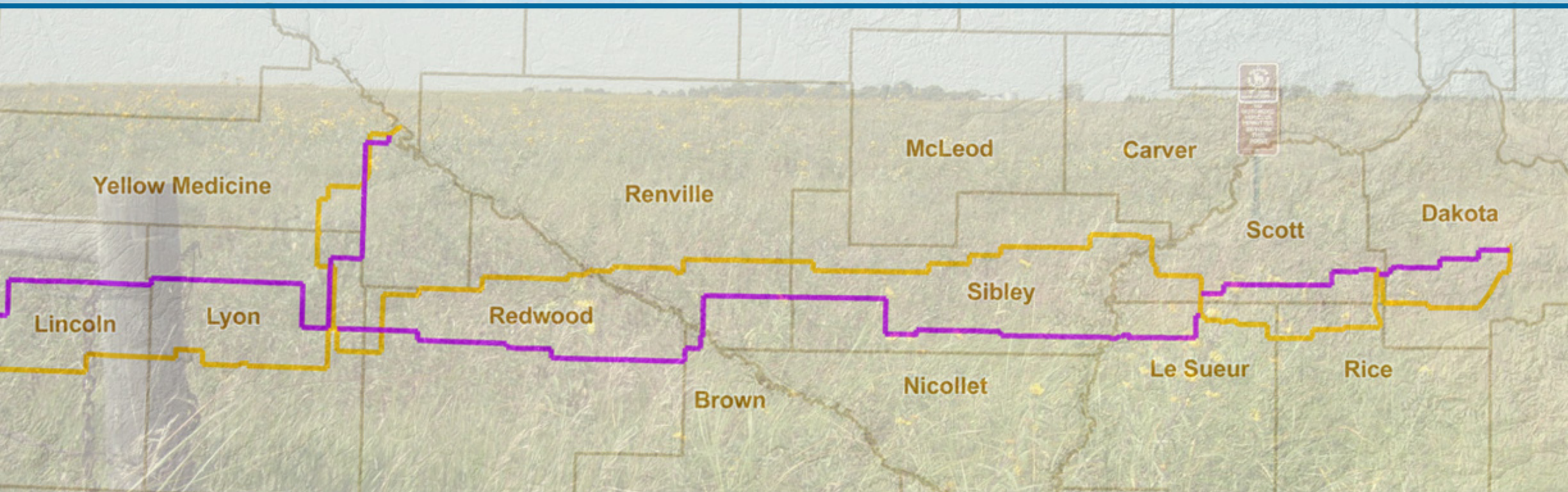
Brookings County – Hampton 345 kV Transmission Line Project

Draft Environmental Impact Statement

October, 2009



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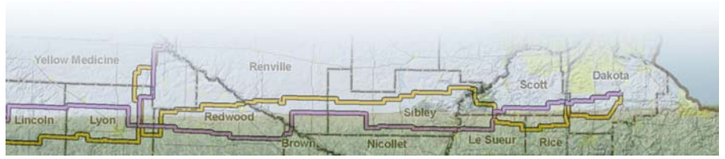

Abstract

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Abstract

Pursuant to the provisions of Minnesota Statutes, Chapter 216E, Great River Energy and Xcel Energy (the applicants) filed a route permit application with the Minnesota Public Utilities Commission (the commission) on December 29, 2008, for a permit to construct the Brookings County–Hampton 345 kilovolt (kV) transmission line facility consisting of a series of 345 kV transmission line connections between Brookings County, South Dakota, and the southeast Twin Cities, Minnesota (the Project). The Project is designed to increase generation outlet capability in southwestern Minnesota, improve regional reliability, and enhance local community reliability.

The proposed transmission system includes a 345 kV transmission line, approximately 230 to 270 miles long, depending on the route selected, between the existing Brookings County Substation near White, South Dakota, and a new substation near Hampton, Minnesota, and between the Lyon County Substation near Marshall, Minnesota, and the Minnesota Valley Substation near Granite Falls, Minnesota. Also included are the construction of four new substations, the expansion of four existing substations, and construction of electric system interconnections to tie existing high voltage transmission lines (HVTLs) to the Project. Construction on the Project is scheduled to begin in fall 2011 and the Project is expected to be in service by spring 2013.

The commission rules regarding route permits require a number of procedural steps, including public notice, information meetings, a draft and final environmental impact statement (EIS), a public-contested case hearing, and finally a decision by the commission (Minn. Rules 7850.3900). The primary purpose of this draft EIS is to summarize the potential impacts of the Project and help the commission make an informed decision on the best route.

Should the commission issue a route permit, the applicants would begin negotiating easements with landowners and start detailed design.

The Office of Energy Security (OES) Energy Facility Permitting (EFP) is part of the Minnesota Department of Commerce and is tasked with conducting environmental review of applications for transmission line route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigations for a proposed Project. The OES is responsible for developing the EIS for this Project.

Comments on the accuracy and completeness of this draft EIS will be accepted by the OES until November 30th, 2009. Formal comments on the draft EIS should be sent by fax, e-mail, or U.S. mail to:

U.S. Mail

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Comments may also be submitted online at:

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

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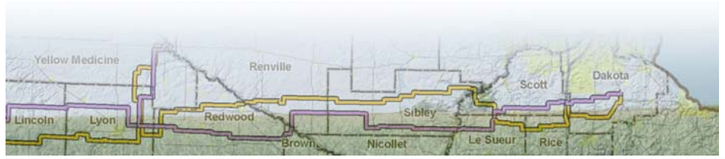

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*Appendix A (Detailed Map Supplement) is not included with the document. A DVD version is available upon request or can be viewed on the Public Utilities Commission's website at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=19860.

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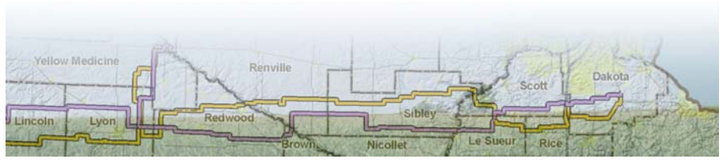

1.0 Summary

The Project is one of four transmission projects proposed as part of the CapX2020 Transmission Initiative. CapX2020 is a joint initiative of 11 transmission-owning utilities in Minnesota, Wisconsin, and the surrounding region.

The proposed 345 kV transmission line facilities would be constructed primarily with single-pole self-weathering rust-colored steel structures, ranging in height from 130 to 175 feet, with an average span of 1000 feet between poles. The typical right-of-way (ROW) for the 345 kV transmission line would be 150 feet. ROW widths up to 180 feet may be required under certain limited circumstances along the transmission line. A 115 kV transmission line would connect the Cedar Mountain Substation to an existing 115 kV transmission line. Poles for the 115 kV transmission line would be 65 to 90 feet in height, with spans averaging 350 feet between poles.

Under the Minnesota Power Plant Siting Act, a route may have a variable width of up to 1.25 miles. In this case, the applicants have requested a route width of 500 feet on each side of a preliminary centerline (1,000-foot total width) for most areas in order to allow for flexibility during final design. The commission can and may limit a new power line to a more specific route in the permit in order to ensure the protection of sensitive areas or in response to specific landowner concerns.

The OES reviewed and updated the information in the utility's route permit application, including house locations, numbers of houses within various distances from the routes, airport locations and potential conflicts, as well as natural resource data such as that on wetlands, rare species, and other information.

The OES also analyzed each of the alternative route segments proposed during the scoping process that were selected for detailed review in the EIS. These alternative route segments were evaluated at the same level of detail as that for the Preferred and Alternate routes. Each of the proposed additional route segments proposed by the public and evaluated in this draft EIS are a variation on either the applicant's Preferred Route or their Alternate Route.

The OES has prepared this draft EIS for the proposed Project, consistent with the EIS Scoping Decision. A draft EIS comment period in concert with public information meetings will follow the release of this EIS. After the close of the comment period, the OES staff will prepare a final EIS based on public comments. The final EIS will include revisions to the draft as well as staff responses to comments on the draft EIS.

The commission will hold a series of formal public hearings regarding the best routes for the proposed lines (Minn. Stat. 216E.03, subd. 6). The hearings, presided over by a state-appointed administrative law judge, are scheduled to occur at various locations between November 30, 2009, and December 11, 2009 (details provided in EIS Section 3.0). Interested persons will have an opportunity at the hearing to ask questions about the proposed Project and provide comments that will become part of the administrative record.

A variety of issues that are critical to a final route decision were evaluated, including:

- Minimizing interference with farming operations;
- Avoiding homes to reduce proximity to magnetic fields and minimizing aesthetic impacts;
- Minimizing loss of tree groves and impacts to property values;
- Minimizing waterfowl and other bird collisions;
- Minimizing cost and construction time, while maintaining reliability.

The route analysis and comparison in the impact statement is divided into six primary sections, corresponding to each major section between the substations:

- Brookings County to Lyon County
- Lyon County to Minnesota Valley
- Lyon County to Cedar Mountain
- Cedar Mountain to Helena
- Helena to Lake Marion
- Lake Marion to Hampton

The potential impacts of the various route options in each section are compared for each of these six sections primarily using maps and tables for each major human or natural resource issue in Section 7.0.

This draft EIS covers the required environmental review of the Project and route permit application.

- Section 2 describes the proposed Project, including location, route description, and right-of-way requirements.
- Section 3 provides information about the regulatory framework for the Project, including permitting procedures, public scoping and review processes, and hearings before the commission.
- Section 4 describes the engineering and operation design for the proposed transmission line and associated facilities.
- Section 5 provides information on the proposed construction and maintenance procedures.
- Section 6 gives a general overview of the affected environment and potential impacts along the entire route.
- Section 7 provides additional detail on affected environment and specific impacts for each of the six route segments and the proposed substation locations.
- Section 8 outlines the required permits and approvals for the proposed Project.
- Section 9 provides the document's references.
- Section 10 lists the acronyms used in the draft EIS.

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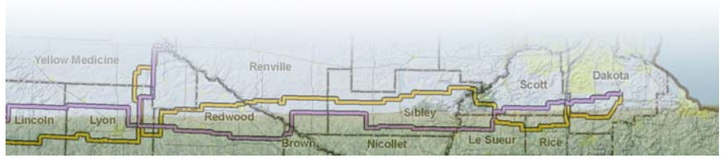


2.0 Project Overview

This section of the draft environmental impact statement (EIS) provides basic information about who is proposing to build the transmission line, why they are proposing it, and an overview of what is being proposed, including the routes, right-of-way (ROW) requirements, and estimated cost.

2.1 The Applicants

Great River Energy, headquartered in Maple Grove, Minnesota, is a not-for-profit electric cooperative that provides electrical energy and related services to 28 distribution cooperatives serving nearly 1.5 million customers in Minnesota and Wisconsin.

Xcel Energy is a Minnesota corporation headquartered in Minneapolis, Minnesota, and is a wholly-owned subsidiary of the utility holding company Xcel Energy Inc. Xcel Energy provides electricity services to approximately 1.2 million customers and natural gas services to 425,000 residential, commercial, and industrial customers in the state.

2.2 Permittees

The requested permittees are Great River Energy and Xcel Energy on behalf of themselves and the other potential CapX2020 Project owners.

What is CapX 2020?

CapX2020 is a joint initiative of regional electric utilities partnering to satisfy increasing demand for electricity in the region by constructing new high-voltage transmission lines. The initiative is made up of 11 transmission-owning utilities in Minnesota, Wisconsin, and the surrounding region: Great River Energy, Xcel Energy, Central Minnesota Municipal Power Agency, Dairyland Power Cooperative, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, Southern Minnesota Municipal Power Agency, and Wisconsin Public Power.

