## 2.1 Summary of Proposed Project

On April 15, 2014, the Applicant applied to the U.S, Department of Energy (DOE) for a Presidential permit to cross the U.S. / Canadian border in Roseau County, Minnesota.[34] The Applicant also applied to the MN PUC for a Route Permit to construct an approximately 220-mile, 500 kV alternating current (AC) high-voltage transmission line.[35]

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to both DOE and the Minnesota Public Utilities Commission (MN PUC), respectively. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration to cross the U.S. / Canadian border at latitude 49 00 00.00 N and longitude 95 54 50.49 W, approximately 2.9 miles east of Highway 89 in Roseau County.

The transmission line would cross the border between the U.S. and Canada in Roseau County, Minnesota as identified above, and connect into a new 500 kV substation adjacent to the existing Blackberry Substation near Grand Rapids, Minnesota (Map 2-1).

The proposed Project would be located on all new 200-foot wide right-of-way (ROW) with a wider ROW required for certain spans at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The ROW will be cleared of all vegetation and maintained in herbaceous or low shrub cover for the duration of the proposed Project.

The Applicant continues to evaluate several structure types and configurations that would be used for the Project, including: a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed delta structure. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. The Applicant has requested 650 to 3,000 foot-wide route width for the Route Permit, depending on location, in order to provide flexibility during detailed design.

The transmission tower heights would range from approximately 100 feet to about 170 feet. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures would be required. None of the structures are anticipated to be taller than 200 feet so they would not be required to meet Federal Aviation Administration (FAA) lighting standards. The Applicant currently estimates approximately 4 to 5 structures per mile of transmission line and the structures would be placed approximately 1,000 to 1,700 feet apart, with a maximum span of 1,700 feet. Where the transmission line crosses farmland, the Applicant would use self-supporting lattice structures to minimize interference with farm operations. The area of permanent impact for the guyed structures is anticipated to be 33 square feet per structure, with a temporary construction disturbance footprint of approximately 0.92 acres per structure.

As part of the proposed Project, the Applicant is also proposing to construct associated facilities including a new 500 kilovolt (kV) substation, a new 500 kV series compensation station, and three regeneration stations with permanent and temporary access roads. Additionally, construction of the proposed Project would require temporary and permanent access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

The Applicant proposes to expand the site of its existing 8.8 acre Blackberry 230/115 kV Substation near Grand Rapids, Minnesota to incorporate the new 500 kV substation, which would be constructed adjacent to and east of the existing Blackberry Substation. The new 500 kV substation required for the proposed Project would be expected to permanently impact approximately 17.8 acres. The Applicant has entered a purchase option agreement with the owner of the property adjacent to and east of the existing Blackberry 230/115 kV Substation. The new 500 kV substation would accommodate the new 500 kV transmission line, existing 230 kV transmission lines, and all associated 500 kV and 230 kV equipment.

The Applicant proposes to locate a new 500 kV series compensation station within or adjacent to the final route approved by the MN PUC. The final location for the 500 kV series compensation station would be determined by electric design optimization studies and final route selection, but would likely be located at the approximate midpoint of the Minnesota portion of the transmission line. The series compensation station will permanently impact approximately 60 acres.

The Applicant proposes to locate three regeneration stations within or adjacent to the final route

34 The Presidential permit application and application amendment are available at: http://www.greatnortherneis.org/Home/documents

35 Available at: http://mn.gov/commerce/energyfacilities//resource.html?Id=33849 (The Route Permit application is nearly identical to the Presidential permit application)

approved by the MN PUC. The sites would be 75 feet by 75 feet and located on upland areas.

The Applicant has indicated that it will be necessary to construct temporary access roads within the ROW for construction. They will work with local property owners to identify suitable access locations during final design. The typical width of the temporary access road would be 16 feet.

The Applicant proposes to establish a permanent "2-track" trail on uplands within the permanent right-of-way as a result of construction traffic. This "2-track" trail would be unimproved and it is assumed that there will be no grading or filling for this permanent access.

The Applicant proposes to establish a main staging area for temporary storage of materials and equipment. There would be other temporary staging areas located along the ROW for laydown and framing prior to structure installation. The laydown areas would be approximately 20 to 40 acres, and would be located along suitable roadways approximately 40 to 50 miles apart, and would be within 5 miles from the final route approved by the MN PUC. Upland areas with prior disturbance will be preferred; however, there may be some areas where this is not feasible, so other areas may need to be used. These yards would be in place for at least one year and used to store equipment and materials and include the construction offices. The Applicant will identify specific staging areas during final design.

The Applicant proposes to establish temporary stringing sites within or adjacent to the final route approved by the MN PUC. The sites would be approximately 2.8 acres in size and spaced two miles apart.

The Applicant proposes to establish fly-in sites that would be approximately 10 acres in size, located as near to the ROW as possible, and approximately 5 to 7 miles apart. These sites would be in place for less than 1 year (likely 6 months) and are used to assemble structures for helicopter (sky crane) construction. Upland areas with prior disturbance will be preferred; however, there may be some areas where this is not feasible and other areas would be used. The Applicant will identify fly-in sites during final design.

Additional details of the proposed Project and construction methods are provided in Section 2.7 through Section 2.11.

## 2.2 Applicant's Objectives

According to their federal and state permit applications, the Applicant's decision to move forward with the proposed Project is primarily driven by three factors: 1) the opportunity to access new hydroelectric generation capacity in Manitoba, 2) the projected electricity shortages in their service territory and across the region by 2020, and 3) the potential to use hydroelectric power to complement the Applicant's existing wind energy investments in North Dakota. As described in their certificate of need application, the Applicant's evaluated a wide range of alternative methods to meet their long-term goals, and determined that the proposed Project best meets their objectives and provides other benefits to their region and customers.[36] The complex relationship between the three factors listed above and the need for this transmission line is the central issue of the MN PUC's ongoing certificate of need proceeding for this proposed Project.[37] The purpose of this Environmental Impact Statement (EIS), on the other hand, is to provide the information needed by federal and state regulators to make informed decisions on whether to issue permits for the proposed Project and what permit conditions would be in the public interest.

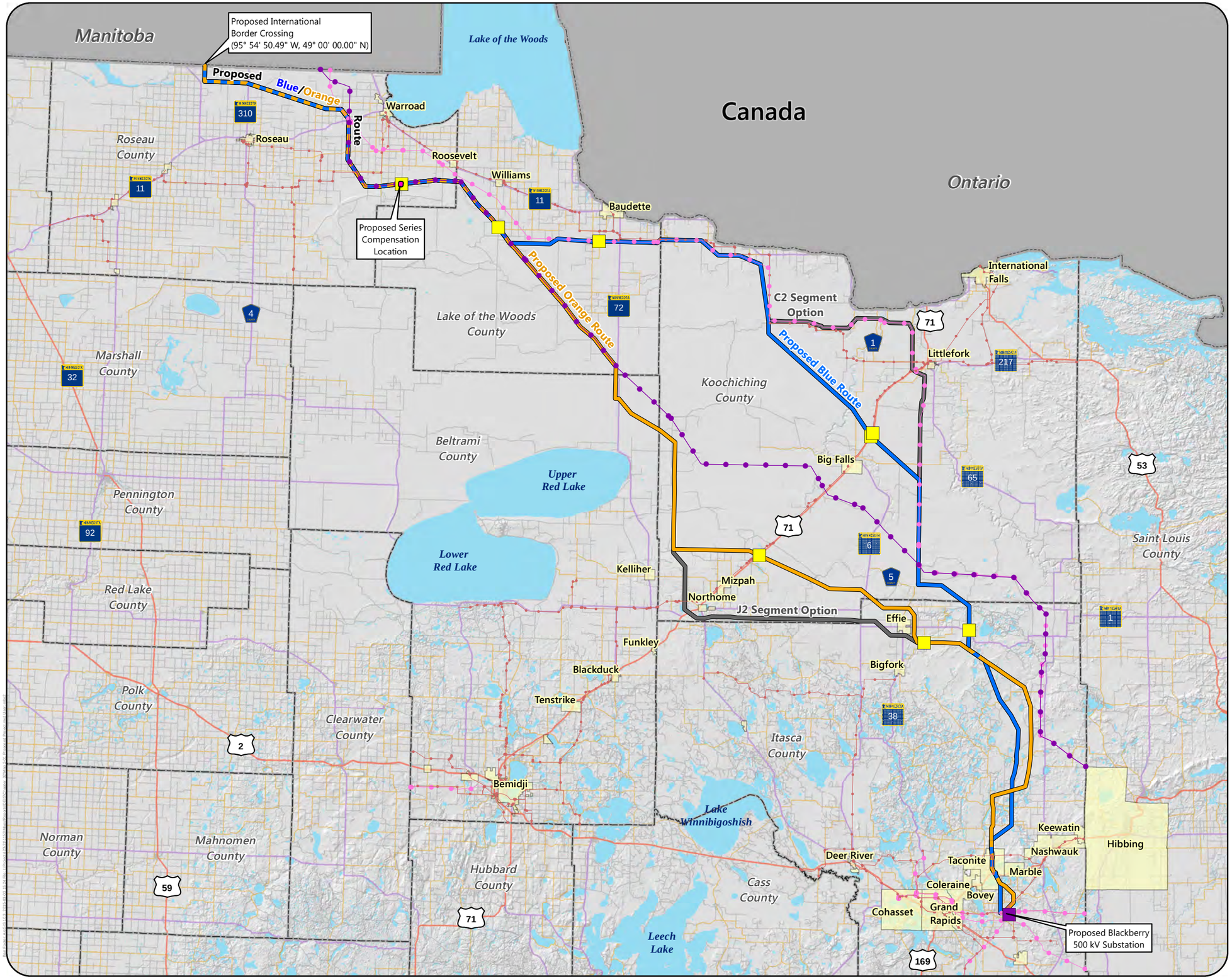
### 2.2.1 Manitoba Hydroelectric Capacity

Manitoba Hydro is a Canadian Crown Corporation and the province's major energy utility. It currently operates 14 hydroelectric generating stations on the Winnipeg, Saskatchewan, and Nelson rivers in Manitoba with a total generating capacity of more than 5,000 megawatts (MW), and has supplied power to Minnesota since 1970. The existing Manitoba hydroelectric facilities already supply approximately 10 percent of Minnesota's electrical needs. Manitoba Hydro estimates that up to 5,000 MW of additional hydroelectric capacity could be developed in the province if there were sufficient demand for the power and more transmission capacity.[38] According to Midcontinent Independent System Operator's (MISO) Manitoba Hydro Wind Synergy Study,

36 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line,* MN PUC Docket No. E015/CN-12-1163

37 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line,* MN PUC Docket No. E015/CN-12-1163

38 Manitoba Hydro's System Development Plans, http://www.cce.umn.edu/documents/cpe-conferences/mipsycon-papers/2012/manitobahydrossystemdevelopmentplan.pdf, accessed December 15, 2014




Map 2-01

**PROPOSED PROJECT**
Great Northern Transmission Line
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Manitoba Hydro is looking to expand its hydro system by 2,230MW over the next 15 years.[39]

Manitoba-based hydropower is currently exported to the U.S. on four high-voltage transmission lines: one 500 kV transmission line and three 230 kV transmission lines. However, only two of these transmission lines directly connect into Minnesota. One is a 230 kV transmission line that is jointly owned by Minnkota Power Cooperative and the Applicant, and the other is the 500 kV Forbes-Riel transmission line owned by Xcel Energy.

Both of these transmission lines cross the Manitoba-Minnesota border near Roseau, Minnesota, and connect into substations on Minnesota's Iron Range. The 230 kV transmission line crosses the Manitoba-Minnesota border approximately four miles north-northwest of County Road 137 and 540th Avenue and connects into the Shannon Substation near Hibbing, Minnesota. Xcel Energy's 500 kV transmission line crosses the international border about 1.5 miles west of the 230 kV transmission line and connects to the Forbes Substation. From there, a separate 500 kV transmission line continues from Forbes to the Chisago Substation near Minneapolis-St. Paul.

