# NORTHERN STATES POWER COMPANY
# APPLICATION TO THE
# SOUTH DAKOTA PUBLIC UTILITIES COMMISSION
# FOR A
# FACILITY PERMIT

## BROOKINGS COUNTY SUBSTATION TO
## YANKEE SUBSTATION
## 115 kV TRANSMISSION LINE PROJECT

January 31, 2008

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# APPENDIX EXHIBIT LIST

Exhibit A: Detailed Route Maps

Exhibit B: MPUC Certificate of Need Order

Exhibit C: Agency Correspondence

Exhibit D: Landowner List

Exhibit E: Written Public Comments

Exhibit F: Buffalo Ridge Incremental Generation Outlet Electric Transmission Study Volume 1 (June 15, 2005)

# 1 APPLICANT'S VERIFICATION

State of Minnesota )
:SS
County of Hennepin )

Thomas G. Hillstrom, being duly sworn, deposes and says that he is a permitting analyst for the Yankee – Brookings County #2 Transmission Project on behalf of Northern States Power Company, a Minnesota corporation.

He states that he does not have personal knowledge of all of the facts recited in the foregoing Application, but the information in the Application has been gathered by and from employees and contractors of Northern States Power Company and Xcel Energy Services Inc. and is believed to be accurate and reliable; and on that basis the information in the application is verified by him as being true and accurate on behalf of Northern States Power Company.

Dated this 30th day of Jan 2008.

Thomas G. Hillstrom

Subscribed and sworn to before me
This 30th day of Jan, 2008.

Bonnie Jean Anderson
Notary Public

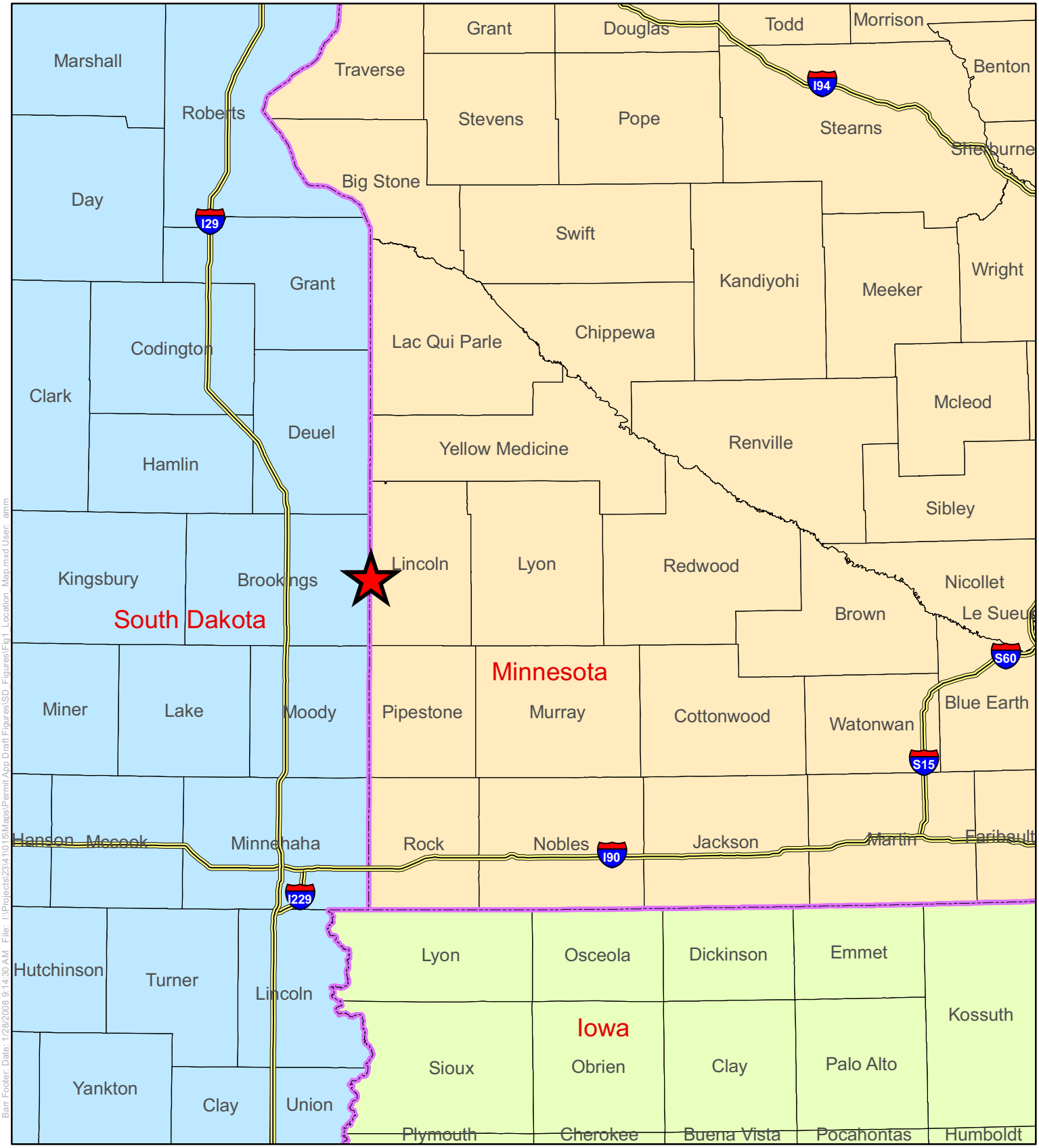
BONNIE JEAN ANDERSON
NOTARY PUBLIC
MINNESOTA
My Commission Expires 1/31/2009

# 2 SUMMARY

## 2.1 Proposal Summary

Northern States Power Company, a Minnesota corporation operating in South Dakota ("NSPM," "Xcel Energy" or the "Company"), proposes to construct and own a new 115,000 volt ("115 kV") transmission line approximately 13 miles long between the existing Yankee Substation in Lincoln County, Minnesota and the existing Brookings County Substation in Brookings County, South Dakota ("Project"). This line will create a second 115 kV connection between the two substations ("Yankee – Brookings #2"). The general project area is shown in Figure 1 ("Project Area"). The proposed route ("Route") is shown in Figure 2. More detailed maps of the Route and Project Area are provided in Exhibit A.

Xcel Energy submits this application ("Application") for a facility permit for the South Dakota portion of the Project to the South Dakota Public Utilities Commission ("Commission") pursuant to South Dakota Codified Laws("SDCL") Chapter 49-41B and South Dakota Administrative Rules ("ARSD") Chapter 20:10:22. The South Dakota portion of the Project consists of an approximately 6.5-mile 115 kV transmission line from the Brookings County Substation to the Minnesota/South Dakota border and associated modifications to the Brookings County Substation. The Company has obtained a Certificate of Need for the Project from the Minnesota Public Utilities Commission ("MPUC") and on January 18, 2008, filed an application for a route permit with the MPUC for the Minnesota portion of the Project pursuant to the Minnesota Power Plant Siting Act, Minnesota Statutes Chapter 216E. (See Northern States Power Company Application for Route Permit, Yankee Substation to Brookings Substation 115 kV Transmission Line Project, MPUC Docket No. E002/TL-07-1626).




**Legend**

State Boundary

Project Location

N

10 0 20

Miles

**Figure 1. Project Area**
BRIGO Yankee-Brookings County Transmission Line

Xcel Energy
Route Permit Application
January 2008

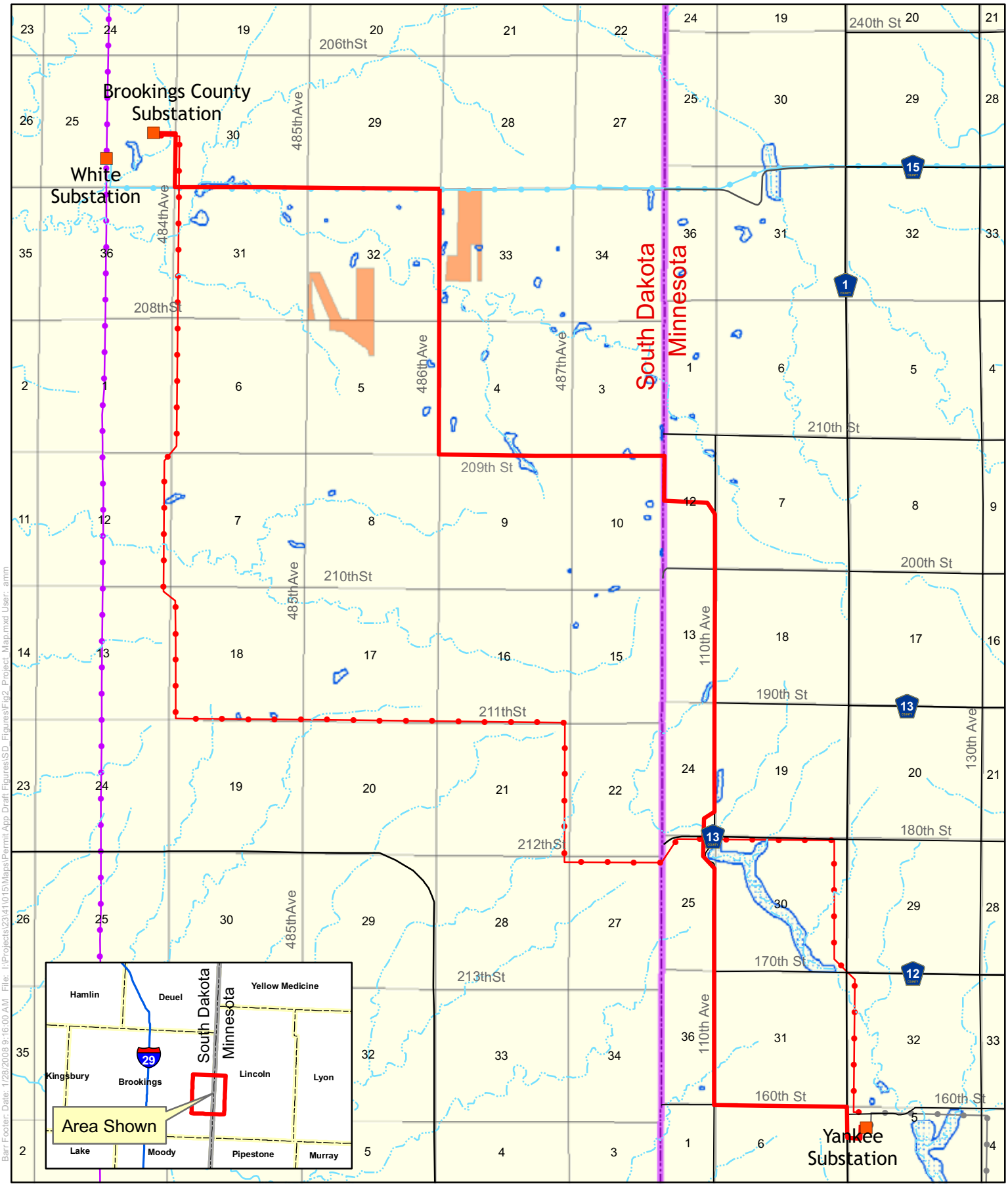



**Figure 2. Proposed Route**
BRIGO Yankee-Brookings County Transmission Line

Xcel Energy
Route Permit Application
January 2008

## 2.2 Application Completeness Checklist

The South Dakota facility permit regulations contain a list of application requirements. SDCL 49-41B-11 and ARSD 20:10:22:05 *et seq.* The following Table 1 provides a checklist of these requirements and the location in this Application where each requirement is addressed. Some of the content requirements do no precisely fit our proposal to construct a 115 kV line to provide additional generation outlet. In such cases, alternative information customized to our proposal has been provided. Xcel Energy requests the Commission find that this Application generally contains the content required by SDCL Chapter 49-41B and associated rules.

**Table 1: Completeness Checklist**

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | 20:10:22:04 (5) | **Applicant Verification** | 1.0 |
| 49-41B-11(1) | 20:10:22:06 | **Names of participants required.** The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons. | 4.0 |
| 49-41B-11(7) | 20:10:22:07 | **Name of owner and manager.** The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility. | 4.0 |
| 49-41B-11(8) | 20:10:22:08 | **Purpose of facility.** The applicant shall describe the purpose of the proposed facility. | 5.0 |
| 49-41B-11(12) | 20:10:22:09 | **Estimated cost of facility.** The applicant shall describe the estimated construction | 6.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | cost of the proposed facility. | |
| 49-41B-11(9) | 20:10:22:10 | **Demand for facility.** The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility. | 5.0, 7.0 |
| 49-41 B-11(2) | 20:10:22:11 | **General site description.** The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to state, county, and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site. | 3.0, 8.0 |
| 49-41B-11 (6), | 20:10:22:12 | **Alternative sites**. The applicant shall present information related to its selection of the proposed site for the facility, including the following:<br>(1) The general criteria used to select alternative sites, how these criteria were measured and weighted, and reasons for selecting these criteria; | 9.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | (2) An evaluation of alternative sites considered by the applicant for the facility;<br>(3) An evaluation of the proposed plant or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method. | |
| 49-41B-11 (11),<br>49-41B-21, 49-41B-22 | 20:10:22:13 | **Environmental information.** The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant, and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse affect of the environment as a result of their construction or operation in the transmission site or siting area. | 10.0-17.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| 49-41B-11; 49-41B-22 | 20:10:22:14 | **Effect on physical environment**. The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include:<br>(1) A written description of the regional land forms surrounding the proposed plant site or through which the transmission facility will pass;<br>(2) A topographic map of the transmission site or siting area;<br>(3) A written summary of the geological features of the siting area or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area;<br>(4) A description and location of economic deposits such as lignite, sand and gravel, scoria , and industrial and ceramic quality clay existent within the plan or transmission site;<br>(5) A description of the soil type at the plant site;<br>(6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control;<br>(7) Information on areas of seismic risks, subsidence potential and slope instability for the siting area or transmissions site, and<br>(8) An analysis of any constraints that may be imposed by geological characteristics on the | 10.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | design, construction, or operation of the proposed facility and a description of plans to offset such constraints | |
| 49-41B-11; 49-41B-21; 49-41B-22 | 20:10:22:15 | **Hydrology.** The applicant shall provide information concerning the hydrology in the area of the proposed plant or transmission site and the effect of the proposed site on surface and groundwater. The information shall include:<br>(1) A map drawn to scale of the plant or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility;<br>(2) Using plans filed with any local, state, or federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects;<br>(3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission;<br>(4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water; | 11.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems;<br>(6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected. | |
| 49-41B-11; 49-41B-21;<br>49-41B-22 | 20:10:22:16 | **Effects on terrestrial ecosystems.** The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility. | 12.0 |
| 49-41B-11; 49-41B-21;<br>49-41B-22 | 20:10:22:17 | **Effects of aquatic ecosystems.** The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site or operation of the proposed facility on the total aquatic biotic environment and planned | 13.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility. | |
| | 20:10:22:18 | **Land use.** The applicant shall provide the following information concerning present and anticipated use or condition of the land:<br>(1) A map or maps drawn to scale of the siting area and transmission site identifying existing land use according to the following classification system:<br>(a) Land used primarily for row and nonrow crops in rotation;<br>(b) Irrigated lands;<br>(c) Pasturelands and rangelands;<br>(d) Haylands;<br>(e) Undisturbed native grasslands;<br>(f) Existing and potential extractive non renewable resources;<br>(g) Other major industries;<br>(h) Rural residences and farmsteads, family farms, and ranches;<br>(i) Residential;<br>(j) Public, commercial, and institutional use;<br>(k) Municipal water supply and water sources for organized rural water districts; and<br>(l) Noise sensitive land uses;<br>(2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility; | 14.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and<br>(4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts. | |
| | 20:10:22:19 | **Local land use controls.** The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant SDCL 49-41B-28. | 15.0 |
| | 20:10:22:20 | **Water quality.** The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted. | 16.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | 20:10:22:21 | **Air quality.** The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any federal or state agency having jurisdiction and variances permitted. | 17.0 |
| | 20:10:22:22 | **Time schedule**. The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of the proposed facility. | 18.0 |
| | 20:10:22:23 | **Community impact**. The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following:<br>(1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services;<br>(2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdiction;<br>(3) A forecast of the impact on agricultural production and uses;<br>(4) A forecast of the impact on population, income, and occupational distribution, and integration and cohesion of communities; | 19.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | (5) A forecast of the impact on transportation facilities;<br><br>(6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plan to coordinate with the local and state office of disaster services in the event of accidental release of contaminants from the proposed facility; and<br><br>(7) An indication of means of ameliorating negative social impacts of the facility development. | |
| | 20:10:22:24 | **Employment estimates.** The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the applicant shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of the commercial operation in the one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is | 20.0 (operating jobs and labor costs not applicable for a transmission line) |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | located after construction is completed. | |
| | 20:10:22:25 | **Future additions and modifications.** The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit. | 21.0 |
| | 20:10:22:34 | **Transmission facility layout and construction.** If a transmission facility is proposed, the applicant shall submit a policy statement concerning the route clearing, construction and landscaping operations, and a description of plans for continued right-of-way maintenance, including stabilization and weed control. | 22.0 |
| | 20:10:22:35 | **Information concerning transmission facilities.** If a transmission facility is proposed, the applicant shall provide the following information as it becomes available to the applicant:<br>(1) Configuration of the towers and poles, including material, overall height and width;<br>(2) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower;<br>(3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps;<br>(4) Reliability and safety;<br>(5) Right-of-way or condemnation requirements;<br>(6) Necessary clearing activities; and | 23.0 |

| SDCL | ARSD | Required Information | Where (Application Section) |
|---|---|---|---|
| | | (7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits. | |
| | 20:10:22:36 | **Additional information in application.** The applicant shall also submit as part of the application any additional information necessary for the local review committee to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22. | 25.0<br>(local review committee not applicable for a transmission line) |
| | 20:10:22:39 | **Testimony and exhibits.** Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application. | 26.0 |

# 3 GENERAL SITE DESCRIPTION

Xcel Energy proposes to construct an approximately 13-mile single-circuit 115 kV transmission line in Brookings County, South Dakota and Lincoln County, Minnesota to connect the Brookings County Substation to the Yankee Substation. Aerial photograph maps for the Project, including the South Dakota and Minnesota sections, are provided in Exhibit A (Figures A-1 through A-5).