Contact information for Great River Energy and Xcel Energy is shown below:

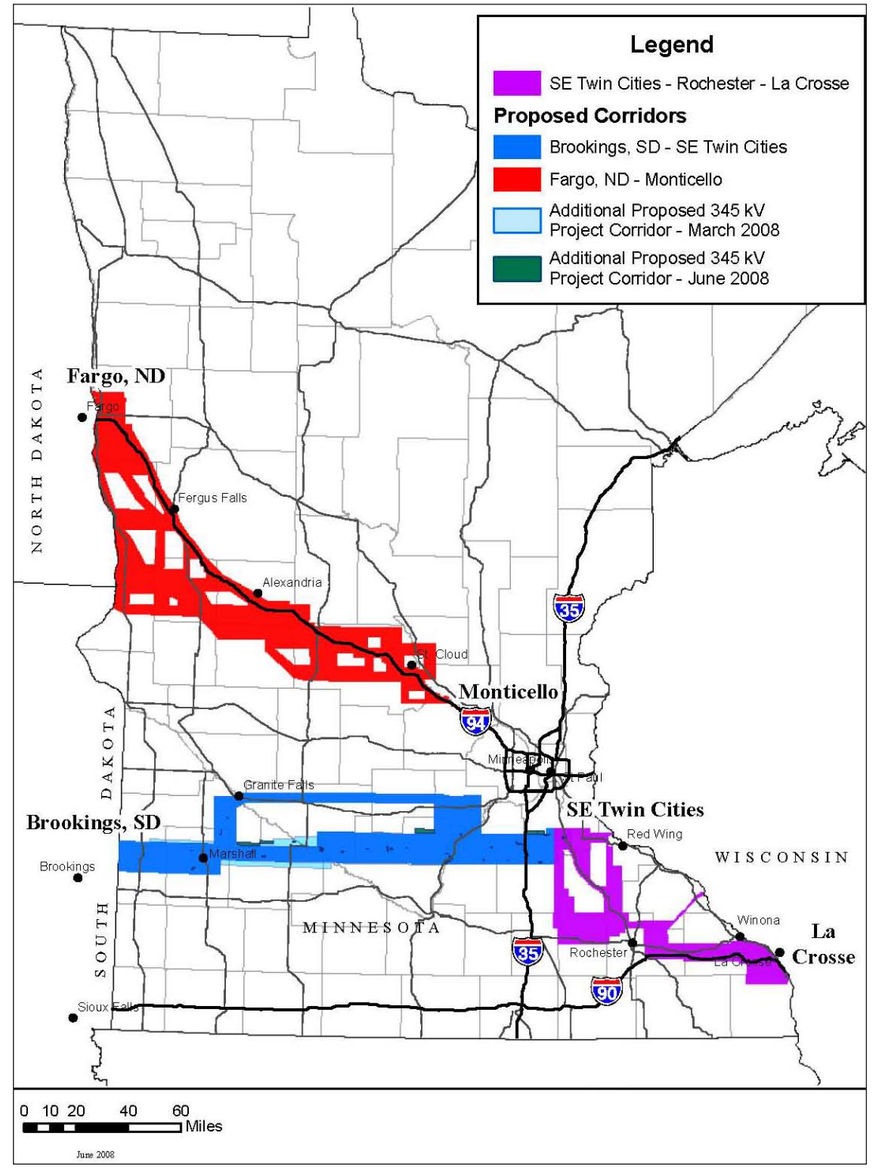
Great River Energy

Craig Poorker or Carole Schmidt
CapX2020
12300 Elm Creek Boulevard
Maple Grove, MN 55369-4718
1-888-473-2279
brookingsinfo@CapX2020.com

Energy Xcel Energy

Pamela Rasmussen
CapX2020
P.O. Box 9437
Minneapolis, MN 55440-9437
1-800-238-7968
lacrosseinfo@CapX2020.com

Figure 2.3-1. The four new proposed high-voltage transmission lines



Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project

2.3 The Project

The applicants propose to construct and operate a new 237 to 262-mile, 345 kilovolt (kV) transmission line beginning at the state's western border near Hendricks, Minnesota, and ending south of the Twin Cities metro area near Hampton, Minnesota. The applicants have proposed two possible routes for the transmission line, a Preferred Route and an Alternate Route. These routes would cross portions of the following counties: Lincoln, Lyon, Yellow Medicine, Chippewa, Redwood, Brown, Renville, Sibley, Le Sueur, Scott, Rice, and Dakota. The project would also include the construction of four new substations and the expansion of four existing substations. New substations include the Hazel Creek Substation near Granite Falls, the Helena Substation near New Prague, the Cedar Mountain substation near Franklin, and the Hampton Substation near Hampton.

The Brookings to Hampton 345 kV transmission line project is one of four new high-voltage transmission lines proposed as part of the CapX2020 Transmission Initiative, collectively referred to as the Group 1 projects. The Group 1 projects are shown in Figure 2.3-1.

The three other proposed CapX2020 Group 1 projects are:

- The Fargo to Twin Cities project, a 345 kV transmission line from Fargo, North Dakota, to Monticello, Minnesota;
- The Twin Cities to LaCrosse project, a 345 kV transmission line between the southeast Twin Cities, Rochester, and LaCrosse, Wisconsin; and
- The Bemidji to Grand Rapids project, a 230 kV transmission line from Bemidji, Minnesota to Grand Rapids, Minnesota.

2.4 Project Purpose

The Brookings County–Hampton project would provide community load serving benefits to regional communities in western Minnesota. Specifically, the New Ulm, Olivia, Bird Island, and Redwood Falls areas will benefit because the new 345 kV power source in the Franklin area and the Hazel Creek–Lyon County 345 kV segment will strengthen service to the Granite Falls area. Finally, the Brookings County–Hampton project is needed to increase renewable generation outlet capability in the Buffalo Ridge area.

The Brookings to Hampton transmission line project, in particular, will:

- **Increase community service reliability.** The project is needed to alleviate emerging community service reliability concerns by increasing reliability by reducing the chance that failure of a few key system components would temporarily cut off the supply of electricity.
- **Accommodate system-wide growth.** The project is also part of a longer-term plan to strengthen the transmission network to meet 4,000 to 6,000 MW of additional demand for electrical power anticipated in Minnesota and parts of surrounding states by 2020.
- **Increase generation outlet/renewable energy support.** The project will add increments of transmission capacity to the network to support the continuing development of new generation. In particular, the Brookings-Hampton project will allow wind farm development to continue along Buffalo Ridge in southwestern Minnesota and eastern South Dakota. It will open up parts of the Ridge that currently do not have adequate transmission support, and it will bring the generation outlet capacity of the transmission system to support approximately 1,900 MW in the area. Wind developers have made applications to the Midwest Independent Transmission System Operator (MISO) to connect well over 1,000 MW of additional generation in the area.

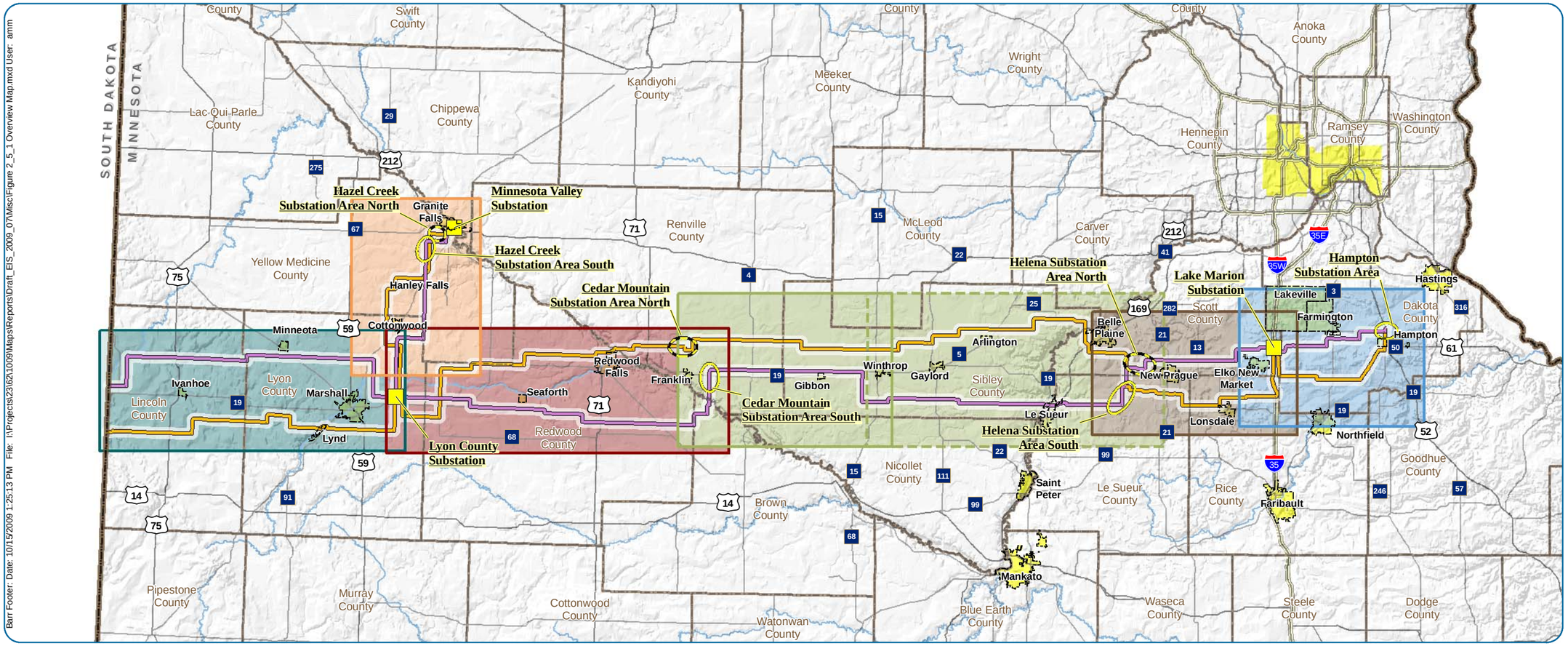
2.5 Route Descriptions

The applicants' proposed and alternative routes, as shown in Map 2.5-1, can be divided into six main segments:

- **Brookings County Substation to Lyon County Substation.** The transmission line would originate at the Brookings County Substation, near White, South Dakota, and extend approximately four to eight miles to the Minnesota border. The length of this segment from the Minnesota border to the Lyon County Substation is approximately 50 miles in length and would pass through Lincoln and Lyon Counties. This segment would be constructed and operated as a 345 kV single circuit on double-circuit structures (see Section 4.3 for further detail regarding structure types).
- **Lyon County Substation to Hazel Creek Substation to Minnesota Valley Substation.** This segment is approximately 29 to 34 miles long and passes through Lyon, Yellow Medicine, and Chippewa Counties, and would replace the existing Lyon County to Minnesota Valley 115 kV transmission line. This segment would also be constructed and operated as a 345 kV single circuit on double-circuit structures, with the exception of the segment of transmission line running from the Hazel Creek Substation to the Minnesota Valley Substation, which would initially be operated at 230 kV (see Section 4.3 for further detail regarding structure types).
- **Lyon County Substation to Cedar Mountain Substation.** This segment is approximately 51 to 53 miles long and would pass through Lyon, Redwood, Brown, and Renville Counties. This segment would be constructed and operated as a double-circuit 345 kV, that is, two 345 kV circuits strung on one double-circuit structure (see Section 4.3 for further detail regarding structure types).
- **Cedar Mountain Substation to Helena Substation.** This segment is approximately 62 to 74 miles long and would pass through Renville, Sibley, Le Sueur, and Scott Counties. This segment would also be constructed and operated as a double-circuit 345 kV (see Section 4.3 for further detail regarding structure types).

What is a substation?

A substation connects two or more transmission lines and may increase or decrease the voltage, by use of a transformer, as required. It may also interconnect with lower-voltage distribution lines, which deliver power to the customer. Between the generating plant and the end-user, power may go through several substations.



Map 2.5-1
Overview Map
Brookings to Hampton
Transmission Line

- **Helena Substation to Lake Marion Substation.** Passing through Le Sueur, Rice, and Scott Counties, this section is approximately 26 to 31 miles in length. Similar to the first two segments this stretch of the route would also be constructed and operated as a 345 kV single circuit on double-circuit structures (see Section 4.3 for further detail regarding structure types).

- **Lake Marion Substation to Hampton Substation.** This segment would connect the Lake Marion Substation to the final termination point, the Hampton Substation. This segment is approximately 18 to 24 miles in length and would pass through Scott and Dakota Counties. This route segment would be constructed and operated as a 345 kV single circuit on double-circuit structures (see Section 4.3 for further detail regarding structure types).

2.6 Associated Facilities

The associated facilities for the Project would include four new substations and modifications to four existing substations. The four new substations would be Hazel Creek, Cedar Mountain, Helena, and Hampton. The applicants are requesting up to 40 acres for each of these substations to ensure adequate space for planned facilities, future facilities, and buffer areas. The existing substations are Brookings County (South Dakota), Lyon County, Minnesota Valley, and Lake Marion.

All existing substations except for the Minnesota Valley Substation would be expanded. The anticipated expansion areas for these substations may be up to 16 acres. Transmission system connections would be required at the Cedar Mountain, Helena, and Hampton Substations. All descriptions depend on what route is finally selected and how substations are designed. The Minnesota substations and system connections are described in more detail below. For maps and further descriptions of proposed substation work, see Section 7.7.

Lyon County Substation (Existing)

The existing Lyon County 115/69 kV Substation would be expanded to accommodate new 345 kV equipment. The expansion would cover four to six acres or more to the north and east, depending on route and substation design.

Hazel Creek Substation (Proposed)

A new Hazel Creek 345/230/115 kV Substation would require five to 10 acres of fenced and graded substation area in one of two possible locations, Minnesota Falls Township or the Minnesota Falls and Hazel Run Townships.

