately one half mile west running cross country along the half section line of Section 31, Moulton Township, Murray County.

Two comment letters were received during the scoping comment period concerning the Fenton – Nobles #2 Transmission Project. Jim and Joan Kluis provided comments proposing the alternative discussed above. The other comment letter was filed by the U.S. Army Corps of Engineers clarifying wetland permitting requirements for the Project.

The EA Scoping Decision was signed by the Director of the OES on January 18, 2008. The EA was made available on March 6, 2008.

### ***Public Hearing***

The OES EFP staff requested that the Office of Administrative Hearings assist the OES by assigning an ALJ to preside over the public hearing and provide a summary of testimony at the public hearing.

ALJ Eric Lipman conducted a public hearing during the evening of April 1, 2008. The public hearing was held at the Wilmont Community Center, 316 4<sup>th</sup> Avenue, Wilmont, Minnesota. Approximately 25 persons attended the hearing. The ALJ provided the opportunity for members

of the public to air their views regarding the proposed route of the 115 kV HVTL. The comment period closed on April 11, 2008. The ALJ filed his summary of testimony at the public hearing on April 15, 2008.

At the hearing and in written comments, several people raised concerns that the compensation Xcel pays to landowners for easement acquisition is inadequate. While this is an important issue to many, it is outside of the PUC's jurisdiction; disputes regarding easement valuation are subject to condemnation and eminent domain proceedings (Minnesota Statute Chapter 117) in the appropriate district courts.

The Kooiman family, in oral and written comments, opposed using the Kluis Alternative, as it would run along the eastern property boundaries of the family lands in Moulton Township, Section 31. The Kooiman family raised concerns that the placement of the transmission line along the Kluis Alternative will reduce the number of wind turbines that could potentially be built on this land. However, the family does not have any immediate plan or pending proposal to develop a wind facility on these lands. The Kooiman family would prefer a different route across its land which would add an additional mile of transmission line along their property, all of which is along road ROW. The route suggested by the Kooimans at the public hearing was not analyzed in the EA.

The president of the Nobles County Minnesota Farmer Union chapter, Tim Henning, testified in favor of the Nobles to Fenton transmission project. He also expressed concerns regarding crop and soil damages due to construction of the line and suggested that Xcel avoid springtime construction, avoid routing the line cross country through agricultural lands, and suggested that Xcel coordinate closely with landowners on the final placement of poles. Finally, Mr. Henning suggested having a local person, rather than an Xcel employee, serve as an ombudsman to act on complaints from landowners regarding construction of the line.

Jim Joens, a farmer and landowner, provided oral and written testimony pointing out soil and crop damages which resulted from construction practices related to building the first transmission line between the Fenton and Nobles substations. In addition, Mr. Joens complained about how landowners were treated by several of the contractors responsible for easement acquisition and construction for that line.

Greg Ponto, a landowner immediately adjacent to the Nobles County Substation, expressed his frustration with crop damages from construction of the first Fenton to Nobles transmission line. Mr. Ponto expressed preference for using larger transmission line structures as they allow for spans approaching 1,000 feet, thus requiring roughly half the number of structures when compared to the shorter structures. He indicates that fewer structures build reduces the permanent impacts to agricultural lands.

Kooiman family, who own lands along portions of the Kluis Alternative, expressed in written and oral comments that they believe the Kluis Alternative will negatively impact the future ability to develop a wind project on the Kooiman properties. In addition, the Kooimans indicated that the placement of the line on their fields will make future maintenance of the line and farm operations more difficult. At the hearing, the Kooimans suggested that the

transmission line be routed along Highway 91 through this area to avoid both homes and farming operations, which would add at least one additional mile to the route. The Kooiman's suggested route segment was not proposed until the public hearing and was not evaluated in the EA.

### ***Standards for Permit Issuance***

The Power Plant Siting Act sets standards and criteria and outlines the factors to be considered in determining whether to issue a permit for a HVTL (Minnesota Statute 216E and Minnesota Rules 7849.5900). Also, the law allows the PUC to place conditions on HVTL permits (Minnesota Statute 216E.03 and Minnesota Rule 7849.5960).