The proposed Project would add a new high-capacity grid connection between Manitoba's hydroelectric generation facilities and the U.S. The proposed Project is part of the Applicant's long-term plan, called EnergyForward, to shift from primarily coal-fired generation to an approximately equal mix of coal, natural gas, and renewables. Recent regional transmission studies have shown that these existing transmission tie lines from Manitoba cannot accommodate significant additional energy transfers into the U.S.[40]

On July 2, 2014, Manitoba Hydro was granted approval to build a new hydroelectric station on the Nelson River: the 695 MW Keeyask Generating Station. This approval was based in part on the recent power agreements between Manitoba Hydro and the Applicant (described below), as well as an agreement with another U.S. electric utility. Manitoba Hydro started building the Keeyask Generating Station on July 16, 2014.

39 https://www.google.com/search?sourceid=navclient&aq=&oq=Miso+Manitoba+Hydro+wind+energy+study&ie=UTF-8&rlz=1T4NDKB_enUS570US570&q=Miso+Manitoba+Hydro+wind+energy+study&gs_l=hp....0.0.0.13675.....0.oBT5HzE-xNA

40 See, e.g., https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={B4350025-B874-47BE-AC84-365B2239B082} at 19

The major remaining barrier to increasing Manitoba hydroelectric power delivery to the U.S. is the lack of transmission capacity. Therefore, the Applicant's primary objective is to add at least 383 MW of new reliable transmission capacity between their system and Manitoba Hydro's system in order to meet their long-term resource-mix and wind-energy storage goals.

### 2.2.2 Northeast Minnesota and Regional Energy Demand

The proposed Project is designed to be able to transmit enough capacity to meet the Applicant's 383 MW requirements as well as an additional 500 MW—up to a total of 883 MW— in order to accommodate the Applicant's agreements with Manitoba Hydro and other projected requirements in the MISO region.[41] Both MISO and the Applicant believe that a new 500 kV transmission line—which can carry a total of up to 883 MW of electric power—is needed to meet long-term regional needs, especially as industrial load in Minnesota's Iron Range continues to increase. As described in more detail below, the MN PUC is reviewing the Applicant's analysis of these issues in its ongoing certificate of need proceeding.[42]

Not only would the new transmission line help meet long-term regional needs, but it would enhance system reliability. An unplanned outage of the existing 500 kV transmission Riel-Forbes tie line is the second largest contingency in the MISO footprint.[43] Developing a second 500 kV transmission tie line from Manitoba to the Iron Range would reduce loading on the existing Riel-Forbes 500 kV transmission line and improve the performance of the transmission system during such a contingency.[44]

41 Midcontinent Independent System Operator (MISO) is an independent, not-for-profit regional transmission organization responsible for maintaining reliable transmission of power in 15 U.S. states and the Canadian province of Manitoba. MISO also provides independent, equal, and non-discriminatory access to the electric transmission system. MISO's efficient market operations ensure and support increased grid reliability.

42 *In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, MN PUC Docket No. E015/CN-12-1163

43 A contingency is the loss or failure of a part of the power system (e.g. a transmission line). Current electric utility operating policies require that each utility's power system must be able to withstand and recover from any "first contingency" or any single failure such as the loss of a major component like the Riel-Forbes 500 kV transmission line.

44 See, e.g., https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={B4350025-B874-47BE-AC84-365B2239B082} at 19

The Applicant supplies retail electric service to 144,000 customers, and wholesale electric service to 16 municipalities, within a 26,000 square-mile area in northeastern Minnesota. It operates transmission and distribution systems, including 8,866 miles of transmission lines and 169 power substations, including the existing Blackberry Substation, where the proposed Project would interconnect.

The Applicant has historically generated the majority of its electricity from coal-fired units located in northern Minnesota and west-central North Dakota. However, as part of their two most recent integrated resource plans submitted to the MN PUC, the Applicant included a portfolio of North Dakota wind resources and a 250 MW power purchase agreement (PPA) with Manitoba Hydro.

Subsequently, in the docket that approved a 250 MW PPA with Manitoba Hydro, the MN PUC affirmed that the Applicant had significant projected deficits in capacity and output over the period 2020-2035, and therefore, the company "would need a significant additional amount of peaking capacity and energy to meet its future capacity and energy needs."[45] The details regarding the relationship between the Manitoba Hydro 250 MW agreements, the Applicant's demand forecast, and this proposed transmission line is part of the MN PUC's ongoing certificate of need proceeding.[46]

### 2.2.3 North Dakota Wind Energy Renewable Optimization Opportunity

Since 2012, the Applicant has constructed nearly 500 MW of wind capacity at its Bison Wind Energy Center in south-central North Dakota near the town of New Salem. Once the 200 MW Bison 4 project is operating, the total wind energy produced by the four Bison wind projects will already bring the company to the verge of meeting Minnesota's energy standard of 25 percent renewable energy by in 2015, nearly ten years before the statute's 2025 deadline.

The Applicant's North Dakota wind facilities at times produce more energy than they need or can sell to other utilities. Therefore, any cost-effective method to store and dispatch wind energy would add value to their wind energy investment. The Applicant has determined that a new 500 kV transmission tie line with the Manitoba hydroelectric system would not only provide them with additional hydroelectric capacity, but it would also provide an opportunity to optimize and use what would otherwise be excess wind energy on Manitoba Hydro's system such that it can be dispatched when it is needed.

Therefore, in addition to the 250 MW PPA, the Applicant negotiated an Energy Exchange Agreement that allows the Applicant to sell excess wind energy to Manitoba Hydro when their North Dakota wind production is high and not needed for customer load. This in turn would allow Manitoba Hydro to reduce the flow of water through their hydropower plants during high wind periods, storing hydro energy by increasing the water stored behind those generating stations. The water stored during this process could be used later to generate electricity to be scheduled to Minnesota when wind energy production is low.

The Applicant and Manitoba Hydro also recently finalized the critical commercial terms for an additional 133 MW "Renewable Optimization Agreement" that the Applicant will also submit to the MN PUC for approval once the agreement has been formally approved by both parties. As summarized above, the Energy Exchange Agreement (which is part of the PPA) and the Renewable Optimization Agreement allow the Applicant and Manitoba Hydro to optimize the use of both wind-generated energy and hydropower. The PPA and the Energy Exchange Agreement were approved by the MN PUC on February 1, 2012.[47] If the MN PUC approves the additional 133 MW renewable optimization agreement, the total capacity of the recent Manitoba Hydro agreements would be 383 MW.

## 2.3 Applicant's Route Selection Process

### 2.3.1 Summary of Process

The Applicant began their route selection process with a 20,000 square mile study area and undertook an iterative process that used several routing factors and rounds of public involvement meetings to narrow the initial study area, first into study corridors, then into preliminary route alternatives, and finally into refined route alternatives. From August 2012 to November 2013, the Applicant organized more than 75 agency and public meetings and, as noted in Section 1.4.3, prior to DOE and Minnesota Department of Commerce – Energy Environmental Review and Analysis (DOC-EERA) joint scoping meetings, the Applicant placed advertisements in 11 local and regional newspapers along the proposed Project corridor to invite the

45 MN PUC Order approving the Minnesota Power – Manitoba Hydro Purchased Power Agreement and Energy Exchange Agreement, MN PUC Docket No. E-015/M-11-983, February 1, 2012

46 In the Matter of the Request by Minnesota Power for a Certificate of Need for the Great Northern Transmission Line, MN PUC Docket No. E015/CN-12-1163

47 MN PUC Docket No. E-015/M-11- 938 ("938 Docket")

public to local agency and public meetings and to announce meeting times and locations. Copies of newspaper tear sheets and affidavits are available at the DOC-EERA e-dockets website.[48]

### 2.3.2 Study Area

The boundary of the Applicant's 20,000 square mile study area was generally developed to include the proposed Project endpoints, extending from the Minnesota-Manitoba border to the delivery location at the proposed Blackberry 500 kV Substation. The boundaries of the Applicant's study area are described in further in their Presidential permit and Route Permit applications (Minnesota Power 2014, reference (1)).

The counties in the western one-third of the Applicant's study area are primarily agricultural, characterized by a relatively dispersed population with several small, distributed population centers. The communities in these more agricultural areas to the west value the economic activities of agriculture, tourism, and manufacturing.

The counties in the eastern two-thirds of the Applicant's study area are mostly wetlands, peatlands, and forested areas with lower population density areas and large tracts of federal, state, and county owned lands located throughout the middle of the study area including southern Lake of the Woods County, northern Beltrami County, and Koochiching County. Population density increases moving south and east, with Itasca and Beltrami counties having the highest population in the study area, concentrated in large population centers such as Bemidji and Grand Rapids and Iron Range cities. The economies of the communities in this region are centered on mining, tourism, and manufacturing with relatively little agriculture.

#### 2.3.2.1 Study Corridors

The Applicant developed several study corridors within the study area by reviewing information on environmental and human settlement, meeting with stakeholders, and performing broad environmental and engineering analyses. The Applicant's study corridors were generally 5 to 20 miles wide and met the Applicant's objective of avoiding constraints such as densely populated areas, U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuges, American Indian Lands and Reservations, Minnesota Scientific and Natural Areas (SNAs), large lakes and areas with a high-density of lakes and large wetland complexes, and contiguous areas of relatively undisturbed natural resources. The Applicant then evaluated the study corridors based on the following factors:

**Constraints**: Routing constraints as defined as resources or conditions that could limit or prevent transmission line development. Avoiding those resources was a goal, but not necessarily a requirement, of the Applicant's route development process. Constraints identified by the Applicant included areas restricted by regulations, or areas where impacts on resources will be difficult to mitigate.

**Opportunities**: Opportunities are defined as resources or conditions that will facilitate the proposed Project development, for example pre-existing linear infrastructure or other features (for example, roads, transmission lines, and public land survey divisions of land) along which the proposed Project development will be particularly compatible. These opportunities are viewed by the Applicant as avenues to facilitate the proposed Project development by reducing impacts from constraints.

**Technical Guidelines**: Technical guidelines are defined as the specific engineering requirements and objectives associated with the construction of the proposed Project. These technical guidelines are specific to the proposed Project and provide the technical limitations related to the design, ROW requirements, and reliability concerns.

#### 2.3.2.2 Preliminary Route Alternatives

The Applicant developed a network of potential route segments to compare and evaluate potential route alternatives. The network included opportunities for corridor sharing while avoiding areas with a high concentration of constraints, such as municipalities, and minimizing proximity to residences.

Once the network was developed, the Applicant analyzed the potential impacts associated with the route segments. The first step was to compare groups of smaller routes (contiguous route segments typically 3 to 10 miles long) that had common start and end points and were based on the Applicant's opportunities, constraints, and technical considerations identified in Section 2.3.2.1. When all other factors were relatively equal, the Applicant generally gave preference to the route that had fewer residences in its proximity, less impact on wetlands, and was the shortest length.

Preliminary route alternatives were presented to the public at a second round of open house meetings and to individual agencies during spring 2013. These

48 E-dockets number 14-21, document ID 20149-103236-01 is available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showeDocketsSearch&showEdocket=true

meetings provided the public and agencies with updated information and facilitated the collection of comments for use in the next step of the route development process.

#### 2.3.2.3 Refined Route Alternatives

The Applicant screened the preliminary route alternatives and defined the refined route alternatives based on feedback from stakeholders and the public and further analysis of the routing factors. Each route alternative was 1,000 to 3,000 feet wide.

The Applicant presented the refined route alternatives to the public at a third round of open house meetings and to individual agencies in the fall 2013. Again, the Applicant used these meetings as an opportunity to both inform stakeholders about the proposed Project and to gather additional information from the public and agencies for use in the route development process.

At the beginning of project planning, the Applicant anticipated development of two transmission lines and associated facilities – the proposed Project and a separate 345 kV transmission line between the proposed Blackberry 500 kV Substation and the Arrowhead Substation near Hermantown, Minnesota. Subsequently, the Applicant determined that there were not sufficient transmission service requests to support this 345 kV transmission line. Therefore, the Applicant is not pursuing the 345 kV transmission line at this time.