Minnesota Valley Substation (Existing)

The existing Minnesota Valley 115/69 kV Substation would be expanded to accommodate new 230 kV equipment. The applicants do not anticipate that this expansion would require any additional land.

Cedar Mountain Substation (Proposed)

A new Cedar Mountain 345/115 kV Substation near Franklin would require four to six acres of fenced and graded area in one of two possible locations: one southeast of Franklin and the other north of Franklin. The Cedar Mountain Substation would connect with the Minnesota Valley–Franklin–New Ulm 115 kV transmission line.

Helena Substation (Proposed)

A new Helena 345/115 kV Substation would require approximately three to five acres of fenced and graded area in one of two possible locations, one west of Heidelberg in Derrynane Township, Le Sueur County, and the other northwest of New Prague in Belle Plaine and Helena Townships, Scott County. The Helena Substation would also include sufficient space for a future 115 kV substation yard and a future 345 kV transformer, and would also connect with the Wilmarth–Blue Lake 345 kV transmission line. Depending on how far the substation is sited away from this line, a tap may be required to interconnect it with the Helena Substation. If the Helena Substation area south is chosen (see Map 2.5-1) the distance to the Wilmarth–Blue Lake 345 kV transmission line would be less than one half mile. If the Helena substation area north is chosen (see Map 2.5-1) the distance to the Wilmarth–Blue Lake 345 kV transmission line would be less than one mile.

Lake Marion Substation (Existing)

The existing Lake Marion Substation would be expanded to accommodate new 345 kV equipment and would require an additional 12 to 16 acres of fenced and graded area.

Hampton Substation (Proposed)

A new Hampton 345 kV Substation would require approximately three to five acres of fenced and graded area and would be designed to connect with the existing Prairie Island–Blue Lake 345 kV transmission line.

2.7 Applicants' Route Selection Process

In selecting a route for a transmission line, the goal is to ensure that energy can be reliably and safely delivered to consumers, while minimizing any potential environmental or social impacts. With these principles in mind, the applicants' route selection process included the following four ongoing elements:

- Following Minnesota rules governing route selection (Minnesota Rules 7850.1000 to 7850.5600), as well as all other applicable laws and regulations.

- Thoroughly analyzing and refining the choices presented.

- Obtaining and responding to public input.

- Obtaining and responding to local, state, and federal agency input.

The applicants, as stated in the route permit application, met with the public and with state and federal agencies to get their input and understand their concerns before identifying possible areas for a proposed Project corridor, after which the applicants again sought feedback from the public and various agencies. Taking this new round of information into account, the applicants further analyzed geographical, environmental, and design data to come up with Proposed and Alternate Routes as identified in the route permit application.

What is a route?

Under the Minnesota Power Plant Siting Act, a high-voltage transmission line route granted to a utility may have a variable width of up to 1.25 miles between the two endpoints. In this case the requested route width is typically 500 feet on either side of the proposed transmission centerline (1,000 total feet). By requesting a route at these larger widths during the permitting phase, the utilities seek to work closely with landowners to develop detailed design and pole placement that minimizes human and environmental impacts.

2.8 Preferred, Alternate, and Additional Routes

In their route permit application, the applicants identified a Preferred and Alternate Route. Additional route segments and alignment alternatives were added during the EIS scoping process for the project. The Preferred and Alternate Routes are described in great detail in Section 7, and are depicted on maps located in Appendix A.

Preferred Route

The Preferred Route includes six 345 kV transmission line sections between the South Dakota border and the proposed new Hampton substation near Hampton, Minnesota. The Preferred Route is approximately 237 miles long.

As shown in Map 2.5-1, the Preferred Route (shown in) begins near Hendricks, Minnesota, passes north of Marshall, and then takes a southerly route via Franklin and Le Sueur. The Preferred Route then heads north of New Prague and Elko New Market to terminate at the proposed substation near Hampton.

The Lyon County–Hazel Creek–Minnesota Valley section of the Preferred Route heads north from the existing Lyon County Substation and follows an existing 115 kV transmission line corridor north to connect into a new Hazel Creek Substation. The route then crosses the Minnesota River near Granite Falls to connect into the existing Minnesota Valley Substation. The Preferred Route also crosses the Minnesota River southeast of Franklin (Brown County crossing) and just north of Le Sueur (Le Sueur Treatment Pond crossing).

Alternate Route

The applicants' Alternate Route, shown in on Map 2.5-1, is approximately 262 miles long. From west to east, the Alternate Route begins near Hendricks, Minnesota, passes south of Marshall, and then takes a northerly route via Redwood Falls, Franklin, and Belle Plaine. The Alternate Route then heads south of New Prague and Elko New Market to terminate at the proposed Hampton Substation.

The Lyon County–Hazel Creek–Minnesota Valley section of the Alternate Route heads north from the Lyon County Substation for seven miles along an existing 69 kV transmission line. It then follows field lines and roads and connects to a new Hazel Creek Substation, crosses the Minnesota River at the Granite Falls crossing, and connects into the existing Minnesota Valley Substation. The Alternate Route also crosses the Minnesota River north of Redwood Falls (Redwood crossing) and north of Belle Plaine (West Belle Plaine crossing).

Additional Routes Added During Scoping Process

The public suggested over 297 route alternatives to the applicants' proposed routes through comment during the EIS scoping process, completed in June 2009. Of the 297 route alternative suggestions, 197 comments expressed opposition or preference for the applicants' Preferred Route, Alternate Route, or no Project at all. This left 100 remaining route alternatives that were divided into those that fell within the applicants' requested route width and those that fell outside the requested route width. After further refinement and removal of missed duplicates, 26 alternatives fell within the requested route width and were categorized as alignment alternatives (an "alignment alternative" in this case means a suggested change in the applicants' proposed transmission centerline, such as a shift from one side of a roadway to the other, but where the line would still be located within the original route width) and 47 alternatives fell outside the requested route width and were categorized as route alternatives. Alternative routes recommended by two advisory task forces were also included in this review.

What is the difference between a route and the right-of-way?

The permitted route described above, is the area in which the utility is allowed to complete final design. The right-of-way (ROW), on the other hand, is the specific area that is actually required for the final easement for the transmission line. In this case the applicants have, in most areas, requested a 1,000-foot-wide route. However, the ROW actually needed for the transmission line facilities is only 150 feet wide—and even less (about 80 feet) when the transmission line can share right-of-way with other infrastructure such as roads or highways.

2.9 Route Width

The Minnesota Power Plant Siting Act (Minnesota Statutes 216E) authorizes the commission to provide for route and site selection for large electric power facilities; in this case a 345 kV high-voltage transmission line. A high-voltage line transmission line may only be constructed along a route identified in a route permit issued and approved by the commission.

The route permit process usually does not establish an exact centerline for a transmission line but a general alignment that best balances competing land use, human settlement, and environmental interests. At the same time, a route designation cannot be so wide that it is unclear what the intended general alignment of the transmission line is meant to be. The commission does have the authority to identify specific transmission line alignments in a route permit. Once a route is established by the commission, the utility then does more detailed engineering and contacts landowners to gather additional information about the circumstances of their property.

Only after considering input from landowners and other interests does the utility establish an exact centerline and pole placement. Once the utility establishes a centerline and structure placement, construction drawings are provided to the commission so the commission can confirm that the utility's plans are consistent with the route permit.

Applicants' Route Width Request

For most of the proposed routes, the applicants request a route width of 1,000 feet, or 500 feet on either side of the preliminary centerline (shown in the detailed maps in Appendix A).

The applicants have requested a wider route width of up to 1.25 miles in the following areas to address site specific concerns. (These wider route request areas are shown in the detailed maps in Appendix A.)

Wider Route Width Areas: Preferred Route

- At the Brown County crossing of the Minnesota River near County Highway 8 in Brown County.
- At the Le Sueur Wastewater Treatment Pond crossing of the Minnesota River near Le Sueur.
- In Helena Township, along 270th Street from 0.5 miles east of Church Avenue to Aberdeen Avenue.
- Along the Preferred Route, east of Natchez Avenue and just north of 245th Street, approaching the Lake Marion Substation from the west.
- South and east out of the Lake Marion Substation along Pillsbury Avenue.
- At the South Dakota border, along 290th Street in Hendricks Township.

Wider Route Width Area: Alternate Route

- At the crossing of the Redwood River southwest of Marshall.
- On the west side of the Redwood crossing of the Minnesota River, northeast of Redwood Falls.
- Along I-35 and Pillsbury Avenue into and out of the Lake Marion Substation.
- On the north side of County Road 137, bordered to the west by the South Dakota border and to the east by an unnamed stream valley.

2.10 Applicants' Schedule

An expected review permitting and construction schedule for the Project is outlined below.

Minnesota Certificate of Need ..... Issued Spring 2009

Minnesota Route Permit ..... January 2010

South Dakota Facility Permit ..... January 2011

Environmental permits ..... First Quarter 2012

Pre-construction activities ..... First Quarter 2010 to Third Quarter 2011

Construction ..... Fourth Quarter 2011 to Second Quarter 2013

Project completion ..... Second Quarter 2013

2.11 Project Cost

As indicated in the applicants' route permit application, Project costs include the survey, engineering, materials, construction, ROW, and project management associated with the transmission line and substations. Project costs (estimated in 2007 dollars) are summarized in Tables 2.11-1 and 2.11-2. The total cost of the Project is between $700 million and $755 million.

Table 2.11-1. Estimated transmission line construction costs, Preferred Route and Alternate Route

Route Section	Total Cost – Preferred Route (millions)[1]	Total Cost – Alternate Route (millions)[1]
Brookings County to Lyon County	$97.9	$97.9
Lyon County to Minnesota Valley	$62.7	$69.0
Lyon County to Cedar Mountain	$127.6	$129.2
Cedar Mountain to Helena	$152.5	$176.3
Helena to Lake Marion	$83.9	$93.5
Lake Marion to Hampton	$57.9	$72.2
Total	**$582.5**	**$638.1**

[1]Transmission costs include materials, engineering, survey, ROW, and project management in 2007 dollars.

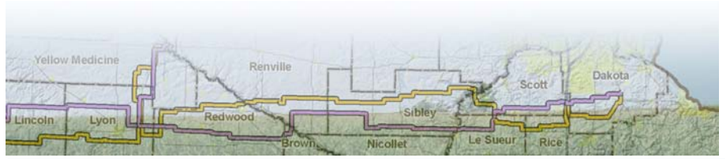
Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project

Table 2.11-2. Substation modifications and construction cost estimate

Substation	Status	Total Cost[1]
Brookings County Substation	Existing	$3.8 million
Lyon County Substation	Existing	$17.2 million
Cedar Mountain Substation Area	To be constructed	$19.9 million
Helena Substation Area	To be constructed	$12.2 million
Lake Marion Substation	Existing	$17.3 million
Hampton Substation Area	To be constructed	$12.3 million
Hazel Creek Substation	To be constructed	$25.8 million
MN Valley Substation	Existing	$9.0 million
Total		**$117.5 million**

[1]Substation costs include materials, engineering, survey, ROW, and project management in 2007 dollars.

Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project



This section of the draft environmental impact statement (EIS) summarizes the state transmission line siting and permit process, including what has and what has not been decided.

3.1 State High-Voltage Transmission Line Process

The State of Minnesota requires two major approvals before a high-voltage transmission line can be built: a certificate of need (CON) and a route permit.

The commission is responsible for making the final decision on both the CON and the route permit. In the case of this project, the Office of Energy Security (OES), which is part of the Minnesota Department of Commerce, is responsible for the draft EIS required under the state regulations. The draft EIS has to be complete and found "adequate" before the commission can make a final decision on which route the line should follow.

The CON process is designed to evaluate the need for a large energy project (i.e., a high-voltage transmission line) in Minnesota, and if it is in the public interest. Evaluation factors include, but are not limited to, (1) whether other reasonable alternatives to constructing the transmission line have been thoroughly reviewed, (2) the best locations for the transmission line to begin and end, and (3) whether potential environmental impacts have been adequately assessed. Simply stated, the commission determines the basic types of facility (if any) to be constructed, the size of the facility, and when the facility is projected to be in service. The process typically takes 12 months to complete.

What is the Minnesota Public Utilities Commission?

The Minnesota Public Utilities Commission (the commission) regulates the electricity, natural gas, and telephone service industries in Minnesota. Their mission is to create and maintain a regulatory environment that ensures safe, reliable, and efficient utility services at fair and reasonable rates. The commission makes the final decision on the need for the transmission line as well as its final route.

The commission issued the certificate of need for this project in May 2009.