### **DOC EFP Staff Analysis and Comments**

The OES EFP staff has attached proposed Findings of Fact, Conclusions and Recommendation (Attachment A) and a proposed Route Permit (Attachment B). A list of documents that are part of the record in this proceeding is included on the attached Exhibit List (Attachment C). EFP staff made these documents available to the public on April 25, 2008. The Findings indicate that the permitting process has been conducted in accordance with Minnesota Rules Chapter 7849, identify route impacts and mitigation measures, and make conclusions of law. The proposed Route Permit includes measures to ensure the line is constructed in a safe, reliable manner and that impacts are minimized or mitigated.

### ***Staff Analysis***

EFP staff has reviewed Xcel Energy's proposed route and the Kluis Alternative segment. The proposed route and Kluis Alternative were examined in detail in the EA and at the public hearing.

The Kluis Alternative segment reduces the impact of the proposed route along 70<sup>th</sup> Street between 1<sup>st</sup> Avenue and 1<sup>1/2</sup> Avenue by moving the proposed transmission line off the road ROW to run cross country along a half section line, thus avoiding two farmsteads and the mature windbreaks protecting these homes. The Kluis Alternative does not add length or cost to the Project. Xcel Energy has stated its support for constructing the line along the Kluis Alternative. The EFP staff concludes that the Kluis Alternative is a more reasonable and prudent route than the proposed route in the affected area.

EFP staff has reviewed Xcel Energy's request for permission to install taller transmission line structures along the northern 2.5 miles of the route, in locations where the proposed line will cross sensitive streams and where the line will cross existing transmission lines. It is important to note that the northern 2.5 miles of the route is also within the 205 MW Fenton Wind Project, which features approximately 137 wind turbine generators, each approximately 380 feet tall.

Taller transmission line structures will likely be more visible due to their height and have spans approximately twice as long as standard 115 kV transmission structures (500 feet vs. 950 feet). Thus, while taller and more visible, only about half the number of structures will be required in this portion of the route. These visual impacts are highly subjective. Xcel Energy reports that no landowner potentially impacted along this portion of the route has objected to use of these taller

structures. In fact, at least one landowner has expressed a preference for the taller transmission structures as their use reduces the overall number of transmission poles required to be built.

The OES EFP staff conclude that approving the limited use of taller transmission line structures as requested by Xcel is appropriate in this case.

Unfortunately, crop damages do occur when transmission lines and other energy facilities are constructed. Xcel has identified in its Application several measures it plans to undertake to minimize crop damages. Xcel will compensate landowners for crop or soil damages caused by the construction of the transmission line.

The proposed route modified by the Kluis Alternative will place the transmission line primarily along road ROW, which reduces the impacts to agricultural properties. While crop damages are still possible, routing the line along road ROW generally reduces the amount of land exposed to potential crop and soil damage as the route can be accessed from the adjacent road.

Finally, EFP staff note that the route permit requires Xcel to designate a field representative who is the point person for the PUC and landowners to communicate with regarding construction related concerns, questions or complaints. EFP staff believe that having an Xcel Energy appointed representative provides the public with direct access to get questions answered and problems resolved in the most direct and expeditious manner.

## **PUC Decision Options**

### **A. Approve and Adopt the Findings of Fact, Conclusions of Law and Order for the Xcel Energy Fenton – Nobles Transmission Project which:**

1. determines that the Environmental Assessment and record created at the public hearing address the issues identified in the EA Scoping Decision;
2. approves the proposed route modified by the Kluis Alternative segment for the construction of the transmission line;
3. issues a high voltage transmission line Route Permit, with appropriate conditions, to Xcel Energy, and;
4. approves Xcel Energy's request to install taller transmission line structures along the northern 2.5 miles of the approved route and other locations where longer spans and clearance are required to cross streams, environmentally sensitive area and existing transmission lines.

### **B. Approve and adopt the Findings of Fact, Conclusions and Order as above while imposing any further permit conditions as deemed appropriate.**

### **C. Amend the Findings of Fact, Conclusions and Order and Route Permit as deemed appropriate.**

### **D. Make some other decision deemed more appropriate.**

## **EFP Staff Recommendation**

Staff recommends Option A.