The Project also includes necessary modifications to both substations. The line is one of three 115 kV transmission line projects that together will improve the overall system's capability to support further wind generation development in eastern South Dakota and southwestern Minnesota.

Approximately 6.5 miles of the new transmission line will be located in South Dakota. within Richland Township and Sherman Township in Brookings County. The sections and ranges are listed below in Table 2.

**Table 2: South Dakota Project Area (Section, Township and Range)**

| Range | Section | Township |
|---|---|---|
| 47W | 3 | 110N (Richland) |
| 47W | 4 | 110N (Richland) |
| 47W | 5 | 110N (Richland) |
| 47W | 9 | 110N (Richland) |
| 47W | 10 | 110N (Richland) |
| 47W | 25 | 111N (Sherman) |
| 47W | 29 | 111N (Sherman) |
| 47W | 30 | 111N (Sherman) |
| 47W | 31 | 111N (Sherman) |
| 47W | 32 | 111N (Sherman) |
| 47W | 33 | 111N (Sherman) |

# 4 NAME OF OWNER AND MANAGER (ARSD 20:10:22:07), NAMES OF PARTICIPANTS (ARSD 20:10:22:06)

NSPM is a Minnesota corporation operating in South Dakota with its headquarters in Minneapolis, Minnesota. The Company is a wholly-owned subsidiary of Xcel Energy Inc. ("Xcel Energy Inc."), a utility holding company with its headquarters in Minneapolis. Xcel Energy provides electricity service to more than 73,000 customers in South Dakota. Xcel Energy also provides electricity services to approximately 1.2 million customers and natural gas services to 425,000 residential, commercial and industrial customers in the state of Minnesota; and electric and natural gas service to approximately 55,000 customers in North Dakota. Xcel Energy owns and operates the existing Brookings County and Yankee substations, the existing Yankee – Brookings #1 115 kV line, and will construct, own and operate the new Yankee – Brookings #2 115 kV transmission line. There will be no other participants in the Project.

Xcel Energy Services Inc. is the service company for the Xcel Energy Inc. holding company system, and its personnel prepare, submit and administer regulatory applications to the Commission on behalf of NSPM, including facility permit applications.

The project manager and individuals authorized to receive communications relating to this Application on behalf of NSPM are:

Mr. Tom Hillstrom (Permitting Analyst)
Xcel Energy Services Inc.
414 Nicollet Mall, MP-8A
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# 5 PURPOSE OF THE TRANSMISSION FACILITY (ARSD 20:10:22:08)

The proposed Project is one of three new 115 kV transmission lines that the Company has proposed to construct and operate in the Buffalo Ridge area of southwestern Minnesota and southeastern South Dakota. Collectively, the three transmission projects are known as the Buffalo Ridge Incremental Generation Outlet ("BRIGO") projects. The BRIGO transmission lines are projected to create approximately 350 megawatts ("MW") of additional transmission capability for wind generation in the Buffalo Ridge area, increasing generation outlet capacity from 825 MW to approximately 1,175 MW.

## 5.1 New Right-of-Way Requirement

Xcel Energy recently completed construction of the Yankee – Brookings #1 line on a route approved by the Commission in 2006 in Docket No. EL05-28-; and by the Minnesota Environmental Quality Board ("MEQB") in 2005. (See Figure 2). (The MEQB's authority over electric transmission line routing transferred to the MPUC in 2005 pursuant to Minn. Stat. § 216E.02, subd. 2.) Yankee – Brookings #1 is now a "critical circuit" in the Project Area and limits system-wide outlet capacity. To further increase generation outlet capacity in the area, the Yankee – Brookings # 2 line is needed. This second 115 kV line will provide a redundant transmission pathway that will remove the reliability-based limit on transmission capacity in the area. The Yankee – Brookings #2 line will support the electrical system in the event of an outage of Yankee – Brookings #1. To provide the necessary redundancy, the second Yankee – Brookings 115 kV transmission line must be constructed on separate right-of-way. If the Yankee – Brookings #2 were constructed on the same poles or in the same right-of-way as Yankee – Brookings #1, both circuits would be at risk during a single event, such as a storm. Consequently, the Route proposed in this Application for Yankee – Brookings #2 is located on a separate right-of-way.

## 5.2 Regulatory Requirements

South Dakota requires that a utility obtain a facility permit from the Commission prior to constructing a transmission facility. SDCL 49-41B-4.

## 5.3 Minnesota Regulatory Process Summary

In Minnesota, no large energy facility can be constructed without the issuance of a Certificate of Need by the MPUC. Minn. Stat.§ 216B.243, subd. 2. The MPUC granted the Company a Certificate of Need to construct the BRIGO projects by an order dated September 14, 2007 ("Certificate of Need Order").[1]

A route permit is also required for the Project. The Company's route permit application was filed on January 18, 2008 and is pending action by the MPUC.

[1] In the Matter of Application of Northern States Power Company d/b/a Xcel Energy for Certificates of Need for Three 115 kV Transmission Lines in Southwestern Minnesota, Docket No. E-002/CN-06-154, Order Granting Certificates of Need (Sept. 14, 2007) ("Certificate of Need Order"). A copy of the Certificate of Need Order is attached as Appendix B.

# 6 ESTIMATED COST OF FACILITY (ARSD 21:10:22:09)

Xcel Energy estimates that the transmission line and substation improvements will cost approximately $18.7 million, as follows:

**Table 3: Facility Costs**

| Route | Cost |
|---|---|
| Yankee – Brookings County #2 115 kV Transmission Line | $7,700,000 |
| Yankee Substation Modifications | $5,000,000 |
| Brookings County Substation Modifications | $6,000,000 |
| **Total Project Costs:** | **$18,700,000** |

Operating and maintenance costs for the transmission line will be nominal for several years, since the line will be new and there is minimal vegetation maintenance required. Annual operating and maintenance costs for 115 kV transmission voltages across Xcel Energy's Upper Midwest system have averaged in the range of $300 to $500 per mile of transmission right-of-way over the last five years. The principal operating and maintenance cost will be inspections, usually done by fixed-wing aircraft on a monthly basis and by helicopter once a year.

Xcel Energy performs periodic inspections of substations and equipment. The type and frequency of inspection varies depending on the type of equipment. Typical inspection intervals are semi-annually or annually.

# 7 DEMAND FOR TRANSMISSION FACILITY (ARSD 21:10:22:10)

The demand for the Project is not driven by demand for increased power. Rather, it is needed to support both the existing wind generation development along Buffalo Ridge and to accommodate additional wind generation projects as they develop in this area. The majority of the existing, proposed or contemplated wind generation resources in the Upper Midwest are located on the Buffalo Ridge and to the west. Buffalo Ridge is the premier area for wind generation development and cannot be further developed without additional transmission infrastructure to deliver that generation to load centers.

The transmission system in southwestern Minnesota and southeastern South Dakota can reliably transmit up to 825 MW of power from Buffalo Ridge. Without the construction of the Project, further development of wind generation on Buffalo Ridge beyond 825 MW cannot occur. The Project is part of an orderly development of the transmission system that will enhance the transmission system and allow for the expansion of additional wind generation in and around the Buffalo Ridge area.

The MPUC granted Certificates of Need for the Project and two other 115 kV lines to address the need for additional transmission outlet capacity near Buffalo Ridge. These three transmission lines are together known as the BRIGO projects. As discussed in the MPUC Certificate of Need Order, the three BRIGO projects compliment the proposed CapX2020 345 kV transmission projects.

Xcel Energy initiated the Buffalo Ridge Incremental Generation Outlet Study ("BRIGO Study") to determine what additional system improvements would be needed to meet growing demand for wind generation development in the Buffalo Ridge area. A copy of the BRIGO Study, Volume 1, is contained in the Appendix, Exhibit F. It was apparent from the beginning of the study that significant high voltage transmission improvements (*e.g.*, 345 kV) would be required. Such larger improvements typically take significant time to permit, design and construct. The study shifted focus to evaluate shorter term solutions *i.e.*, what smaller transmission infrastructure projects (*e.g.*, 115 kV) could be undertaken as an interim step to cost effectively provide a few hundred megawatts of additional generation outlet capacity until higher voltage projects could be developed.

Planning engineers initially identified eleven different transmission improvement options to increase outlet capacity on Buffalo Ridge. After more detailed analysis,

planning engineers concluded that the combination of three 115 kV lines, including the Yankee – Brookings #2, was the most economical option to increase generation outlet capability from Buffalo Ridge from 825 MW to about 1200 MW. Route permit applications have been submitted to the MPUC in Minnesota for all three lines: Yankee – Brookings #2, Lake Yankton – Marshall 115 kV and Fenton – Nobles 115 kV. The Yankee – Brookings #2 also requires a facility permit from the Commission.

Not constructing the Project would adversely affect ratepayers. If transmission constraints prevent further development in the Buffalo Ridge area, new wind generation projects would be forced to locate to less desirable locations. This would result in lower energy production per MW of installed capacity, leading to an increased cost per MWh of delivered energy. In addition, any delay of this Project will create a corresponding delay in the availability of additional wind power generation to meet the increasing demand for renewable energy from the Buffalo Ridge area. Specifically, the MinnDakota 200 MW wind project proposed to be constructed near the Brookings Substation would not be able to proceed. After construction of this Project, the wind farm will be able to interconnect at the Brookings Substation.

# 8 FACILITY SITE DESCRIPTION (ARSD 21:10:22:11)

## 8.1 Proposed Route

On the Minnesota side of the border, the proposed Route begins at the Yankee Substation at the corner of 120th Avenue and 160th Street in Lincoln County and proceeds west for one-mile along 160th Street and then turns northward along 110th Avenue on the Minnesota side of the state line until it reaches a point approximately one-half mile north of 200th Street. (See Figure 2 and Exhibit A).

At this point, the Route turns west toward the South Dakota border along a half-section line and then jogs north along the South Dakota border for approximately one-third mile to connect with 209th Street in South Dakota. (See Figure 2). This northernmost segment of the Route in Minnesota was developed in consultation with the two affected landowners (See Section 24.2) and is the only section of the Route that does not follow existing roadway right-of-way.

Once across the border in South Dakota, the Route then follows 209th Street west for approximately one and three-fourths mile to the intersection with 486th Avenue. At 486th Avenue, the proposed Route then turns north for two miles to connect with the existing East River Electric Power Cooperative ("East River") White — Ivanhoe 115 kV line, which runs parallel to and south of 207th Street. Along this portion of the Route, Xcel Energy proposes to remove the existing East River 115 kV structures and consolidate the new 115 kV circuit with the existing 115 kV transmission circuit on new single-pole, double circuit structures. This 115 kV/115 kV "double-circuit" part of the Route then follows 207th Street for two miles until reaching 484th Avenue.

The line will then head north and run parallel to the Yankee – Brookings #1 115 kV transmission line for approximately 0.4 mile and enter the Brookings County Substation. This last segment will be constructed on single circuit structures. The entire South Dakota portion of the proposed 115 kV transmission line is located along roadway right-of-way.

Key features on the South Dakota portion of the Route include the two-mile segment along the south side of 207th Street where Xcel Energy proposes to remove the existing East River 115 kV structures and consolidate the existing line with the new 115 kV circuit on single-pole, double circuit structures. In this segment, there is also a wetland on the north side of 207th Street. (See Exhibit A, Figure A-5). Other route

options in South Dakota that were considered but rejected are summarized in Section 9.1.4 below.

Key features also include one occupied residence located within 300 feet of the proposed route (along 486th Street). (See Figure A-1 and A-5 in Exhibit A). There is also a 34.5 kV feeder line owned by PPM Energy, Inc. ("PPM") located along three miles of the proposed Route in Minnesota (one mile along 160th Street, and two miles along 110th Avenue. (See Exhibit A, Figure A-1). These feeder lines are needed to connect the new PPM Energy wind turbines in the Project Area to the Yankee Substation (and the NSPM Transmission system). MinnDakota Wind, LLC ("MinnDakota"), an affiliate of PPM, is the owner of the 34.5 kV facilities. The Company and PPM are currently discussing how best to accommodate both the Yankee – Brookings #2 Project and planned extensions of the proposed PPM feeder lines along the Route in South Dakota.

## 8.2 Substations

### 8.2.1 Brookings County Substation

The existing Brookings County Substation was built in 2007 and was constructed to accommodate expansion. The Brookings County Substation will be modified to accommodate the 115 kV Brookings County – Yankee #2 line and the 345 kV Brookings County – White #2 line. The required work will include adding a new 345-115 kV, 50 megavolt amp, transformer and upgrading the 345 and 115 kV yards. The upgrades will include four new 345 kV, 3000 amp, circuit breakers, three new 115 kV, 3000 amp, circuit breakers, 345 kV and 115 kV, 3000 amp, switches. Two new deadend, line-termination structures will be installed for the new 115 kV and 345 kV lines. All controls and protection for the new breakers will be installed, as well as foundations, steel structures, conductor, trenching and grounding for the new equipment. No additional grading will be needed. All new equipment will be installed within the existing substation fence.

### 8.2.2 Yankee Substation

The existing Yankee Substation was built in 2007 and was constructed to accommodate expansion. The existing substation will be modified to accommodate the switching gear, bus work and new transformers necessary to integrate the proposed 115 kV transmission line into the transmission network. The new equipment at Yankee Substation will be placed within the existing fenced area.

The new equipment will include a 115 kV dead end structure with a 115 kV, 2000A motor-operated disconnect; two empty circuit breaker bays to connect the new line to the existing Main Bus #1; a 115 kV, 3000A breaker between the Main Bus #1 and the second transformer; a single-phase coupling capacitor voltage transformer on the second transformer position; and four 115 kV, 3000A group-operated disconnects. All controls and protection for the new breaker also need to be installed, as well as all foundations, steel, conductor, trenching and grounding for the equipment installations for the modified substation. No additional grading will be required.

# 9 ROUTE SELECTION PROCESS, ALTERNATIVE SITES (ARSD 20:10:22:12)

The Project Area was originally studied during the planning process by a team of siting, right-of-way, ecological and engineering personnel. The team reviewed the general area identified for significant routing issues that may arise. Additional field studies were conducted to identify natural resources along the route alternatives. In consultation with affected landowners, route alternatives were further developed using the process described below and ultimately one route was selected for the Application.

### 9.1.1 Initial Route Selection Criteria

Xcel Energy first developed potential routes using digital data such as aerial photographs and topographic maps. The siting group requested input from various natural and cultural resource regulatory agencies and potentially affected landowners. The group analyzed the Project Area and identified preliminary route options based on the following criteria:

- Minimize impacts to reliability (*e.g.*, consider if existing lines can be double circuited);
- Decrease the amount of right-of-way required by routing lines parallel to roads and existing transmission lines;
- Minimize impacts on landowners by routing lines parallel to field lines and property lines where access is adequate and the transmission line would cause minimal conflicts with existing land use; and
- Minimize the length of the transmission line to reduce the impact area and costs for the Project.