The purpose of the route permit is to locate high-voltage transmission lines in an orderly manner compatible with environmental preservation and the efficient use of resources. In deciding on a route, the commission considers locations that minimize adverse human and environmental impacts and cost while ensuring continued electric power system reliability and integrity.

3.2 Certificate of Need Process

Minnesota Statutes Section 216B.243 states that a certificate of need is required to site or construct a "large energy facility" in Minnesota. The definition of "large energy facility" in this context is defined in Minnesota Statutes Section 216B.2421 as "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length."

The applicants applied for one CON covering three of the Group 1 CapX2020 transmission line projects, including this one, on August 16, 2007.

- Twin Cities–La Crosse
- Fargo–Twin Cities
- Brookings County–Hampton

After accepting the CON application as complete, the commission referred the matter to the Office of Administrative Hearings for hearing before an administrative law judge (ALJ). Prior to the evidentiary hearing from June 17 to July 2, 2008, the ALJ convened 19 public hearings along the anticipated corridors for all three proposed 345 kV transmission lines in the cities of Moorhead, Fergus Falls, Alexandria, Melrose, Clearwater, Marshall, Redwood Falls, Arlington, New Prague, Lakeville, Cannon Falls, Winona, and Rochester.

Evidentiary hearings were held from July 14, 2008, to August 1, 2008; from August 11, 2008, to August 14, 2008; and from September 11, 2008, to September 18, 2008, in St. Paul, Minnesota. The ALJ issued the *Findings of Fact, Conclusions, and Recommendation* (ALJ's report) to the commission on February 27, 2009.

On May 22, 2009, the commission issued an order granting CON with conditions, titled, *In the Matter of the Application of Great River Energy, Northern States Power Company (d/b/a Xcel Energy) and others for Certificates of Need for the Cap X 345-kV Transmission Projects, Docket No. ET-2, E-002, et al./CN-06-1115.* The CapX CON is available at: http://www.puc.state.mn.us/PUC/energyfacilities/certificate-of-need/011260.

What is a High-Voltage Transmission Line

Under the Minnesota Power Plant Siting Act, a high-voltage transmission line is defined as any conductor of electric energy and associated facilities designed for and capable of operating at a voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities include, but are not limited to, insulators, towers, substations, switches, and terminals.

3.3 Route Permit Process

The Power Plant Siting Act provides that no person may construct a high-voltage transmission line without a route permit from the commission (Minnesota Statutes Section 216E.03, subd. 2). The definition of a high-voltage transmission line under the Power Plant Siting Act is broader than the definition of a large energy facility under the CON statutes. Under the Power Plant Siting Act, a high-voltage transmission line includes a transmission line of 100 kV or more and greater than 1,500 feet in length, with its associated facilities (Minnesota Statutes Section 216E.01, subd. 4). This proposed 345 kV transmission line by definition is a high-voltage transmission line

and, therefore, requires a route permit prior to construction. See Figure 3.3-1 for detailed route permit process.

The applicants submitted a route permit application to the commission on December 29, 2008. On January 29, 2009, the Minnesota commission issued an order accepting the route permit application as complete and authorizing the Department of Commerce's OES to develop and implement one or more advisory task forces. The commission also referred the route permit application to the Office of Administrative Hearings, so that office could conduct a contested case hearing.

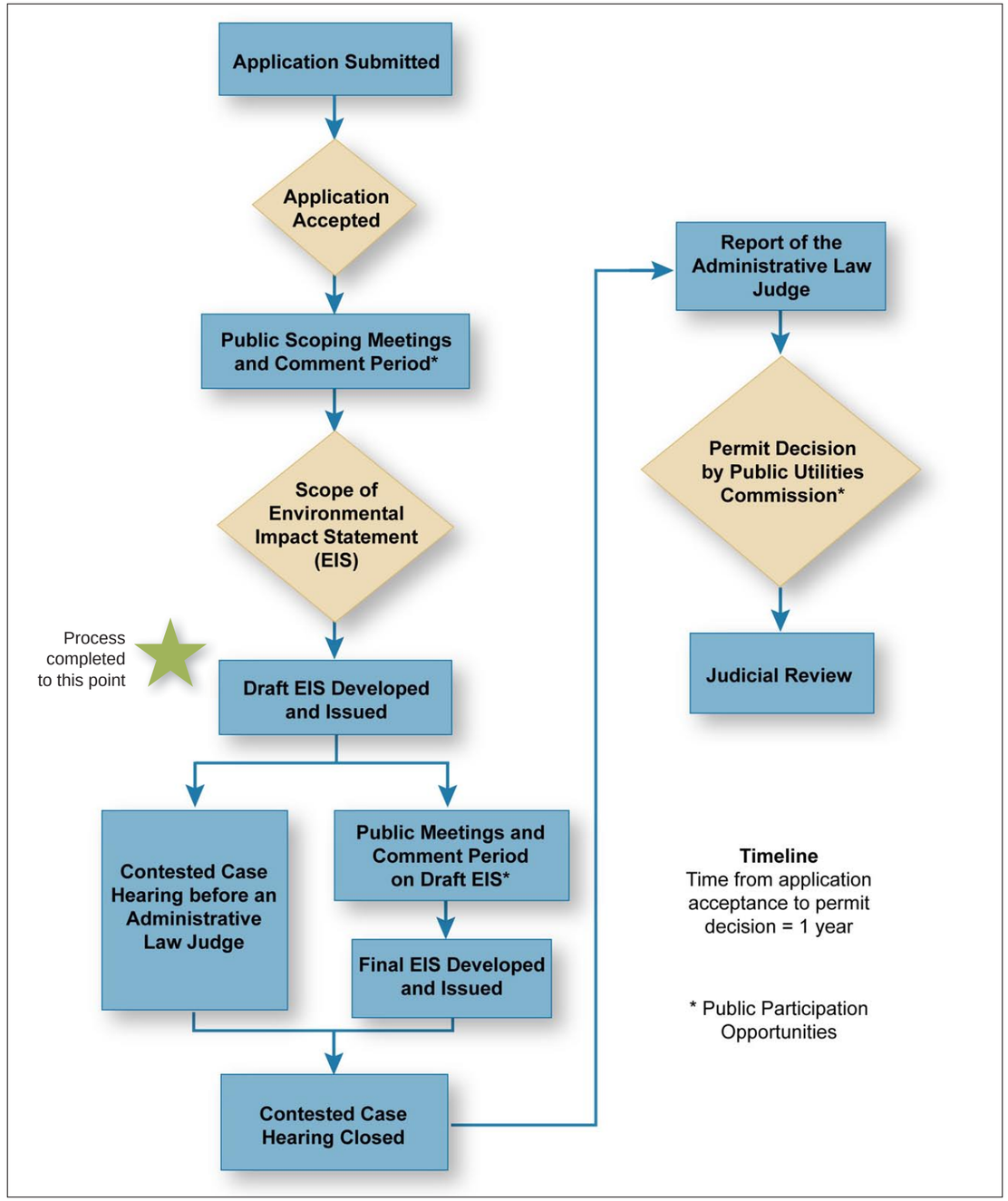
Scoping the Draft Environmental Impact Statement

Route permit applications for high voltage transmission lines are subject to environmental review in accordance with Minnesota Rules 7850.5200 to 7850.5340 (full permitting process). The OES is responsible for completing an EIS for high-voltage transmission lines.

The first step in the review process after application acceptance is scoping. The scoping process has two primary purposes: to ensure that the public has a chance to participate in determining what routes and issues should be studied in the EIS; and to help focus the EIS on the most important issues surrounding the route permit decision. See Appendix F.

OES staff collected and reviewed comments on the scope of the EIS by convening two advisory task forces (Lake Marion to Hampton Task Force and Minnesota River Crossing to New Prague Task Force); holding 12 public scoping meetings between March 30 and April 9, 2009, at nine different locations (Marshall, Hendricks, Granite Falls, Redwood Falls, Gaylord, Henderson, New Prague, Lakeville, and Cannon Falls); and accepting written comments from March 30 through April 30, 2009.

Figure 3.3-1. Permit process flow diagram



Source: Barr-created figure, 2009

The scoping decision document was issued by the OES on June 30, 2009, and is presented in Appendix F.

The following issues are not considered or addressed in the EIS:

1. Any route or substation alternatives not specifically addressed in the EIS Scoping Decision Document, PUC Docket No. ET2/TL-08-1474.
2. Questions of need, including size, type, and timing; questions of alternative system configurations; or questions of voltage.
3. The no-build option regarding the high voltage transmission line.
4. The impacts of specific energy sources, such as carbon outputs from coal-generated facilities.
5. Policy issues surrounding whether utilities or local-government should be liable for the cost to relocate utility poles when roadways are widened.
6. The manner in which land owners are paid for transmission rights of way easements, as that is outside the jurisdiction of the Public Utilities Commission.

Draft EIS Comments

As shown in Figure 3.3-1, the process is currently at the draft EIS stage. At this point, the OES has issued the draft EIS and is asking the public to review the draft and submit comments so it can have the best information possible for this route decision. Formal comments on the accuracy and completeness of the draft EIS will be accepted until November 30, 2009.

Draft EIS Public Meetings

The OES will hold public information meetings in concert with the draft EIS comment period to provide information to the public about the draft EIS, to answer any questions, and receive any comments.

The information meetings are currently scheduled to take place at the following locations and times:

Draft EIS Public Meetings			
11/12/09 Thursday	1:00 PM - 4:00 PM 5:00 PM - 8:00 PM	Lonsdale VFW	115 2nd Ave SW Lonsdale
11/13/09 Friday	1:00 PM - 4:00 PM 5:00 PM - 8:00 PM	Holiday Inn	20800 Kenrick Ave Lakeville
11/16/09 Monday	1:00 PM - 4:00 PM	Prairie's Edge Casino	5616 Prairie's Edge Ln Granite Falls
11/17/09 Tuesday	1:00 PM - 4:00 PM 5:00 PM - 8:00 PM	Best Western Hotel	1500 E. College Dr Marshall
11/18/09 Wednesday	1:00 PM - 4:00 PM 5:00 PM - 8:00 PM	Jackpot Junction	39375 Cty Hwy 24 Morton
11/19/09 Thursday	5:00 PM - 8:00 PM	Brass Top Hall/Hog Wild Saloon	514 Main St Henderson

Formal Public Hearing Scheduled

Before the commission makes a final decision, formal administrative hearings will be conducted by an independent ALJ. At the hearing, anyone can provide comments regarding the proposed Project, routes, structures, and other permit conditions. Any person may testify at the hearing without being first sworn under oath. The ALJ will ensure that the record created at the hearing is preserved and transmitted to the commission. The ALJ will prepare a report that will include proposed findings of fact, conclusions of law, and a recommendation on routes.

The hearings are currently scheduled to take place at the locations and times listed in the following column.

It is not necessary for citizens to attend more than one session to have input heard and included in the record.

Final EIS

After the draft EIS comment period, the OES staff will prepare a final EIS. The final EIS will include revisions as well as staff responses to substantive comments on the draft EIS.

EIS Adequacy and Route Permit Decision

After the final EIS is published and the ALJ issues the findings of fact, conclusion of law, and order with recommendations, the commission would make a route permit decision. The date for the commission's decision will not be scheduled until the final EIS and ALJ report are issued.

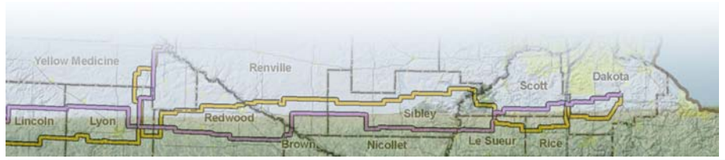
The commission must first find that the draft EIS has adequately addressed potential environmental issues presented in the scoping decision. Then the commission will make a decision on which route to permit and what conditions to include in the route permit.

Formal Public Hearing			
11/30/09 Monday	2:00 PM-5:00 PM 7:00 PM-10:00 PM	Prairie's Edge Casino	5616 Prairie's Edge Ln Granite Falls
12/01/09 Tuesday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Best Western Hotel	1500 E. College Dr Marshall
12/02/09 Wednesday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Redwood Area Community Center	901 Cook St Redwood Falls
12/03/09 Thursday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Winthrop Vets Club	206 N Main St Winthrop
12/07/09 Monday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Brass Top Hall/ Hog Wild Saloon	514 Main St Henderson
12/08/09 Tuesday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Lonsdale VFW	115 2nd Ave SW Lonsdale
12/09/09 Wednesday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Park Ballroom/ American Legion	300 Lexington Ave New Prague
12/10/09 Thursday	1:00 PM-5:00 PM 7:00 PM-10:00 PM	Holiday Inn	20800 Kenrick Ave Lakeville
12/11/09 Friday	9:30 AM-12:30 PM	Holiday Inn	20800 Kenrick Ave Lakeville

There is no easy formula for the commission to follow in selecting the final route. In selecting a route, the commission is guided by, but not limited to, the rules established in Minnesota Rules 7850.5910, which consider:

- Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.
- Effects on public health and safety.
- Effects on land-based economics, including, but not limited to, agriculture, forestry, tourism, and mining.
- Effects on archaeological and historic resources.
- Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
- Effects on rare and unique natural resources.
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
- Use or paralleling of existing ROWs, survey lines, natural division lines, and agricultural field boundaries.
- Use of existing large electric power generating plant sites.
- Use of existing transportation, pipeline, and electrical transmission systems or ROWs.
- Electrical system reliability.
- Costs of constructing, operating, and maintaining the facility which are dependent on design and route.