### 2.3.3 Border Crossing - Applicant Considerations and Preference

The proposed border crossing location is identified by the Applicant in its October 2014, amended Presidential permit application to DOE. While multiple alternate border crossings were considered during the development of proposed Project, the Applicant and Manitoba Hydro identified the proposed border crossing location as their preferred crossing due to concerns related to First Nations in Canada and environmental impacts affecting the viability of alternate border crossings. Details regarding the Applicant's border crossing selection process, including the factors and alternate border crossings they considered, are described in Section 4.11 of the April 2014 Presidential permit and Route Permit applications.[49]

#### 2.3.3.1 Border Crossing - Manitoba Hydro Considerations and Preference

Key border crossing considerations for Manitoba Hydro included determining route options that balance natural and engineering considerations while taking into consideration feedback from the public, stakeholders, and aboriginal communities. Manitoba Hydro identified Option A7 as the best option based on all considered factors. Option A1 and Option A2 were not feasible as they traverse areas of high biological diversity in Manitoba that have been noted by agencies and environmental non-governmental organizations and primarily traverse Crown lands, which have been criticized as a routing approach by the Clean Environment Commission. Additionally, Option A1 and Option A2 could raise significant concerns from First Nation communities in terms of traditional uses of the area. Manitoba Hydro maintains a website for the Manitoba-Minnesota Transmission project that details the Environmental Assessment and route selection process.[50]

#### 2.3.3.2 Border Crossing - Decision Process

Option A6 and Option A7 were infeasible from the Applicant's perspective because the associated route on the U.S side of the border would affect too many homes, farmland, and a state designated area of outstanding biological diversity. Options A1 and A2, however, were infeasible from Manitoba Hydro's perspective, so these crossings were removed from further consideration. Additionally, Manitoba Hydro preferred the most western crossing (Option A5) over the east crossing (Option A3/A4), since access to the east crossing (Option A3/A4) would also require the selection of a route with more potential environmental impacts.[51]

Therefore, Manitoba Hydro and the Applicant agreed that Option A5 was the best and only feasible Border Crossing Option, taking into account its acceptability to parties, environmental impacts, community impacts, and overall proposed Project schedule (Minnesota Statutes, section 216E.02, subdivision 3). Section 4.11 of the April 2014 Presidential permit and Route Permit applications (reference (1) describes DOE's consideration of border crossing alternatives during the scoping process.

49 Available at: http://www.greatnortherneis.org/Home/documents or http://mn.gov/commerce/energyfacilities//resource.html?Id=33849

50 Available at: https://www.hydro.mb.ca/projects/mb_mn_transmission/index.shtml

51 Available at: http://www.greatnortherneis.org/Home/documents or http://mn.gov/commerce/energyfacilities//resource.html?Id=33849

## 2.4 Applicant's Proposed Routes

The following provides a detailed description of the locations for the Applicant's proposed route alternatives and segment options (Map 2-1).

### 2.4.1 Blue Route

The Blue Route is the Applicant's Preferred Route. The Blue Route would originate at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. It would proceed southeast 0.5 miles to 410th Street, approximately 0.16 of a mile from the intersection of 410th Street and County Road 3. The Blue Route would travel south 2 miles to 390th Street and turn east following 390th Street for 10.5 miles (where 390th street then turns into County Road 118). At 0.25 miles from Highway 310 the proposed line would turn southeast and continue for another 12 miles. At 0.5 miles from 510th Avenue, the proposed line would again turn and travel 2.3 miles east to join the existing Minnkota Power 230 kV line. The Blue Route would parallel the existing Minnkota Power 230 kV line southeast for 1.8 miles and then turn south where it would meet the existing Xcel 500 kV line. Beginning at a tenth of mile north of US Highway 11, the proposed transmission line would parallel the existing Xcel 500 kV line route for 36 miles after which it would turn east, leaving the Xcel 500 kV line 2 miles southeast of the intersection of Faunce Forest Road and 19th Street Southwest in Lake of the Woods County.

The Blue Route would proceed east for 5.8 miles and then turn northeast to rejoin the existing Minnkota Power 230 kV line at its intersection with Pitt Grade Trail. The proposed line would then parallel this existing 230 kV line in an easterly direction for 31 miles to a point 1.5 miles west of the County Road 86 in Koochiching County where it would then proceed southeast for 8.3 miles and then south for 1.8 miles. At this point, the Blue Route would be roughly 1.5 mile south from the intersection of County Road 32 and County Road 36 in Koochiching County. The line would then continue southeast for 21.3 miles and intersect Highway 71 roughly 4.5 miles northeast of Big Falls, where it would continue an additional 9.6 miles to the southeast where it would rejoin the existing Minnkota Power 230 kV line, following the existing line in a southerly direction for 12.3 miles.

The Blue Route would continue south for 3 miles following Deer River Line Road (also called County Road 62). The transmission line would turn east for 3.5 miles and then turn southeast again and travel 5 miles to Itasca County near the intersection of County Road 523 and South Lofgrin Forest Road. The proposed line would extend south for 6.4 miles, turning slightly southeast for another 2.8 miles, and then head south for 11.5 miles. At 2.8 miles north of Scooty Lake, the Blue Routewould continue to travel 7.5 miles south to County Road 530, where it would cross the West Fork Prairie River. At County Road 530, the proposed line would again turn south and continue 6.5 miles to County Road 57. The line would turn southwest for 3.7 miles, and then head south for 3.8 miles to Diamond Lake Road. The route then heads south, southeast for 2.7 miles. At the Swan River, Blue Route heads south for 4.4 miles where it would meet the existing Minnesota Power 230-kV line, paralleling it for 1 mile to the Blackberry 500 kV Substation near Grand Rapids, Minnesota. The Blue Route is 220 miles in length.

### 2.4.2 Orange Route

The Orange Route originates at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County and continues south for approximately 2.5 miles. The Orange Route then heads east for 11 miles to Minnesota TH 310. From Section 2, Township 163N, Range 40W, the Orange Route proceeds southeast for 12 miles to Section 26, Township 163N, Range 38W.

From there, the Orange Route continues east for 2.5 miles to the existing Minnkota Power 230 kV transmission line. The Orange Route follows the 230 kV transmission line southeast for 1.75 miles to the existing Xcel Energy 500 kV transmission line. From this point, the Orange Route follows the existing Xcel Energy 500 kV transmission line to Section 25, Township 157N, Range 31W.

The Orange Route then heads south for 4.75 miles to Section 24, Township 156N, Range 31W. The Orange Route then heads east for 0.5 mile, crossing TH 72, then southeast for 10.5 miles to Section 21, Township 155N, Range 29W. The Orange Route continues south for 16.0 miles to Section 9, Township 152N, Range 29W.

From there, the Orange Route continues east for 12.0 miles to Section 8, Township 152N, Range 27W. The Orange Route then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. The Orange Route then continues east for 5.0 miles, southeast for 4.25 miles, and then east for 4.0 miles to Section 11, Township 162N, Range 62W.

The Orange Route then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. The Orange Route then heads east for 6.0 miles to Section 6, Township 161N, Range

24W. The Orange Route then proceeds southeast for 11.5 miles to Section 3, Township 60N, Range 23W. The Orange Route then heads south for 15.0 miles, staying east of Bear Lake and Wolf Lake, to Section 15, Township 58N, Range 23W.

From there, the Orange Route continues southwest, utilizing an old Minnesota Power ROW to Section 26, Township 58N, Range 24W. The Orange Route then heads south, between Bass Lake and Lawrence Lake, to Section 11, Township 56N, Range 24W. From there, it follows an existing 115 kV transmission line south to Section 23, Township 56N, Range 24W. The Orange Route continues southeast, between Holman Lake and South Twin Lake, for 4.0 miles to Section 5, Township 55N, Range 23W. From there, the Orange Route heads south for 1.0 mile to the existing Minnesota Power 115 kV transmission line. The Orange Route follows the existing 115 kV transmission line southwest and then south to the new substation location. The Orange Route is 220 miles in length.

### 2.4.3 Segment Options

Based on comments received from the public and agencies during its route selection process, the Applicant identified two additional route segments as potential options, which it included in its Presidential permit and Route Permit applications (Minnesota Power 2014, reference (1)). These segment options, according to the Applicant, would have the following impacts compared to the primary route.

- The Applicant compared two segments for the Blue Route: Segment Option C1 which is a segment of the Blue Route, and its alternative segment - Segment Option C2. Segment Option C1 is shorter, and goes through undeveloped forest, whereas Segment Option C2 is longer, parallels an existing transmission line, and is closer to residences.
- The Applicant compared two segments for the Orange Route: Segment Option J1 which is a segment of the Orange Route, and its alternative segment - Segment Option J2. Segment Option J1 goes through undeveloped forest, whereas Segment Option J2 is closer to residences.

#### 2.4.3.1 Segment Option C1

Segment Option C1, which is the equivalent part of the Blue Route, begins in Section 22, Township 158N, Range 27W. This segment continues to the southeast, cross-country, for 32 miles to the Minnesota Power 230 kV transmission line in Section 6, Township 65N, Range 25W.

#### 2.4.3.2 Segment Option C2

Segment Option C2 begins in Section 22, Township 158N, Range 27W and follows the Minnkota and Minnesota Power 230 kV transmission line east and then south for 47.0 miles to Section 6, Township 65N, Range 25W.

#### 2.4.3.3 Segment Option J1

Segment Option J1, which is equivalent part of the Orange Route, begins in Section 9, Township 152N, Range 29W. From there, Segment Option J1 heads east for 12.0 miles to Section 8, Township 152N, Range 27W. It then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. Segment Option J1 continues east for 5.0 miles; southeast for 4.25 miles; and east for 4.0 miles to Section 11, Township 162N, Range 62W. Segment Option J1 then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. Segment Option J1 then heads east for 6.0 miles to Section 6, Township 161N, Range 24W. Segment Option J1 proceeds southeast for 5.0 miles to Section 8, Township 61N, Range 24W.

#### 2.4.3.4 Segment Option J2

Segment Option J2 begins in Section 9, Township 152N, Range 29W. It heads southeast for 2.5 miles; south for 6.0 miles; and then southeast for 2.0 miles to Section 36, Township 151N, Range 29W. Segment Option J2 then heads east for 26.0 miles to Section 24, Township 62N, Range 27W. It then heads southeast for 3.0 miles, crossing TH 1. Segment Option J2 then heads east for 2.0 miles, crossing TH 38, then southeast for 2.0 miles to Section 1, Township 61N, Range 26W. Segment Option J2 heads east for 6.0 miles to Section 6, Township 161N, Range 24W. It then heads southeast for 5.0 miles to Section 8, Township 61N, Range 24W.

### 2.4.4 Route Alternatives Considered but Rejected by Applicant

The Applicant considered numerous factors when selecting the two proposed route alternatives. Potential western route options were eliminated from further analysis for the following reasons:[52]

**Timing Considerations Associated with Public Opposition**: Based on the amount of property it would have to acquire, and the likelihood of

52 See Chapter 4 of the Presidential permit/Route Permit Application for a detailed description of the Applicant's route development and screening process.

resistance from landowners, the Applicant estimated the time it would take to construct the transmission line. As part of that estimation, the Applicant took into consideration the possibility that it would have to conduct time-consuming condemnation proceedings, including Minnesota condemnation law.

Because the western-southern routes would involve a larger number of privately owned parcels, many of which are used for residential or agricultural purposes, and because public meeting attendees in the vicinity of the western and southern routes voiced more numerous and strenuous objections, the Applicant concluded that using the western-southern routes would make achieving the contractually-determined June 1, 2020, in-service date unlikely. Not achieving the June 1, 2020, in service date would be inconsistent with the Applicant's statement of purpose and need for the proposed Project. On this basis, the Applicant eliminated the western-southern routes from further consideration.

**Impacts on Community**: The density of human settlement in the areas west and south of Red Lake is much higher than areas further to the east. The least populated western-southern route had a higher percentage of private land, and more than twice the number of homes within a 3,000-foot potential route width, than the eastern routes (Table 2-1). The least impactful of the western and southern routes on communities also crossed through more than 2,646 acres of agricultural land, as compared to 79 to 90 acres for the eastern routes.