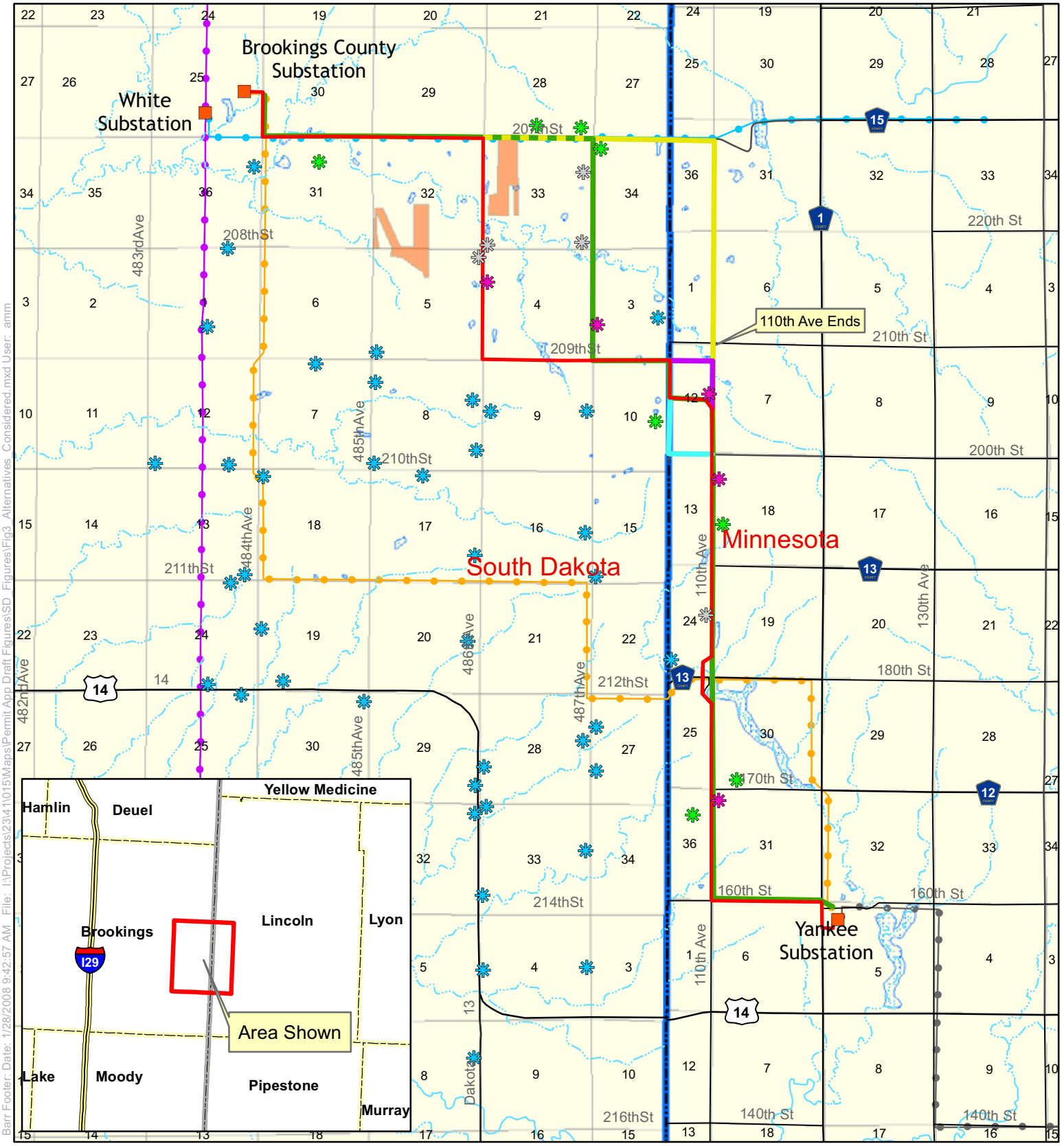
The routes were further refined to avoid the following to the extent possible:

- Existing or planned farm homesteads or other residences;
- Areas where clearances are limited because of trees or nearby structures;
- Conflicts with agricultural areas or agricultural operations, or other land uses;
- Areas with higher potential for archeological or historic features or artifacts; and
- Environmentally sensitive sites such as wetlands, significant sites, areas with threatened and endangered species and species of special concern,

areas of significant biological or cultural significance and state and federal lands.

Xcel Energy did not consider any route that required double circuiting or sharing right-of-way with the existing Yankee – Brookings #1 line. As noted above, the primary purpose of the Project is to provide a second, redundant 115 kV circuit between the Yankee and Brookings County substations. Under North American Electric Reliability Corporation ("NERC") reliability standards, constructing a second 115 kV transmission line in the on the same right-of-way as the Yankee – Brookings #1 line would not provide the same reliability benefit as two lines on separate rights-of-way because both lines on a shared right-of-way are at risk of being taken out of service by a single event – *e.g.*, a tornado. Likewise, route segments were rejected if they would closely parallel the existing Yankee – Brookings #1 to reach the Brookings County Substation.

Xcel Energy also rejected routes that would require a crossing into South Dakota along 160th Street because of their greater impacts on nearby residences. To reach the Brookings County Substation, these routes would then have had to turn north along Highway 14 or 487th Avenue to meet the existing East River 115kV line. Both of these alternatives would impact more homes adjacent to the roadway than the north/south portions of the Route along 110th Avenue in Minnesota and 486th Avenue in South Dakota. Figure 3, below, shows the residences along this alternative and other alternatives evaluated.




Legend

- Proposed Route
- Common to Options 1 & 2
- Option 1
- Option 2
- Suboption B
- Suboption D
- Brookings-Yankee 115-kV Line #1
- Yankee-Buffalo Ridge 115-kV Line
- Wetlands
- MN-SD State Line
- SDGFP Walk-in Areas
- Residential w/in 300'
- Residential w/in 1500'
- Residence outside of route
- Abandoned
- East River 115 kV
- Western 345 kV

N

0 0.5 1 2 Miles

**Figure 3. Alternatives Considered**
BRIGO Yankee-Brookings County Transmission Line

Xcel Energy
Route Permit Application
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### 9.1.2 Detailed Route Selection Criteria

Once the overall route strategy was developed, Xcel Energy identified a route heading west from the Yankee Substation along 160th Street and then north along 110th Avenue between 160th Street to 210th Street. North of 210th Street, where 100th Avenue ends, various route options to the Brookings Substation were considered. The route options are shown on Figure 3. To evaluate these route options, the Company considered the following criteria in more detail:

- **Number of residences passed**: For comparing alternatives, residences along each of the alternatives were identified. The number of residences within 300 feet of each alternative was tabulated as well as residences within 300 feet to 1,500 feet. These impacts for each alternative were then compared.
- **Number of wetlands to be spanned**: Wetlands to span are primarily small emergent wetlands associated with drainages and/or small depressions near or adjacent to the road. Two larger wetland areas lie within segments of the route that are common to all alternatives. These are:
  - Emergent and scrub-shrub wetland associated with drainage along the north edge of 207th Street in South Dakota between 484th and 485th Avenues; and
  - Emergent wetland in the southeast corner of the intersection of 180th Street and 110th Avenue in Minnesota.
- **Number of streams and drainages to be spanned:** The Route crosses five unnamed intermittent streams that are tributaries to Deer Creek, and it crosses one wetland. The two required stream crossings in Minnesota include both perennial streams and drainage swales tributary to the perennial streams. Spanning stream crossings should not pose a design or construction challenge.
- **Cultural resources:** The entire Project Area has some potential to contain archeological sites because of the geography and history of the area. Past surveys in the area for other transmission line and wind energy projects have found minor, scattered artifacts, particularly in areas with rolling topography near streams. For example, Route Option 1 in Minnesota (See Figure 3) crosses through an area with no roads and also

may have increased potential for cultural resources artifacts because of its proximity to streams and rolling topography similar to where other artifacts have been found in the area.

### 9.1.3 Public Participation

In addition to using the route criteria listed above, the Company held two open houses in the Project Area to inform potentially affected residents and government officials about the Project, to listen to any concerns and review potential route options. The first open house was held on July 17, 2007 at the Midwest Center for Wind Energy, which is about 6 miles south of Hendricks, Minnesota. The second open house was held in Elkton, South Dakota on December 12, 2007. Xcel Energy mailed notices or otherwise contacted potentially affected landowners in both South Dakota and Minnesota to inform them of these open houses. Written public comments from both open houses are provided in Exhibit E. In addition, in some cases Xcel Energy contacted landowners by telephone or in person to discuss potential options affecting their parcels.

**First Open House**

The primary purpose of the first open house in July, 2007, was to inform local residents about the project and hear about initial concerns or route suggestions. Approximately 40 to 45 people attended, including two Lincoln County (Minnesota) Commissioners.

Primary issues raised at the open house included the need for the Project, the extent to which the Yankee – Brookings #2 could cross or run parallel to the Yankee – Brookings #1 line, and the details of where and how the existing East River 115 kV line could be double-circuited with the Yankee – Brookings #2 line. Residents and landowners on the initial route had detailed questions regarding exact pole placement, tree conflicts and route plans. Several alternative routes in South Dakota and Minnesota were suggested and evaluated informally. However, only one nearby resident filled in or mailed a formal written comment (See Exhibit E).

**Second Open House**

At the second open house held in December, 2007, the Company presented a preferred route, explained how the route was selected and received public comments and about the preferred route. Twelve persons signed in at the open house and five submitted formal written comments. In addition to general concerns regarding

avoiding tree damage where possible, one resident in South Dakota identified a potential conflict with his personal air strip. Also, in consultation with one of the affected landowners, Xcel Energy developed the proposed final segment of the route in Minnesota. (See Exhibit A, Figure A-3). Based on discussions with affected landowners, the proposed Route in this area heads west from 110th Avenue across a half-section line to the Minnesota/South Dakota border (through Section 12, T110N, R47W) and then turns north along the border for one-third mile before crossing into South Dakota.

### 9.1.4 Route Alternatives Considered

In developing the proposed Route, Xcel Energy considered and rejected various segment alternatives. In addition to the general alternatives discussed above, multiple route options were considered primarily in the area north of 200th Street in Minnesota where 110th Avenue ends. (See Figure 3).

One option would continue north from 200th Street/110th Avenue north to 207th Street and connect into the East River 115 kV line at 110th Avenue. (Option 1 on Figure 3.) This option would provide additional double-circuiting opportunities with the existing East River 115 kV transmission line and has few wetlands and streams to cross. However, it would require crossing through an approximately two-mile segment of pasture where there is no existing right-of-way. This option also appears to have a higher potential for archeological artifacts because of the rolling topography and streams in the area.

Other options in this area, shown in Figure 3, were considered but rejected—primarily based on landowner concerns regarding conflicts with their farming operations. Two other options were rejected because they would cross an unnamed tributary of Deer Creek twice in the area just south and west of intersection of 210th Street and 110th Avenue. (See Figure 3).

The Company also considered alternatives on the South Dakota portion of the Project using a crossing at 209th Street. One alternative would turn north along 487th Avenue to reach the existing East River 115 kV line on 207th Street (instead of using 486th Avenue). Shown as Option 2 on Figure 3, this option was rejected because, overall, the alternative would pass within 300 feet of three more residences than the proposed Route, and approximately the same number of wetlands and streams.

The Company also considered using separate right-of-way for two miles near the Brookings County Substation in South Dakota, rather than double-circuiting with the East River 115 kV line. The double-circuit approach was preferred to consolidate transmission lines near the substation and to avoid impacts to the wetland north of 207th Street. This proposed double circuit configuration does not cause any reliability concerns because the East River 115 kV line does not serve the same purpose as the proposed line.

### 9.1.5 Final Route Selection

Based on the information described above, the Company refined its route proposal as detailed in this Application. The Company believes the proposed Route represents the best alternative in terms of meeting customer, landowner, legal and regulatory concerns, while minimizing impacts to the environment and existing land use. The Route includes the following important features:

- Land use impacts are minimized by sharing road and transmission right-of-way. 100% of the South Dakota portion of the Facility follows road right-of way. In addition, two miles of the new Facility will be consolidated on one set of structures with an existing East River 115 kV transmission line in South Dakota.

- Impacts to residents are minimized. There is only one occupied residence within 300 feet of the proposed Route in South Dakota (three in Minnesota). Impacts to these residences will be minimized during detailed design by constructing the Project across the roadway from affected residences where possible.

- Impacts to environmental resources are minimized. In South Dakota, the route crosses approximately eight unnamed intermittent streams and associated wetlands that are tributaries to Deer Creek. These required stream crossings are all narrow, and include both perennial streams and drainage swale tributaries to the perennial streams. The Company anticipates that the tributaries and associated wetlands will be spanned or otherwise avoided and no impact to these resources will occur.

## 9.2 Substation Identification

The proposed Facility does not require the construction/location of any new substations. Therefore, no new substation locations were considered.

# 10 EFFECT ON PHYSICAL ENVIRONMENT (ARSD 21:10:22:14)

This section provides a description of the environmental setting, potential impacts and mitigation measures Xcel Energy has proposed to minimize the impacts of siting, constructing and operating the proposed Facility. The majority of the measures proposed are part of the Xcel Energy standard construction practices. Unless otherwise identified in the following text, the costs of the mitigation measures proposed are considered nominal. All mitigation costs are included in the identified cost of the Project.

## 10.1 Existing Physical Environment

The Project Area between the Brookings County and Yankee Substations is located within the Coteau Moraines and Inner Coteau subsections of the North Central Glaciated Plains Section identified by the Ecological Classification System.

### 10.1.1 Description of Land Forms

The Project Area is characterized by rolling to steeply rolling moraines and a well-developed drainage system with few lakes. Prior to settlement, the landscape was mostly tall grass prairie with wet meadows and floodplain forests surrounding streams. Existing streams and surface water drainage patterns are shown generally in Figure A-1 in Exhibit A. Figure 4 provides an overview of the topography in the Project Area.

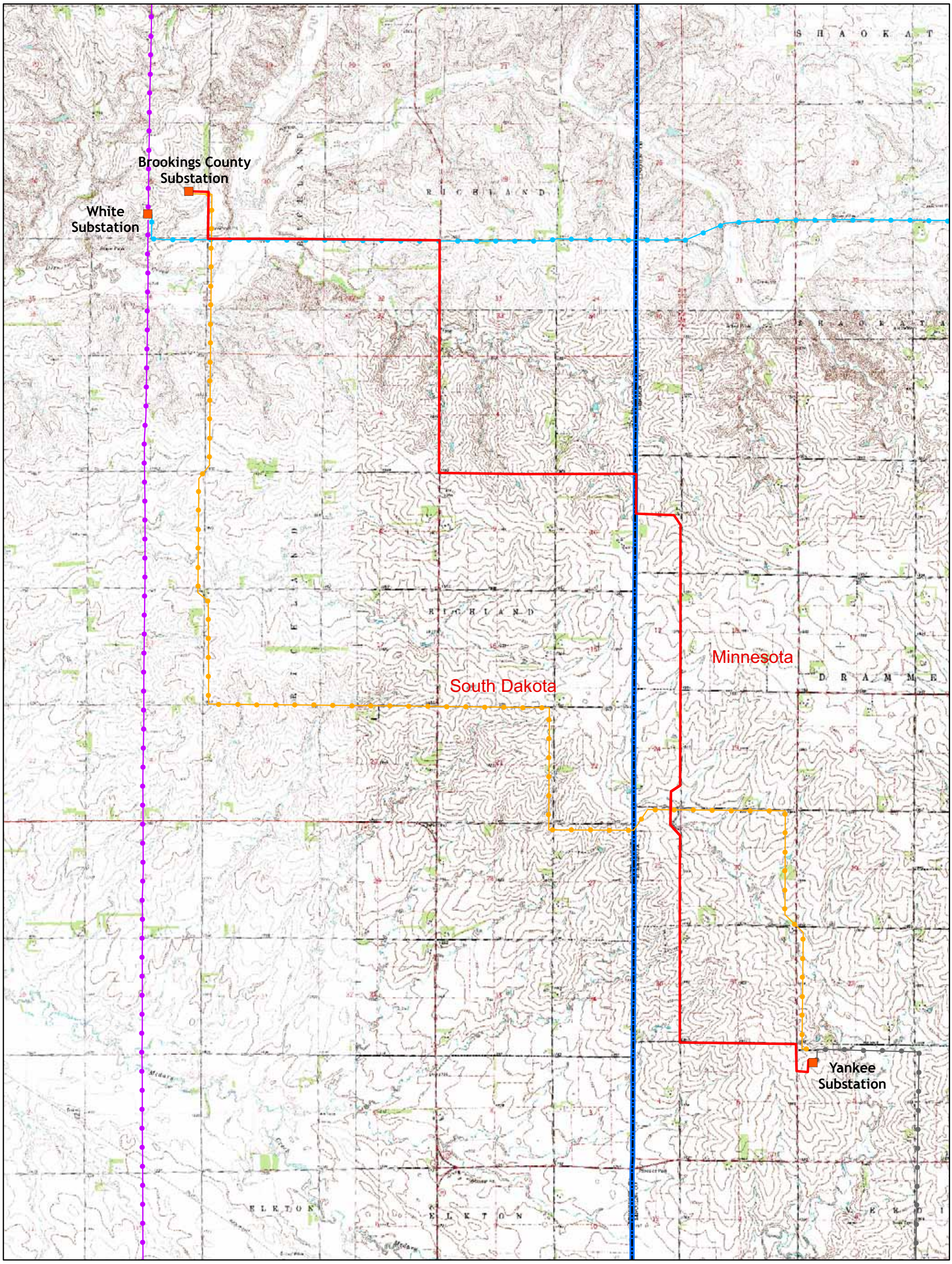


**Figure 4. Topography**
BRIGO Yankee-Brookings County Transmission Line

Xcel Energy
Route Permit Application
January 2008

The elevation near the Yankee Substation is about 1,870 feet. In a steeply rolling terrain that slopes to the southwest along the Medary Creek and Deer Creek watersheds, the elevation along the Route first increases to nearly 2000 feet near the South Dakota border and then drops to approximately 1780 feet near the Brookings County Substation in South Dakota. Surface water in the Minnesota portion of the Project Area generally flows into the intermittent tributaries to Medary Creek from where it then flows south and west toward the Big Sioux River. In South Dakota, as the Project Area extends northward, the overall slope switches to the northwest and toward the Deer Creek watershed near the Brookings County Substation.