- Adverse human and natural environmental effects which cannot be avoided.
- Irreversible and irretrievable commitments of resources.



This section of the draft environmental impact statement (EIS) describes what the proposed power poles would look like and how wide the right-of-way (ROW) will have to be for the selected structure type. It finishes with a discussion on the potential for undergrounding and aerial river crossings for 345 kV transmission lines and the applicability with regard to this proposed Project.

4.1 High-Voltage Transmission Line Basics

High-voltage transmission line circuits generally consist of three phases, each at the end of a separate insulator, and physically supported by structures. A phase consists of one or more conductors (single, double, or bundled). A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. There may also be shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire could also include a fiber optic cable that allows for substation protection equipment to communicate with other terminals one the line.

Figure 4.1-1 shows the major components of a typical transmission line. The diagram shows a typical double-circuit high-voltage transmission line structure. There are three conductors per circuit because most power plants generate electricity such that each of the three conductors operates at a different phase. Second, as shown in the figure, each of the wires hangs from the end of a separate insulator string.

Why three phases?

Most high-voltage transmission lines carry three-phase alternating-current power because that is how the electricity is generated at power plants. Electricity is generated when a magnet rotates inside the coils in a generator. Because one pole of a magnet will move past one coil and then the subsequent coils, there is a difference in timing of the alternating current induced in each coil. These are the different phases of current.

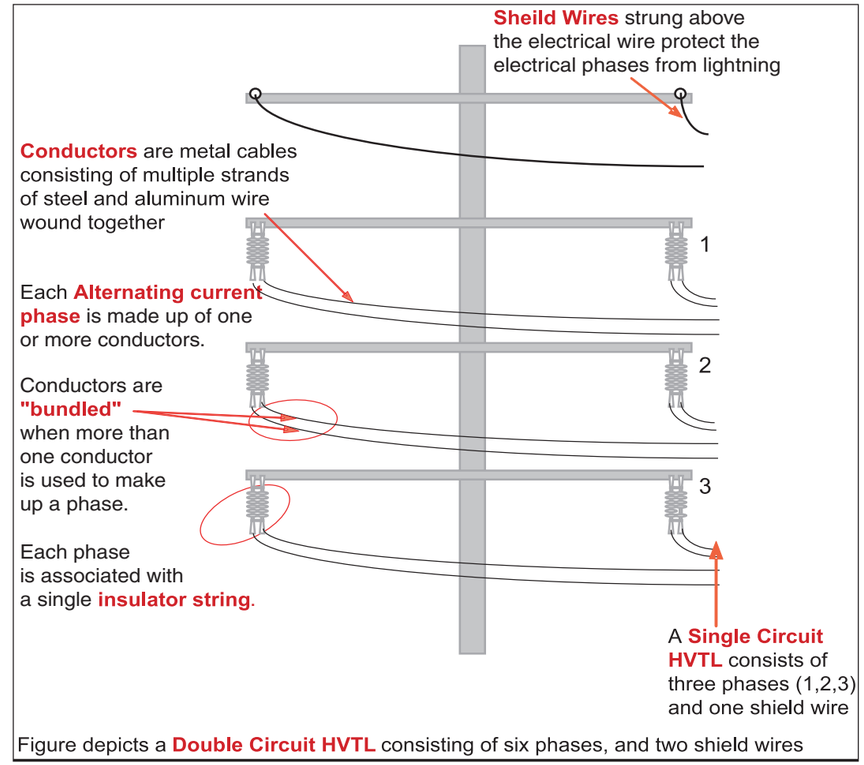
The transmission line, therefore, transfers each of the three phases of alternating current on separate wires so that power can be transferred constantly over each cycle. It also makes it possible for the electric motors to use the electric energy to operate more efficiently.

Finally, transmission lines are usually either single-circuit, (carrying one three-phase conductor set), or double-circuit (carrying two three-phase conductor sets, totaling six conductors). The various structure configurations and conductors proposed for this Project are shown and described in the following subsections.

4.2 Conductors

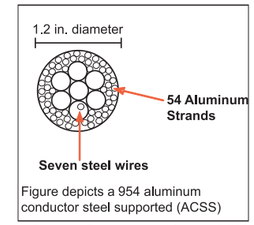
For the proposed project, each phase would consist of bundled conductors composed of two 954 aluminum conductor steel supported (ACSS) cables or conductors of comparable capacity. An ACSS consists of seven steel wires surrounded by 54 aluminum strands. Each conductor is approximately 1.2 inches in diameter (Figure 4.2-1). As indicated by the applicants, the same conductor and bundled configuration would be used for all the 345 kV single circuit and double-circuit transmission line sections.

Figure 4.1-1. Major components of typical transmission line



Source: Barr-created figure, 2009

Figure 4.2-1. Cross-section of a conductor



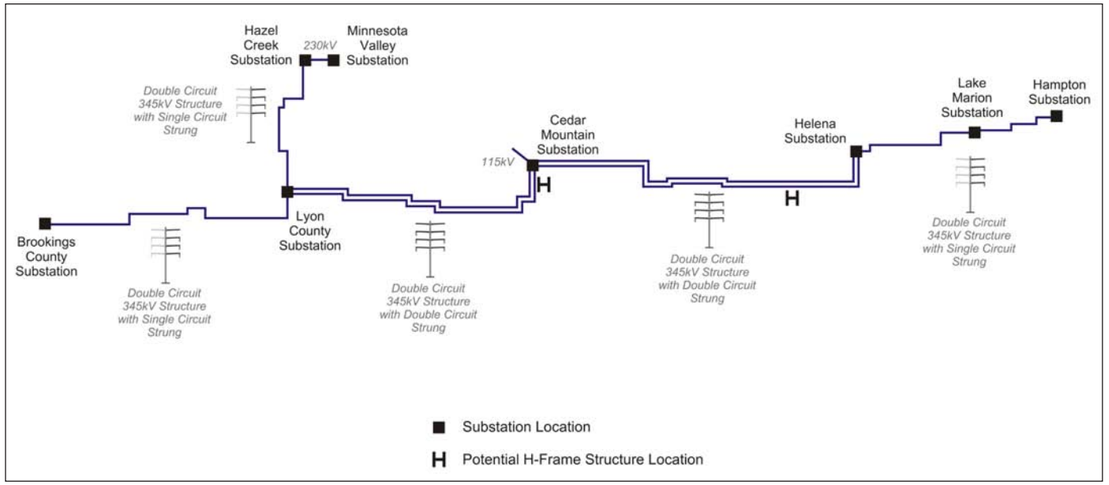
Source: Barr-created figure, 2009

4.3 Transmission Line Structures

There are many different types of structures/configurations used for transmission lines that include single steel-pole structures and H-frame structures. The exact width of ROW required for the transmission line, in turn, depends on structure design, span length, and the electrical safety requirements associated with the transmission line's voltage. Figure 4.3-1 shows the proposed structure types for the project.

For this project, the applicants are proposing to use self-weathering single-pole double-circuit structures for the majority of the project. Self-weathering steel oxidizes or rusts to form a dark reddish brown surface coating which protects the structure from further weathering.

Figure 4.3-1. Proposed structure types for the Project



Source: Barr-created figure, 2009

The transmission line would be supported by direct-embedded weathering steel poles with davit arms for the majority of the route. These tangent structures are 130 to 175 feet high with foundations that are approximately six to 12 feet in diameter with a 750 to 1,100 foot span between each structure. Figure 4.3-2 shows a typical single pole double-circuit structure.

In areas of poor soil strength and for angle and dead-end structures, a rock-filled galvanized steel culvert or drilled pier concrete foundation may also be inserted for additional stability. Support cables (guying) may also be used for angle structures.

Table 4.3-1 summarizes the proposed structure types for the entire project, including the ROW requirements for the 115-kV transmission lines that are also proposed as part of the project.

H-frame structures may be required in certain areas where longer spans are desired, or in environmentally sensitive areas, areas of difficult topography and elevation changes or where poor soil conditions exist. These structures, when used, typically minimize the overall total number of structures required in an area as well (e.g., minimizing the number of structures in a river's riparian zone). Figure 4.3-3 shows a typical H-frame structure.

Figure 4.3-2. Typical single-pole double-circuit structure

Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project, Barr created-figure, 2009

Table 4.3-1. Structure design summary

Line Type	Structure Type	Structure Material	ROW Width (feet)[a]	Structure Height (feet)	Structure Base Diameter (inches)	Foundation Diameter (feet)[b]	Span Between Structures (feet)	Pole to Pole Span on Single H-Frame Structure (feet)
345 kV/ 345 kV Double Circuit	Single Pole Davit Arm	Steel	150	130-175	36-48 (tangent structures) 48-72 (angle structures)	6-12	750-1,100	N/A
	H-Frame	Steel	150-180	105-125	30-42 (tangent structures)	5.5-9	750-1,100	27
115 kV	Horizontal Post	Wood	100	65-90	20-25 (tangent structures)	N/A	300-400	N/A
		Steel	100	65-90	18-24 (tangent structures)	2.5-3.5	300-400	N/A
345/345/ 115 kV Triple Circuit	H-Frame	Steel	150-180	120-160	40-65 (tangent structures)	4.5-6.5	400-700	27
345/345/ 69 kV Triple Circuit	H-Frame	Steel	150-180	120-160	40-65 (tangent structures)	4.5-6.5	400-700	27

[a] ROW width depends on span length between structures.

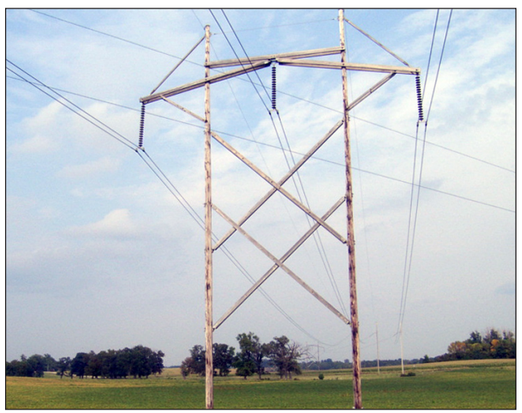
[b] It is unlikely that foundations will be used for H-frame structures as these poles are normally directly imbedded. Concrete foundations will only be used on an H-frame structure in special locations such as very poor soil conditions.

Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project, Barr created-figure, 2009

Why single-pole steel?

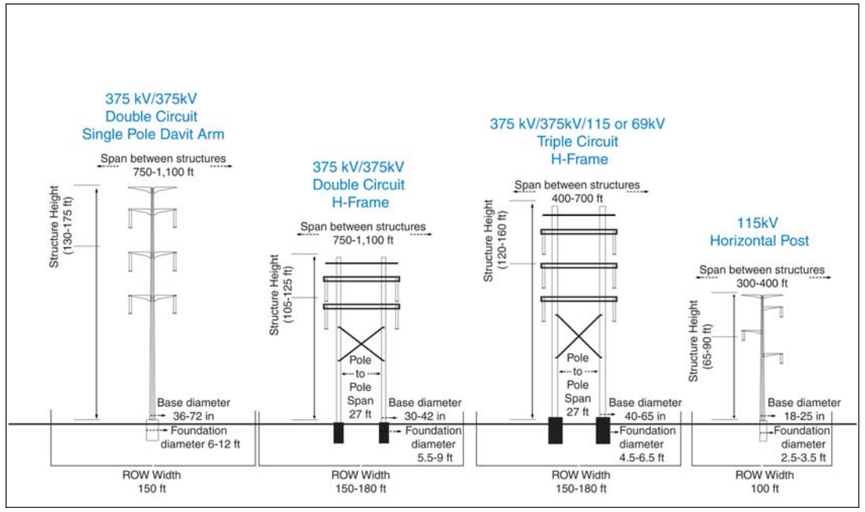
Single-pole structures require only one pole along the ROW, reducing the impact on farming operations and other impacts compared to the two poles required for H-frames.