The portion of the route south of Red Lake is an area of particularly dense human settlement, and numerous lakes. In addition, the area is home to a number of wild rice lakes, which are seasonally flooded and provide transitional habitat to several avian species. All of the western-southern routes would have to cross this area south of Red Lake. One of the Applicant's goals when constructing any project is to have a positive impact on the affected communities. The Applicant concluded that the higher population density and negative reaction from residents near the western and southern routes would threaten that goal. The Applicant accordingly concluded that the western-southern routes do not satisfy its objective to positively impact communities. That failure was a second, independent reason to eliminate the western-southern routes from further consideration.

**Availability of Western Border-crossing Options**: The proposed Project depends on the alignment of the permitted international border crossings in Manitoba and Minnesota. During the negotiations regarding the international border crossing, the Applicant and Manitoba Hydro agreed to eliminate the westernmost international border crossing area because it was less desirable than other international border crossing options for a number of reasons, including effects on human settlement and the environment. The elimination of the westernmost international border crossing necessarily eliminated the westernmost route alternatives, which were exclusively associated with that international border crossing.

**Table 2-1 Comparison of Resources Types in the Western and Eastern Regions**

| Resource Type | Western Region | Eastern Region |
|---|---|---|
| Number of houses/section | 1.76 | 0.5 |
| Acres of farmland/section | --- | --- |
| All Agricultural Land(1) | 442 | 65 |
| Prime farmland(2) | 89 | 27 |
| Prime farmland if drained(2) | 203 | 99 |
| Farmland of statewide importance(2) | 157 | 54 |
| Acres of forestland/section | 113 | 395 |
| Acres of wetlands/section | 97 | 435 |
| Acres of forested wetlands/section | 43 | 394 |
| Acres of public land/section | 65 | 482 |
| Acres of private land (does not include corporate land)/section | 566 | 123 |
| Acres of corporate land/section | 0.3 | 29 |

*Source: Minnesota Power2015, reference (8)*

(1) Acreages were calculated using data from Minnesota Department of Natural Resources (MnDNR) Gap Analysis Program (GAP) Level 2 Data for "Farm/Crop".

(2) Acreages were calculated using data from U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Soil Survey Geographic Database (SSURGO).

**Limited Opportunities for Corridor Sharing**: MN PUC's routing criteria for high-voltage transmission lines favor routes that parallel existing high-voltage transmission lines (corridor sharing) to the greatest extent practicable. The Orange and Blue routes that the Applicant presented in its Presidential permit and Route Permit applications both parallel existing transmission lines along large sections of the route (Minnesota Power 2014, reference (1)). The potential western route alternatives, on the other hand, do not parallel any existing high-voltage transmission lines. While this factor did not require the elimination of the western route alternatives, it does make those route alternatives less desirable from the state's regulatory perspective. The Applicant considers the limited opportunities for corridor sharing to be an additional reason for excluding the western routes from further analysis

## 2.5 Technical Description

### 2.5.1 Number of Circuits

The Applicant proposes to construct a single-circuit 500 kV alternating current (AC) overhead transmission line.

### 2.5.2 Operating Voltage and Frequency

The nominal three -phase operating voltage for the proposed Project will be 500 kV AC. The proposed Project will be operated at a frequency of 60 Hertz (Hz).

### 2.5.3 Conductor Specifications

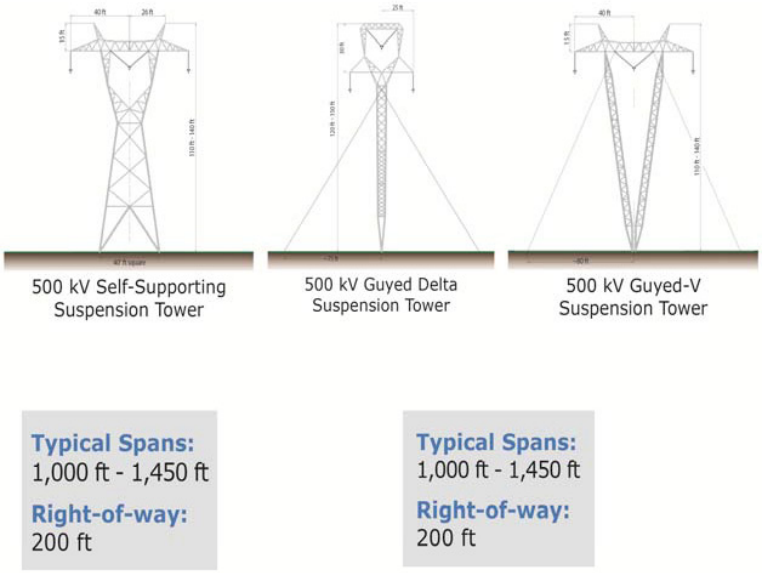
The Applicant anticipates using a 3-bundle 1192.5 thousand circular mil (kcmil) aluminum conductor steel reinforced (ACSR) "bunting" with 18 inch sub-spacing as the conductor for the proposed Project. This 3-conductor bundle is the same as that used on the U.S. portion of the existing Riel-Chisago 500 kV transmission line (and so will look the same). The Applicant will, however, perform a conductor optimization study before a final determination is made on conductor selection and bundle configuration.

### 2.5.4 Typical Supporting Structure

The Applicant is evaluating several structure types and configurations, including a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed-delta structure (Figure 2-1). It is currently estimated that 4 to 5 structures will be needed per mile of transmission line. The type of structure in any given location of transmission line will depend on land type and land use.

The structures will typically range in height from 100 to 170 feet, depending on the structure type and the terrain. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures may be required. The structures would be placed approximately 1,000 to 1,450 feet apart, with a maximum span of 1,700 feet. Where the transmission line crosses farmland, the Applicant would use self-supporting lattice structures to minimize interference with farm operations.

**Figure 2-1 Structure Schematics**



On cultivated land or in areas of intensive land use, the Applicant anticipates using self-supporting lattice structures. In other areas where guy wires will not significantly interfere with land use, the proposed Project may be installed on one of the guyed structure types. The area of permanent impact for guyed structures is anticipated to be 33 square feet per structure with a temporary construction disturbance footprint of approximately 0.92 acres per structure. Structure types are illustrated in Figure 2-1.

The self-supporting suspension towers (or structures) will be anchored to foundations at each leg of the structure. The guyed-delta and guyed-V structures will utilize a single foundation system at the center of the structure and a set of at least four guys and anchors per structure. The anchors used will vary depending on terrain.

The Applicant anticipates using either a single I-string or a V-string insulator assembly. The structures will support two overhead static ground wires to protect from lightning. In each case, one of the overhead static ground wires will have a fiber optic core to enable communications and system protection functions between the two endpoints.

### 2.5.5 Structure Spacing

The Applicant anticipates that the proposed Project typically would be located on all new ROW that is approximately 200 feet wide. A wider ROW (250 to 300 feet in width) may be required for longer spans, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. Generally, structures will be typically be spaced approximately 1,000 to 1,450 feet apart with shorter or longer spans as necessary. Longer spans may be needed to cross areas such as waterbodies or watercourses, or in areas where special design requirements are dictated by topography.The maximum span is anticipated to be 1,700 feet with an average span of 1,250 feet.

The Applicant identified that spans would be adjusted such that structures, where practicable, would avoid open water and transportation corridors. To the greatest extent possible, waterways would be spanned in the same location as existing disturbances or ROWs; otherwise, the proposed Project would be designed to cross waterways perpendicularly to the extent practical to minimize visual effects of the proposed Project for recreational users of the waterways.

### 2.5.6 Conductor Spacing

Lateral spacing of phase conductor bundles would vary with the various types of structures and would range from approximately 25 to 40 feet.

### 2.5.7 Line to Ground and Conductor Side Clearances

The required clearances at the structure, horizontal distance between each energized phase, and the minimum required ground clearance will be determined based on electrical studies during detailed design of the proposed Project. All clearances would meet or exceed the recommended clearances in the National Electric Safety Code (NESC). Based on preliminary design criteria for the proposed Project, minimum ground clearance for the conductors is estimated to be 40 feet.

### 2.5.8 Wind and Ice Loading

Wind and ice loading for the proposed Project will incorporate three NESC loading cases required for this area of the U.S.; Rule 250B, Rule 250C, and Rule 250D. Rule 250B, the NESC heavy district loading case, specifies a wind velocity of 40 miles per hour (mph), 0.5 inch of ice, and a wire temperature of 0° Fahrenheit (F). This loading case requires an additional NESC constant of 0.3 pounds per foot for the sag and tension calculations. Additional NESC Rules include:

- NESC Rule 250C considers extreme wind loading. A wind velocity of 90 mph at 60° F is the weather condition that satisfies the NESC Rule 250C loading.
- NESC Rule 250D considers an extreme ice load with a concurrent wind load. For the study area, an ice thickness of one-half inch, a wind gust speed of 50 mph and a wire temperature of 15° F satisfies the conditions of NESC Rule 250D.
- NESC Rules 250C and 250D, as well as American Society of Civil Engineers (ASCE) Manual No. 74: "Guidelines for Electrical Transmission Line Structural Loading," provide default 50-year values for extreme ice and wind. The Applicant will conduct a weather study to identify additional reliability-based wind and ice load cases to be considered during detailed design of the proposed Project.

### 2.5.9 Requested Route Width

The Applicant's proposed routes vary from 650 to 3,000 feet wide in order to provide flexibility during

detailed design, in part to try to accommodate landowner's preferences once the route is selected by the MN PUC. See Section 1.3.1.4 for a summary of the applicable state regulatory definitions of ROW and route that allow flexibility in the Route Permit. The Applicant's requested route widths and anticipated alignments are shown on the detailed maps provided in Appendix A of the Applicant's Route Permit Application.[53]

## 2.6 Associated Facilities

### 2.6.1 Blackberry 500 kV Substation

The proposed Project would terminate at a new 500 kV substation located on the same site as the Applicant's existing Blackberry 230/115 kV Substation, adjacent to and east of the existing substation, and will be designed to accommodate the new 500 kV transmission line, 500/230 kV transformation, existing 230 kV transmission lines, and all associated 500 kV and 230 kV equipment. Existing 230 kV and 115 kV transmission lines currently located on the property will also need to be rerouted. The Applicant has entered a purchase option agreement with the owner of the property adjacent to and east of the existing approximately 8.8-acre Blackberry 230/115 kV Substation. The proposed Blackberry 500 kV Substation will permanently impact approximately 17.8 acres.

### 2.6.2 500 kV Series Compensation Station

The proposed Project would require a 500 kV series compensation station to be located within or adjacent to the final approved route. The series compensation station will include the necessary 500 kV series capacitor banks and all associated 500 kV equipment. The 500 kV series compensation station will permanently impact approximately 60 acres.

The location of this facility would be determined by several factors that affect the design of the transmission line and the series capacitor equipment, including the voltage profile along the transmission line and the available fault current at the series capacitors. Since both of these factors are directly affected by the overall length of the transmission line between the existing Riel Substation in Manitoba and the proposed Blackberry 500 kV Substation in Minnesota, the final location of the 500 kV series compensation station is dependent on the final route determinations in both the U.S. and Canada.

The Applicant initiated electrical design optimization studies to identify the preferred location for the 500 kV series compensation station. Based on these studies, candidate sites in Minnesota include the overall midpoint of the line and at one-third of the overall transmission line distance from the Riel Substation to the Blackberry 500 kV Substation.

### 2.6.3 Regeneration Locations

The Applicant proposes to locate three regeneration stations within or adjacent to the final route approved by the MN PUC. The sites would be 75 feet by 75 feet and located on uplands.

### 2.6.4 Permanent Access Roads

The Applicant proposes to establish a permanent "2-track" trail on uplands within the permanent 200-foot right-of-way as a result of construction traffic. This "2-track" trail would be an unimproved road and it is assumed that there would be no grading or filling for this permanent access road.

### 2.6.5 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

The Applicant has indicated that it would be necessary to construct temporary access roads outside of the ROW and that they would work with local property owners to identify suitable access locations during final design. The Applicant would be required in state and federal approvals to coordinate with the applicable agencies to reduce construction impacts of these temporary access roads. A typical temporary access road width of 16 feet is anticipated.