### 10.1.2 Geological Features

The surface geology of the corridor consists of unconsolidated glacial materials deposited during the Wisconsin glacial advance. These materials generally consist of till intermixed with outwash deposits. The till is made up of mostly calcareous clay and silt with inclusions of rock fragments. Outwash materials consist of sands and gravels deposited by glacial melt water. Unconsolidated glacial materials are generally over 400 feet thick in the Project Area. The bedrock geology of this area consists of the Upper Cretaceous Pierre Shale and Niobara Formation, and the Precambrian Sioux Formation.

### 10.1.3 Economic Deposits

The primary economic geologic deposits in Brookings County, South Dakota consist of sand and gravel. The main economic uses for these resources are in construction, primarily road base and concrete aggregates. No active gravel mines have been identified in this area.

### 10.1.4 Soil Type

Soils in the Project Area consist primarily of loam, silty loam, silty clay loam, clay loam and sandy clay loam. Slopes range from nearly flat to up to 40 percent, which is characteristic of the rolling topography. Approximately 57 percent of the soils within the Project Area are listed as prime farmland; approximately 16 percent of the soil is listed as prime farmland when drained (USDA 2004). Prime farmlands are determined by the South Dakota Natural Resources Conservation Service ("SDNRCS") to have adequate potential of Hydrogen ("pH"), water supply, growing season length and temperature for growing crops and are not excessively erosion prone or wet throughout the growing season.

### 10.1.5 Seismic Risks

The seismic activity in South Dakota is fairly low. This is especially true in the eastern portions of the state. No earthquakes have been reported in Brookings County. The proposed transmission facilities will be designed and constructed in accordance with all applicable codes and will incorporate state-of-the-art standards to address potential structural difficulties associated with seismic, subsidence or slope instability.

## 10.2 Facility Impacts, Potential for Erosion or Sedimentation

During construction there is a possibility of sediment reaching surface waters as the ground is disturbed by foundation excavation, grading and construction traffic. Both Deer Creek and Medary Creek flow into the Big Sioux River. The Big Sioux River in South Dakota is already impaired for total suspended solids ("TSS"), so any sediment reaching these streams has the potential to adversely affect water quality in an impaired water.

Although a National Pollution Discharge Elimination System ("NPDES") stormwater permit is not anticipated, during construction Xcel Energy will follow standard erosion control measures identified in the applicable stormwater Best Management Practices ("BMP") Manual such as using silt fences to minimize the potential for erosion and sedimentation into water bodies within the Project Area. Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the transmission line to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. Once the Project is completed, it will have no impact on surface water quality. With implementation of BMPs the Project is not expected to affect water quality within the watershed.

In addition, each transmission line project has unique erosion and sediment control issues, so the construction crew leaders are provided general training so that they can determine what BMP application is necessary to address the issue. The type of BMPs used on the construction projects is based on the past experience of the crews, training programs held and any permit requirements. Xcel Energy forepersons are provided periodic training in the use of various erosion control measures. When contractors are hired to build Xcel Energy projects, they are required to comply with any permit requirements and to implement BMPs based upon their foremen's judgment. Projects are periodically inspected by Xcel Energy staff to ensure that measures are being used where needed. Xcel Energy field crews use a variety of

BMPs in the field during transmission line and substation construction. See section 10.2 for additional information regarding the potential for soil erosion and sedimentation.

### 10.3 Geological Constraints

Few geological constraints on design, construction or operation are anticipated in the Project Area. No shallow bedrock or outcrops are present; soil types generally consist of loam, silty loam, silty clay loam, clay loam and sandy clay loam.

# 11 HYDROLOGY (ARSD 20:10:22:15)

## 11.1 Existing Hydrology

The Project Area lies within the Upper Big Sioux River watershed. Along the proposed Route, surface water generally flows into the intermittent tributaries to Deer Creek or Medary Creek where it then flows south and west toward the Big Sioux River.

Medary Creek drains approximately 200 square miles in Brookings County. The average annual flow of Medary Creek, measured at the United States Geological Survey ("USGS") gauging station near Brookings, South Dakota from 1981 to 1990, is approximately 60.3 cubic feet per second ("cfs"). Peak flows historically occur in the spring and early summer with a maximum flow of 2,310 cfs recorded in June 1984. Low flows occur in December through February (USGS 2005).

## 11.2 Facility Impacts

### 11.2.1 Effect on Current or Planned Water Use

The proposed transmission facilities will not use either municipal or private water and therefore will have no impacts on either current or planned water uses by communities, agriculture, recreation, fish or wildlife.

### 11.2.2 Surface and Groundwater Impacts

The proposed projects will not require water. However, should groundwater be encountered during foundation installation, small scale dewatering may be necessary. Any discharged water will be directed to an upland location and treated by pumping through a filter bag or a small settling pond. Sediment laden water will not be discharged to any surface water body.

### 11.2.3 Water Storage, Reprocessing and Cooling by Proposed Facility.

No water storage or reprocessing will be required for the construction or operation of the proposed transmission facilities.

### 11.2.4 Deep Well Injection Use by Proposed Facility

No deep well injection would be required for the construction or operation of the proposed transmission facilities.

# 12 EFFECT ON TERRESTRIAL ECOSYSTEMS (ARSD 20:10:22:16

## 12.1 Flora

The majority of the land adjacent to the Facility in South Dakota is in pasture and hay, with some row crops. Row crops in the area include corn and soybeans. For a discussion on impacts to agriculture, see Section 19.2.4.

There are four areas along the Project where the adjacent land contains native prairie species. These areas are dominated by typical prairie grasses, including big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*), with prairie forbs, including rough blazing star (*Liatris aspera*), prairie rose (*Rosa arkansana*), sweet coneflower (*Rudbeckia subtomentosa*), hoary vervain (*Verbena stricta*) and leadplant (*Amorpha canescens*). These are medium-quality prairie areas, with moderate plant diversity and evidence of occasional grazing. A higher-quality tract of prairie, not affected by the Facility, is located approximately 1.2 miles northwest of the Project Area in Minnesota, along County Road 15, approximately one-half mile east of the South Dakota state line.

## 12.2 Fauna

Wildlife along the Project is primarily deer, small mammals, waterfowl, raptors and perching birds. These are species typically observed in areas that are primarily agricultural, with limited opportunities for nesting and cover.

The Natural Heritage Databases of the South Dakota Department of Game, Fish and Parks ("SDGFP") and the Minnesota DNR were consulted for known occurrences of sensitive species and other rare or unique natural resources. No endangered or threatened terrestrial species were identified in the Project Area in South Dakota, although on the Minnesota side of the Project Area, sensitive species were identified in a tract of native prairie approximately 1.2 miles northeast of the Project Area. In the Minnesota portion of the Project Area, the Minnesota DNR has records of the Ottoe skipper (*Hesperia ottoe*), a butterfly and the slender milk-vetch (*Astragalus flexuosus*), a vascular plant.

## 12.3 Impact to Terrestrial Ecosystems and Mitigation

Impacts to flora include impacts to trees that may occur at several points along the Facility. These impacts will be small land isolated to a few trees at scattered locations.

The area of trees that will be impacted by the proposed Project due to the routing of these transmission lines is expected to be approximately 0.25 acre (~11,000 $ft^2$). In general, a width of 40 feet will be cleared for the 115 kV transmission line right-of-way in areas of the Route where trees are present. To minimize impacts to trees in the Project Area, Xcel Energy will only remove trees located in the right-of-way for the transmission lines or that would impact the safe operation of the Facility.

Wildlife along the Project is primarily deer, small mammals, waterfowl, raptors and perching birds. These are species typically observed in areas that are primarily agricultural, with limited opportunities for nesting and cover.

There is a potential for temporary displacement of wildlife during construction and the loss of small amounts of habitat from the Project. Wildlife that inhabit trees that will be removed for the Project and organisms that inhabit agricultural areas will likely be displaced. Comparable habitat is adjacent to the Route for both habitat types, and it is likely that these organisms would be displaced only a short distance.

The primary potential impact presented by high-voltage transmission lines is potential injury and mortality to raptors, waterfowl and other bird species. Avian collisions, for example, are a possibility after the completion of the transmission line in areas where there are agricultural fields that serve as feeding areas, wetlands and open water.

However, unlike other nearby areas, there are no open water areas immediately adjacent to the Project, and the wetlands present are primarily small basins that provide minimal wildlife support. In areas near wetlands, Xcel Energy will evaluate mitigative measures where feasible as described below. As a result, the Project has a low potential for avian collisions.

Additionally, the electrocution of large birds, such as raptors, can be a concern with distribution lines. Electrocution occurs when birds with large wingspans come in contact with two conductors or a conductor and a grounding device. Xcel Energy transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution, so there are no concerns about avian electrocution as a result of the proposed Project.

Displacement of fauna is anticipated to be minor and temporary in nature. No long-term population-level effects are anticipated; therefore, no mitigative measures are proposed.

The Company has been working with various state and federal agencies over the past 20 years to address avian issues as quickly and efficiently as possible. In 2002, the Company, entered into a voluntary memorandum of understanding ("MOU") with the USFWS to work together to address avian issues throughout its service territories. This includes the development of Avian Protection Plans ("APP") for each state the Company serves: South Dakota, Minnesota and North Dakota. Work is currently underway on the NSPM APP.

# 13 EFFECT ON AQUATIC ECOSYSTEMS (ARSD 21:10:22:17)

## 13.1 Description of Aquatic Ecosystems

The primary aquatic ecosystems within the Project Area are Deer Creek and tributaries to Deer Creek and Medary creek. These creeks are primarily grassy waterways with low flows. Several small wetlands are also in the Project Area.

The Natural Heritage Databases of the SDGFP and the Minnesota DNR were consulted for known occurrences of sensitive aquatic species and other rare or unique natural resources. No species were identified in the Project Area in South Dakota, although records of sensitive species in the prairie streams of southwest Minnesota indicate that this area does contain critical habitat for the Topeka shiner (*Notropis topeka*). The Topeka shiner is a small minnow that inhabits small, quiet pools in clear upland creeks. The Topeka shiner is listed as a federally-endangered fish species

In the Minnesota section of the Route, there is one record of the Topeka shiner in an unnamed tributary to Medary Creek. A wetland associated with this creek will be near the project but preliminary design options avoid any construction within the wetland. (See Exhibit A, Figure A-2).

Outside the Project Area, the South Dakota and Minnesota Natural Heritage Database information also identified eight additional known locations of Topeka shiner populations. Two of these locations are near the confluence of Medary Creek itself and the unnamed tributary crossed by the Facility. These populations are at least five stream-miles downstream of the proposed crossing of the tributary. The other six Topeka shiner records are either upstream of the crossing of the tributary or are over eight stream-miles downstream.

## 13.2 Impacts to Aquatic Ecosystems and Mitigation

No structures will be placed in wetlands; therefore, no federal Section 404 permit will be required.

Construction near environmentally sensitive areas and wetland areas may also require special techniques in some circumstances. During construction, the most effective way to minimize impacts to wet areas will be to span all streams and rivers. In addition, Xcel Energy will not allow construction equipment to be driven across waterways except under special circumstances and only after discussion with the appropriate resource agency. Where waterways must be crossed to pull in the new

conductors and shield wires, workers may walk across, use boats, or drive equipment across ice in the winter. These construction practices help prevent soil erosion and ensure that equipment fueling and lubricating will occur at a distance from waterways.

If impacts to wetlands occur, they will be minimized through construction practices. Construction crews will maintain sound water and soil conservation practices during construction and operation of the facilities to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. Crews will avoid major disturbance of individual wetlands and drainage systems during construction. This will be accomplished by strategically locating new access roads and spanning wetlands and drainage systems where possible. When it is not feasible to span the wetland, construction crews will rely on several options during construction to minimize impacts:

- When possible, construction will be scheduled during frozen ground conditions;
- Crews will attempt to access the wetland with the least amount of physical impact to the wetland (*i.e.*, shortest route);
- The structures will be assembled on upland areas before they are brought to the site for installation; and
- When construction during winter is not possible, construction mats will be used where wetlands would be impacted.

When construction operations occur over the waterway, Xcel Energy will ensure that the operations are controlled in a manner to prevent materials from falling into the water body. If materials do fall into the water, they will promptly be removed by hand or by equipment working from the stream banks.

# 14 LAND USE (ARSD 20:10:22:18)

## 14.1 Existing Land Use

The Project is compatible with the existing land uses in the area.

The Project Area is mostly zoned agricultural, reflecting the typical land use of Brookings and Lincoln counties. Figure 5 shows the general land use in the project area (USGS National Land Cover Database, 2001), including pasture, rural residential and other land uses required to be listed in ARSD 20:10:22:18. As shown in Figure 5, South Dakota portion of the Project primarily passes through pasture and grassland. There are no public, commercial or industrial land uses in the Project Area.

There is only one residence located along the Route in South Dakota (Section 4, along 486th Avenue). Tree removal or other impacts maybe necessary at this residence, although even these impacts will be minimized or avoided by constructing the Project on the other side of the street from that residence. (See Exhibit A). (There are three occupied residences within 300 feet of the proposed Route in Minnesota that may require tree removal or other impacts.) There are five additional occupied residences within 1500 feet of the Project from which the line will likely be visible (two in South Dakota and three in Minnesota). There are no areas of known future residential development in the South Dakota portion of the Project Area.

There are no commercially harvested forested areas or woodlots within 20 miles of the Project. There are no active mining operations in the Project Area

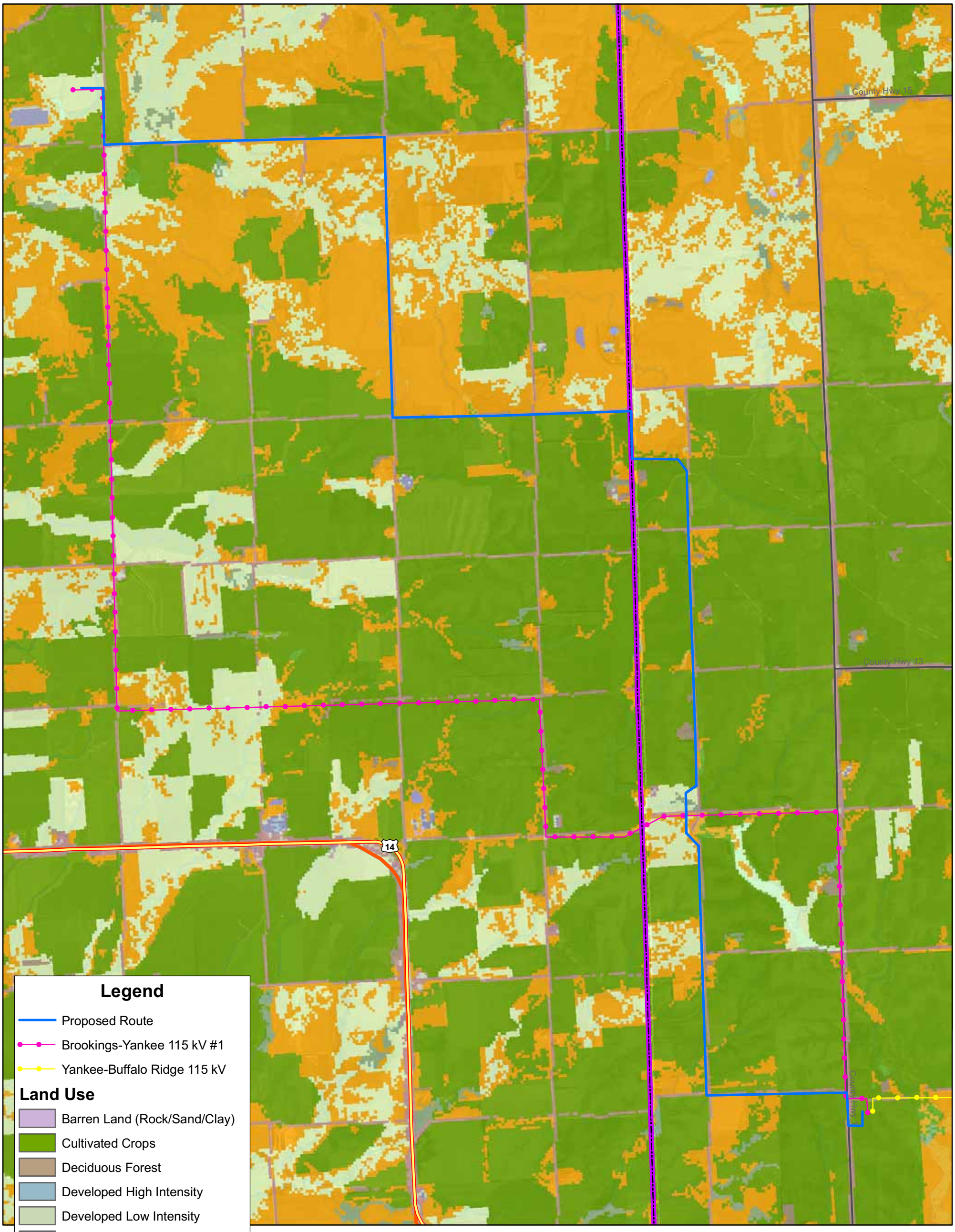


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**Figure 5. Land Use**
BRIGO Yankee-Brookings County Transmission Line

Xcel Energy
Route Permit Application
January 2008

## 14.2 Land Use Impacts

The proposed transmission line will be compatible with surrounding commercial and industrial land uses. Regarding residential land use, Xcel Energy has selected a proposed Route that avoids occupied residences and associated tree groves as much as possible. In addition, during detailed design, Xcel Energy will attempt to place the new line on the opposite side of the road from residences and avoid existing tree groves as much as possible in coordination with the affected landowner. The Project will not impact any forestry or mining operations and therefore no mitigative measures are proposed.