Figure 4.3-3. Typical H-frame structure



Source: Barr photograph, 2009

Figure 4.3-4. Structure designs and foundations being proposed for the 345-kV portions of the Project



Source: Barr-created figure, 2009

4.4 Right-of-Way Requirements

The applicants have indicated that a 150-foot wide ROW (easement) would be required for the proposed transmission line. As stated above, H-frame or other specialty structures may be required for long spans or in environmentally sensitive areas. In that case, an up to 180-foot wide ROW may be needed.

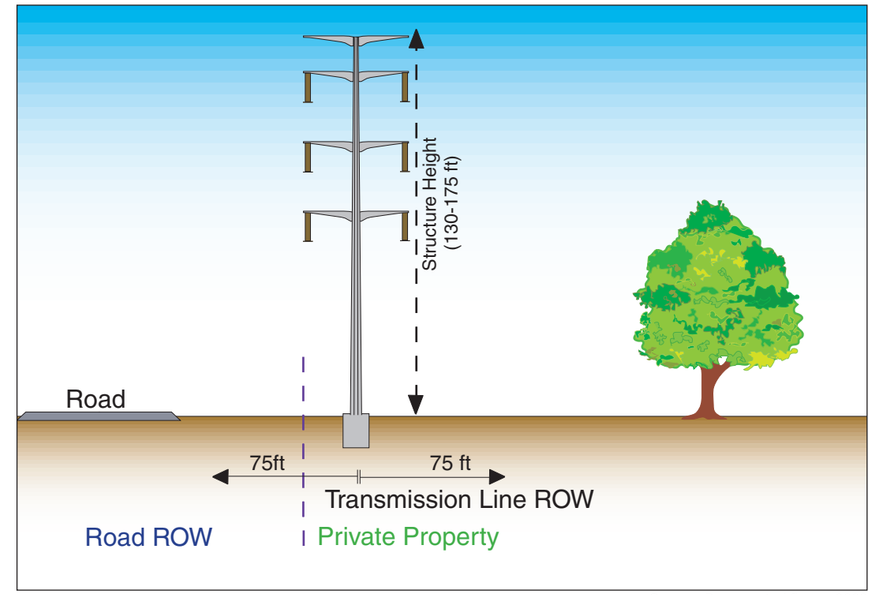
Figure 4.3-4 shows the structure designs and foundations for the structures the applicants are proposing for the 345-kV portions of this project, along with the typical ROW required.

When a transmission line is placed entirely across private land, an easement for the entire 150-foot to 180-foot-wide ROW would need to be acquired from the landowner(s). The applicants have indicated they would locate the poles as close to property division lines as reasonably possible to reduce the amount of ROW on a particular property.

When the transmission line parallels roads, railroads, or other transmission lines, a less wide ROW is needed (Figure 4.4-1). When paralleling existing roadways, for example, the general practice is to place the poles on the adjacent private property, a few feet inside the existing roadway ROW. So, although the pole is still located on private property, the transmission line can share some of the public ROW, thereby reducing the size of the easement required from the private landowner. For example, if the normally required ROW width is 150 feet, and the pole is placed five feet off of an existing road ROW, only an 80-foot easement would be required from the landowner. The roadway and transmission line would share the other 70-foot-wide section of ROW.

For this reason, siting transmission lines along existing ROW can help to minimize the proliferation of new utility corridors. However, in order to share ROW, the applicants would have to acquire necessary approvals from the owner (e.g., railroad) or the agency (e.g., Minnesota

Figure 4.4-1. Typical right-of-way requirements for 345-kV portions of the Project



Source: Barr-created figure, 2009

Department of Transportation or DOT) for state trunk highways and interstates.

The DOT's Utility Accommodation Policy outlines the policies and procedures governing use and sharing of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (Code of Federal Regulations, Title 23, Part 645, Subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic and the safe operation of vehicles.

The DOT has a responsibility to preserve the public investment in the transportation system and to ensure that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges, or bridges, or to safely maintain the existing system. In addition, state law requires DOT to reimburse the utility if a utility must be relocated from an ROW along an interstate highway as a result of future expansion or new interchanges.

Requirements vary based on whether the utility is crossing the highway or being installed parallel to it and based on the type of highway. For control access highways or freeways, "The installation of new utility facilities shall not be allowed longitudinally within the right-of-way of any freeway, except in special cases under strictly controlled conditions." This means that the transmission structure–the poles and davit arms–must be completely outside of the ROW. For this Project, this would mean placing a pole approximately 20 to 25 feet outside the right-of-way.

Table 4.4-1. Comparison of varying centerlines along Interstate 35

Impacts[9]	5 ft off DOT ROW	25 ft off DOT ROW	75 ft off DOT ROW
New ROW (Acres)[2]	59	90	113
Percent DOT Sharing[2]	48.5%	21.2%	0.8%[10]
Number of Homes Within ROW[3]	0	0	0
Number of Structures Within ROW[3]	2	2	3
Wetland (Acres)[4] Crossed	15	18	21
Prime Farm Land (Acres)[5] Crossed	52	58	62
Crop Land (Acres)[6] Crossed	43	46	52
Forest (Acres)[6] Crossed	3	5	6
Number of Stream Crossings[7]	8	8	12
Number of Recorded Archaeological Sites[8]	2	2	1

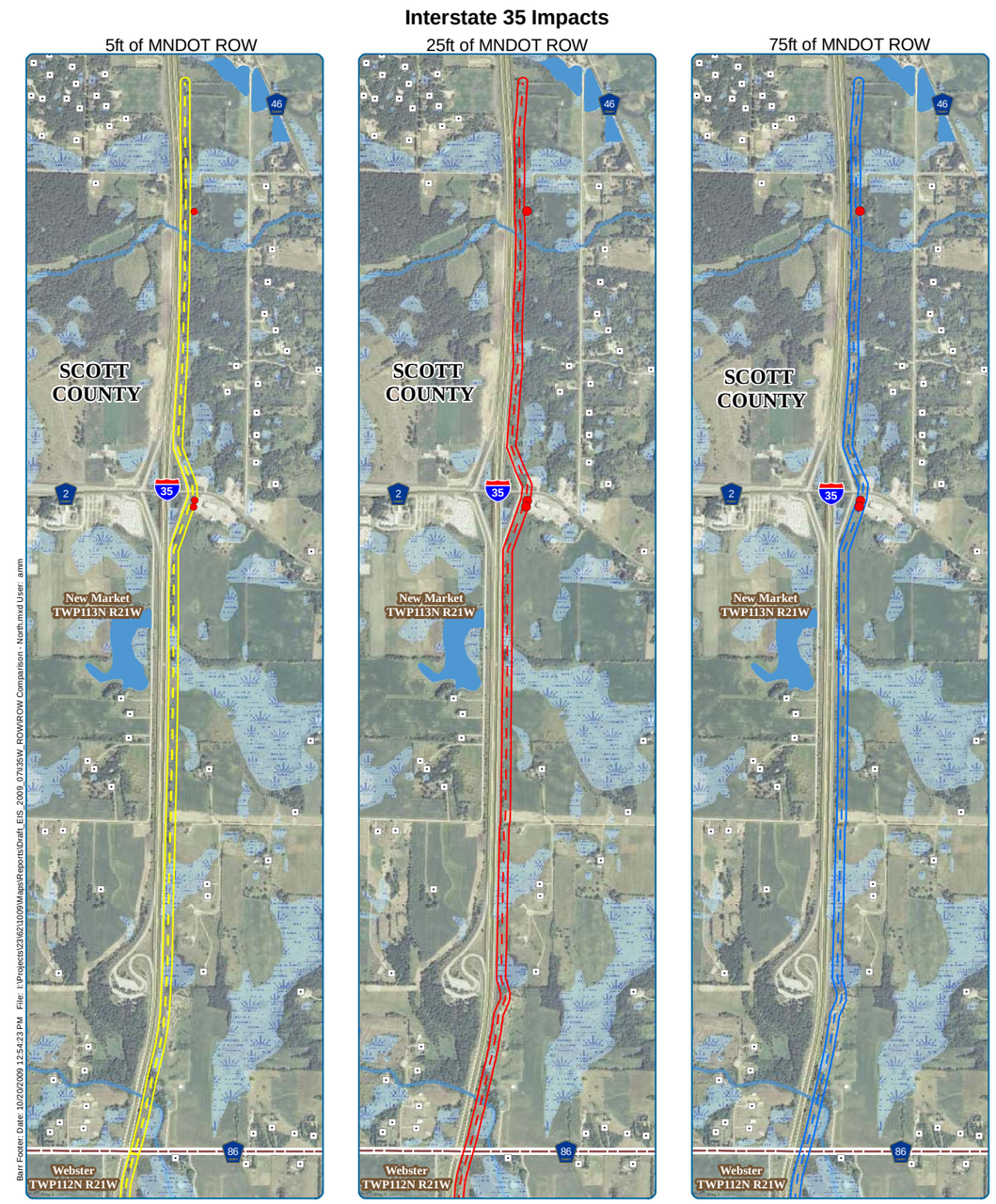
Assumptions

1. The applicants are requesting a 150 foot wide right-of-way (ROW); 75 feet on either side of the pole. Additional ROW may be required in special situations.
2. Percent ROW sharing was calculated using 2006 Parcel Dataset for Scott and Rice counties. DNR Real Estate Management Parcels were included as State owned.
3. Occupied homes and structures (e.g., silos, sheds, barns, outbuildings) were identified during field investigations in 2009 and using 2006 and 2008 NAIP aerial photographs.
4. Wetland numbers were compiled using the NWI maps and provide an estimate of the number of wetlands likely present along the route. These numbers do not necessarily represent the number of wetland impacts subject to State and federal wetland regulations.
5. Prime farmland numbers were compiled using the USDA County Soil Survey Geographic (SSURGO) data for all counties.
6. Land cover numbers were compiled using the U.S. Geological Survey's Gap Analysis Program Data (GAP)
7. Stream crossings were compiled using MN DNR 1:24000 topo streams.
8. Cultural resource data were obtained from the MN State Historic Preservation Office.
9. Acreages are rounded to the nearest acre.
10. The 75 feet off DOT ROW centerline does not share any DOT ROW accept where it crosses the interstate.

The Utility Accommodation Policy does provide for exceptions where special circumstances exist. If the highway is part of the National Highway System, the exception must be approved by the Federal Highway Administration and would be considered a federal action, meaning that the requirements of the National Environmental Policy Act must be met.

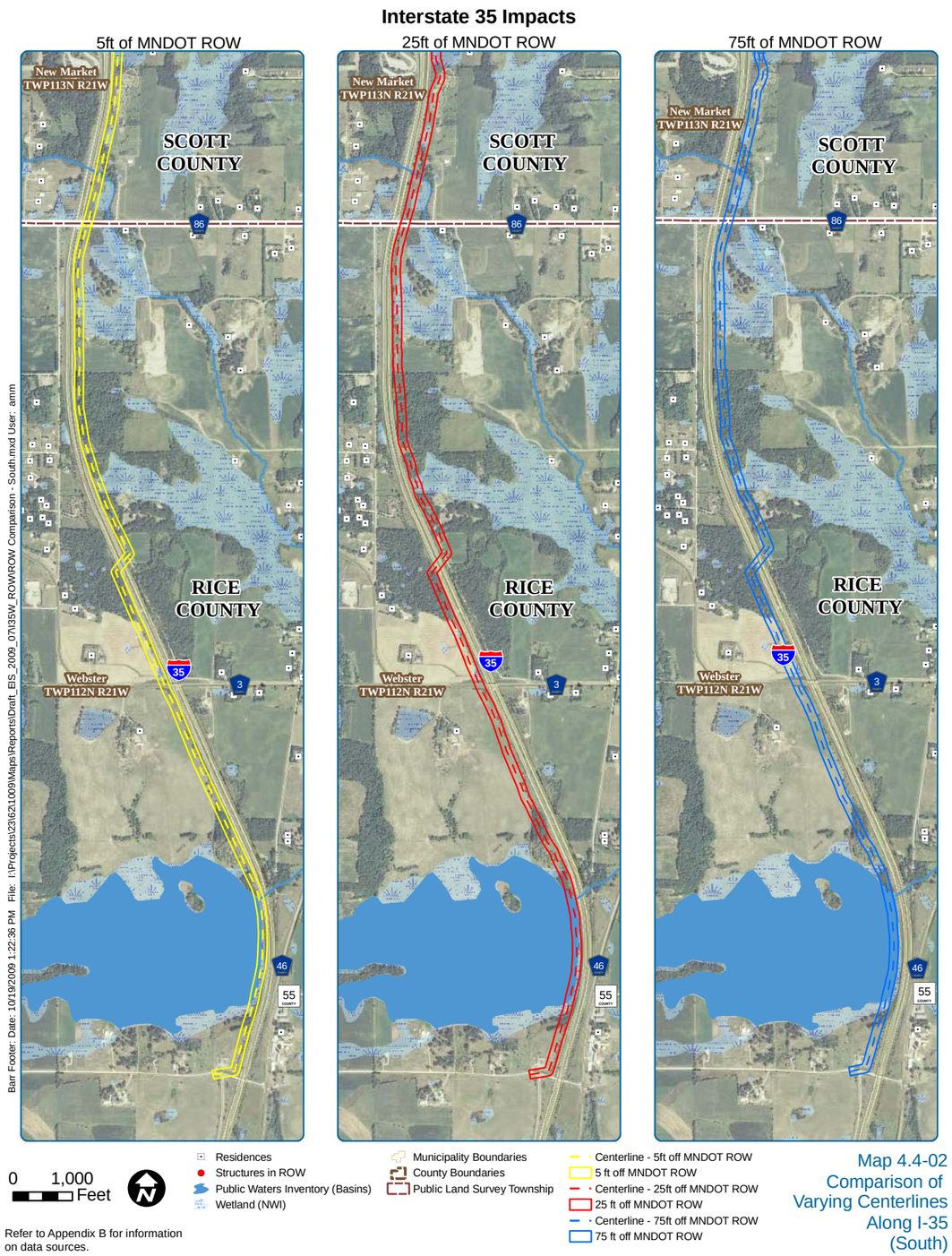
Several road alignments for the Interstate 35 segment were examined including distances of the transmission centerline from the road ROW at five feet, 25 feet, and 75 feet. The impacts of each of the alignments were analyzed and are shown in Table 4.4-1. Detailed maps of these areas can be found in Maps 4.4-01 and 4.4-02. Any placement within 75 feet of the trunk highway or interstate ROW would require a permit from the DOT.