The Applicant proposes to establish a main staging area for temporary storage of materials and equipment. Such an area would include sufficient space to lay down material and pre-assemble some structural components or hardware. Other staging areas located along the ROW would be limited to a structure site for laydown and framing prior to structure installation. The Applicant will identify specific staging areas during final design. Generally, the laydown areas will be approximately 20 to 40 acres, they will be located along suitable roadways approximately 40 to 50 miles apart, and will be within five miles of the final route approved by the MN PUC. The Applicant has indicated that upland areas with prior disturbance will be preferred for siting staging areas; however, there may be some areas where this is not feasible and other areas would be used. Staging areas would be in place for

53 Available at: http://mn.gov/commerce/energyfacilities//resource.html?Id=33849

at least one year and will be used to store equipment and materials and include the construction offices.

Similar to laydown areas, the Applicant proposes to establish fly-in sites that would be approximately 10 acres in size, located as near to the ROW as possible, and approximately 5 to 7 miles apart. Upland areas with prior disturbance would be preferred; however, there may be some areas where this is not feasible and other areas would be used. These sites would be in place for less than 1 year (likely 6 months) and will be used to assemble structures for sky crane construction. The Applicant would identify final fly-in sites during final design.

The Applicant proposes to establish temporary stringing sites within or adjacent to the final route approved by the MN PUC. The sites would be 200 feet by 600 feet with a two-mile spacing, normally located near mid-span on the centerline of the ROW. The rope machine, new conductor wire trailers, and tensioner would be located at the wire stringing set- up area. This phase of construction would occur after the structures have been erected, and fitted with stringing blocks (also called dollies or sheaves) and single -leader p-line ropes that reach the ground. Crewmembers would monitor the progress of stringing to ensure the sock does not get hung up in the dollies. One phase at a time, the conductor wire bundles would be pulled to the appropriate tension. Once all three phases have been tensioned, they would be clipped into place utilizing permanent suspension hardware.

If stringing and hard line set-up areas in wetlands are required when surface conditions are not stable, extensive use of timber matting may be required. The most effective means to minimize impacts on water areas during construction would be to span streams and rivers by placing structures above the normal high water level. Where waterways must be crossed by construction equipment, the Applicant would need to commit to using temporary clear span bridges in the applicable water crossing permit to minimize the impact on the waterway. For those waterways that cannot be crossed with construction equipment, workers might walk across or use boats during wire stringing operations to pull in the new conductors and shield wires, or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures would need to be employed to minimize soil erosion and prevent sedimentation of the waterways. The Applicant would also be required to ensure that equipment fueling and lubricating occurs at a reasonable distance from the waterways.

### 2.6.6 Establishing the Final Alignment

After working with landowners and completing detailed engineering work, the Applicant would establish the final alignment for the project and structure placements. These plans (known as "plan and profiles") must be provided to the MN PUC so that the MN PUC can confirm that the Applicant's plans are consistent with the Route Permit and to ensure all permit conditions are met prior to construction of the project.

The Applicant indicated that final alignment and structure placement would be coordinated with the following entities to minimize human and environmental impacts:

**Individual landowners**: The Applicant indicated that during ROW acquisition, the placement of individual structures would be coordinated with property owners, to the extent practicable. Minor shifts to the anticipated alignment would be evaluated once a route is chosen, to minimize visual impacts for landowners.

**Mining operators and mineral lessees**: The Applicant has indicated they would work with existing mine operators and mineral lessees to identify the extent of current and planned mining operations and develop appropriate mitigation measures. These measures may include adjustments to structure placement or ROW alignment within the route.

**Minnesota Department of Transportation (MnDOT)**: The proposed Project would be designed in accordance with NESC to minimize impacts on transportation. The NESC defines the basic clearance requirements between transmission lines and transportation structures (for example, roadways, and railways). Placement of public utilities on or near state ROW would be designed in accordance with the Utility Accommodation Section of the MnDOT Utility Accommodation and Coordination Manual.

**Minnesota Department of Natural Resources (MnDNR) and USFWS**: The Applicant has indicated that they would continue to work with the MnDNR to minimize impacts on sensitive forested areas within the state forests through structure placement and ROW alignment. Similarly the Applicant would work with the MnDNR and USFWS to site the transmission line to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoid habitats that are breeding grounds or feeding areas, to the extent practical. The Applicant would work with USFWS to determine structure configuration that is least

detrimental to wildlife. Applicant would work with USFWS to ensure that construction and on-going use of the transmission line avoids and minimizes impacts to fish and wildlife to the fullest extent practicable.

**U.S. Army Corps of Engineers (USACE)**: The Applicant would avoid and minimize adverse impacts to wetlands and other aquatic resources during construction. This would be accomplished by spanning wetlands and aquatic resources, where practical, and implementing best management practices (BMPs). These avoidance and minimization measures would be incorporated into a Clean Water Act Section 404 permit and Section 401 certification issued by USACE and Minnesota Pollution Control Agency (MPCA), respectively, prior to construction. The applicant will continue to work with the USACE to develop a compensatory wetland mitigation plan that meets agency requirements for unavoidable wetland impacts.

## 2.7 Route Width, Right-of-Way, and Anticipated Alignment

The Applicant has requested in their permit applications to have route widths that vary from 650 feet up to 3,000 feet in some limited areas. The new 500 kV structures would require a 200-foot ROW, 100 feet on either side of the of the transmission line alignment. The anticipated alignment–centerline of the transmission line–would be located within the ROW.

## 2.8 Bulk Power System Information

### 2.8.1 Expected Power Transfer Capability

The proposed Project is designed to increase the total transfer capability between the U.S. and Manitoba by at least 750 MW. This information is required by DOE's Presidential permit regulations (10 Code of Federal Regulations (CFR). Section 205.322(b)(3)(i)). The Applicant will supplement this information after completion of additional MISO system impact studies.

### 2.8.2 System Power Flow

System power flow plots are schematic diagrams of the flow of electric power in an interconnected system. DOE regulations for a Presidential permit require system power flow plots for the Applicant's proposed service areas for heavy summer and light spring load periods, with and without the proposed international interconnection, for the year the proposed Project is scheduled to be placed in service and for the fifth year thereafter (10 CFR. Section 205.322(b)(3)(ii)).

Initial power flow plots for the years 2020 and 2025 are included in Appendix K of the original Presidential permit application. Additional information required under the applicable DOE regulations is found in other sections of the Presidential permit application or will be developed later in accordance with DOE guidance. The Applicant will provide DOE any additional information required under 10 CFR. Section 205.322(b)(3)(v).

### 2.8.3 Weather Events

The Riel – Forbes 500 kV line (described in Section 2.2.2) is the largest of the four existing transmission lines that connect Manitoba and the United States. The Orange Route parallels this existing 500 kV transmission line for 59.9 miles, while the Blue Route parallels this existing 500 kV transmission line for 36.2 miles.

The main impact of locating the Project adjacent to the existing 500 kV transmission line is the perception that the physical proximity of the two 500 kV transmission lines would increase the likelihood of an unexpected simultaneous outage of both lines. In practice, according to the Applicant, unexpected transmission line outages are rare, and simultaneous unexpected outages of parallel transmission lines not sharing a common structure are even rarer (Minnesota Power 2014, reference (1)). Unexpected transmission line outages occur for a number of reasons. In this case, the primary concerns are with extreme weather events and equipment failures.

The Applicant would address potential simultaneous outages of the proposed Project and the existing Riel-Forbes 500 kV transmission line due to weather events by developing a weather study to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the proposed Project may be adjusted to increase the robustness of the design for those lengths where the proposed Project parallels the existing 500 kV transmission line.

Where design criteria cannot fully address potential simultaneous outages due to weather events, as is the case with tornadoes, the Applicant would consider further mitigation as appropriate to enhance restorability. This could include more frequent use of anti-cascade towers, maintaining an increased supply of emergency spare towers, or even locating a permanent storage facility for emergency

spares on or near the location where the proposed Project parallels the existing 500 kV transmission line.

The Applicant would address potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to lightning events by installing shield wires and single pole tripping, a protective relay scheme that allows power to continue being transferred over the line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning.

The Applicant would address potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to equipment failures by maintaining appropriate separation distances between the proposed Project and the existing 500 kV transmission line.

The Applicant would evaluate the steady state and dynamic performance of the regional transmission system after a simultaneous outage of the two 500 kV transmission lines for both north and south flow conditions in the electrical design optimization studies for the proposed Project. These studies should identify any potential electrical problems with this event and if there are any reasonable electrical design considerations that will improve the performance of the system during this event.

Once the proposed Project is in service, the reliability impacts in the United States of a simultaneous outage of the proposed Project and the existing 500 kV transmission line will be addressed by modifying the existing special protection system associated with the four current Manitoba to United States transmission tie lines to include the proposed Project and associated facilities. In the event of an unexpected simultaneous outage of the proposed Project and the existing 500 kV transmission line, the modified special protection system will be set up to preserve the integrity of the system based on the operating studies for the proposed Project.

### 2.8.4 Interference Reduction Data

Direct and indirect impacts of the proposed Project on radio, television, and cellular telephone signals are addressed in detail under Electrical Interference in Section 5.2.1.5. This information is required under applicable DOE regulations (10 CFR. Section 205.322(b)(3)(iii)).

Radio and television interference is generated by corona[54] occurring on the conductors. The Applicant would select conductor size and bundle configuration to minimize corona levels, which will in turn minimize radio and television interference.

This transmission line will use extra high voltage hardware, appropriate construction techniques, and a transmission line configuration that yields a low level of corona, which will minimize the onset of gap discharges, which in turn will minimize television interference. The proposed Blackberry 500 kV Substation will also be designed to minimize corona.

If television or radio interference is caused by the operation of the proposed Project in areas where good reception was available prior to construction of the proposed Project, the Applicant will inspect and repair 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 interference from corona discharges does occur for an AM radio station within a station's primary coverage area with good reception before the proposed Project was built, satisfactory reception can be obtained by appropriate modification of the receiving antenna system.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel transmission line structure) may experience interference because of the signal blocking effects of the structure. Moving either mobile unit by less than 50 feet so that the metallic structure is no longer immediately between the two units should restore communications.

If necessary, the Applicant will work with tower operators to resolve any issues directly related to the proposed Project.

### 2.8.5 Relay Protection

The transmission line would be equipped with protective devices to safeguard the public 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 transmission line connects to the substation. The protective equipment is designed to de-energize the transmission line should such an event occur.

The proposed Project's protective relaying systems will use microprocessor-based devices that conform

54 Corona is defined as small electrical discharges which ionize surrounding air molecules

to the requirements of the Institute for Electrical and Electronics Engineers, North American Electric Reliability Corporation (NERC), and the Midwest Reliability Organization (10 CFR. Section 205.322(b)(3)(iv)). Specific protection schemes, equipment, and functional devices will be determined during the proposed Project's detailed design phase.

## 2.9 Land Acquisition

### 2.9.1 Transmission Line Right-of-Way

The Applicant would need to acquire easement rights so the 200-foot-wide ROW can cross privately owned land as well as federal land that requires ROW agreements. The evaluation and acquisition process includes examining titles, contacting owners, surveying, preparing documents, and purchasing the property and easements. Each of these activities is described in more detail below.

The first step in the ROW process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities would be built. To compile this list, an ROW agent or other persons engaged by the utility would complete a public records search of all land involved, to determine the legal description of the property and the owner(s) of record, and to gather information regarding easements, liens, restrictions, encumbrances, and other conditions.

After all private and public owners are identified, an ROW representative would contact each property owner or the property owner's representative. The ROW agent would explain the need for the transmission facilities and how the proposed Project may affect their land. The ROW agent would also ask the landowner if they have any specific construction concerns. The Applicant has indicated that construction activities would be limited to the ROW, and permanent and temporary access roads, unless access permission is obtained from landowners. Fences, gates, and similar improvements that are removed or damaged would be repaired or replaced.

The next step in the acquisition process is to evaluate the specific parcel. For this work, the ROW agent would request permission from the owner for survey crews to enter the property to conduct preliminary survey work. The ROW agent may also ask to take soil borings to assess the soil conditions and determine appropriate foundation design. The soil is analyzed by an experienced geotechnical testing laboratory. Design surveys are conducted to locate the ROW as well as natural features, man-made features, and associated elevations for use during the detailed engineering process.