The Project is compatible with the existing land uses in the area. There are already several high voltage transmission lines in the Project Area. The addition of power lines to the area would have minimal direct or indirect impacts on the already linear features of the landscape, including the existing transmission lines, roads, fencing and power lines that transect the area. In South Dakota, one hundred percent of the transmission line will parallel existing linear corridors. Impacts to agricultural land use adjacent to the 115 kV transmission line will be minimized by using single, galvanized steel poles located adjacent to road right-of-way. The use of existing linear corridors also helps to minimize impacts to land uses along the route. Agricultural impacts are also discussed in Section 19.2.4.

### 14.2.1 Displacement

Displacement is required when a business or residence is located within the right-of-way for a new transmission facility. No displacement is anticipated as a result of this Project. Because no displacement will occur, no mitigative measures are proposed.

### 14.2.2 Noise

Noise is defined as unwanted sound. It may be comprised of a variety of sounds of different intensities across the entire frequency spectrum. Transmission conductors and transformers at substations can produce noise when it is foggy, damp or rainy. Under these conditions, for example, power lines can create a subtle crackling sound due to the small amount of the electricity ionizing the moist air near the wires. The level of noise or its loudness depends on conductor conditions, voltage level and weather conditions. During heavy rain the general background noise level is usually greater than the noise from a transmission line. Noise levels produced by a 115 kV transmission line are generally less than outdoor background levels and are therefore

not usually audible. The proposed transmission line will not noticeably increase the noise level at nearby residences. Therefore, not mitigative measures are proposed.

### 14.2.3 Radio and Television Interference

Under certain circumstances, corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal.

Television interference is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose and/or damaged hardware may also cause television interference. Tightening loose hardware on the transmission line usually resolves the problem.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations presently providing good reception can be obtained by adjusting the receiving antenna. Moreover, AM radio frequency interference typically only occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Megahertz). Also, the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

Finally, a two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal-blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower.

Xcel Energy does not expect that the proposed 115 kV line would interfere with GPS, satellite, cellular, television or radio signals. No mitigation measures are likely to be necessary since radio or television interference is not expected from the Project. If radio or television interference occurs because of the transmission line, Xcel Energy will work with the affected landowner to mitigate the problems so that reception is restored. If television or radio interference is caused by or from the operation of the

proposed facilities in those areas where good reception is presently obtained, Xcel Energy will inspect and repair any loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if necessary. If radio or television interference occurs because of the transmission line, Xcel Energy will work with the affected landowner to resolve the problems so that reception is restored to pre-Project levels.

Finally, if after installation a structure placement interferes with reception for a satellite dish, Xcel Energy will work with the landowner to find the appropriate location for the dish to remove the interference.

### 14.2.4 Aesthetics

The Project Area has historically been largely agricultural; however, wind energy generation projects are rapidly causing changes to the area. Land use now includes a mixture of residential, commercial and industrial land uses. The transmission line structures will contribute to changing the views throughout the Project Area. There are transmission lines within 0.5 miles of all residences and businesses along the proposed Route, which largely follows existing roadway corridors. There are also wind turbines visible in the landscape.

The Yankee – Brookings #1 is constructed of galvanized poles. However, due to higher costs of galvanized poles compared to weathering steel (over 10 percent higher) Xcel Energy requests the option to use weathering steel poles to construct this Project.

Although the line will be a contrast to some surrounding land uses, Xcel Energy has identified the route that utilizes existing corridors and avoids homes to the greatest extent practicable. Xcel Energy will work with landowners to identify concerns related to the transmission line pole types and location and/or substation aesthetics.

# 15 LOCAL LAND USE CONTROLS (ARSD 20:10:22:19)

The proposed transmission facilities are located on predominantly on private land that is zoned agricultural and is regulated by Brookings County land use plans and ordinances. There are no rezoning permits required by Brookings County for the construction, use and maintenance of the proposed transmission facilities. The Company is not requesting that the Commission issue an order preempting local land use controls. (See SDCL 49-41B-28).

# 16 WATER QUALITY (ARSD 20:10:22:20)

## 16.1 Existing Water Resources

Both Deer Creek and Medary Creek flow into the Big Sioux River. The Big Sioux River in South Dakota is impaired for total suspended solids ("TSS"), so any sediment reaching these streams has the potential to adversely affect water quality. (Impaired waters require studies to determine the total amount of pollution, or total maximum daily load ("TMDL"), that a water body can receive and still comply with the applicable water quality standards.) Stream bank erosion and runoff from feedlots and croplands within the drainage basin likely lead to the high TSS levels in this section of the river. South Dakota has listed this section of the river as high priority for TMDL development, and watershed management programs have been implemented in order to reduce nutrient and sediment loading.

## 16.2 Facility Impacts and Mitigation

During construction there is the possibility of sediment reaching surface waters when excavation, grading and construction traffic disturb the ground. Once the Facility is constructed it will have no impact on surface water quality. The surface water resources that could be affected by the construction of the Project include approximately ten small wetlands that are in line with or adjacent to the Project. In addition, the Project would make eight crossings of small intermittent and perennial tributaries to Deer Creek and Medary Creek.

The Project design will incorporate spacing of structures to span wetlands and streams. No structures will be placed in wetlands; therefore, no federal Section 404 permit will be required. No additional mitigation is proposed.

### 16.2.1 Floodplain Impacts

The Project is not within a mapped 100-year floodplain (FEMA, 1981). No permanent direct impacts to the surface water resources are anticipated. During construction there is a possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Both Deer Creek and Medary Creek flow into the Big Sioux River. The Big Sioux River in South Dakota already is impaired for TSS, so any sediment reaching these streams has the potential to adversely affect water quality in an impaired water.

### 16.2.2 Construction Impacts on Stormwater

As outlined in Section 13.2, although a NPDES stormwater permit is not anticipated, during construction Xcel Energy will follow standard erosion control measures identified in the applicable Stormwater BMP manual such as using silt fences to minimize the potential for erosion and sedimentation into water bodies within the Project Area. Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the transmission line to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. Once the Facility is completed, it will have no impact on surface water quality. With implementation of BMPs the Project is not expected to affect water quality (*i.e.*, fecal coliform or TSS levels) within the watershed.

# 17 AIR QUALITY (ARSD 20:10:22:20)

## 17.1 Existing Air Quality

The entire area of the proposed Facility is currently in attainment for both National and South Dakota Ambient Air Quality Standards. The nearest Ambient Air Quality Monitoring Site is located at the Brookings City Hall in Brookings County, South Dakota, which is southwest of the Project.

## 17.2 Facility Impacts

Particulate emissions associated with construction of the utility lines and substation would be mitigated using dust-suppression techniques. Examples of measures for control of particulates are, if necessary:

- Covering open haul trucks with tarps both on site and off site.
- Ensuring that construction vehicles use paved roads wherever possible to access the construction ROW.
- Removing any soil or mud deposited by construction equipment on paved roads and near the egress from unpaved areas, when necessary.
- Stabilizing disturbed areas in compliance with the revegetation plan after construction is complete.

With implementation of these mitigation measures, particulate emissions from construction would be substantially reduced. Accordingly, particulate emissions from construction of the project, as mitigated, will not be significant. No significant emissions are expected from the operation of the transmission facilities.

Once constructed, the only direct air pollution issue associated with transmission lines is ozone formation due to the corona effect. Corona consists of the breakdown or ionization of air within a few centimeters of conductors. Usually some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone also forms in the lower atmosphere from lightning discharges, and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight, and inversely proportional to humidity.

Thus, humidity and moisture, the same factors that increase corona discharges from transmission lines, inhibit the production of ozone. Ozone is a very reactive form of oxygen molecules and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived.

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The state and national ambient air quality standards for ozone are similarly restrictive. The national standard is 0.08 parts per million (ppm) during an eight-hour averaging period. The state standard is 0.08 ppm based upon the fourth-highest eight-hour daily maximum average in one year. The typical maximum ozone levels associated with a 115 kV line, single and double circuit, are in the range of 0.002 to 0.004 ppm.

Most calculations of the production and concentration of ozone assume high humidity or rain, with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the actual production of ozone under 115 kV transmission lines have generally been unable to detect any increase due to the transmission line facility.

Xcel Energy does not anticipate impacts to air quality; therefore, no mitigation is proposed.

# 18 SCHEDULE (ARSD 20:10:22:22)

Xcel Energy anticipates a spring 2009 in-service date for the Yankee – Brookings #2 transmission line. Construction for the Project is expected to begin in summer of 2008. This schedule is based on information known as of the date of this filing and upon planning assumptions that balance the timing of implementation with the availability of crews, material and other practical considerations. This schedule may be subject to adjustment and revision as further information is developed.

# 19 COMMUNITY IMPACT (ARSD 20:10:22:23)

## 19.1 Existing Socioeconomic and Community Resources

### 19.1.1 Communities

The population and economic characteristics of the states and counties included in the Project Area, based on the 2000 U.S. Census, are presented in Table 4.

**Table 4: Population and Economic Characteristics**

| Location | Population | Minority Population (Percent) | Caucasian Population (Percent) | Per Capita Income | Percentage of Population Below Poverty Level |
|---|---|---|---|---|---|
| State of South Dakota | 781,919 | 11.5% | 88.5% | $17,562 | 12.9% |
| Brookings County | 28,195 | 4.3% | 95.7% | $17,586 | 12.9% |
| State of Minnesota | 4,919,479 | 10.4% | 89.6% | $23,198 | 8.1% |
| Lincoln County | 5,693 | 0.7% | 99.3% | $16,009 | 8.4% |

*Source: U.S. Census Bureau, Quick Facts*

As reported in the 2000 U.S. Census, the population density of Brookings County is 35.5 people per square mile. Minorities and persons living in poverty make up 4.3% and 12.9% of the population, respectively. For comparison, minorities comprise 11.5% of the statewide population and 12.9% of South Dakota residents live in poverty. In South Dakota, the closest city to the Project Area is White, South Dakota, with an estimated population of 505. The town of Thompsonburg is the only settlement with a concentration of people in the Minnesota portion of the Project area. The town has an estimated population of 35 (U.S. Census Bureau, 2000).

Per capita incomes within the Project Area are similar to those found throughout Brookings County. The percentages of the population within the townships in the Project area are comparable to the levels found in Brookings County. The Project Area does not contain disproportionately high minority populations or low-income populations.

### 19.1.2 Agriculture

The U.S. Department of Agriculture ("USDA") 2002 Census of Agriculture found that Brookings County has 418,115 acres of farmland with 83.9% of that acreage in cultivation. In Minnesota, Lincoln County has 271,345 acres of farmland with 88% of

that acreage in cultivation. Corn (*Zea mays*) and soybean (*Glycine max*) are the predominant crops; wheat (*Triticum aestivum*) and forage are also common. Cattle and hogs are the predominant livestock operations. (USDA, 2002). Federal regulations define prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is available for these uses." (7 CFR § 657.5 (a)(1)). Under current drainage conditions, approximately 65% of the acreage in Brookings County is considered prime farmland or farmland of statewide importance. An additional 15% of the land in Brookings County can be considered prime farmland if it were drained or irrigated. (NRCS, 2005).

#### 19.1.3 Transportation

Brookings and Lincoln Counties provide typical public infrastructure to the community. (Brookings County, 2007; Lincoln County, 2007a). Brookings County's transportation system is generally laid in a one-mile rectilinear grid system with a majority of the roads having 66-foot ROWS. The township roadway system represents the largest road system within the county. The public right-of-way for County, State and Federal Highways with a bituminous or concrete surface generally equal or exceed 100 feet.

#### 19.1.4 Cultural and Recreational Resources

Cultural values include those perceived community beliefs or attitudes that provide a framework for unity in a given community. The communities near the Project Area appear to value pioneer roots and the local history. The economy of these areas depends on agricultural practices (typically corn, soybeans, grains and grazing), manufacturing and tourism. Tourist attractions in the Project Area in Brookings County are centered primarily around outdoor activities. (Brookings County, 2007).

### 19.2 Impacts on Socioeconomic and Community Resources

#### 19.2.1 Population and Community Impact

The Facility will not by itself impact population, income, occupational distribution or the integration or cohesion of communities in the Project Area. No significant adverse socioeconomic impacts to the local communities and governmental facilities or services are anticipated as a result of the construction and maintenance of the proposed transmission facilities. There will be long-term beneficial impacts from the new line primarily because it will improve the capability of local wind generators to

transport energy generated in the area. This in turn will allow continued increases in the amount of wind development in the area and contribute to the local economy through easement dollars and taxes generated due to wind farm construction and operation. The establishment of this area of South Dakota as an important producer of alternative energy sources, primarily wind, may also spur the development of wind-related businesses in the area, in turn contributing to economic growth in the region.

The Project does not have a disproportionate impact on minority or low-income residents. For example, once operational, the Facility's socioeconomic effects are generally negligible except for increases in the local tax base. The effect on the local tax base is proportional to the size of an area's tax base valuation after the construction of the transmission facility. In rural areas with relatively small tax bases, the added valuation resulting from transmission lines can be significant. The exact amount of taxes contributed to the local economy by a transmission line depends on several factors, including the original cost of the line, the proportion of original cost within a specific taxing unit. The Facility is not expected to significantly impact land values or schools in the Project Area.

The Facility is not located near any tourist attractions that would be impacted.

### 19.2.2 Public Health and Safety

The Facility will be designed in compliance with local, state, National Electric Safety Code ("NESC") and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and right-of-way widths. Xcel Energy construction crews and/or contract crews will comply with local, state, NESC and Xcel Energy standards regarding installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures will be followed during and after installation of the transmission line. This will include clear signage during all construction activities.

The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground. The protective devices are circuit breakers and relays located where the line connects to the substation. The protective equipment will de-energize the line should such an event occur. In addition, the substation facility will be fenced and access limited to authorized personnel. Proper signage will be posted warning the public of the risk of coming into contact with the energized equipment.

Lincoln County and Brookings County provide typical emergency public infrastructure to the community (Lincoln County, 2007a). The Facility does not have any contaminants associated with it that would require coordination with the local and state office of disaster services.

The Project is not expected to have any impacts on sewage and water, solid waste management facilities, health facilities, energy, fire protection, law enforcement, recreational facilities, schools, transportation facilities or other community and government facilities or services. (ARSD 20:10:22:23).

#### 19.2.2.1 Electric and Magnetic Fields

The term EMF refers to electric and magnetic fields that are coupled together such as in high frequency radiating fields. For the lower frequencies associated with power lines, EMF should be separated into electric and magnetic fields. Electric and magnetic fields arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors. Transmission lines operate at 60 hertz (cycles per second); therefore, the resulting EMF is at 60 hertz.

Xcel Energy has minimized proximity to residences per their "prudent avoidance" strategy summarized below. There are no additional mitigation measures necessary to address human health and safety other than meeting electrical codes and standards.

#### 19.2.2.2 Electric Fields

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high voltage transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles. The electric field from a power line gets weaker as it moves away from the line. Nearby trees and building material also greatly reduce the strength of power line electric fields.

The intensity of electric fields is associated with the voltage of the line and is measured in kilovolts per meter (kV/m). Power line electric fields near ground are designated by the difference in voltage between two points (usually 1 meter). Table 5 provides the electric fields at maximum conductor voltage for the proposed 115 kV transmission line. Maximum conductor voltage is defined as the nominal voltage plus five percent.

**Table 5: Calculated Electric Fields (kV/m) for Proposed 115 kV Transmission Line Designs (3.28 feet above ground)**

| Structure Type | Nominal Voltage | Distance to Proposed Centerline | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -300' | -200' | -100' | -50' | -37.5' | 0' [a] | 37.5' | 50' | 100' | 200' | 300' |
| Single Circuit 115kV Steel Pole Davit Arm | 121 kV | 0.005 | 0.012 | 0.057 | 0.253 | 0.408 | 0.862 | 0.413 | 0.248 | 0.062 | 0.014 | 0.006 |

The proposed 115 kV single-circuit transmission line will have a maximum electric field density of approximately 0.862 kV/m at centerline, one meter above ground. Although South Dakota has no standard in place for maximum electric field density, this is significantly less than the maximum limit of 8 kV/m, which has been a permit condition imposed by Minnesota in route applications. This standard was designed by the MEQB in the 1970s to prevent serious hazard from shocks when touching large objects, such as tractors, parked under extra high voltage transmission lines of 500 kV or greater.