The percentage and type of total line length that utilities share ROW under each route alternative is discussed in Section 7 of this impact statement.



Refer to Appendix B for information on data sources.

Map 4.4-01 Comparison of Varying Centerlines Along I-35 (North)



Map 4.4-02 Comparison of Varying Centerlines Along I-35 (South)

4.5 Design Options to Accommodate Future Expansion

In order to meet future transmission system needs throughout the Project area, approximately 123 to 136 miles of the 345 kV transmission line is to be constructed using double-circuit capable poles, but with only one-circuit initially installed. This will allow a second circuit to be strung when conditions justify expansion. (However, the approximately 114 to 127 mile section between the Lyon County Substation and the Helena Substation will be constructed on double-circuit poles with both circuits installed from the outset of the Project). The proposed new substations will be also designed to enable additional future transmission line connections. This strategy will maximize the use of the existing ROW and minimize construction time for a new circuit.

What is a clear zone?

The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes, speeds, and roadside geometry.

4.6 Underground Options

Undergrounding of transmission lines is a feasible option, especially for lower voltage transmission lines. However, at higher voltages, undergrounding becomes progressively more complex and problematic. It is common today to see lower-voltage distribution lines that connect to homes and businesses buried directly in the ground using less invasive construction methods. In these cases, undergrounding offers aesthetic and environmental benefits while posing relatively few construction, maintenance, and operational challenges.

Undergrounding of High-Voltage Transmission Lines Requires Greater Infrastructure

Underground lines require additional equipment to compensate for voltage rise along the distance of the transmission line. The additional equipment translates to a higher overall cost, limits the length of the underground installation, and increases the likelihood of failure due to additional components. Depending on the type of cable system used, cooling equipment may be required at underground transmission line substations. The cooling equipment increases noises above ground. Overhead lines are air cooled and widely spaced for safety. In general, there are three major types of underground transmission facilities: high- and low-pressure oil-filled systems, solid dialectic systems, and compressed gas insulated systems. These systems may require the installation of addition cables to meet the equivalent capacity requirements of the overhead line. Because of these challenges, placing high voltage transmission lines, like the lines proposed for this Project, underground is a practice generally used only when there is no viable overhead corridor and for very limited distances.

Where undergrounding of high voltage transmission lines is necessary, there are a number of factors that should be considered:

Construction

Installation generally includes direct burial in backfilled trenches and concrete trenches with covers or concrete ductbanks. Constructing the trench for the underground transmission line would result in greater temporary construction impacts than the proposed overhead line. Underground transmission construction as compared to overhead lines increases noise, dust, and traffic disruption. Considerable clearing and grading would be expected in suburban and rural settings, and dust and noise from construction would last three to six times the duration of an overhead line. Concrete manholes or large splice vaults are needed at recurring intervals. During repairs, a whole segment between these vaults may need to be excavated again.

A typical progression rate for underground construction would be two to three days for each 200-foot section of trench. Approximately 500-to 700-feet of trench is open at one time. Steel plates are typically placed over open sections of trench when crews are not at that location. Access to homes (driveways, front yards, sidewalks, and street parking) may be limited for several days to weeks during construction and local traffic would likely be rerouted to other streets, or redirected by a traffic monitor. According to the applicants, underground conductors of the size appropriate for this Project are generally limited to approximately 1,000-foot-long segments, due to the state of the technology, materials, and shipping weight and size restrictions.

Electromagnetic Fields

The calculated electromagnetic field (EMF) profiles for underground lines generally show a higher EMF level directly above the line, but the fields decrease faster with distance compared to levels under overhead lines.

Electric fields created by transmission lines can be blocked by different objects such as trees, structures, cars, and soil, therefore, electric fields may be significantly diminished by undergrounding transmission lines. Magnetic fields are however difficult to block and will continue to pass through the ground. Regardless of overhead or underground construction, magnetic and electric field intensity decrease with distance.

Cost

An underground line is expected to cost up to 10 times more per mile compared to overhead construction due to time, materials, process, and the use of specialized labor. An underground line must also be routed to avoid other underground installations such as water, gas, and sewer lines. Unstable slopes, hazardous material sites, wetlands, and bedrock must be avoided. Going under a road, highway, or river requires expensive construction techniques such as directional boring. All these aspects of underground transmission construction lead to a much higher cost than overhead line construction. Great River Energy has studied the costs of undergrounding approximately 1.5 miles of 345 kV transmission line and found it would cost approximately $400 million.

Maintenance

Though rare, one major disadvantage of building underground transmission lines is the difficulty of finding and repairing failures. It can be difficult to determine the location of a failure on an underground line. Overhead failures can usually be found through visual inspection. And while overhead failures can usually be repaired in hours or days, repair on an underground system can be more complex. Underground cable failures must first be located, then excavated and repaired. These excavated repairs can take weeks or months, depending on the extent of damage and the availability of replacement materials, so there could be significant impacts to traffic and residences adjacent to the excavation. Thus the cost for continued maintenance on an underground line compared to an above ground line can be significantly higher.

Undergrounding at River Crossings

Two different construction methods are available for undergrounding a transmission line at a river crossing: submarine cable and directional boring.

- Submarine cable: The transmission line can be laid along the bottom of the river using a hydro-plowing procedure that partially imbeds the line on the bottom of the river. Submarine cables can be susceptible to damage from floods, river debris, and boat anchors. Submarine cables also create a potential safety hazard for boaters.

- Directional boring: A casing could be directionally bored at each river crossing and the conductor could be installed in the casing. Unknown bedrock or boulders may be encountered during the drilling phase, which may result in damage to expensive drilling equipment and sometimes requires new boring paths to be started.

Whether installed using submarine cable or directional drilling, underground high-voltage transmission lines presents some obstacles.

First, either installation method would require a transition structure at each end, where the transmission line transitions from overhead to underground and from underground to overhead. Because of the high voltage, these transition structures would likely be low to the ground and enclosed by a fence, typically requiring approximately one acre of land. Accessing construction and excavation sites and the associated below ground vaults and transition structures may be complicated by the challenging topography of the Minnesota River area.

Second, the submarine cable underground construction method would disturb the riverbed and aquatic vegetation and could impact water quality and aquatic organisms. The directional boring underground construction method would require significant excavation and relatively large work areas at each end of the bore. In addition, depending on the location needed for construction, vehicles and equipment and materials for directional drilling may impact the surrounding environment more than the equipment required for installation of overhead lines.

4.7 Aerial Crossing of River

One proposed option for crossing the Minnesota Rive near Le Sueur is installation of the transmission line on the Highway 169 bridge. The DOT's Utility Accommodation Policy includes policies and procedures for the installation of utilities on highway bridge structures. However, placement on the Highway 169 bridge does not appear to be possible.

The policy provides that installation of utility facilities must be considered in the design of a bridge and installed in conjunction with

its construction. Such things as structural integrity of the bridge and ease of highway and utility maintenance are of particular concern, particularly for high voltage transmission lines of a size proposed here which must be encased in heavy conduits.

High voltage transmission line installations on bridge structures are generally not permitted except in extraordinary circumstances, and then only after a detailed analysis of all other construction methods or alternatives are determined not to be practicable.

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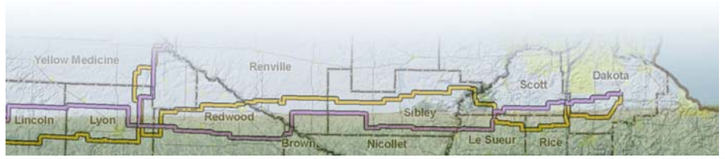

Before construction can begin, the applicants must obtain all federal, state, and local approvals. They must also acquire private easement rights, complete soil testing, and finish detailed engineering and design, including determining exact pole placement locations.

This section of the environmental impact statement (EIS) summarizes the procedures that the applicants would use to acquire private right-of-way (ROW) easements, construct and maintain the transmission line, and compensate landowners for any damage done during construction or maintenance.

5.1 Applicable State Regulation

After the route permit is issued, but before construction begins, the applicants would send their preliminary designs and other information to the Minnesota Public Utilities Commission (and the Office of Energy Security) for review to ensure that permit conditions are being followed. In addition, the commission's route permit would incorporate an agriculture impact mitigation plan, that describes the applicant's plan for soil damage mitigation. This plan is approved by the Minnesota Department of Agriculture (MDA).

Construction impacts are also addressed in a variety of construction-related permits, such as the Minnesota Pollution Control Agency's (PCA) construction storm water discharge permit (see Section 8 for a complete list of necessary permits).

Finally, as described below, the applicants have their own standard construction and mitigation best practices that have been developed from past projects to address ROW clearing, staging, erecting transmission line structures, and stringing transmission lines.

5.2 Utility Right-of-way Acquisition Process

Should the commission select a route and issue a route permit, the applicant's easement acquisition process would begin early in the detailed design phase. The commission is not involved in the easement acquisition process.

Typically, utilities acquire easement rights (not fee title) from landowners to accommodate transmission lines and associated facilities. However, utilities would purchase the land necessary for new or expanded substations. For these transmission lines, the applicants would have to acquire an 80- to 180-foot-wide ROW easement to accommodate the proposed 345 kilivolt (kV) transmission line. (See Section 4 for details.)

Section 3.3 of the applicants' route permit application provides details regarding the ROW acquisition process. Their acquisition process can be broken down into the following eight steps:

- **Title examination:** A public records search is completed and a title report is developed to determine the owner(s), and legal description;
- **Initial contact:** A utility ROW agent contacts each property owner to discuss pole placement and to identify other construction concerns.
- **Survey work and site assessment:** The agent may request permission for preliminary survey work and soil borings to determine the detailed engineering of the transmission line. The proposed location of each structure or pole on the ground would be staked and easement area required for safe operation of the line would be marked.
- **Negotiation:** The agent then negotiates with the owner to determine compensation for the rights to build, operate, and maintain the transmission facilities within the easement area.
- **Appraisal:** The initial appraisal is completed by the utility's representative(s). The landowner is allowed a reasonable amount of time to consider the offer and present material relevant to determining the property's value. If the landowner desires a second opinion on the fair market value of the property, the landowner may have an appraisal made. The landowner is reimbursed up to $500 toward the appraiser fee as long as the appraisal follows standard and accepted appraisal practices. Refer to the Section 6.1 discussion of displacement.
- **Document preparation and purchase:** In most cases, utilities are able to work with the landowners to address their concerns and an agreement is reached for the utilities' easement purchase. The agent then prepares all of the documents required to complete each transaction. Required documents may include: easement, purchase agreement, or contract and deed.
- **Pre-construction owner contact:** Prior to construction, the utility's ROW agent would contact the owner of each parcel to discuss the construction schedule and requirements. Special consideration may be needed for fences, crops, or livestock. In each case the same agent coordinates these processes and compensation for any damages with the landowner.
- **Eminent domain:** If, however, a negotiated settlement cannot be reached, the landowner may choose to have an independent third party determine the value of the land acquisition. Such valuation is made through the utility's exercise of the right of eminent domain pursuant to Minnesota Statutes Chapter 117.

5.3 Transmission Line Construction

The precise timing of construction would take into account various requirements that may be in place due to permit conditions, system loading issues, and available workforce. Again, details regarding the applicant's construction process are provided in Section 3.3 of their route permit application.

5.3.1 Construction Impact Areas

Major construction-related impacts during transmission line construction (in the general sequence they occur due) are due to the following five activities: ROW access, staging and lay-down areas, grading areas, pole installation, and conductor installation.

Right of Way Access

Typically, existing roads or trails that run parallel or perpendicular to the transmission line are used to access the actual transmission line ROW. Where use of private field roads or trails is necessary, permission from the property owner is obtained prior to access. In some cases, new access roads may have to be constructed when no current access is available or existing access is inadequate for the heavy equipment used in construction.

Staging and Lay-Down Areas

The materials are stored on-site at staging areas until they are needed for construction. Larger temporary lay down areas may also be needed in some areas depending on access, security, and efficiency and safety for warehousing supplies. Temporary lay-down areas outside of the transmission line ROW would not be included in a route permit. Permission would be obtained from land owners through rental agreements.

Areas Requiring Grading

Transmission line structures are generally installed at existing grades. However, along areas with more than 10 percent slope, working areas would have to be graded level or fill would be brought in to create working pads. If the landowner permits, it is preferred to leave the leveled areas and working pads remain in place for future maintenance activities. Otherwise, the site is graded back to its original condition as much as possible and all imported fill is removed.

Power Pole Installation

When sites are prepared for installation, poles are generally moved from the staging areas and delivered to the staked location and placed within the ROW. Insulators and other hardware are attached while the pole is on the ground. The pole is then lifted, placed, and secured using a crane.

In nearly all cases, the poles would be installed using concrete foundations or direct embedding. Where single poles structures are under lower stress (tangent and light angle structures) poles are placed on concrete foundations or directly embedded. Where single pole structures are under higher stress (medium angle, heavy angle or dead-end structures) drilled pier concrete foundations are required (Figure 5.3.1-1). Where H-frame structures are used, the applicants may use poured concrete foundations.

Conductor Installation

After pole placement, conductors are installed in stringing setup areas located approximately every two miles along a project route, either within the ROW or on temporary construction easements. Brief access to each structure is needed to secure the conductor wire to the insulator hardware and the shield wire. Where the transmission line crosses streets, roads, highways, or other obstructions, a temporary guard or clearance poles may be installed to protect conductors and to ensure safety during installation.

Post Installation Back-Filling

Excavated material, native soil, or crushed rock is used to back-fill holes after pole placement. If landowner permission is obtained, it is preferred to spread excess soil from foundation holes on the structure site. Otherwise, depending on landowner preference, the material would be given to the landowner or would be completely removed from the site.

When needed, how big are the concrete foundations?

Holes five to seven feet in diameter and 12 or more feet deep (depending on soil conditions) are drilled. After concrete is set, the pole is bolted to it. No guy wires are required in this setup.

What is direct embedding?

Holes approximately six feet in diameter and 10- to 15-feet deep are augured or excavated. The hole is partially filled with crushed rock, the pole is set on top of the rock base and the hole is backfilled with crushed rock and/or soil. In poor soil conditions, a galvanized steel culvert may be installed vertically with the structure set inside. No guy wires are required.

Figure 5.3.1-1 Pier concrete foundation

Source: Great River Energy and Xcel Energy. Application to the Minnesota Public Utilities Commission for a Route Permit for the Brookings County – Hampton 345 kV Transmission Line Project

5.3.2 Mitigation

Generally, whether following their own procedures or specific permit requirements, the applicants would minimize impacts from construction activities by:

- placing construction mats in wet or soft soil locations and narrow ditches to minimize disturbances,
- spanning all streams and rivers, and spanning all wetlands to the extent possible,
- not driving construction equipment across waterways except under special circumstances and only after discussion with the appropriate resource agency,
- crossing waterways using boats, or by driving equipment in water crossing areas only when frozen in winter (to pull in new conductors and shield wires for example), and
- fueling and lubricating far from waterways to ensure that fuel and lubricants do not enter waterways.

5.4 Substation Construction

The Project would require construction of four new substations, and expansion of four existing substations. The four new substations are: Hazel Creek, Cedar Mountain, Helena, and Hampton. As requested by the applicants, approximately 40 acres would be acquired for each of these substations to ensure adequate space for planned facilities, future facilities, and buffer area. The existing substations are Brookings County (South Dakota), Lyon County, Minnesota Valley, and Lake Marion. The anticipated area of expansion at existing substations would be up to 16 acres. Both new construction and expansion of existing substations would require clearing and grading

of the new or expanded substation site.

5.4.1 Expansion of Existing Substations

The existing Lyon County 115/69 kV Substation would be expanded by adding four to six acres of fenced and graded substation area and associated equipment. The substation expansion is proposed to extend to the north and east and may require acquisition of additional land depending on final transmission line route selection and final substation design. The substation expansion would upgrade the system with 345 kV equipment, including one 345 kV breaker and a half-yard with nine breaker positions and five breakers. One new 345 kV transformer (448 MVA), one future 345 kV transformer position and associated line switches, foundations, steel structures, and control panels would be installed to integrate this transformer into the existing equipment. The existing 115 kV yard would be expanded with two additional breakers and a total of six breaker positions. Two circuit breakers and capacitor banks would be installed.

Equipment additions to the existing Minnesota Valley 115/69 kV Substation would include a 230 kV breaker and a half-yard with nine breaker positions and five breakers and the associated foundations, steel structures and control panels. It is not anticipated that additional land would be required to accommodate the upgraded facilities.

The existing Lake Marion Substation would require 12 to 16 acres of fenced and graded substation area to house necessary equipment. The equipment includes a 345 kV breaker and a half-yard with six breaker positions and three breakers, one new 345 kV transformer (448 million volt-amperes or MVA) and one 345 kV transformer position. The expansion would also include expansion of the 115 kV yard to breaker and a half configuration with a total of twelve breaker positions and five breakers, and a 115 kV bus with circuit breakers and capacitor banks. The construction would include the associated line switches, foundations, steel structures, and control panels.

5.4.2 Construction of New Substations

Construction of a new Hazel Creek 345/230/115 kV Substation would require five to 10 acres of fenced and graded substation area. Two potential substation siting areas have been identified. The north area (Hazel Creek Substation north area) is located in Minnesota Falls Township, south of Trunk Highway 67 and north of 260th Avenue. The south area (Hazel Creek Substation south area) is located in Minnesota Falls and Hazel Run townships generally between County Highway 43 and 530th Street. Equipment to be installed includes 345 kV equipment (one 345 kV breaker and a half-yard with nine breaker positions and five breakers with one new 345 kV (336 MVA) transformer and one future 345 kV transformer position), 230 kV equipment (a 230 kV yard with nine breaker positions and five breakers, one new 230 kV transformer, and one future 230 kV transformer position), and reactive support on the 115 kV yard. The substation would also include the associated line switches, foundations, steel structures, and control panels. The substation yard would require access roads.

The new Cedar Mountain Substation near Franklin would be located at one of two identified substation siting areas, depending on the final route selection. One potential location is southeast of Franklin (Cedar Mountain Substation south area), and the other potential location is north of Franklin (Cedar Mountain Substation north area). The new substation would require four to six acres of fenced and graded area depending on the final route selection and final substation design. The new substation would be designed and constructed with a 345 kV breaker and a half-yard with nine breaker positions and five breakers, one 345 kV transformer (448 MVA), and one future transformer position. A 115 kV breaker and a half-yard would be constructed with six to nine breaker positions and two breakers and a 115 kV bus with circuit breakers and reactive support. The new substation would require line switches, a control house, relay panels, foundations, steel structures, and switches. The substation yard would require access roads.

The Cedar Mountain Substation would connect with the Minnesota Valley–Franklin–New Ulm 115 kV transmission line. The new 115 kV transmission line would be a single circuit wood or steel horizontal post structure. The typical span length would be approximately 350 feet with a ROW of up to 100 feet.

Two potential routes have been identified between the Franklin to New Ulm 115 kV transmission line and the Cedar Mountain Substation south area. The first alternative (Reroute A) would tap the existing Franklin to New Ulm 115 kV transmission line approximately one mile east of the existing Franklin Substation. It would run approximately 0.75 miles to the proposed Cedar Mountain Substation south area. The second alternative (Reroute B) would tap the existing Franklin to New Ulm 115 kV transmission line and extend approximately 0.25 to 0.5 miles to the proposed Cedar Mountain Substation south area.

Additionally, a potential route has been identified between the Minnesota Valley to Franklin 115 kV transmission line and the Cedar Mountain Substation north area. The new transmission line (Reroute C) would tap the existing Minnesota Valley to Franklin 115 kV transmission line and would run approximately two miles to the proposed Cedar Mountain Substation north area (Section 7.7). With Reroute C, there would be an option to route the new 115 kV transmission line directly into the existing Franklin Substation. Additionally, the existing Minnesota Valley to Franklin 115 kV transmission line would run through the Cedar Mountain Substation north area and could also be tapped for the proposed transmission line.

The new substation near Helena would be constructed in one of two identified substation siting areas, depending on the final route selection. One location is west of Heidelberg in Derrynane Township, Le Sueur County (Helena Substation south area) and the other is northwest of New Prague in Belle Plaine and Helena townships, Scott County (Helena Substation north area). The substation fenced and graded area would be approximately three to five acres depending on final route selection and final substation design. The new substation would initially be designed and constructed with one 345 kV breaker and a half yard with nine breaker positions and five breakers. The new substation would require line switches, a control house, relay panels, foundations, and steel structures. The substation yard would require access roads. The Helena Substation would also include sufficient space for a future 115 kV substation

yard and a future 345 kV transformer.

The Helena Substation would also connect with the Wilmarth–Blue Lake 345 kV transmission line. If the Helena Substation is sited away from the Wilmarth–Blue Lake 345 kV transmission line, a tap may be required to interconnect it to the Helena Substation.

The Project would require construction of a new substation near Hampton (Section 7.7). The applicants have identified one substation siting area for the substation (Hampton Substation area) that could be used as part of the Preferred Route or Alternate Route. The substation fenced and graded area would be approximately three to five acres depending on final route selection and final substation design. The new substation would be designed and constructed with one 345 kV breaker and a half-yard with nine breaker positions and five breakers. The new substation would require line switches, a control house, relay panels, foundations, and steel structures. The substation yard would require access roads.

The Hampton Substation would be designed to connect with the existing Prairie Island–Blue Lake 345 kV transmission line. To make this connection, the Prairie Island–Blue Lake 345 kV transmission line would need to be split prior to the connection point, creating two transmission lines. As a result, two transmission lines would be built to the new Hampton Substation.

If the Hampton Substation is located within one mile of the Prairie Island–Blue Lake 345 kV transmission line, the two connecting transmission lines could be placed on double circuit structures consistent with North American Electric Reliability Corporation (NERC) criteria. If the Hampton Substation is located more than one mile away, all or a portion of the two connecting transmission lines would be built on separate, single-circuit poles.

5.5 Cleanup and Restoration

In general, as construction on each parcel is completed, disturbed areas are restored to their original condition to the maximum extent possible. Afterword, the utility ROW agent would contact each property owner to see if any damage has occurred as a result of the Project. This issue is also covered in the agriculture impact mitigation plan to be reviewed and approved by the MDA.

In general, if damage has occurred to crops, fences or the property, the applicants would reimburse the landowner for the damages sustained. In some cases, an outside contractor may be hired to restore the damaged property to as near as possible to its original condition.

Any vegetation disturbed or removed during the construction of transmission lines would usually naturally reestablish to pre-disturbance conditions. However, areas with significant soil compaction and disturbance from construction activities would require assistance in reestablishing the vegetation stratum and controlling soil erosion.

Commonly used methods to control soil erosion during construction and assist in reestablishing vegetation include, but are not limited to erosion control blankets with embedded seeds, silt fences, and hay bales.

What is the agricultural impact mitigation plan?

Based on similar plans developed for pipeline construction permits, this plan (which is approved by the MDA) outlines the requirements the utility must follow when constructing, restoring, and maintaining the project on agricultural property.

5.6 Maintenance

Transmission infrastructure has very few mechanical elements and is built to withstand normal weather extremes. With the exception of severe weather, such as tornadoes and heavy ice storms. High-voltage transmission lines rarely fail, and the structures very seldom tip or fall even in severe storms.

The primary operating and maintenance cost for transmission facilities is the cost of inspections, usually done monthly by air. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99 percent.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and National Electrical Safety Code and NERC requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be kept free of vegetation and drainage must be maintained.

How much maintenance would be required?

Transmission lines and substations are designed to operate for decades with minimal maintenance, particularly in the first few years of operation.