During the evaluation process, the location of the proposed transmission line may be staked with permission of the property owner. This means that the survey crew would locate each structure on the ground and place a surveyor's stake to mark the structures' anticipated locations. The ROW agent can then show the landowner where the structure(s) would be located on the property. The ROW agent may also delineate the boundaries of the easement area required for operating the transmission line safely.

Prior to acquiring easements, the Applicant (and landowner potentially) would collect appraised land value data for similar properties in the area as described below. Based on how the easement or purchase will affect the market value of each parcel, a fair-market-value offer will be developed. The ROW agent would contact the property owner to present the offer and discuss the amount of just compensation for the rights to build, operate, and maintain the transmission facilities within the easement area. The offer would include an amount to cover reasonable access to the area. The agent would also provide maps of the transmission line easement or site, as well as maps showing the landowner's parcel.

The landowner would be allowed time to consider the offer and to present any material that the owner believes is relevant to determining the property's value and the value of the easement. In nearly all cases, utilities are able to work with landowners to address their concerns, and an agreement is reached for the utility's purchase of land rights in the form of an easement. When a negotiated settlement cannot be reached, the landowner may choose to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain, pursuant to Minnesota Statutes, chapter 117. The process of exercising the right of eminent domain is called condemnation. State and federal land is not, however, subject to eminent domain. The Applicant would have to obtain permits or licenses to cross these federal and state owned land as described in Section 1.2.3 (federal interest land) and Section 1.3.3 (state land).

Before commencing a condemnation proceeding, the ROW agent must obtain at least one appraisal for the property on which the proposed easement is to be acquired and a copy of that appraisal must be provided to the property owner in accordance with Minnesota Statutes, section 117.036, subdivision 2(a). The property owner may also obtain another

property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Statutes, section 117.036, subdivision 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with a value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility would file a petition in the district court where the property is located and would serve the petition on all owners of the property. If the court grants the petition, it would appoint a three-person condemnation commission that will determine the compensation for the easement. Once appointed, the commissioners would schedule a viewing of the property over and across which the transmission line easement is to be located.

Next, the condemnation commission would schedule a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The condemnation commission would then make an award as to the value of the easement acquired and file it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury will hear land-value evidence and render a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the ROW acquisition process, the ROW agent would discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the transmission line, fences, crops, or livestock may need special consideration. Fences, for instance, may need to be moved, 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 ROW agent and construction personnel would coordinate these activities with the landowner.

### 2.9.2 Minnesota PPSA "Buy the Farm" Provision

The Minnesota Power Plant Siting Act provides land owners the option of requiring the utility to condemn a fee interest in land contiguous to the proposed HVTL easement. Known as the "Buy the Farm" provision, it reads in part as follows:

Minnesota Statutes section 216E.12, subdivision 4. **Contiguous land**. "(a) When private real property that is an agricultural or nonagricultural homestead, nonhomestead agricultural land, rental residential property, and both commercial and noncommercial seasonal residential recreational property, as those terms are defined in section 273.13 is proposed to be acquired for the construction of a site or route for a high-voltage transmission line with a capacity of 200 kilovolts or more by eminent domain proceedings, the owner shall have the option to require the utility to condemn a fee interest in any amount of contiguous, commercially viable land which the owner wholly owns in undivided fee and elects in writing to transfer to the utility within 60 days after receipt of the notice of the objects of the petition filed pursuant to section 117.055. Commercial viability shall be determined without regard to the presence of the utility route or site. Within 60 days after receipt by the utility of an owner's election to exercise this option, the utility shall provide written notice to the owner of any objection the utility has to the owner's election, and if no objection is made within that time, any objection shall be deemed waived."

### 2.9.3 Blackberry 500 kV Substation

Land for the proposed Blackberry 500 kV Substation has been secured adjacent to and east of the Applicant's existing Blackberry 230/115 kV Substation. The Applicant has entered a purchase option agreement with the owner of the property. The purchase agreement would be executed upon receiving the necessary regulatory permits.

### 2.9.4 500 kV Series Compensation Station

Additional property would also be required for the proposed Project's 500 kV series compensation station. Based on electrical design optimization studies and route selection, the Applicant has identified a candidate site for the compensation station that is located at the approximate midpoint of the Minnesota portion of the transmission line.

The Applicant may then seek to obtain purchase option agreements with the owners of the identified properties along the route selected by the MN PUC. Once the route has been determined, the Applicant would execute the appropriate purchase agreement.

### 2.9.5 Regeneration Site Locations

Additional property would also be required for the proposed Project's regeneration sites. Based on electrical design optimization studies and route selection, the Applicant has identified seven candidate sites for the regeneration sites that are

located along both the Proposed Blue Route and Proposed Orange Route.

The Applicant may then seek to obtain purchase option agreements with the owners of the identified properties along the route selected by the MN PUC. Once the route has been determined, the Applicant will execute the appropriate purchase agreement.

### 2.9.6 Permanent Access Roads

The Applicant anticipates that a permanent, unimproved "2-track" access trail would be established on uplands within the ROW as a result of construction traffic. This "2-track" trail would be unimproved with no grading or filling.

### 2.9.7 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

Preliminary site selection is underway by the Applicant, however the Applicant would not determine locations for the temporary access roads, laydown areas, fly-in sites, or stringing areas until the route has been chosen and permitted by the MN PUC. The fly-in sites would accommodate the use of helicopters (sky cranes) for personnel transportation, structure and conductor installation, and transport of materials such as insulator assemblies, foundation materials, anchors, mats, or other equipment.

## 2.10 Preconstruction Activities

Preconstruction activities include preparation and approval of the certificate of need and the route permit applications, completing the required environmental review and surveys, coordinating and obtaining all other necessary permits and approvals, performing the studies, surveys, and engineering necessary for the design of all transmission line and substation facilities, and acquiring ROW easements.

## 2.11 Construction Procedures

The Applicant has indicated that they would retain an environmental inspector during project construction, responsible for understanding all of the conditions of the proposed Project's environmental permits and ensuring that contractors abide by these conditions. These Applicant proposed measures are potential MN PUC Route Permit conditions.

The Applicant has indicated that construction crews would follow local, state, and federal regulations with regard to construction noise, dust, and timing. Construction crews would comply with local, state, and NESC standards regarding installation of facilities and standard construction practices. Established Applicant and industry safety procedures would be followed during and after construction of the proposed Project, including clear signage during all construction activities.

### 2.11.1 Transmission Line ROW

#### 2.11.1.1 Landowners

Once access to the land has been granted and all necessary approvals have been obtained, the Applicant would coordinate with landowners to prepare the ROW for construction.

#### 2.11.1.2 Coordination with Local Utilities

The Applicant would also coordinate with local utilities to identify and locate underground utility lines to minimize conflicts. As construction progresses, information would be provided to local emergency services to inform personnel of upcoming activity and impacts of the work as well as to plan for emergency situations on the construction site, should they occur. The Applicant would coordinate and provide the necessary requirements for any short term road or lane closure with the appropriate authority, including emergency services. Prior to construction, the Gopher State One-Call utility locating service will be utilized to identify buried utilities that must be avoided during construction, including pipelines and any associated distribution lines.

The Applicant would also coordinate the appropriate construction measures to protect buried pipelines or electric lines where they must be crossed by heavy equipment. If any disruptions to the electrical system are required during construction, the Applicant or the contractor will contact the appropriate utility or electric cooperative to schedule planned disruptions.

#### 2.11.1.3 Coordination with Transportation Authorities

Preparation for construction begins with developing access points from existing roads. The Applicant would work with state and local officials to coordinate and minimize any impacts during construction and operation of the proposed Project. The Route Permit will direct the Applicant to comply with Minnesota MnDOT and all applicable road authorities' management standards and policies during construction. The Route Permit also will direct the Applicant to provide written notice of construction to MnDOT and applicable city, township, and county road authorities. Under the Route Permit, the Applicant would be required to

restore the ROW, temporary work space, access roads, abandoned ROW, and any other lands affected by construction. This could include the replacement of living snow fences affected by construction activities.

Installation of additional temporary access points would be subject to review and approval of highway officials. Construction staff will implement traffic control measures in accordance with the MnDOT Manual on Uniform Traffic Control Devices. Stringing of new overhead conductors over highways may require installation of temporary wooden pole guard structures or other measures to safeguard the public and construction forces during the stringing process.

The Applicant has indicated that construction activities and timing would be announced through their proposed Project website[55] in an effort to minimize conflicts with local recreational activities.

#### 2.11.1.4 Vegetation Clearing

The Applicant would have to clear all woody vegetation and brush within the 200-foot-wide ROW requested for the transmission line to ensure that facilities can be safely and efficiently constructed, operated, and maintained. A reasonably level temporary access path is necessary so construction equipment can pass safely. At structure locations, a stable working surface free of tripping hazards is necessary for installing foundations and guy anchors and for assembling and erecting structures.

Vegetation would be cut at or slightly above the ground surface. Rootstock would be left in place to stabilize existing soils and to regenerate vegetation after construction. With the approval of the landowner or land manager, stumps of tall-growing species would be treated with an approved herbicide to discourage re-growth.

Surveys will be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species. Detailed survey procedures and monitoring processes would be negotiated with the USFWS and MnDNR as appropriate to minimize and avoid impacts on resident and migratory wildlife. For example, the appropriate construction windows would be incorporated into the construction schedule to minimize impacts on species such as bald eagle and goshawk in areas where these species are found to be present.

The Applicant proposed the following mitigation measures regarding forest clearing to minimize impacts to birds and bats:

- Surveys would be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species.
- Appropriate construction windows would be incorporated into the construction schedule to minimize impacts on species such as bald eagle and goshawk in areas where these species are found to be present.
- The Applicant would work with USFWS and MnDNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant will incorporate industry best practices, which are consistent with the APLIC's 2012 guidelines.
- The Applicant would select a transmission line alignment during detailed design to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoiding habitats that act as breeding grounds or feeding areas to the extent practical.

With regard to rare and unique species, USFWS first preference is to only allow the ROW to be cleared or mowed in the fall or winter before the breeding season. If this is not possible, under limited circumstances the Applicant would have a qualified biologist conduct surveys for active nesting birds and bats prior to construction. If active nesting locations are identified during the surveys, the Applicant proposes to avoid nest sites during the breeding season and to identify construction restraints that would avoid disturbance to nesting birds.

The Applicant would conduct surveys for sensitive plants during appropriate periods of the growing season to properly identify their presence and/or absence along the selected ROW before clearing begins. If sensitive plants or communities are identified during surveys, individual avoidance and minimization measures would be evaluated and submitted to the appropriate regulatory agencies.

The Applicant would conduct surveys for native prairie areas and other sensitive plant communities such as calcareous fens along the selected ROW. These areas can be first refined through a desktop analysis. If sensitive resources are encountered, construction plans that minimize the impacts, such as shifting structure locations or implementing construction techniques that avoid or minimize

55 Available at: http://greatnortherntransmissionline.com/

impacts on these resources, would be developed and submitted to the appropriate regulatory agencies.

To minimize the potential for tire and chassis damage to construction equipment, and to maintain a safe, level, temporary access path during construction, incidental stumps would be removed.

Merchantable timber would be cut to standard log lengths and stacked along the ROW. To the extent practical, the Applicant will work with the landowner to determine a mutually agreeable means of disposing of the cleared material, such as chipping, burning, or stacking for landowner use or sale. Vegetation clearing debris (that is, un-merchantable trees, brush, and slash) may be cut and scattered, placed in windrow piles, chipped, or burned, depending on location.

Finally, the Applicant proposes the following mitigation measures to reduce the spread of non-native plant species during construction:

- The Applicant would retain an environmental inspector during Project construction. Working on behalf of the Applicant, the environmental inspector would be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- Regular, frequent cleaning of construction equipment and vehicles.
- Minimization of ground disturbance to the greatest degree practicable; and rapid revegetation of disturbed areas with native or appropriate non-native, seed mixes.
- The environmental inspector would conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction would identify infestations of the ROW and staging sites.
- New infestations within the ROW would be addressed and eradicated as soon as practicable in conjunction with property owners input.