#### 19.2.2.3 Magnetic Fields

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The magnetic field associated with a high voltage transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as gauss (G).

The question of whether exposure to power-frequency (60 Hertz(Hz)) magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is weak. The National Institute of Environmental Health Sciences ("NIEHS") issued its final report, "NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" on June 15, 1999, following six years of intensive research. NIEHS concluded that there is little scientific evidence correlating extra low frequency electromagnetic field exposure with health risk.

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. In addressing

this issue, Xcel Energy provides information on EMF to the public, interested customers and employees to assist them in making an informed decision about EMF. Xcel Energy will provide measurements for landowners, customers and employees who request them. In addition, Xcel Energy has followed the "prudent avoidance" guidance suggested by most public agencies. This includes using structure designs that minimize magnetic field levels and attempting to site facilities in locations with lower residential densities.

Table 6 provides the existing and estimated magnetic fields based on the proposed line and structure design. The expected magnetic field for the proposed structure type and phase current has been calculated at various distances from the center of the pole in milligauss.

**Table 6: Calculated Magnetic Flux Density (milligauss) for Proposed 115 kV Transmission Line Designs (3.28 feet above ground)**

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

### 19.2.3 Stray Voltage

Stray voltage is defined as a natural phenomenon that can be found at low levels between two contact points in any animal confinement area where electricity is grounded. Electrical systems, including farm systems and utility distribution systems, must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage ("NEV"). When a portion of this NEV is measured between two objects that may be simultaneously contacted by an animal, it is frequently called stray voltage. Stray voltage is not electrocution, ground currents, EMFs or earth currents.

Stray voltage has been raised as a concern on some dairy farms by farmers who believe that it impacts operations and milk production. Problems with stray voltage are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting farm animals that are confined in areas of electrical use. In those instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was located directly under and parallel to the transmission line. These circumstances are considered when installing transmission lines and can be readily mitigated by, for example, avoiding the placement of transmission lines over or parallel to the electric distribution system serving the farm or the wiring on the farm.

### 19.2.4 Agricultural Impacts

Landowners will be compensated for the use of their land through easement payments. Additionally, to minimize loss of farmland and to ensure reasonable access to the land near the poles, Xcel Energy intends to place the poles approximately five feet outside of the public roadway right-of-way. When possible, Xcel Energy will attempt to construct the transmission line before crops are planted or following harvest. The Company will compensate landowners for crop damage and soil compaction that occurs as a result of the Project. Soil compaction will be addressed by compensating the farmer to repair the ground or by using contractors to chisel-plow the site. Normally, a declining scale of payments is set up over a period of a few years.

Where possible, the Company avoids spring time construction. However, if construction during spring time is necessary, disturbance to farm soil from access to each structure location will be minimized by using the shortest access route. This may require construction of temporary driveways between the roadway and the structure, but would limit traffic on fields between structures. Construction mats may also be used to minimize impacts on the access paths and in construction areas.

Xcel Energy normally estimates a permanent impact area of approximately 60 square feet occurring in a circle around each transmission pole. These impacts are largely attributable to lost productivity from soil compaction and the foundations themselves. With an average span of 400 to 500 feet between transmission pole structures along the 6.5 mile length of transmission line in South Dakota, an estimated 70-85 transmission structures are likely to be placed along the route. Therefore, the total area of impact due to soil compaction in the South Dakota portion of the Project would be less than 0.25 acres.

### 19.2.5 Transportation Impacts

There are no planned roadway expansions within the Project Area, in either Minnesota or South Dakota. To avoid potential conflicts with future right-of-way widening transmission line structures will be installed five feet outside the existing roadway right-of-ways. It is not anticipated that the Facility will affect emergency or other public services. Because no impacts are anticipated, no additional mitigation is required.

Additionally, the Company is currently discussing a potential conflict with a private airstrip in Section 5 of Richland Township. (See Exhibit E). The Company will accommodate the request to help resolve this potential conflict to the extent it does not conflict with other land use constraints such as residences along the Route.

### 19.2.6 Historical and Cultural Resource Impacts

Relatively few investigations of historical or archaeological resources in the Project Area have been conducted. Of the six major project surveys completed in South Dakota portion of the Project Area, three studies identified potential archeological sites. No known sites were found within the proposed transmission line Route itself. The three surveys in which artifacts were found focused on lands located partly within, partly to the west and southwest, and partly to the east of the current study area:

- A survey for Sioux Valley Southwestern Electric's proposed project for the conversion of overhead lines to underground lines which identified one archeological site (39BK0082) approximately one mile west of the proposed route. (Lueck, Edward, 2002);
- A survey for Xcel Energy's Buffalo Ridge to White Transmission Line which identified several archeological sites (39BK135, 39BK147, 149, 150 and 156) in the area south of the proposed route (Terrell et al., 2006); and
- A survey for the MinnDakota Wind Farm Project identified eight sites (39BK0118, 0119, 0120, 0122-6) in an area over one-mile to the south and southwest of the proposed route (Howell et al., 2006).

Three other studies were completed in 1980 - 1989. Neither study resulted in the identification archeological sites.

Table 7 identifies those cultural resources known archeological resources within one mile of the proposed Project Area (including all route options considered).

**Table 7: Cultural Resources in South Dakota Within One Mile of Project Area**

| County | Township | Range | Section | Site Number | Site Type | NRHP Status |
|---|---|---|---|---|---|---|
| Brookings | 111N | 47W | 31 | 39BK0135 | Artifact scatter | Unknown |
| Brookings | 111N | 048W | 25 | 39BK0147 | Isolated find | Unknown |
| Brookings | 111N | 048W | 25 | 39BK0148 | Isolated find | Unknown |
| Brookings | 111N | 048W | 25 | 39BK0150 | Artifact Scatter | Unknown |
| Brookings | 111N | 048W | 26 | 39BK0156 | Artifact scatter (secondary and tertiary flake) | Unknown |
| Brookings | 110N | 047W | 9 | 39BK0124 | Artifact Scatter | Unknown |
| Brookings | 110N | 047W | 6 | 39BK0082 | Farmstead | Unknown |
| Brookings | 110N | 047W | 8 | 39BK0118 | Isolated find | Unknown |
| Brookings | 110N | 047W | 8 | 39BK0119 | Isolated find | Unknown |
| Brookings | 110N | 047W | 8 | 39BK0120 | Artifact scatter | Unknown |
| Brookings | 110N | 047W | 8 | 39BK0122 | Artifact scatter | Unknown |
| Brookings | 110N | 047W | 8 | 39BK0123 | Artifact scatter | Unknown |
| Brookings | 110N | 047W | 10 | 39BK0125 | Isolated find | Unknown |
| Brookings | 110N | 047W | 10 | 39BK0126 | Isolated find | Unknown |

The literature search results indicate that there is potential for archeological artifacts in the area, particularly in areas near streams and rolling topography. Although the cultural artifacts have been found in the area, to date they have not been significant. Therefore, there is little indication, from existing data, that the proposed undertaking would affect archaeological resources.

Xcel Energy does not anticipate finding any cultural resources during Facility design or construction. However, based on the relatively small size of archaeological sites found in the area to date, should a cultural resource be identified in the Project Area, they are likely to be small enough that they can be easily avoided by design modification (moving the planned structure placement) or mitigated by data recovery (selective excavation).

# 20 EMPLOYMENT ESTIMATES (ARSD 20:10:22:24)

The Project is expected to take less than one year to construct. The relatively short-term nature of the Facility construction and the number of workers who will be hired from outside of the Facility area should result in short-term positive economic impacts in the form of increased spending on lodging, meals and other consumer goods and services. It is not anticipated that the Facility will create new permanent jobs, but it will create temporary construction jobs that will provide a one-time influx of income to the area. The estimated labor costs for construction are estimated at $3 to $ 4 million. Table 8 summarizes the number of people Xcel Energy estimates will work on the Facility.

**Table 8**
**Estimated Numbers of Workers**

| Type of Work | Number of Employees | Comments |
|---|---|---|
| Right-of-Way | 2-4 | |
| Survey | 2-4 | |
| Construction - Foundations | 8-12 | |
| Construction - Poles | 8-12 | |
| Construction - Substation | 8-12 | |
| Office Personnel | 4 | Infrequent Visits |

# 21 FUTURE ADDITIONS AND MODIFICATIONS (ARSD 20:10:22:25)

The transmission line portion of the Project is being designed to provide a reliable second 115 kV circuit between the Yankee Substation and the Brookings County Substation. Xcel Energy does not anticipate the need to connect the two substations at a higher voltage within the foreseeable future and is therefore not proposing to build the line to accommodate greater voltage or transfer capacity than proposed. Both the Brookings County and Yankee substations were designed and constructed to accommodate future additional future transmission line interconnections.

# 22 TRANSMISSION FACILITY LAYOUT, CONSTRUCTION AND MAINTENANCE (ARSD 20:10:22:34)

## 22.1 Route Clearing

Xcel Energy does not anticipate significant vegetation clearing will be required for the Facility. During the right-of-way acquisition phase, individual property owners will be advised as to the construction schedules, needed access to the site and any vegetation necessary to construct, operate and maintain the proposed transmission line. It is standard practice to remove any vegetation that would be a danger to the line at a mature height. Also, any vegetation that is in the way of construction equipment may have to be removed. Wood from the clearing operation will be offered to the landowner or removed from the site. Brush will be chipped and disposed of in the right-of-way in the area that is cleared. The maximum height that will be allowed for vegetation within the clear zone will be 15 feet tall. Any trees near or over that height will be removed. In addition, any trees with the potential to grow taller than 15 feet will be removed. The Company goes by height of the vegetation, not the actual distance of the vegetation from the conductors, since the conductor height can vary with the amount of energy being carried on the line.

## 22.2 Staging and Lay Down Areas

Staging areas are usually established for the project. Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. Construction of the project would likely include one or two staging areas. The materials are stored at staging areas until they are needed for the project.

Temporary lay down areas may be required for additional space for storage during construction. These areas will be selected for their location, access, security and ability to efficiently and safely warehouse supplies. The areas are chosen to minimize excavation and grading. The temporary lay down areas outside of the transmission line right-of-way will be obtained from affected landowners through rental agreements.

Access to the transmission line right-of-way corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line right-of-way. In some situations, private field roads or trails are used. Permission from the property owner is obtained prior to accessing the transmission line corridor. Where necessary to accommodate the heavy equipment used in construction, including cranes, concrete

trucks and hole drilling equipment, existing access roads may be upgraded or new roads may be constructed. New access roads may also be constructed when no current access is available or the existing access is inadequate to cross roadway ditches.

When it is time to install the poles, structures are moved from the staging areas, and delivered to the staked location. The structures are placed within the right-of-way until the structure is set. Insulators and other hardware are attached while the steel pole is on the ground. The pole is then lifted, placed and secured on the foundation using a crane.

To place single steel poles in the ground, concrete foundations will be used for all structures. Holes will need to be drilled in preparation for the concrete. Drilled pier foundations may vary from five to seven feet in diameter and 12 or more feet deep, depending on soil conditions. Concrete trucks are required to bring the concrete in from a local concrete batch plant.

### 22.3 Transmission Construction Procedures

Construction will begin after federal, state and local approvals are obtained, property and rights-of-way are acquired, soil conditions are established and final design is completed. The precise timing of construction will take into account various requirements that may be in place due to permit conditions, system loading issues, available workforce and materials.

The actual construction will follow standard construction and mitigation practices that were developed by the Company from experience with past projects. These best practices address right-of-way clearance, staging, erecting transmission line structures and stringing transmission lines. Construction and mitigation practices to minimize impacts will be developed based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain and other factors. In some cases these activities, such as schedules, are modified to minimize impacts to sensitive environments.

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with 10 percent or less slope will not be graded or leveled. Sites with more than 10 percent slope will have working areas graded level or fill brought in for working pads. If the landowner permits, it is preferred to leave the leveled areas and working pads in place for use in future maintenance activities, if any.

If permission is not obtained, the site is graded back to its original condition as much as possible and all imported fill is removed from the site.

Typical construction equipment used on a project consists of tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks and various trailers. Many types of excavation equipment are set on wheel or track-driven vehicles. Steel poles are transported on tractor-trailers.

The materials are stored at staging areas until they are needed for the project. Steel pole structures are then hauled unassembled on pole trailers to the staked location and placed within the right-of-way until the pole sections are assembled and the arms attached. Insulators and other hardware are attached while the steel pole is on the ground. The pole is then lifted, placed and secured on the foundation using a crane.

Insulators and other hardware are attached to the structure while it is on the ground in the laydown area (or temporary laydown areas as described in section 22.2), and then a line truck lifts and places it.

When it is time to install the poles, structures are moved from the staging areas, delivered to the staked location and placed within the right-of-way until the structure is set. Typically, access to the transmission line right-of-way corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line right-of-way. In some situations, private field roads or trails are used. Permission from the property owner is obtained prior to accessing the transmission line corridor. Where necessary to accommodate the heavy equipment used in construction, including cranes, cement trucks and hole drilling equipment, existing access roads may be upgraded or new roads may be constructed. New access roads may also be constructed when no current access is available or the existing access is inadequate to cross roadway ditches.

To place single steel poles in the ground, concrete foundations are generally used, especially for angle and dead end structures along the route. In such cases, holes will need to be drilled in preparation for the concrete. Drilled pier foundations may vary from six to eight feet in diameter and twelve or more feet deep, depending on soil conditions. Concrete trucks are required to bring the concrete in from a local concrete batch plant.

### 22.3.1 Construction Period Best Management Practices

Xcel Energy will minimize adverse effects to the landowner and environment from the time the initial excavation begins until the lines are attached. Table 9 presents each stage of line construction as it relates to a generic foundation/structure construction site. Specific use of BMPs will be analyzed on a site-by-site basis. BMPs listed below are not a comprehensive listing of those available. Many other BMPs such as those listed in the Facilities Permit Application are available and will be used where appropriate. Dates and ranges presented below are rough estimates and are subject to change due to weather conditions and various other factors.

**Table 9: Construction Best Management Practices to Avoid or Reduce Crop and Property Damage**

| Activity | Approximate Duration (per structure) | BMPs |
|---|---|---|
| Foundation Installation | One Day | • Install erosion control measures if warranted by steep slopes or concentrated water flow areas.<br>• Select shortest access route from roadway.<br>• Minimize number of vehicles off roadway.<br>• Use Winter Construction Where Possible.<br>• Remove excavated soil from site as soon as possible.<br>• Install Construction Mats in areas with soft soil. |
| Structure Erection | One to Two Days | • Follow previous access route.<br>• Minimize number of construction vehicles off roadway. |
| Conductor Installation | One to Two Weeks | • Follow previous access route.<br>• Minimize number of construction vehicles off roadway. |
| Restoration | One Day | • Restore ground surface to pre-construction conditions where it was disturbed.<br>• Seed and mulch disturbed areas in non-cultivated fields. |

### 22.3.2 Restoration Procedures

During construction, crews will attempt to limit ground disturbance wherever possible. Areas, however, generally are disturbed during the normal course of work,

which can take several weeks in any one location. As construction on each parcel is completed, disturbed areas are restored to their original condition to the maximum extent practicable. The right-of-way agent contacts each property owner after construction is completed to determine whether any damage has occurred as a result of the project. If damage has occurred to crops, fences or the property, Xcel Energy will fairly reimburse the landowner for the damages sustained. In some cases, Xcel Energy may engage an outside contractor to restore the damaged property as near as possible to its original condition. Portions of vegetation that are disturbed or removed during construction of transmission lines will naturally reestablish to pre-disturbance conditions. Resilient species of common grasses and shrubs typically reestablish with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line corridor will require assistance in reestablishing the vegetation stratum and controlling soil erosion. Commonly used methods to control soil erosion and assist in reestablishing vegetation include, but are not limited to:

- Prompt seeding
- Silt fences
- Erosion control blankets

These erosion control and vegetation establishment practices are regularly used in construction projects and are referenced in the construction permit plans. Long-term impacts are minimized by utilizing these construction techniques.

### 22.4 Maintenance Procedures

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

The estimated service life of the proposed transmission line for accounting purposes is approximately 40 years. But, practically speaking, high voltage transmission lines are seldom completely retired. Transmission infrastructure has very few mechanical elements and is built to withstand weather extremes that are normally encountered. Except in instances of severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail. When such a failure occurs, a fault is sensed on the system and the transmission line is automatically taken out of service by the operation of protective relaying equipment. Such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99 percent.

The principal operating and maintenance cost for transmission facilities is the cost of inspections, usually done monthly by air. Annual operating and maintenance costs for Company transmission lines in South Dakota and the surrounding states vary. However, past experience shows that costs are approximately $300 to $500 per mile for voltages from 115 kV through 345 kV. Actual line-specific maintenance costs depend on the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used and the age of the line.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and the NESC 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 maintained.

As Xcel Energy conducts routine maintenance, the vegetation management personnel analyze trees located off the right-of-way to determine if any have the potential to jeopardize the line. This includes assessing any faults with the tree (rotting trunks, cracked limbs, leaning) and the type of tree. The type of tree comes into play since certain species will grow to a height that may cause problems. If a species is identified as a danger tree, Xcel Energy will remove branches that extend into the right-of-way or remove the damage tree pursuant to the easement rights it obtains when constructing a transmission line. Compliance with vegetation management practices is required by NERC electric reliability standards.

Danger trees and tree problems are also identified by Xcel Energy air patrol on quarterly bases. If a problem is reported, the vegetation management personnel will view and/or analyze its threat to the line. If necessary Xcel Energy will dispatch a crew to resolve.

In addition the inspection schedule for all transmission lines can be found in on the following Table 10.

**Table 10: Transmission Line Inspection Plan Schedule**

| Xcel Energy<br>Transmission Line Inspection Plan | | |
|---|---|---|
| Types of Patrols | Bulk System | Load Serving |
| Fixed Wing | Monthly | Quarterly |
| Helicopter | Yearly | Yearly |
| Ground Patrol | Yearly | Yearly |

| | | |
|---|---|---|
| Wood Pole Inspection | 12 year | 12 year |
| Climbing Inspection | As Needed | As Needed |
| Vegetation | As Needed | As Needed |
| Infrared | As Needed | As Needed |

The fixed wing patrols are performed at the intervals shown. Emergency patrols are performed on an as needed basis, following breaker operations. A helicopter patrol is performed at the interval shown at a reduced flying speed to give a more detailed inspection of the transmission system. Ground patrols are performed on those portions of the transmission system that cannot be flown by fixed wing or helicopter. Climbing, vegetation and infrared inspections are performed in response to known hardware or structural problems.

The following criteria are used in the development of yearly transmission line maintenance work plans:

- Perform emergency repairs as needed.
- Track all anomalies found on patrols or inspections.
- Schedule maintenance work as indicated by priority of need.
- Track all completed repairs.

Development of the transmission right-of-way maintenance plan uses the following guidance:

- Perform emergency trimming or clearing as needed.
- Perform cycle trimming or clearing of system lines.

Transmission Pole and Tower Maintenance plans are developed based upon inspections:

- Reinforce or replace wood poles as indicated by inspections.
- Monitor or install preservative in poles as indicated by inspections.
- Repair or recondition steel poles and towers as indicated by patrols or inspections.

# 23 INFORMATION CONCERNING TRANSMISSION FACILITIES (ARSD 20:10:22:35)

The Project is proposed to be constructed with single-circuit single-pole steel structures with the exception of a two-mile double-circuit segment near the Brookings County Substation to include both Company and East River 115 kV lines.

## 23.1 Configuration of Towers and Poles

Xcel Energy proposes to use the same structure and conductor types as used for the Yankee – Brookings #1. The majority of the structures will be steel, single circuit poles with davit arms and constructed on concrete foundations and will have a galvanized or weathering steel finish. (See Figure 6). The poles will average 90 feet in height, and there will be an average span of 500 feet between structures. Table 11 summarizes the structure design for the line.

For a two-mile segment, 115 kV/115 kV double circuit structures are proposed. (See Figure 7). This segment is along 207th Street in South Dakota, where the existing wood poles supporting the East River 115 kV HVTL would be removed and the conductors consolidated on the same structures with the new Xcel Energy 115 kV HVTL. The double circuit line will be constructed with steel single poles with davit arms.

**Figure 6: 115 kV Single-Circuit Davit Arm Structure**

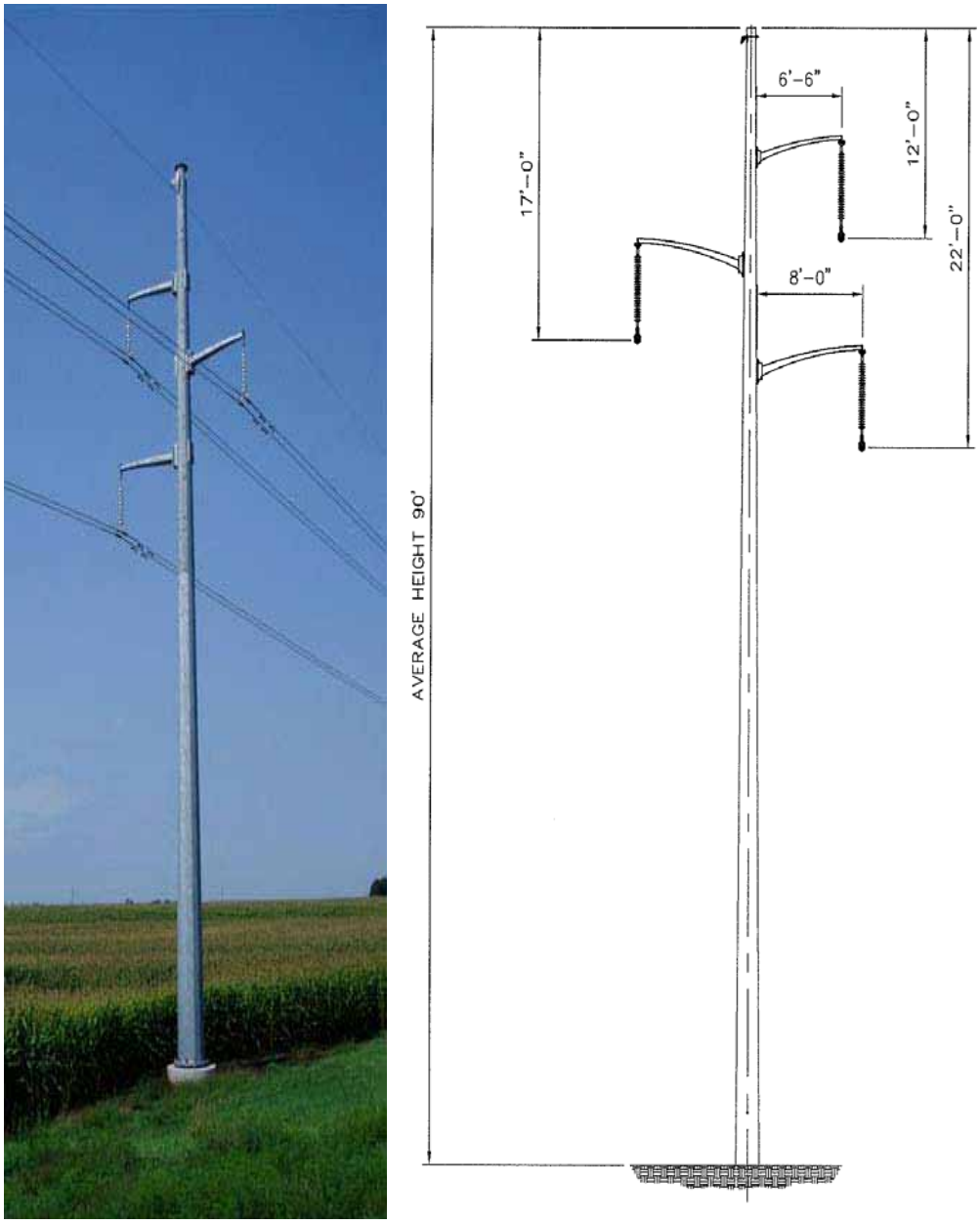
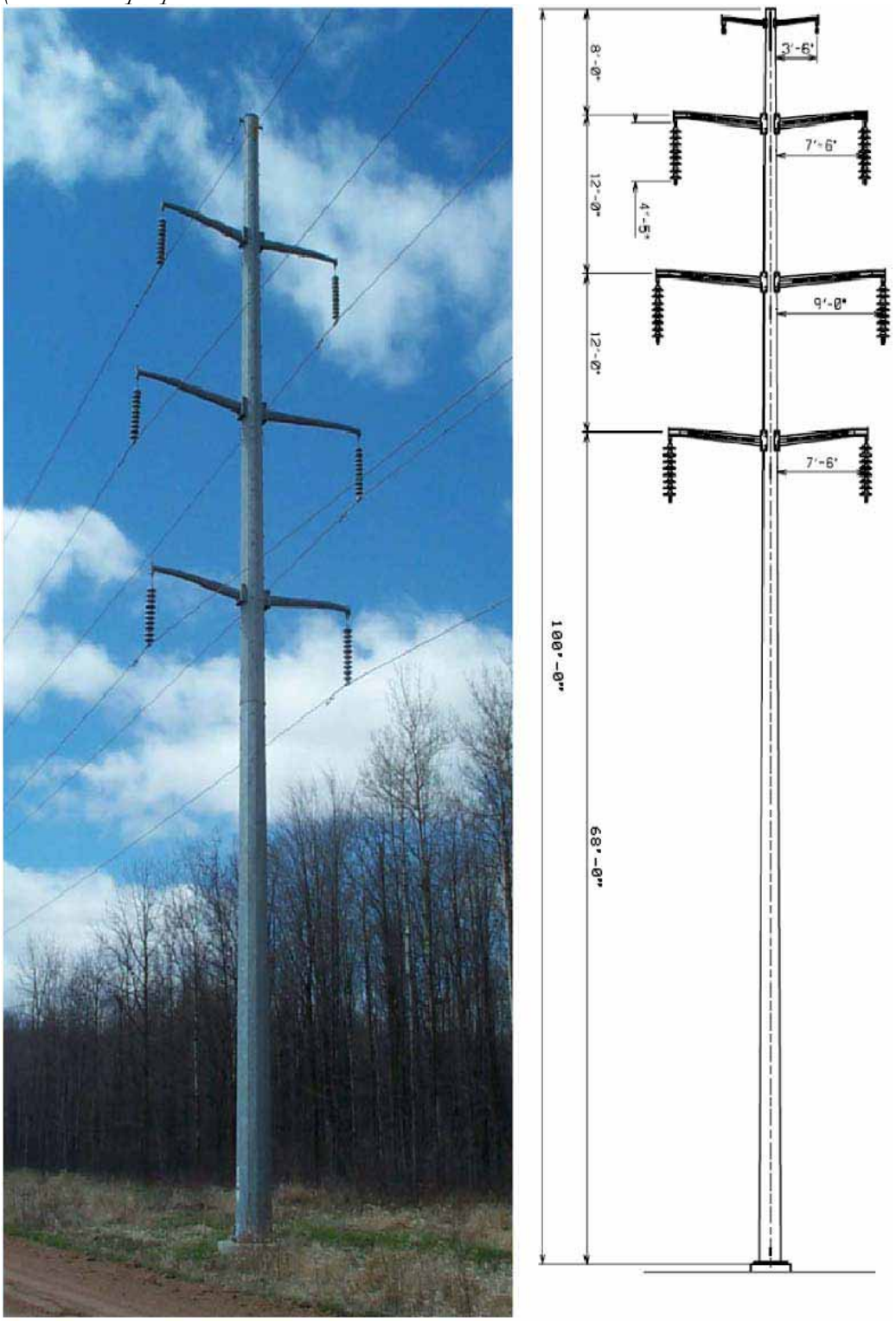


**Figure 7: 115 kV/115 kV Steel Double-Circuit Davit Arm Structure**

*(Note: The proposed double circuit structures would have bundled conductor on one side.)*



For Yankee – Brookings County #2, Xcel Energy requests the flexibility to use a combination of weathering and galvanized poles because of the higher cost of galvanized poles compared to weathering steel (over 10 percent higher) and a lack of any established preference for one finish over the other  It is anticipated that galvanized structures would be used near substations and at the line crossing where there are existing galvanized poles and weathering structures would be used for the rest of the Project.  The average structure height for the double-circuit structures will be 100 feet, and the poles will have an average span of 400 to 500 feet between structures.

**Table 11: South Dakota Structure Design Summary**

| Project Component | Line Voltage | Structure Type | Pole Type | Conductor | Foundation | Double-Circuit/ Single-Circuit | Average Height (feet) |
|---|---|---|---|---|---|---|---|
| Single-Circuit: | 115 kV | Davit Arm | Steel | Bundled 795 kcmil 26/7 | Concrete | Single | 90 |
| Double-Circuit: | 115 kV/115 kV | Davit Arm | Steel | Bundled 795 kcmil 26/7 (one circuit) | Concrete | Double | 100 |

The proposed transmission line will be designed to meet or surpass all relevant local and state codes, NERC standards, the NESC and Xcel Energy standards. Appropriate standards will be met for construction and installation and all applicable safety procedures will be followed during and after installation.

## 23.2 Conductor Configuration

The conductors will be bundled 795 kcmil 26/7 Aluminum Core Steel Supported ("ACSS"). A bundled conductor configuration consists of two conductors spaced approximately 18 inches apart at the end of each insulator string.

## 23.3 Proposed Transmission Site and Major Alternatives

The proposed Facility and major alternatives have been previously described in Sections 8.0 and 9.0 (See Figure 3 and Exhibit A).

## 23.4 Reliability and Safety

### 23.4.1 Transmission Line Reliability

The MPUC considered reliability when it issued a CON for the three new BRIGO lines including the line for which a Facility Permit is sought in this Application. In granting its approval, the MPUC determined the system of lines was the most reasonable and prudent option to reliably increase outlet capacity from the Buffalo Ridge area. The Facility proposed in this Application is designed to support electric system reliability.

### 23.4.2 Transmission Line Safety

There are several criteria that are considered in the design of the structures to handle stresses created by high winds or heavy ice loadings on the structures and wires. Xcel Energy's criteria to address these stresses to the transmission structures are more conservative than the typical criteria used for transmission line design. For example, an extreme high wind condition with 92 mph wind is typically used for the high wind condition. Xcel Energy's criteria for this Project require the line to be designed for 108 mph wind.

Since icing conditions in southeastern South Dakota exceed that of other parts of the Xcel Energy territory, the criteria "heavy ice with reduced wind condition" has been modified to provide additional pole and wire attachment strength. Xcel Energy's typical heavy ice case is for a 40 mph wind and 0.5 inches of ice. For this project, Xcel Energy will design for a 50 mph wind and 1.5 inches of ice.

### 23.4.3 Clearance Requirements

The following Table 12 provides the National Electric Safety Code and Xcel Energy standards regarding clearances for the 115 kV transmission line. The Xcel Energy minimum clearances are more conservative than the NESC minimum clearances.

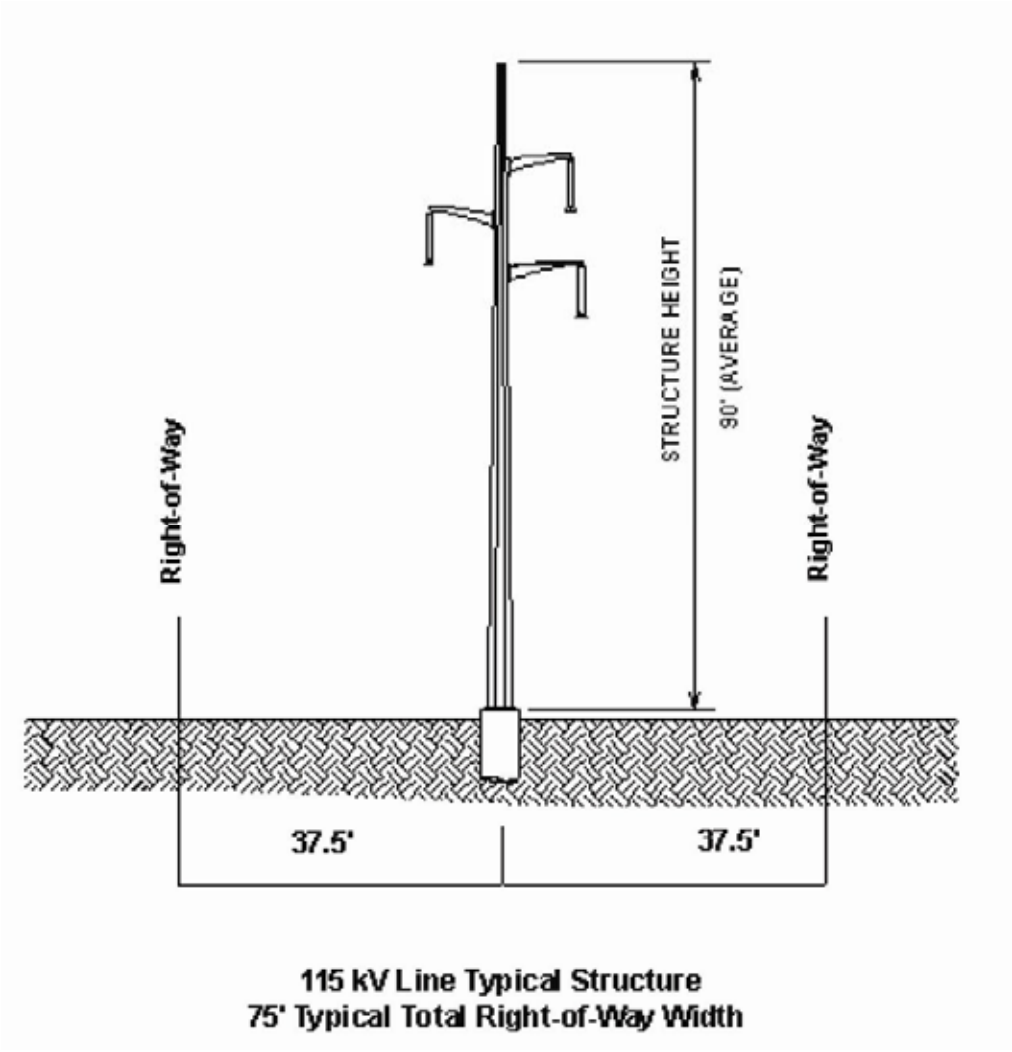
**Table 12: 115 kV NESC and Xcel Energy Clearances**

| Condition | NESC minimum clearance to conductor | Xcel Energy design minimum clearance to conductor |
|---|---|---|
| Roads, streets, agricultural lands, forests traversed by vehicles | 20'-1" (vertical) | 25' (vertical) |
| Water areas not suitable for sail boating | 18'-6" (vertical) | 25' (vertical) |
| Water areas suitable for sail boating - 20 to 200 acres | 30'-1" (vertical) | 31' (vertical) |
| Water areas suitable for sail boating - 200 to 2,000 acres | 36'-1" (vertical) | 37' (vertical) |
| Building roofs not accessible to pedestrians | 14'-1" (vertical) | No buildings allowed in easement |
| Building roofs accessible to pedestrians | 15'-1" (vertical) | No buildings allowed in easement |
| Building walls, projections, balconies | 6'-1" (horizontal) | 9'-1" horizontal from conductor blowout<br>No buildings allowed in easement. |
| Grain Bin vertical clearance | 18' above highest fill point | No grain bins allowed in easement |
| Grain Bin horizontal clearance | Highest bin height + 18' | No grain bins allowed in easement<br>Highest bin height + 18' horizontal clearance |
| Tree horizontal clearance | No specific requirement | 9'-1" horizontal from conductor blowout<br>15' maximum mature height of trees within easement<br>No trees within 20" of structures or within maintenance |
| Tree vertical clearance | No specific requirement | 15' vertical<br>15' maximum mature height of trees within easement<br>No trees within 20' of structures or within maintenance access roads |

### 23.5 Right of Way or Condemnation Requirements

Xcel Energy will require a 75-foot wide right-of-way for the transmission line. When the line is parallel to a roadway, poles will generally be placed five feet within the private right-of-way and therefore, a little less than half of the line right-of-way will share the existing road right-of-way, resulting in an easement of lesser width being required from the landowner. (See Figure 8).