Also, construction vehicles, including the undercarriage, would be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area. The introduction and establishment of noxious weeds would be minimized by prompt revegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements. No Minnesota Department of Agriculture (MDA) or MnDNR prohibited noxious weed seeds will be allowed in any revegetation seed mix. Seed mix composition will be coordinated with MnDNR on all state lands. Seed mixes used for the proposed Project will be certified as weed free. Only clean straw mulch will be used; meadow hay would not be allowed as mulch.

#### 2.11.1.5 Soil Management

The Applicant has indicated that to the extent practical, soil disturbance and excavation activities in steep slope areas would be avoided. Where disturbance and excavation cannot be avoided entirely, the Applicant has indicated it will be minimized by using BMPs such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize impacts during construction. Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff. Erosion control practices will be inspected during construction, especially during significant precipitation events. Environmentally sensitive areas or areas susceptible to soil erosion would require special construction techniques. These techniques may include using low ground pressure equipment, matting, terracing, water bars, bale checks, rock checks, or temporary mulching and seeding of disturbed areas exposed during long pauses in construction activity.

The Applicant has indicated that construction of the proposed Project would occur in wetlands and wet soils during frozen conditions to the extent practical to minimize soil compaction. Construction mats would be used to help protect wet soils where encountered during construction. Regular, frequent cleaning of construction mats on the ROW would be performed as appropriate to avoid the introduction and minimize the spread of invasive species.

Permanent soil erosion control measures may include permanent seeding, mulching, erosion control mats, or other measures depending on site conditions. Temporary silt fences, sedimentation ponds, and other measures may be used to prevent sediment from running off into wetlands or other surface waters.

#### 2.11.1.6 Spill Management

Construction equipment would be inspected frequently to ensure hydraulic systems and oil pans

are in good condition and free of leaks. Portable spill containment kits would be required for each piece of construction equipment with the potential to discharge a significant amount of oil into the environment. Operators would be present at the nozzle at all times when refueling is in progress.

To minimize the potential for contamination of groundwater, Spill Prevention Control and Countermeasure (SPCC) plans will be developed and maintained during the construction and operation of the proposed Project. Oil products and hazardous materials will be stored inside appropriate containment, and any spills of oil or hazardous materials will be mitigated immediately in accordance with the procedures in the SPCC plan. In the event of a spill, the source of the spill would be identified and contained as soon as it is discovered. The spill and contaminated soils would be collected, treated, and disposed of in accordance with all applicable federal, state, and local requirements.

If a significant spill were to occur to surface waters, methods for containing and recovering released material such as floating booms and skimmer pumps would be used. Noticeably contaminated soils would be excavated, placed on, and covered by plastic sheeting in bermed areas. An emergency response contractor would be secured, if necessary, to further contain and clean up a severe spill. Equipment would not be refueled in wetlands. In addition, no petroleum products, herbicides or pesticides or hazardous chemicals of any kind should be mixed or poured or otherwise handled in wetland areas.

#### 2.11.1.7 Cultural Resource Management

In the event that protected species or archaeological and historic architectural sites are encountered during construction activities, project management personnel would consult with regulatory authorities regarding appropriate construction procedures and mitigation measures, which would be determined through applicable regulatory procedures. Any cultural resource issues that might arise, would be addressed by using agreed-upon methods as outlined in a Programmatic Agreement (PA). The National Historic Preservation Act (NHPA) Section 106 process, which is summarized in applicable sections of Chapter 5, will be undertaken to identify and avoid resources of potential concern. This effort includes identifying and avoiding eagle nesting areas, which can be considered important cultural resources to tribes.

#### 2.11.1.8 Structure Construction

Construction materials would be hauled either directly to structure sites from the local highway or railroad network, or brought first to material staging areas and then to the structure sites.

The transmission line components, including the structures, conductor, and hardware, are normally brought to the temporary staging areas on flatbed trucks. These materials are stored until needed and then loaded on flatbed trailers or special structure trailers for delivery to the structure site where they are unloaded for installation.

Where reinforced concrete foundations are required, large rubber-tired or track-mounted auger equipment is used to excavate a circular hole of the appropriate diameter and depth. In upland areas, excavated material would be spread evenly around the structure base to promote site drainage. Reinforcing steel and anchor bolts are set in position. Ready-mixed concrete is then placed in the excavation.

In wetland areas, a telescoping temporary steel caisson would be placed in the foundation hole to stabilize the soil walls. Water pumped from the excavation would be either 1) appropriately filtered prior to discharge at the site, 2) placed in tanker trucks or empty concrete trucks and hauled to a specially designated upland disposal area, or 3) brought back to the concrete batch plant for discharge. Concrete truck wash-water would be discharged only in specially designated upland disposal areas or at the concrete batch plant.

After the concrete is poured, the steel caisson is removed. In some situations, a permanent caisson may be required to stabilize the excavation. During drilling, a minimal amount of granular material (from an outside source) may be placed in the area between the caissons and the matting (if required at that location) to provide safe footing for construction personnel.

The Applicant and its contractors would remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts. Regular, frequent cleaning of construction equipment and vehicles on the ROW would occur. Restoration of cleared ROWs, storage areas, and access roads would minimize the extent of disturbed areas and limit the potential for dust generation.

When the site is later restored, the granular material would be leveled or removed to reinstate the original ground contours for re-vegetation of native species. Once the foundation concrete has been placed, excess excavated materials would be transported by truck to a suitable upland site for disposal.

After allowing adequate curing time, the baseplate structures are bolted to the concrete foundations.

In some cases driven-piling foundations may be required, as well as temporary and permanent guy anchors, large rubber-tired or track-mounted pile-driving equipment would be used to install the foundation. Additional fixtures or a concrete pile cap may also be attached to the piling foundation as necessary for structure setting. Piling foundations generally result in little or no generation of spoils or dewatering requirements.

Once the structures have been completed and appropriate stringing equipment has been installed, wires can be strung. The wire-stringing process would begin in a set-up area prepared to accommodate the stringing equipment and materials, normally located near mid-span on the centerline of the ROW.

Using stringing blocks, pulley ropes and other equipment, and with careful monitoring by the construction crew, the wires are finally strung and clipped into place. If set-up areas in wetlands have unstable surface conditions, timber matting may need to be used. The Presidential permit and Route Permit applications provide a more detailed description of the wire-stringing process (Minnesota Power 2014, reference (1)).

#### 2.11.1.9 Management of Water Resource Impacts

The most effective means of minimizing impacts on water areas during construction is to span streams and rivers by placing structures above the normal high water level, restrict vehicular activity within riparian corridors, and minimize use of heavy equipment when clearing riparian corridors. The Applicant has indicated that structure spans would be adjusted such that structures, where practicable, would avoid open water and stockpiled material would be contained away from stream banks and lake shorelines. Where construction equipment must cross waterways, the Applicant would seek the appropriate permits and use temporary clear span bridges to minimize adverse effects. Turbidity control methods would be implemented prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters.

For those waterways that construction equipment cannot cross, workers might walk across or use boats during wire stringing operations, or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures would be employed to minimize soil erosion and prevent sedimentation of the waterways. The Applicant would ensure that equipment is only fueled and lubricated at a reasonable distance from waterways, depending on terrain.

Structures would be located outside of floodplains to the extent practicable. The Applicant would work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures (Section 1.3.1).

Temporary impacts during construction may occur if dewatering is necessary to install the transmission structures or if pumping wells are installed to supply water for concrete batch plant operations. If dewatering or pumping is necessary, water appropriations permits would be obtained from MnDNR. If the dewatered groundwater contains substantial quantities of suspended sediments, then the water would be filtered through silt fence or bio-rolls prior to discharge.

The Applicant expects to avoid constructing the transmission line over existing wells. If crossing over wells cannot be avoided, the Applicant would work with existing landowners to develop appropriate mitigation measures.

#### 2.11.1.10 Restoration/Re-vegetation

When the site is later restored, the granular material would be leveled or removed to reinstate the original ground contours for re-vegetation. Where rutting occurs, the Applicant would repair the surface before restoring ground vegetation. Soil compaction in cultivated areas would be treated and restored through tillage operations, for example using a subsoiler.[56]

All areas of ground disturbance not permanently altered would be prepared for restoration and reseeded with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements. The Applicant has indicated that they would continue to coordinate with MnDNR to minimize and avoid impacts on plant communities on state lands through adjustments to the anticipated ROW, permit conditions, and mitigation. Where forested areas are cleared, appropriate herbaceous native seed mixes from sources as close as possible to the impacted area would be used to re-vegetate, as rapidly as possible, to prevent encroachment by non-native and noxious weed species. Where possible, reliance on natural re-

56 A subsoiler is a tillage tool that would loosen and break up soil at depths about twice that of a common farming tiller or rototiller.

vegetation would be encouraged (particularly in wetland areas).

As described above regarding vegetation clearing procedures, regular, frequent cleaning of construction equipment and vehicles on the ROW would be performed as appropriate to minimize spread of invasive species. In addition, spread of invasive species would be limited through the minimization of ground disturbance to the greatest degree practicable and rapid re-vegetation of disturbed areas with native or appropriate non-native, seed mixes. The environmental inspector would conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction would identify infestations of the ROW and staging sites. New infestations within the ROW would be addressed and eradicated as soon as practicable in conjunction with property owners input. Construction vehicles, including the under carriage, would be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area. Only clean straw mulch would be used; meadow hay would not be allowed as a mulch material because of its potential to contain seeds of invasive species.

### 2.11.2 500 kV Substation

The site of the proposed 500 kV substation is located to the east of the existing Blackberry 230/115 kV Substation near Grand Rapids. The new substation facilities would be constructed in compliance with the applicable requirements of NESC, Occupational Safety and Health Administration (OSHA), and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed. They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the substation facilities, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the site by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the substation site are disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the substation or the transmission lines entering the substation.

### 2.11.3 500 kV Series Compensation Station

The proposed 500 kV series compensation station would be constructed in compliance with the applicable requirements of NESC, OSHA, and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed. They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the proposed 500 kV series compensation station, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the site by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the proposed 500 kV series compensation station site is disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the proposed 500 kV series compensation station.

### 2.11.4 Regeneration Site Locations

The proposed regeneration sites would be constructed in compliance with the applicable

requirements of NESC, OSHA, and state and local regulations. Designs would be completed by professional engineers who are licensed in Minnesota and have relevant experience. Contractors would be committed to safe working practices.

The final designs would consider local conditions and access considerations, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. The designs would also strive to facilitate future maintenance.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific BMPs would be employed. They would be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the proposed regeneration sites, and they would take into account environmentally sensitive areas.

Once construction has been completed, the Applicant would restore the remainder of the sites by removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures.

If areas outside the proposed regeneration sites are disturbed by construction activities, they would be reseeded with vegetation similar to that which was removed, within certain height restrictions so they won't interfere with the proposed regeneration sites.

### 2.11.5 Permanent Access Roads

The Applicant anticipates that a permanent, unimproved "2-track" trail would be established on uplands within the ROW as a result of construction traffic. This "2-track" trail would be unimproved with no grading or filling.

### 2.11.6 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas

To the extent practicable, laydown areas, fly-in sites, and stringing areas would be located and arranged in a manner to preserve trees and vegetation and restored to preconstruction conditions.

Temporary access roads outside of the ROW would be required. The Applicant would work with local property owners to identify suitable access locations. Temporary roads and other temporarily impacted areas would be restored as appropriate once construction is completed.

## 2.12 Maintenance and Operation

### 2.12.1 Transmission Line

A transmission line must be inspected, maintained, and repaired over the entire life of the facility. The 500 kV transmission lines are generally inspected annually by foot, all-terrain vehicle, truck, or snowmobile, or by air. Inspections are limited to the ROW and to those areas where obstruction or terrain may require off-ROW access. The proposed transmission line would be expected to be in operation in perpetuity,

If inspectors find any problems, the Applicant would make an effort to notify the landowner before making the repairs. If damages are incurred during maintenance or repairs, the landowner would be compensated appropriately. The structures for the proposed Project would be new, so very little maintenance would be expected for many years.

Vegetation in the ROW that could interfere with operations must be removed. In most cases, the ROW would need to remain free of trees throughout construction and operation of the proposed Project; however, the Applicant has indicated that bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening would be considered on a case-by-case basis.

Vegetation maintenance for 500 kV transmission lines is typically on a 2- to 5-year cycle. Vegetation may be cleared using a combination of mechanical and hand clearing, and herbicides may be applied where allowed and approved by the landowner. Prior to maintaining vegetation in a particular area, the Applicant would make an effort to notify affected landowners. Vegetation clearing could be scheduled to avoid bird nesting periods, with the ongoing vegetation clearing schedule included as part of state or federal permits.

In addition, the Applicant would work with the USFWS and MnDNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant would incorporate industry best practices, which are consistent with Avian Powerline Interaction Committee's (APLIC's) 2012 guidelines.

### 2.12.2 500 kV Substation

Substation facilities must be regularly inspected, maintained, and repaired over the life of the facilities,

**Table 2-2 Applicant Proposed Measures to Minimize Environmental Impacts**

| Proposed Project Phase | | Applicant-Proposed Measure | Resource Impacts Addressed |
|---|---|---|---|
| Routing / Design | General Design | Incorporation of safety measures into design:<br>Design in accordance with local, state and NESC safety standards (clearances, material strengths, ROW widths, minimization of transportation impacts)<br>Protective devices including circuit breakers and relays located where the transmission line connects to the substation<br>Signage, fencing and limited access at substation | Human Settlement |
| | | Design considerations to address simultaneous outages of the proposed Project and the existing 500 kV line | Public Services & Utility Systems |
| | | Design to minimize impact area:<br>Minimization of area and coordination of location with landowners for access road<br>Siting Blackberry 500 kV Substation facilities | Land Use, forestry |
| | | Design to minimize visible impacts at specific sites (e.g., travel ways, recreation sites, Big Bog State Recreation Area, and bodies of water with access and residences) | Aesthetics |
| | | Coordination with the USFWS and MnDNR to minimize avian impacts:<br>Identification of potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors<br>Incorporation of industry best practices, consistent with APLIC's 2012 guidelines. | Wildlife |
| | | Coordination with owners of private airstrips and with aerial applicators to determine methods to improve visibility, such as installing markers on the transmission line. | Transportation |
| | Applicant Routing | Paralleling existing ROWs to the extent practical | Aesthetics, recreation and tourism, wildlife |
| | | Avoidance of/maximizing distance from residences in routing to the extent practical | Aesthetics |
| | | Perpendicular crossing of Water of the Dancing Sky Scenic Highway (Minnesota Highway 11) parallel to existing 500 kV line | Aesthetics |
| | Final Alignment | Shifts in alignment to avoid construction over existing wells, aesthetic impacts, floodplains, wetlands and bird concentration sites to the extent practical and avoidance of cultural resources in accordance with the Programmatic Agreement | Water Resources, Aesthetics, Wetlands, Wildlife, Rare and Unique Species and Communities, Archaeological and Historic Resources |
| | | Coordination with regulatory agencies to avoid and minimize effects on forest resources (including sensitive forested areas and HCVFs) on federal, state, and county-owned properties, plant communities on state lands | Forestry, Rare and Unique Species and Communities, Land Use |
| | | Placement near MnDOT ROW in accordance with MnDOT's Accommodation Policy | Transportation |
| | | Coordination with owners of private airstrips and with aerial applicators | Transportation |
| | | Coordination with existing mining operators and mineral lessees to identify the extent of current and planned mining operations | Mining |
| | Final Structure Placement | Adjustment of span and pole placement to avoid waterways (perpendicularly), wetlands, sensitive resources, and transportation corridors to the extent practical and to avoid of cultural resources in accordance with the Programmatic Agreement | Aesthetics, Water Resources, wildlife, recreation, Rare and Unique Species and Communities, Transportation, Archaeological and Historic Resources |
| | | | Human settlement, Land Use |
| ROW Acquisition | | Property or easement acquisition will be conducted in accordance with applicable state and federal regulations. | Human Settlement |
| | | Coordination with landowners through the ROW acquisition process to address unauthorized access concerns. | Recreation and Tourism |
| Permitting | | Agency Coordination:<br>Development of PA with DOE and consulting parties<br>Development of AIMP with MDA<br>Coordination with railroad authorities<br>Coordination with MnDOT, FAA, and MnDOT Office of Aeronautics | Archaeological and Historic Resources, Agricultural Production, Transportation |

| Proposed Project Phase | Applicant Proposed Measure | Resource Impacts Addressed |
|---|---|---|
| Construction | Construction in accordance with local, state and NESC safety standards (clearances, material strengths, ROW widths, construction practices including signage) | Human Settlement (Public Health and Safety) |
| | Coordination with local public service, utility and transportation authorities:<br>Lane closure coordination with local emergency services<br>Identification/protection of buried utilities<br>Scheduling planned disruptions<br>Installation of temporary access points<br>Safeguards during stringing process<br>Construction near railways | |
| | Preconstuction surveys for rare and unique natural resources:<br>Identification and avoidance of nest sites during breeding season and implementation of restraints to avoid disturbance to nesting birds<br>Identification of sensitive plants and coordination with regulatory agencies to develop individual avoidance and minimization measures<br>Identification of native prairie and other sensitive communities such as calcareous fens along the selected ROW and coordination with regulatory agencies to develop individual avoidance and minimization measures | Rare and Unique Species and Communities |
| | Minimization of construction disturbance to the extent practical:<br>Avoidance or soil disturbance and excavation in steep slope areas<br>Coordination with MnDNR to minimize impacts on sensitive forested areas<br>Limiting construction activities to ROW unless landowner permission is granted<br>Minimization of ground disturbance<br>Spanning wetlands and drainage systems where practical<br>Accessing wetland via shortest practical route | Soils, Water Resources, Vegetation, Land Use, Wetlands |
| | Development/implementation of construction BMPs:<br>Agricultural impact mitigation plans (in consultation with MDA)<br>Development of SWPPP required by the NPDES permitting process specifying BMPs (e.g., silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls, containment of stockpiled material away from stream banks and lake shorelines, use of turbidity control methods, silt fence or bio-roll filter prior to wastewater discharge to surface waters, spreading of topsoil and seeding in a timely manner, restriction of vehicular activity within riparian corridors)<br>Regular inspections of soil and erosion control BMPs particularly during significant precipitation events<br>BMPs to minimize soil disturbance and compaction (matting, ice roads, low ground pressure equipment, construction during frozen conditions on wet soils)<br>BPMs to minimize impacts to wild rice | Soils, Agricultural Production, Water Resources, Wetlands, Cultural Values (wild rice related) |
| | Development/implementation of SPCC and related BMPs<br>Refueling at sites away from wetlands and waters<br>Storage of oil products and hazardous materials inside appropriate containment<br>Immediate mitigation of spill in accordance with the procedures in the SPCC plan | Water Resources, Wetlands |
| | Minimization of opportunity for noxious weed infestation/establishment<br>Weed surveys<br>Prompt eradication of infestations<br>Inspection of construction vehicles | Noxious Weeds and Exotic Organisms |
| | Adherence to PA for cultural resource management | Archaeological and Historic Resources, Cultural Values |
| | Announcement of construction activities and timing via the Applicant's project website to minimize conflicts with local recreational activities. | Cultural Values, Recreation and Tourism |
| | Regular, frequent cleaning of construction equipment and vehicles on the ROW | Air quality, Noxious Weeds |
| | Removal of construction waste and scrap on a regular schedule or at the end of each construction phase | Aesthetics |
| Restoration | Restoration of rutted or compacted soil | Soils |
| | Prompt revegetation of all areas of ground disturbance not permanently altered (including temporary roads and staging areas:<br>Soil preparation including repairing ruts and restoration of compacted soil<br>Reseeding with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements<br>Restoration of temporarily impacted wetlands to pre-construction conditions to the extent practical<br>Restoration of MnDNR PWI wetlands according to provisions in Land and Water Crossing permits<br>Use of clean straw mulch | Soils, Agricultural Production, Vegetation, Cultural Values, Noxious Weeds and Exotic Organisms, Water Resources, Wetlands |
| | Repair of Fences, gates, and similar improvements that are removed or damaged | Land Use |
| | Regeneration of bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening will be considered on a case-by-case basis | Aesthetics |
| | Coordination with landowner on disposal method for cleared material (chipping, burning, or stacking) | Forestry |
| Operation and maintenance | Restoration of television or radio reception to pre-project conditions | Radio, Television, and Cellular Telephone |

(1) The Applicant proposed measures, along with industry BMPs, are potential MN PUC Route Permit conditions.

and vegetation that might interfere with the safe and reliable operation of the facilities must be removed.

In order to minimize potential safety impacts, the substation facilities would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

### 2.12.3 500 kV Series Compensation Station

The 500 kV series compensation station site must be regularly inspected, maintained, and repaired over the life of the facility, and vegetation that might interfere with the safe and reliable operation of the facility must be removed.

In order to minimize potential safety impacts, the 500 kV series compensation station would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

### 2.12.4 Regeneration Sites

Regeneration sites must be regularly inspected, maintained, and repaired over the life of the facilities, and vegetation that might interfere with the safe and reliable operation of the facilities must be removed.

In order to minimize potential safety impacts, the Regeneration sites would have appropriate signage, would be fenced, and access would be limited to authorized personnel.

### 2.12.5 Permanent Access Roads

The Applicant has committed to using the minimum area required for permanent access roads. Permit conditions and procedures for maintenance along permanent access roads to minimize impacts would be similar to those required for the transmission line ROW.

## 2.13 Summary of Applicant Proposed Measures to Minimize Environmental Impacts

Table 2-2 provides a summary of the Applicant proposed measures intended to minimize potential environmental impacts.

## 2.14 Estimated Costs

The Applicant has continued to refine its cost estimates since they filed their original certificate of need application in October 2013. Based on preliminary engineering considerations, the Applicant currently estimates that the construction of the proposed Project on the route alternatives or any combination of proposed segment options, including substation facilities, would cost between $495.5 million and $647.7 million (2013 dollars).

If the MN PUC selects other routes, these cost estimates may change. The major components of these preliminary estimates are shown in Table 2-3.

## 2.15 Project Schedule

The Applicant requires an in-service date of June 1, 2020, as agreed upon in the contract between the Applicant and Manitoba Hydro. Currently, the Presidential permit and Route Permit approval process (including federal and state environmental review) would be completed by early 2016. Depending on the timing of other permits, construction is estimated to begin in fall 2016, as shown in Table 2-4.

**Table 2-3 Proposed Project Cost Estimates**

| Proposed Project Components | Low End (in millions) | High End (in millions) |
|---|---|---|
| 500 kV Transmission Line | $425.6 | $570.8 |
| Blackberry 500 kV Substation | $41.0 | $45.1 |
| 500 kV Series Compensation Station | $24.7 | $27.2 |
| Existing 230 kV Transmission System Modifications | $4.2 | $4.6 |
| Proposed Project Total | $495.5 | $647.7 |

*Source: Minnesota Power 2015, reference (3)*

**Table 2-4 Proposed Project Schedule**

| Year | Month | Activity |
|---|---|---|
| 2013 | December | Certificate of Need Completeness Hearing |
| 2015 | February | Certificate of Need Environmental Report Scoping Meetings |
| | April | File Route Permit Application |
| | April | File Presidential Permit Application |
| | June | Route Permit/Presidential Permit Scoping Meetings |
| | June | Certificate of Need Environmental Report Released |
| | October | Certificate of Need Public Hearings |
| 2015 | April | Certificate of Need Decision |
| | June | Draft EIS Published |
| | June | Draft EIS Comment Meetings |
| | October | Final EIS Published |
| | November | State Final EIS Hearing |
| 2016 | January | Presidential Permit Issued |
| | February | Route Permit Issued |
| | March | Construction Permitting Starts |
| | October | Construction Begins |
| 2020 | June | Project In Service |