**Figure 8: 115 kV Single Circuit Typical Right-of-Way Width**



### 23.5.1 115 kV Right-of-Way Width.

The design of the 115 kV lines vary based on the existing structures, terrain and potential wind and ice loadings. The 75-foot minimum right-of-way width for a typical 115 kV line is calculated under two design conditions:

1) Blowout Condition: 60° F conductor temperature and 6 psf (48 mph) wind utilizing minimum horizontal clearance of 9'-1" to edge of the right-of-way; and

2) High Wind Condition: 60° F conductor temperature and 22 psf (92 mph) wind utilizing zero (0) minimum horizontal clearance to edge of the right-of-way.

The proposed Yankee – Brookings County #2 line is planned to utilize steel davit arm single shaft poles and bundled 795 kcmil 26/7 (Drake) ACSS conductor with average span of 500 feet. The case 1 blowout design parameters are the same as the typical Xcel Energy 115 kV transmission line noted above. The case 2 high wind design parameters utilize a 37 psf (120 mph) wind instead of the 22 psf (92 mph) used in the typical Xcel Energy 115 kV transmission line due to the anticipated higher sustained winds in the Buffalo Ridge area.

The dimension of the proposed davit arm structures from the centerline to the outermost conductor attachment point is about 10 feet. The length of insulators is 5 feet and the minimum clearances to the edge of right-of-way are the same as the typical 115 kV transmission line. For a 600 foot span, the 795 kcm 26/7 (Drake) ACSS conductor has a calculated sag of 14 feet and 5 feet for blowout and high wind cases, respectively. The calculated blowout angle is 27° and 72° respectively for the blowout and high wind cases. The calculated blowout distance is 9 feet and 31 feet respectively for the blowout and high wind cases. The minimum required right-of-way width is twice the sum of: the distance from structure centerline to outside insulator attachment plus blowout of sagged conductor and insulator plus minimum specified clearance from conductor to edge of right-of-way. For case 1 the minimum right-of-way width = 2 x (10'+9'+9.1') = 56'. For case 2 the minimum right-of-way width = 2 x (10'+31'+0') = 72'. The minimum width of the right-of-way is the greater of the two conditions, so 75 feet is needed for a davit arm type structure. A 75 foot right-of-way is requested to allow use of longer spans if conditions warrant it.

### 23.5.2 Right-of-Way Acquisition

The right-of-way acquisition process begins early in the detailed design process. For transmission lines, utilities acquire easement rights across the parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation and purchase. Each of these activities, particularly as it applies to easements for transmission line facilities, is described in more detail below.

The first step in the right-of-way process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities will be built. To compile this list, a right-of-way agent or other persons engaged by the utility will complete a public records search of all land involved in the project. A title report is then developed for each parcel to determine the legal description of the property and the owner(s) of record of the property, and to gather information regarding easements, liens, restriction, encumbrances and other conditions of record.

After owners are known, a right-of-way representative personally contacts each property owner or the property owner's representative. The right-of-way agent describes the need for the transmission facilities and how the specific project may affect each parcel. The right-of-way agent also seeks information from the landowner about any specific construction concerns. Xcel Energy expects to initiate contact with landowners of affected properties to start the survey for the new 115 kV line in the next several months.

The next step in the acquisition process is evaluation of the specific parcel. For this work, the right-of-way agent will request permission from the owner for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess the soil conditions and determine appropriate foundation design. Surveys are conducted to locate the right-of-way corridors, natural features, man-made features and associated elevations for use during the detailed engineering of the line. The soil analysis is performed by an experienced geotechnical testing laboratory.

During the evaluation process, the location of the proposed transmission line will be staked. This means that the survey crew locates each structure or pole on the ground and places a surveyor's stake to mark the structure's anticipated location. By doing this, the right-of-way agent can show the landowner exactly where the structure(s) will

be located on the property. The right-of-way agent also delineates the boundaries of easement area required for safe operation of the lines.

Prior to the acquisition of easements, land value data will be collected, and based upon the impact of the easement to the market value of each parcel, a fair market value offer will be developed. The right-of-way agent then contacts the property owner(s) to present the offer for the easement and discuss the amount of just compensation for the rights to build, operate and maintain the transmission facilities within the easement area and reasonable access to the easement area. The agent will also provide maps of the line route or site, showing the landowner's parcel. The landowner is allowed a reasonable amount of time in which to consider the offer and to present any material that the owner believes is relevant to determining the property's value.

In nearly all cases, utilities are able to work with the landowners to address their concerns and an agreement is reached for the utility's purchase of land rights. The right-of-way agent prepares all of the documents required to complete each transaction. Some of the documents that may be required include: easement, purchase agreement or contract and deed.

In rare instances, a negotiated settlement cannot be reached, and the landowner chooses to have an independent third party determine the value of the rights taken. Such valuation is made through the Company's exercise of the right of eminent domain. The process of exercising the right of eminent domain is called condemnation.

As part of the right-of-way acquisition process, the right-of-way agent will discuss with the owner of each parcel the construction schedule and construction requirements. To ensure safe construction of the line, special consideration may be needed for fences, crops or livestock. For instance, fences may need to be moved or temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the right-of-way agent coordinates these processes with the landowner.

### 23.6 Necessary Clearing Activities

Xcel Energy anticipated minimal tree clearing will need to be preformed for this Facility. General right-of-way clearing and maintenance is described in Section 23.1

## 23.7 Underground Transmission

No portion of the Facility will require underground transmission. Transmission lines can be placed underground but at substantial additional expense compared to overhead construction. For example, placing a 115 kV transmission line underground costs as much as 10 times as much as building overhead. Because of the significantly greater expense associated with underground transmission construction, the use of underground technology is limited to locations where the impacts of overhead construction are completely unacceptable or where physical circumstances allow for no other option. Xcel Energy concluded that the environmental and land use setting did not warrant underground construction of the Yankee – Brookings #2 transmission line.

# 24 AGENCY CONTACTS

This section summarizes agency contacts to date. Copies of the correspondence are provided in Exhibit C. A list of required permits is provided below in Section 24.3.

### 24.1.1 South Dakota Department of Game, Fish and Parks

The South Dakota Department of Game, Fish and Parks was contacted on June 12, 2007 to obtain information from the South Dakota Natural Heritage Database regarding sensitive species and rare or unique natural resources in a 36-section area around the Project. SDGFP responded on June 26, 2007 with a list of Element Occurrence Records identifying documented sensitive species locations and other unique natural resources within the requested area.

### 24.1.2 Brookings County, South Dakota Highway Department

The Brookings County Highway Department was sent a letter on September 20, 2007 describing the Project alternatives and explaining the purpose and need for the Project. A map illustrating the Project alternatives was included with the letter. Brookings County Highway Department staff have attended the public meetings and have provided informal comments.

### 24.1.3 Minnesota Department of Natural Resources (MN DNR)

The Minnesota DNR Natural Heritage and Non-Game Research Program was contacted in February 2007 to obtain information from the DNR Natural Heritage Database regarding sensitive species and rare or unique natural resources. Minnesota DNR responded on February 23, 2007 by sending a set of GIS shapefiles identifying documented sensitive species locations and other unique natural resources within the Project study area.

### 24.1.4 Minnesota Office of the State Archaeologist

The Minnesota State Archaeologist was provided a copy of the Phase I Cultural Resources Inventory for the vicinity of the Project on October 11, 2007. The report was provided for the Minnesota State Archaeologist's review and concurrence with its findings.

### 24.1.5 Lincoln County, Minnesota Highway Department

The Lincoln County Highway Department was sent a letter on September 20, 2007 describing the Project alternatives and explaining the purpose and need for the Project. A map illustrating the Project alternatives was included with the letter. As of this date, no response has been received from the Lincoln County Highway Department.

### 24.1.6 Lincoln County, Minnesota Environmental Office, Division of Planning and Zoning

The Lincoln County Environmental Office was sent a letter on September 20, 2007 describing the Project alternatives and explaining the purpose and need for the Project. A map illustrating the Project alternatives was included with the letter. The Lincoln County Environmental Office responded in a letter on October 2007, indicating that they had no comment on the Project at that time.

## 24.2 Identification of Land Owners

A list of the governing bodies of the counties and municipalities totally or partially within the area of the proposed Yankee – Brookings #2 line and the owner of record of land located within one-half mile of the proposed Route for the facility is contained in Exhibit D.

## 24.3 Required Permits and Approvals

No federal permits or approvals are anticipated for the Project. Table 13 summarizes the list of known local and state permits.

**Table 13: Potentially Required Permits**

| Permit | Jurisdiction | Status |
|---|---|---|
| **Local Approvals** | | |
| Right of Way Permit | Brookings County, South Dakota | To be applied for |
| Driveway/Access Permits | Brookings County Highway Dept. | To be applied for, if necessary |
| Building Permit (substation work only) | Brookings County | To be applied for |
| Over-Width Load Permits | Brookings County Highway Dept. | To be applied for, if necessary |
| **State of Minnesota Approvals** | | |
| Certificate of Need | MPUC | Received Sept. 14, 2007 |
| Route Permit Application (Alternative Process) | MPUC | Applied for Jan. 18,2008 |
| License to Cross Public Waters | MN DNR | To be applied for |
| **State of South Dakota Approvals** | | |
| Facility Permit | Public Utilities Commission | Applied for Jan 31, 2008 |
| Over-Width Load Permits | SD DOT | To be applied for, if necessary |

### 24.3.1 Local Approvals

**Right of Way Permit**

These permits may be required to cross or occupy county, township and city road right-of-way.

**Over-Width Loads Permits**

These permits may be required to move over-width loads on county and state roads.

**Building Permit**

A Brookings County Building Permit will be required for work at the Brookings County Substation.

**Driveway/Access Permits**

Driveway and Access Permits may be required for to construct access roads or driveways from county, township or city roadways.

### 24.3.2 State of South Dakota Approvals

**Facility Permit**

A high voltage transmission line cannot be constructed without a facility permit approved by the Commission.

### 24.3.3 State of Minnesota Approvals

In addition to the Certificate of Need and the Route Permit, the Project will require a Minnesota DNR License to Cross Public Waters.

**License to Cross Public Waters**

The Minnesota DNR Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross public waters is required under Minnesota Statute Section 84.415 and Minnesota Rules, Chapter 6135. Xcel Energy works closely with the Minnesota DNR on these permits and will file them when line design is complete.

# 25 ADDITIONAL INFORMATION IN APPLICATION (ARSD 20:10:22:36)

Xcel Energy believes that this Application contains all the information required to meet Xcel Energy's burden of proof specified at SDCL 49-41B-22.

# 26 TESTIMONY AND EXHIBITS

## 26.1 List of Preparers

This facility permit application and attachments includes all the data, exhibits and related testimony that Xcel Energy intends to submit in support of the application.

The following witnesses are listed to support the information contained in the application:

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**Barr Engineering Company**
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# 28 DEFINITIONS

| | |
|---|---|
| **Avian** | Of or relating to birds. |
| **Breaker** | Device for opening a circuit |
| **Bus** | An electrical conductor that serves as a common connection for two or more electrical circuits; may be in the form of rigid bars or stranded conductors or cables. |
| **Conductor** | A material or object that permits an electric current to flow easily. |
| **Corona** | The breakdown or ionization of air in a few centimeters or less immediately surrounding conductors. |
| **Disconnects** | A power switch that can be shut off and then locked in the "off" position. |
| **Excavation** | A cavity formed by cutting, digging, or scooping. |
| **Fauna** | The collective animals of any place or time that live in mutual association. |
| **Flora** | The collective plants of any place or time that live in mutual association. |
| **Grading** | To level off to a smooth horizontal or sloping surface. |
| **Grounding** | To connect electrically with a ground. |
| **Habitat** | The place or environment where a plant or animal naturally or normally lives and grows. |
| **High Voltage Transmission Lines (HVTL)** | Overhead and underground conducting lines of either copper or aluminum used to transmit electric power over relatively long distances, usually from a central generating station to main substations. They are also used for electric power transmission from one central station to another for load sharing. High voltage transmission lines typically have a voltage of 115 kV or more. |
| **Hydrocarbons** | Compounds that contain carbon and hydrogen, found in fossil fuels. |
| **Ionization** | Removal of an electron from an atom or molecule. |
| **Mitigate** | To lessen the severity of or alleviate the effects of. |
| **Oxide** | A compound of oxygen with one other more positive element or radical. |
| **Ozone** | A very reactive form of oxygen that combines readily with other elements and compounds in the atmosphere. |
| **Raptor** | A member of the order Falconiformes, which contains the diurnal birds of prey, such as the hawks, harriers, eagles and falcons. |
| **Sediment** | Material deposited by water, wind or glaciers. |

| | |
|---|---|
| **Stray Voltage** | A condition that can occur on the electric service entrances to structures from distribution lines. Stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors. |
| **Substation** | A substation is a high voltage electric system facility. It is used to switch generators, equipment and circuits or lines in and out of a system. It also is used to change AC voltages from one level to another. Some substations are small with little more than a transformer and associated switches. Others are very large with several transformers and dozens of switches and other equipment. |
| **Voltage** | A unit of electrical pressure, electric potential or potential difference expressed in volts. |
| **Waterfowl** | A bird that frequents water; especially: a swimming game bird (as a duck or goose) as distinguished from an upland game bird or shorebird. |
| **Waterfowl Production Area (WPA)** | Waterfowl Production Areas preserve wetlands and grasslands critical to waterfowl and other wildlife. These public lands, managed by the U.S. Fish and Wildlife Service, were included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act. |
| **Wetland** | Wetlands are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs and similar areas. |
| **Wildlife Management Area (WMA)** | Wildlife Management Areas are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing and other compatible recreational uses. |

# 29 ACRONYMS

Following is a list of acronyms used in this Application:

**LIST OF ACRONYMS**

| | |
|---|---|
| ACSS | Aluminum Core Steel Supported |
| APP | Avian Protection Plans |
| BMP | Best Management Practices |
| BRIGO | Buffalo Ridge Incremental Generation Outlet |
| cfs | Cubic Feet Per Second |
| EMF | Electric and Magnetic Fields |
| HVTL | High-Voltage Transmission Line |
| kV | Kilovolt |
| kV/m | Kilovolts Per Meter |
| MEQB | Minnesota Environmental Quality Board |
| MOU | Memorandum of Understanding |
| MN DNR | Minnesota Department of Natural Resources |
| MPUC | Minnesota Public Utilities Commission |
| NESC | National Electric Safety Code |
| NERC | North American Electric Reliability Corporation |
| NEV | Neutral-to-Earth Voltage |
| NIEHS | National Institute of Environmental Health Sciences |
| NPDES | National Pollution Discharge Elimination System |
| NRHP | National Register of Historic Places |
| NSPM | Northern States Power Company, a Minnesota corporation |
| pH | Potential for Hydrogen |
| ppm | Parts Per Million |
| SD DOT | South Dakota Department of Transportation |
| SDGFP | South Dakota Department of Game, Fish and Parks |

| | |
|---|---|
| SDNRCS | South Dakota Natural Resources Conservation Service |
| TMDL | Total Maximum Daily Load |
| TSS | Total Suspended Solid |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |